CHAPTER VIII. KNOWLEDGES ON PLANTOLOGY AND THE UTILIZATION OF PLANKTON

A. PLANKTON IN THE LOW LATITUDE ZONE AND THEIR ENVIRONMENTS

1. FRESH WATER PLANKTON

F. Rutter (1952) investigated into the plankton biomass in the lakes and marshes in Java and Sumatra and stated that the standing crop ranged between 1.46 and 19.52 mm^3/cm^2 with 7.6 mm^3/cm^2 as an average. The data obtained by A. Shirota (1963a, 1965) in his survey were the maximum of 14.29 g/m^3 and the mean value of 7.0 g/m^3 (mostly zoo-plankton; water temperature:25.6°C, PH: 6.5) in the Da-Nhim Dam at Dalat in the central mountain district of Viet-Nam while in the survey of an artificial marsh made by damming up a river at Quan-Long in the Ca-Mau Peninsula at the southern tip of South Viet-Nam, the maximum of 28.5 g/m^3 and the average of 8.0 g/m^3 (mostly Cyanophyta; water temperature: 27.8°C, PH: 7.2) were recorded. However, the mean plankton biomass in general lakes and marshes in Viet-Nam ranged from 0.1 to 1.0 g/m^3.

These values obtained from the tropical lakes directly under the equator as well as the lakes and marshes in Viet-Nam, which have thick no-oxygen layers deep in the water due to high water temperature and insufficient circulation of water, are similar to those obtained from the lakes and marshes in the temperate zone, indicating that there exists little difference between the tropical and temperate zones in this respect. In short, it may be said that the production is high in the lakes and marshes in an area abundant in nutrient salts (especially in cases where cities or cultivated land exist by the lake and the age of lake or marsh is 10 to 20 years) whereas the production is comparatively low in the lakes and marshes in an area poor in nutrient salts (in the case of lakes and marshes surrounded by high mountains or rocks).

If one observes the plankton in a lake throughout a year, one will find that their species and quantities vary with the changes in season (in the case of Viet-Nam, dry and rainy seasons). However, such seasonal variances are approximately same every year and therefore, if the correct record concerning the appearance of such variances or so-called "Plankton Calendar" is prepared, it will serve various purposes. Needless to say, such seasonal ups and downs arise depending on the speed of growth of individual plankton and the longevity of generation, etc., but they are also dependent on the water temperature, light intensity in the water, kinds and quantities of nutrient elements as well as the existence of growth promoting or impeding substances in the lake or the marsh. Many of zoo-plankton and

phyto-plankton live in a layer above the metalimnion while Rotifera of zoo-plankton lives principally in the metalimnion and larvae of crustacea gather near the water surface, but the adults live in a layer deeper than there.

In may cases, plankton is not distributed evenly in a lake or marsh, but they gather locally, which is due to the flow under the action of the wind and the fact that plankton having developed and increased rapidly at a place remain there. In the case of a s shallow lake, the action of wind can exert its influence down to the bottom of lake and plankton are washed away in the direction of the wind and as a result, gather in a leeward section. In the case of a deep lake, the action of the wind does not reach a deep layer beyond metalimnion and therefore the migration and subsequent gathering of plankton is limited within the surface layer. Generally, the larvae of zoo-plankton live near the shore of lake, but the plankton biomass is smaller near the shore. Accordingly, a true value cannot be obtained from the sampling near the shore.

2. MARINE PLANKTON

Though it is a common sense today that the distribution of plankton in the ocean is not uniform and its quantity is generally large in the cold sea while it is small in the tropic, this is an important conclusion obtained by V. Hensen (1889) of Germany in his expedition. Later, E. Hentscel (1936) complied the related materials systematically and prepared a model drawing as illustrated in Fig. 25.

Fig.25 Distribution of plankton biomass in the oceanic surface (model). The number on the equivalent line shows the logarithm of individual number per 1 liter. (by Hentschel)

In this model ocean, the waters abundant in plankton are the east coast as well as the south and the north Arctic and Antarctic

Oceans. The two tongue-shaped sections rich in plankton to the south and north of the equator along the east coast (the west coast of the continent) just correspond to the bases of the south and north equatorial current while the portion in between them, which is to the north of the equator and poor in plankton, corresponds to the position of equatorial counter current. As the reason for such abundant development of plankton in the sea water corresponding to the base of current, one can cite the existence of predominant upwelling.

If the wind of the same direction like monsoon wind acting as the motive force for the equatorial current blows successively, surface sea water flows away as drift current, as a compensation for which appears a deep water layer. It is the law established by A. Nathansohn (1906) that active development of plankton can be observed in the upwelling and their production expands in the direction of current. Like this, the upwelling plays an important role in the nutrient replenishment for the oceanic ecosystem, but generally the vertical distribution of animal becomes obscure there and typical abyssal animals appear at a small depth in the west coastal waters in South America or South Africa due to the upwelling of low-temperature water. (Pearse, 1939)

In the arctic ocean, the sea water stratification is very unstable, causing the upper and lower layer water to circulate well, while the upwelling of deep layer water takes place as a compensation for the cold current running towards the lower latitude. According to J. Nagai, the yearly production of phyto-plankton per 1 m^3 of sea water is 3-10 g/m^3 in the tropic and 100-140 g/m^3 (about 1/5 in the case of zoo-plankton) in the frigid zones. Accordingly, the production of plankton in the tropic is about 1/10 of that in the frigid zones. Needless to say, if the water column standing on the unit area of sea bottom is taken into consideration, the said value by far increases whereas it decreases greatly if the standing crop in a certain time section is taken up.

The cause of less standing crop in the low-latitude zone originates in the extremely small quantity of nutrient salts such as dissolved nitrate, phosphate, etc., though the passage of large quantities of mannoplankton (5 μ-20 μ) or ultraplankton (less than 5 μ) through the plankton net can also be considered as a possible cause. According to Riley (1941), the production of the sea in the tropic and subtropic is at least not inferior to that of the sea in a higher latitude. As the reason, therefore, he points it out that in the case of plankton whose generations rotate quickly due to multiplication and extinction, the

standing crop represents a value by far lower than the productivity. This point too will have to be taken into account.

Generally, in case of the sea in the temperate zone, the maximum development of phyto-plankton appears in spring and autumn and the value in autumn is somewhat lower than in spring. This is due to the fact that in these two seasons, the temperature declination (temperature difference or gradient) of the upper and lower layers becomes smaller, causing vertical mixture to take place and the bottom layer nutrient water appears in the surface layer. Such phenomenon can also be observed in lakes and marshes. The relation between nutrient salts and the multiplication of phyto-plankton can be demonstrated both in natural condition and culture experiment.

S. M. Marshall (1933) drew a conclusion from the result of his Great Barrier Reef Expedition that no seasonal changes in the development of plankton can be observed, neither qualitatively nor quantitatively, in the shallow tropical water while the increase and decrease are irregular, but are approximately similar each year. Karsten (1907) reports, asthe finding in his Valdivia Expedition, that the species of phyto-plankton vary between the ocean and coral reefs, that is, Coccolithophores, Trichodesmium and Dinoflagellata falling under Phyto-Mastigophora of Protozoa, etc. exist in large quantities in the ocean as against less Diatoms, whereas Diatoms increases near the reefs. Steuer's law was established by consolidating such seasonal changes. That is, the modes of the most active plankton multiplication period appearing in spring and autumn gradually approach towards summer as one proceeds north from the temperate zone and finally the multiplication can be observed only once in summer. On the other hand, as one approaches south, the two (spring & autumn) modes of the most active multiplication part each other from summer as the center and finally one finds the multiplication only once in winter. It is said that excessive no-cycle conditions follows.

Generally, the amount of the plankton retained by nets decreases with depth, but large deviations from this trend may be found in the upper water layers. On the average, however, the biomass in the western North Pacific (May to October) and tropical Pacific has been found to decrease from the surface to 1000 m by 1 to 1-1/2 orders of magnitude, and from 1000 to 4000 m by another order of magnitude (Vinogradov, 1960, 1961). In the North Indian Ocean, about the same amounts of plankton as in the tropical Pacific are found (Vinogradov, 1962). The biomass of the deep-sea plankton is high where the surface plankton is rich, and low where the latter is poor.

As, however, it is known that in case where a certain oceanic current flows as an undercurrent beneath another current system, rises and appears at another place, its salinity is retained along with plankton to some extent, so the plankton existing in a lower layer are not always dependent upon the plankton in an upper layer.

At the same depth, the biomass in the tropics is 1 to 1.5 orders of magnitude smaller than in the subarctic Pacific; in the tropics, the decrease towards depth may be slightly more rapid than in the higher latitudes. The biomass of net plankton in Pacific deep-sea trenches also seems to reflect changes of plankton abundance in the surface layers, so that in trenches in lower latitudes very little plankton is found (Vinogradov, 1961). For the higher latitudes, such as the Sub-antarctic and Antarctic regions, Foxton (1956) found the maximum of net plankton during winter below 500 m depth.

In surveys with horizontally towed nets of 0.3 mm mesh aperture in the central Equatorial Pacific, Hida and King (1955) found at the surface a night/day ratio of plankton volumes of 1.63, which was statistically highly significant. Hence, the net plankton in the surface did not even double during the night. Other data from the tropical South Pacific (Legard, 1958) showed night/day ratios of 2.2 for the surface; for horizontal hauls at about 50,100, and between 200 and 350 m, the ratios were 1.8, 1.7 and 1.2, respectively. Earlier, Legand had discussed that the ratios are different for various taxonomic groups as might be expected from the different swimming powers.

Plankton appear at any depth. Specially interesting is the existence of phyto-plankton at entirely dark places at the water depth of several thousand meters. According to C. Chun (1900), the distribution of phyto-plankton carrying on photo-synthesis can reach the depth of 350 m, but is mostly limited to 80 m. He states in this connection that it is not the photo-synthetic plant, but the Saprophytic community having recourse to organic matter as nutrient resource falling down from the upper layer that appears in a deep layer which light cannot reach. According to Hentschel, a species of such plant group is the unicell called "olivgrüne Zellen" falling probably under Chroococcaceae.

Recently, the study of Deep Scattering Layer (DSL) has made considerable progress and it is said that DSL can be found during the daytime at the depth of 300-800 m in the ocean and often appears at the depth of 200-350 m below the surface layer in which

the transparency is reduce. According to K. Banse (1964), it is more frequently found deeper in the tropics than in higher latitudes.

The biomass of net plankton at great depths depends on the surface production. It is not yet known what the amount of total zoo-plankton at depth is, but there are indications that the amount of nannoplankton is smaller than that of the net plankton. The transport of organic matter by vertical migrations seems to be of greater importance for the nutrition of deep-sea animals than sinking of dead organisms, or in situ heterotrophic production from dissolved organic matter (K. Banse, 1964).

The solutiblity of oxygen in the sea water decreases the more, the higher the water temperature and the salt content are. Table 12 lists the volume (ml) in the normal condition of the oxygen dissolved in a litre of sea water with chlorine of Cl (‰)at a temperature of t°C at which the air saturated under 1 atom. Generally in the cold sea, phyto-planktons live in large quantities because of the existence of rich nutrient salts and there is much dissolved oxygen due to the low water temperature whereas there exists less oxygen in the warm sea. The vertical distribution is in an ordinary saturation condition on the surface, but often falls into an over-saturation condition at the depth of 10-50 m. M. Uda (1934) drew a conclusion from the result of survey of the Japan Sea and its adjacent areas that the layer presenting a high degree of oxygen saturation ranges between 0 and 25 m and accordingly, the layer in which photosynthesis of phyto-plankton is most active is the range of 0-25 m.

Cl(‰) / t(°C)	0	5.0	10.0	15.0	20.0
0.0	10.29	9.71	9.13	8.55	7.97
5.0	9.03	8.54	8.05	7.56	7.07
10.0	8.02	7.60	7.19	6.77	6.36
15.0	7.22	6.86	6.50	6.14	5.79
20.0	6.57	6.26	5.94	5.63	5.31
25.0	6.04	5.75	5.46	5.18	4.89
30.0	5.57	5.29	5.01	4.74	4.46

Table 20 Saturation value of oxygen in the sea water (Unit, ml/L) computed from C.J.J. Fox's formula $O_2 = 10.291 - 0.2809t + 0.06009t^2 - 0.0000632t^3 - Cl\ (0.1161 - 0.003922t + 0.0000631t^2)$

In the cold water, a saturation value of oxygen ranging from 150 to 180% can be often observed in the plankton pulse period. At the depth of below 100 m, the value of oxygen decreases gradually and when reaching a certain depth, the discontinuity layer appears. M. Uda observed the existence of such layer at a depth of 1,000-1,500 m in the Pacific Ocean near Japan. The stagnat water such as the intermediate water layer of tropics or the deep layer of the Black Sea is considered to be in a condition in which scarcely any oxygen in existing. Ito (1930) conducted a survey of the southwest part of the Pacific Ocean and reported that in the tropic south of Lat. 5°, the discontinuity layer existed at the depth of some 50 m while it became deeper as one proceeds towards the higher latitudes. In the meantime, the result of survey on the S.S. "Dana" by J. Schmidt (1934) reveals that the volume of oxygen and plankton biomass on the Pacific side greatly differ from those on the Atlantic side of the Isthmus of Panama of South America; that is, on the Pacific Ocean side, the saturation percentage of oxygen decreases down to as low as 2% at the depth of 300 m and becomes zero at the depth of 400-500 m whereas on the Atlantic Ocean side, saturation degree of 50% is still retained at such depths and again increases at further deeper positions. He also reports that the quantity of plankton obtained at the depth of 300 m was 1,000 cc in the Pacific Ocean or 10 times as much as that obtained in the Atlantic Ocean. Accordingly, it can be understood from this that the reduction of oxygen volume is due to the respiration of the living or dead plankton or oxidation.

B. ENVIRONMENTAL CONDITIONS AFFECTING PLANKTON PRODUCTION

1. CONCEPTS OF PRODUCTION AND ITS MEASUREMENT

The production refers to the total volume of organic matter produced in a fixed time under the water of a certain area or in the water of a certain volume and the production in a unit time is called "productivity". The production of organic matter in the water is mostly carried out in the form of photosynthesis of phyto-plankton while the production of zoo-plankton, Benthos and Pisces, etc. is dependent directly or indirectly on the production of phyto-plankton. For this reason, the production of phyto-plankton is specially called the "primary production".

The production is generally measured in terms of the volume of carbon. According to Steemann-Nielsen(1952,1954) and Galathea Report (1957), the production in the water of the world ranges between 0.1 and 1.0 g $c/m^2/day$. According to the result of

measurement by Y. Saijo and Ichimura (1957), it ranged from 0.2 to 0.4 g c/m^2/day in the Oyashio and Kuroshio coastal waters and 0.05-0.1 g c/m^2/day in the Kuroshio off-shore areas. Of course, the production in fresh water lakes and marshes is not inferior to marine production. Though the production in the ocean is also influenced by the conditions of water temperature or light, the factor controlling the production is normally the supply of nutrient salts. Accordingly, the production is generally large in the coastal waters or cold sea where nutrient salts are constantly replenished in the upper layer. It is also considered that microelements such as iron, mangan and molybdnum, etc. and active organic matter like Vitamin B_{12}, etc. control the productivity in certain cases.

The following methods of production measurement are available:

(1) C^{14} method

To the sea water placed in a bottle, Na_2CO_3 containing a fixed volume of radioactive carbon C^{14} is added and light is applied thereto for a certain time and with a certain intensity of illumination (12,000-18,000 Lux) and after filtration and drying, the quantity of C^{14} which entered tino phyto-plankton is measured by means of the following formula:

$$\text{Production} = \begin{pmatrix}\text{total carbonic}\\ \text{acid in water}\end{pmatrix} \times \frac{\text{Volume of } C^{14} \text{ assimilated by plankton}}{\text{Volume of } C^{14} \text{ initially added}}$$

This method was first applied by Steemann Nielsen (1952) and is considered to be the best one of the currently available measuring methods, which has brought about a remarkable progress in the study of production. It is not possible to directly obtain the daily production per unit area, but the measurement can be made day and night regardless of bad or fine weather and the capacity of photosynthesis can also be measured per depth.

(2) Light & dark bottle oxygen method

This method is intended for obtaining the production

by means of measurement of oxygen to be discharged in course of assimilation of carbon. Of the two sets of oxygen bottle filled with sample water, one set is left at a place exposed to light and the other at a dark place for a certain time and the changes in dissolved oxygen before and after that are measured. As the (amount of assimilation-respiration) can be obtained from the set exposed to light and the respiration from the other placed at a dark position, the production can be computed therefrom. (The emission of 1 ml of oxygen corresponds to the assimilation of 0.536 mg of carbon).

This method is simple and convenient, but takes time for measurement in case of sample water containing less plankton thus involving the errors due to propagation of bacteria, etc., and a reliable result cannot be obtained.

(3) Chlorophyll method

Chlorophyll in the water is estimated and on the other hand, the quantity of photosynthesis per unit Chlorophyll is determined beforehand under various conditions of light, temperature and nutrient salts, and the production is computed in consideration of the environmental conditions.

The method most extensively employed at present is Richards & Thompson method which is comparatively simple in operation and can be said to be quite practical one. Though it is said that chlorophyll a, b, c and Carotinoid too can be measured by this method, Y. Saijo (1963) remarks that reliable values can be obtained in respect of Chlorophyll a only. Also, as an apprehensive point in the case of obtaining the standing crop from the volume of Chlorophyll a he took up the problem of daily changes in the quantity of Chlorophyll in a layer existing near the surface and exposed to intense light, and reported that in the survey of the Indian Ocean, the maximum was recorded in the morning and the minimum between afternoon and evening in the surface layer, entailing threefold variances within a day.

(4) Phosphate method

This is the method to estimate the production of phyto-plankton from the consumption by phyto-plankton of phosphate in the sea water, and is useful for making a rough estimate.

In the meantime, the standing crop (biomass existing on a unit area at a certain instant) does not represent the real production. That is to say, the standing crop is the quantity remaining after deduction of the respiration consumed for growth, the quantity taken in by animal and the quantity extinct in the course of growth, etc. from the amount of total assimilation due to photosynthesis. The total of these is called the "gross production" while the rest after deduction of respiration is called the "net production" for the purpose of distinction.

2. PHYSICAL CONDITIONS

(1) Light

The primary production in the water is mainly carried out by Diatoms or phyto-mastigophora. As the water is an effective absorber of radiant ray, the part of solar radiation coming into the water which is absorbed directly by phyto-plankton for use in photosynthesis is quite nominal. Generally, in cases where light with intensity I_0 passes through a water layer having a thickness of D (m), the intensity of light I is given by Beer-Lambert formula of $I = I_0 e^{-kD}$ (k : Extinction coefficient). Accordingly, when I_0 is constant, log I and D are in a linear relationship and -k represents the gradient of the said straight line. Though the extinction coefficient of distilled water is k = 0.039/m and the light reduction rate per depth of 1 m is only 3.8 %, the value k by far increases in the case of eutropic ecosystem due to the absorption by phyto-plankton and other plankton.

In the case of an open ocean in the tropic or an upland lake, the value considerably approaches that of distilled water, but the value ranges between 0.15 and 0.3 in the case of coastal water and 0.15 and 1.0 or so in the case of general lakes. It is not seldom that the value reaches 1,5 to 4.0 in the case of a shallow lake. Even k = 1.5 entails the light reduction rate per 1 m of as high as 78 %. Accordingly, the increase of extinction coefficient is not necessarily dependent on phyto-plankton, but it can generally be said that the water having a large value of k is high in productivity.

It is known that light in the range of distribution of Diatoms falls within 0.7 % - 5.2 % in terms of the percentage intensity of light. Also, H.H. Poole and

W.R.G. Atkins (1929) found that the nearer the optimum percentage intensity of light approaches the unit intensity of illumination within the adaptive extent for a species, that is, the smaller the value

$$\frac{\text{Intensity of illumination within adaptive extent}}{\text{Optimum intensity of illumination}}$$

becomes, the more symmetrical becomes the vertical distribution.

(2) Temperature

As the water temperature of lakes, marsher and rivers, etc., that is, the water temperature of inland water is greatly influenced by the atmospheric temperature, its yearly changes are quite large even at the same place. In contrast thereto, the oceanic temperature generally changes between -1.3°C (in deep layer of the cold sea) and 29°C (surface layer in the tropic). However, the range of critical temperature is wider, that is, the surface water temperature of 35°C in the tropical zone and -4°C in the frigid zone coastal water were observed respectively.

In the meantime, the yearly comparative difference (difference between the highest and lowest temperatures) varies 2 - 3°C in the tropic, approx. 8°C in the temperate zone and 25 - 26°C in the vicinity of N. Lat. 40°.

(3) Hydraulic pressure

The density of water which is 1,000 times as high as that of the atmosphere involves enormous hydraulic pressure. Even at the summit of Mt. Everest 8,840 m in height, the atmospheric pressure decreases down to 1/3 of that on the sea surface, but the hydraulic pressure reaches 2 atmos. in the water only 10 m deep. However, even at the bottom of a 10,000-meter deep, that is, in the environment under hydraulic pressure of 1,000 atmos., a considerable number of types of animals are living and it is considered that the distribution of organism will not be impeded by the hydraulic pressure only.

3. CHEMICAL CONDITIONS

Phyto-plankton absorbs the elements necessary for the constitution of its body from the entire surface of body, normally in the form of inorganic matter dissolved in the water, and utilizes the same.

(1) Carbonic acid

The carbon required by phyto-plankton is taken from carbonic acid through photosynthesis process. When carbonic acid gas is dissolved in water, it is decomposed into H_2CO_3, HCO_3^- and CO_3^{--}, the proportions of which very with PH of water. It is known that Chlorella of fresh water plankton mainly utilizes carbonic acid and Scenedesmus, etc. bicarbonic acid ion, but no carbonic acid ion is utilized.

If carbonic acid in water is consumed due to assimilation, PH of water increases. The PH of water in which large quantities of phyto-plankton developed reaches as high as 9 - 10 or over during the daytime. If PH increases like this, carbonic acid decreases first and bicarbonic acid ion next as shown in Table 13, leaving unusable carbonic acid ion as the main constituent, and the assinilation comes to be retarded, thus impeding the growth of phyto-plankton and involving additional harm of self-poisoning. In this way, if phyto-plankton propagate excessively, they decline rapidly and the most part of them can die in an extreme case.

	PH	H_2CO_3	HCO_3^-	CO_3^{--}
Sea water	7	10	90	0
(Cl 18 $^o/_{oo}$)	8	1.0	91	8
(20°C)	9	0.06	54	46
	7	20	80	0
Fresh water	8	2.4	97	0.4
(20°C)	9	0.8	96	4
	10	0	71	29

Table 21. Three types of Carbonic acid and the percentage (from K. Saruhashi, 1955).

Accordingly, the growth of phyto-plankton will be impaired due to lack of carbonic acid if the exchange of water were not carried on sufficiently for reason of current conditions.

In the meantime, excess bass in the sea water has a special biological meaning. According to J.F. McClendon (1918), Pseudomonas calcis in the tropic changes calcium nitrate in the sea water into calcium carbonate and therefore, excess base increases in the tropic, causing calcium to precipitate easily.

(2) Oxygen

The sea water contains 5 - 6 ml/L of oxygen at normal temperature, but the volume varies biologically with the respiration of animals as well as carbon assimilation of plants in the water and varies physically with the salt content, temperature and gas pressure, etc. of the said sea water. The generation of oxygen due to photosynthesis is normally some 10 times that of oxygen consumption through respiration. As, however, photosynthesis declines with the decrease of light, the production of oxygen due to photosynthesis generally becomes equal to the consumption through respiration under a condition of 200 to 500 lux. This intensity of illumination is called the "compensation pint". In the sea or lake, light decreases with the depth and therefore, at a certain depth, that is, at the compensation depth, photosynthesis balances with respiration for the whole day. Accordingly, below the compensation depth, phyto-plankton can not generally grow.

S. Kokubo and Ishida (1944) observed the development of large quantities of Microcystis seruginosa of Cyanophyta in a brackish reducing lake (Suigetsu Lake in Japan) and in respect of zoo-plankton; reported the production of Brachionus urceolaris, Pedalion mirum, Synchaeta sp. and Asplanchna sp. falling under anti-non-air Rotifera as well as Limnocalanus sinensis, Cyclops parasinus and Limnoncaea genuina of Copepoda. In the survey of the same lake, Kikuchi (1941) reported that Pseudodiaptomus was mainly distributed immediately above the layer of oxygen volume "zero" avoiding the surface layer while Ciliata was distributed in the layer less in oxygen volume.

(3) Salinity

Salinity is usually 33 - 37°/oo in the ocean and the

distribution of surface salinity is determined chiefly depending on the difference between evaporation and precipitation. Salinity is low in the arctic zones, increases in the medium latitudes and is high especially in the waters at lat. 20 - 25°, but decreases near the equator. The distribution of salinity is also affected by the current, that is, salinity is generally high in the warm current zones and low in the cold current zones. In the waters to be greatly influenced by precipitation on to the rivers along the coast or in an inlet, salinity greatly decreases at the time of precipitation. On the contrary, the salinity of the waters into which no river flows and where evaporation takes place actively becomes very high and it is known that salinity reaches as high as 41 $^{o}/_{oo}$ in the northern portion of Red Sea.

The vertical distribution of salinity is prominent between the surface layer and the depth of some 1,000 m. In the cold sea, minimum salinity can be observed in the surface layer, which increases with the depth, while in the case of the warm water, the maximum can be observed in the upper layer and the minimum in the middle layer. At the depth of 1,000 m or over, salinity ranges from 34.6 to 35.0 $^{o}/_{oo}$ at any place.

As salinity changes the osmotic pressure of organism (the change of 1 $^{o}/_{oo}$ in salinity corresponds to 2/3 atmos. in terms of osmotic pressure or 506 mm Hg), its biological influence is large. Of the marine animals, those able to withstand a comparatively wide range of salinity changes are called the "Euryhaline" animals whereas those not resistive are called the "Stenohaline" animals, such distinction being just indicative of the difference in adaptability of animal to the osmotic pressure in the environment. Generally, the coastal animals and plants are euryphaline and can well resist the salinity changes due to ebb and flow or inflow of fresh water.

As the examples of influence by salinity change upon the bodily configuration of organism, Artemia milhausenii and A. salina of Phyllopoda are best known.

Of the marine Protozoa, Radiolaria belonging to the warm sea species, for instance, has epidermis made of very thin protoplasmic membrance only, but it is adaptable to certain extent to the osmotic pressure and the direct

osmotic pressure equilibrium with external world is achieved by means of partial opening of the body only and the interior is maintained at somewhat higher osmotic pressure. It is for this reason that the specific gravity of this species is somewhat heavier than the sea water. On the contrary, the body of Noctiluca scintillans belonging to Dinoflagellata distributed in the high latitudes has the osmotic pressure always lower than the external world and is lighter than sea water. Accordingly, this species is floating on the sea surface at all times.

(4) PH

The acidity and alkalinity of water can be determined from hydrogen ion concentration or PH in the water.

PH of lakes and marshes normally ranges from 6.0 to 9.0, with the alpine lakes indicating weak acidity and the eutrophic lakes on a flat, weak alkalinity. PH of the alpine lakes and marshes being located at the height of over 2,000 m is mostly below 6 whereas that of the shallow ponds and marshes on a flat sometimes reaches PH 10 or over.

The sea water has weak alkalinity and its PH normally falls within the range of 7.5 - 8.4, higher in the surface layer and lower in the deeper layer. On the surface, it normally ranges from 8.1 to 8.3, but may reach near 7 in an inlet, etc. diluted by fresh water. PH of sea water is affected to a certain extent by water temperature and salinity, but it is principally determined by the content of carbonic acid. Therefore, if carbonic acid in the water is consumed by plant's photosynthesis, PH increases whereas if the content of carbonic acid increases as a result of the respiration of organism or oxidation decomposition of organic matter, PH decreases. However, various salts are dissolved in large quantities in the sea water and buffer action is quite large, thus making the changes of PH extremely small as compared with the case of fresh water and therefore, the measurement of PH is not an effective means of water mass analysis in the case of sea water.

The difference in PH of sea water between the upper and lower layers is remarkable in the high latitudes where many planktons are living whereas the difference is small in the low latitudes where there are less plankton. It is also well known that PH of sea water in the tropic is higher than that in the temperate or the frigid zone.

(5) Nutrient salts

Of the micro-elements in fresh water as well as marine water, silicate, phosphate, nitrate, nitrite and ammonia, etc. are indispensable to the growth of phyto-plankton and often work as the propagation limiting factors and are therefore called, as a whole, "nutrient salts". The amount of nutrient salts in fresh water lakes, marshes and rivers as well as sea water directly control the production of phyto-plankton and indirectly control the production of zoo-plankton living on the former as well as pisces living on the latter plankton.

	Indicate sign	Density limits in the sea water	
		μg-atmos/L	μg/L
Silicate	Si	0.7 - 140	20 - 4000
Phosphate	PO_4 - P	0 - 3.0	0 - 90
Nitrate	NO_3 - N	0 - 45	0 - 600
Nitrite	NO_2 - N	0 - 3.5	0 - 50
Ammonia	NH_3 - N	0 - 7.0	0 - 100

Table 22. Nutrient salts in the sea water (The Handbook of Fisheries in Japan, 1962).

Generally, the coastal waters and the cold sea contain more nutrient salts and the warm sea, less. In respect of vertical distribution, silicate, phosphate and nitrate are distributed less in the surface layer and more in the deeper layers while nitrite and ammonia are distributed more in the surface layer. Though nutrient salts are consumed by phyto-plankton in the surface layer, no consumption by phyto-plankton takes place in a deep layer into which light does not penetrate and in addition, remains of organism sinking from the upper layers are decomposed by the action of bacteria and nutrient salts are produced there. Therefore, the former three salts are contained more in a deep layer.

Such being the case, many plankton live in the waters in which nutrient salts stored in the lower layer are carried up to the upper layer by convection current,

vortex and upwelling, etc. Also, in the coastal area of sea where nutrient salts are replenished due to inflow of river water, the production of plankton is larger than in the ocean.

Nitrogen is absorbed by phyto-plankton in the form of ammonia or nitrate. In cases where the both co-exist in the water, ammonia will be utilized first. They are quite small in quantity (less than 1 mg/l) in both fresh water and marine water, and limit the propogation as well as growth in many cases. Though ammonia has immediate effect, its high concentration (some 10 mg/l) is harmful. Nitrate does no harm, but is slow to be absorbed. It is also known that urea does no harm and can be absorbed quickly.

Phosphorus is absorbed in the form of phosphate. Though it is contained in quite a small quantity (less than 0.1 mg/l) in water, its shortage is considered to be in no way impeding the growth of phyto-plankton.

Silicon is absorbed in the form of silicate by Diatoms, etc. and is indispensable as the constituent of Diatoms' cell membrane. The content of silicate in the sea water, as indicated in Table 14, is by far larger than phosphate or nitrate, but the quantity required by Diatoms is also quite large. The result of analysis of dried Diatoms reveals that silicate accounts for 54.5 % of the whole content while nitrogen accounts for only 1.8 %. That is, the quantity of silicate required by Diatoms is 30 times that of nitrogen. As, however, the maximum amount of silicate dissolved in the sea water never exceeds more than 7 times the quantity of nitrogen, it is also said according to the minimum law that what controls the growth of Diatoms is not other nutrient salts, but silicate. If Diatoms propagate, silicate decreases and if Diatoms die, the amount of silicate in the sea water again increases.

Certain species of phyto-plankton or Algae losing the coloring matter and unable to carry on photosynthesis directly absorb and utilize organic matter. At the same time, they also need various vitamins. Among general phyto-plankton requiring inorganic nutrients, there are also many that can absorb and utilize decomposed glucose or protein.

With the recent progress of the studies of nutrient salts supply mechanism, it has been made clear that the rate of nutrient salts recovery by zoo-plankton is extremely

high and above all, their secrements directly discharged into the water are playing an important role in the replenishment of underwater phosphate and nitrogen, etc. and its significance has been emphasized by B.H. Ketchum (1962), etc.

4. BIOLOGICAL CONDITIONS

(1) Bacteria

S.I. Kuznezov (1958) reported in his study of Russian lakes and marshes that the distribution of phyto-plankton coincided with the lake type. That is, the individual number of bacteria amounted to 2 x 10^6/cc in the eutropic lake, 1 x 10^6/cc in the mesotropic lake and 0.2 x 10^6/cc in only the surface water in the oligotropic lake. As for its distribution related to the depth, it was in parallel with the distribution of phyto-plankton and bacteria existed most in the water layer in which there we plankton remains in the maximum quantity. He also confirm that the said layer also coincided with the layer in which Diatom cell membrance existed in the greatest quantity while the layer in which live Diatoms existed most were above the said layer.

It has been clarified by the study of L.R. Pomeroy (1962) that in going through the body of zoo-plankton, phyto-plankton is decomposed by far quickly than in the case of independent decomposition of phyto-plankton itself. On the other hand, it is known that in the sea near the equator, the activity of bacteria is much more intensive due to high water temperature than in other waters in the high latitudes, for which reason the speed of metabolism is high.

(2) Predator-prey interaction

Since R.H. Fleming (1939) emphasized the fact that the quantity of Diatoms was controlled by the grazing of zoo-plankton, the question of grazing has come to be taken up frequently in the discussion of the plankton production and the correlation between zoo- and phyto-plankton.

That is to say, the relation between Diatom's density curve and quantity of nutrient salts (for instance, phospha decreases with the growth of Diatoms) as is generally studi in a laboratory is realized only in cases where grazing can

almost be disregarded. He studied such relations and relations and reported an approximate coincidence of the theoretical values with the results of observation. He made it clear that the increase of Diatoms does not bring about the increase of zoo-plankton, but that it takes place when grazing is slower than the speed of Diatom's division. According to this conclusion, there is little chance for Diatoms and zoo-planktons to reach the maximum simultaneously and phenomenologically zoo-plankton and phyto-plankton seem to be in a mutually repulsive relation. G.A. Riley (1946, 1947) discussed the maximum of phyto-plankton in spring and autumn from such stand-point of grazing and similarly, D.H. Cushing (1959, 1961) reported that there is no evidence of limitation of such phyto-plankton's growth in spring and autumn due to the shortage of nutrient salts and the increase or decrease of community can be explained by means of cellular growth rate and zoo-plankton's grazing rate. Also, E. Steemann-Nielsen (1958, 1962) discusses that one of the essential requirements for the formation of red tide, etc. is that zoo-planktons do not exist in such quantities as are sufficient to interrupt the pulse of phyto-plankton.

(3) Excreta

L.M. Sushtchenia (1958) reported that if zoo-plankton co-exists, the photosynthesis of phyto-plankton increases and accordingly, feeding behavoir accelerates the emission of carbonic acid gas and thereby affects the production. In the meantime, M.H. Foreman (1953) made it public that Daphnia dentifera in the Hall Lake, in the distribution of 100 individuals/1 litre, excretes or secretes 0.002 mg/l/day of phosphate phosphorus at 15°C which is higher than the concentration of surface layer water of the above-mentioned Lake in summer season. E. Harris (1959) made it clear that a rapid direct secretion by zoo-plankton contributes greatly to the nitrogen cycle, too.

As above, it has become clear that direct secretion by zoo-plankton is very important for meeting the demand of phyto-plankton and yet its process is prompt efficient.

C. CULTURE METHODS OF PLANKTON

The studies of culture have recently made a rapid progress and developed so far as to the studies and applied researches in plankton physiology, life histroy and primary production, providing many instructive informations. The main culture methods

being applied in various countries in relation to fresh water and marine plankton are described below:

1. FRESH WATER PLANKTON

(1) Culture media of phyto-plankton

1) Detmer's medium

$Ca(NO_3)_2$	1.0 g
KCl	0.25 g
$MgSO_4$	0.55 g
KH_2PO_4	0.25 g
$FeCl_3$	trace
Distilled Water (D.W.)	1000 ml

2) Bristol's medium

KH_2PO_4	0.5 g
$NaNO_3$	0.5 g
$MgSO_4$	0.15 g
NaCl	0.05 g
$CaCl_2$	0.05 g
$FeCl_3$	trace
D.W.	1000 ml

3) Benecke's medium

NH_4NO_3	0.2 g
$CaCl_2$	0.1 g
KH_2PO_4	0.1 g
$MgSO_4$	0.1 g
$FeCl_3$	trace
D.W.	1000 ml

It can be used for the culture of Chlorophyta, Diatoms and Cyanophyta.

4) Matsudaira's medium

A solution	NH_4NO_3	1.0 g
	KNO_3	2.0 g
	$NaNO_3$	2.0 g

	KBr	0.2 g
	KI	0.1 g
	D. W.	100 ml
B soultion	$Na_2HPO_4 \cdot 12H_2O$ . .	4.0 g
	$CaCl_2 \cdot 6H_2O$	4.0 g
	Conc HCl	1.0 ml (add till transparent)
	D. W.	100 ml
C soultion	$FeCl_3$	1.0 g
	D. W.	100 ml
D solution	NaCl	10.0 g
	$MgSO_4$	10.0 g
	D. W.	100 ml
E solution	$NaHCO_3$	1.26 g
	D. W.	100 ml

To make the culture fluid, prepare the above mentioned five solutions. Add 1 ml of A, B, C, and D solutions respectively to 1 of D.W. Heat this until it boils, cool it, and filter the precipitate. Add 10 ml of E solution to 1 of the supernatant fluid, and use this as the medium.

This culture ground was first devised by C. Matsudaira (1943) for the culture of Scenedesmus, but it is also a very good medium for Chlorophyta such as Haematococcus, etc.

5)	Procter's medium	KNO_3	0.25 g
		K_2HPO_4	0.10 g
		$MgSO_4 \cdot 7H_2O$	0.10 g
		Chelated iron . .	0.005 g
		Soil extract . . .	50 ml
		D. W.	950 ml

This was divised by V. Procter (1958), and has had good results in breeding Haematococcus. There is no calcium and chloride in this fluid, but these seem to be provided from the soil extract.

6)	Molish's medium	KNO_3	0.2 g
		$MgSO_4$	0.2 g
		K_2HPO_4	0.2 g
		$CaSO_4$	0.2 g
		$FeCl_3$	trace
		D. W.	1000 ml

This culture fluid is used for the Diatoms and Chlorophyta, but is also good for Dinoflagellata.

7)	Benecke's medium	$Ca(NO_3)_2$	0.5 g
		$MgSO_4$	0.1 g
		K_2HPO_4	0.2 g
		$FeCl_3$	trace
		D. W.	1000 ml

This is mainly used for Diatoms and Chlorophyta, but is also good for Dinoflagellata.

8)	Sach's medium	$Ca(NO_3)_2$	1.0 g
		$MgSO_4$	0.5 g
		$CaHPO_4$	0.5 g
		$CaSO_4$	0.5 g
		$FeCl_3$	trace
		D. W.	1000 ml

This is also good for Dinoflagellata.

9)	Knop's medium	$Ca(NO_3)_2$	0.25 g
		$MgSO_4$	0.25 g
		KH_2PO_4	0.25 g

KCl	. . . . .	0.12 g
$FeCl_3$	. . . . .	trace
D. W.	. . . . .	1000 ml

Besides Diatoms and Chlorophyta, this is also useful for Dinoflagellata.

(2) Culture media of phyto-mastigophora with chlorophyll

10)

NH_4NO_3	. . . . .	0.5 g
KH_2PO_4	. . . . .	0.5 g
$MgSO_4$	. . . . .	0.1 g
NaCl	. . . . .	0.1 g
$FeCl_3$	. . . . .	trace
D. W.	. . . . .	1000 ml

P.H. 7.0 Suitable for the culture of Chlorogonium, and Chlamydomonadidae.

11)

KNO_3	. . . . .	0.5 g
KH_2PO_4	. . . . .	0.5 g
$MgSO_4$	. . . . .	0.1 g
NaCl	. . . . .	0.1 g
Sodium acetate	. . . . .	2.5 g
Dextrose	. . . . .	2.0 g
Trypton	. . . . .	2.5 g
D. W.	. . . . .	1000 ml

P.H. 7.0. Suitable for the culture of Chlorogonium, Haematococcus and Euglena.

12)

NH_4NO_3	. . . . .	1.0 g
KH_2PO_4	. . . . .	0.2 g
$MgSO_4$	. . . . .	0.2 g
KCl	. . . . .	0.2 g

	$FeCl_3$	trace
	D. W.	1000 ml

P.H. 7.0 good for the culture of Eugena gracilis.

13)	NH_2PO_4	0.25 g
	$MgSO_4$	0.25 g
	KCl	0.25 g
	$FeCl_3$	trace
	Trypton	2.0 g
	Sodium acetate	2.0 g
	D. W.	1000 ml

Suitable for the culture of Chlamydomonas, Haematococcus, and Euglena.

14)	KNO_3	0.5 g
	KH_2PO_4	0.5 g
	$MgSO_4$	0.25 g
	NaCl	0.1 g
	$FeCl_3$	trace
	Trypton	5.0 g
	D. W.	1000 ml

Suitable for the culture of Euglena, Haematococcus and Chlorogonium.

15)	K_2HPO_4	0.2 g
	$MgSO_4$	0.05 g
	$FeCl_3$	1.5 g
	Glycine	2.0 g
	D. W.	1000 ml

P. H. 7.0 Suitable for the culture of Chlorogonium, and Haematococcus.

(3) Culture media of phyto-mastigophora without chlorophyll.

16)

KH_2PO_4	0.2 g
K_2CO_3	2.0 g
$MgSO_4$	0.1 g
Glycine	2.0 g
Dextrose	2.0 g
Sodium acetate	2.0 g
D. W.	1000 ml

Suitable for the culture of Polytoma.

17)

KH_2PO_4	0.25 g
KCl	0.25 g
$MgSO_4$	0.25 g
Peptone	2.0 g
Gelatin	150.0 g
Sodium acetate	2.0 g
D. W.	1000 ml

Suitable for the culture of Polytoma

18)

K_2HPO_4	2.0 g
Peptone	10.0 g
D. W.	1000 ml

Used for the culture of Chilomonus and Astasia.

19)

NH_4NO_3	0.5 g
KH_2PO_4	1.5 g
$MgSO_4$	0.25 g

Peptone . . . . . 10.0 g
Sodium acetate . . . . . 2.0 g
D. W . . . . . 1000 ml

Used for the culture of Chilomonas

(4) The most simple culture methos of Protozoa

20) Herbage (chop fine) . . . 50.0 g
City or town water . . . 1000 ml

Boiled for 2 hours, left as it is overnight, then filtered and used.

21) Gravy . . . . . 0.25 g
D. W. . . . . 1000 ml

22) Wheat . . . . . 5 - 10 g
Straw (chop fine) . . . . 3 - 4 g
Soil . . . . . 3 g
City water . . . . . 1000 ml

Filtered after boiling for 10 to 20 minutes. Several grains of wheat are placed into 200 ml of this solution, in which Protozoa (Paramaecium, Euglena, Colpidum, etc.) is cultured.

23) Fresh milk . . . . . 3 - 5 ml
D. W. . . . . 1000 ml

Suitable for the culture of Glaucoma and Tetrahymena.

24) Fresh milk . . . . . 30 - 80 ml
Agar powder . . . . . 15.0 g
D. W. . . . . 1000 ml

Developed by A. Shirota (1959). Fresh milk on the market (Concentration : 3 - 8 %) is sealed in 1.5 % Agar, solidified in a container, to which D.W. is added in a depth of about 1 cm and into which Glaucoma is placed and cultured.

The feature of this method consists in it that, different from the conventional methods, nutrient salts to be added are sealed in Agar beforehand and therefore, nutrients (salts) are gradually dissipated in the water in course of time and utilized little by little by Protozoa, thus also controlling the environment, and a quite high concentration can be obtained. A. Shirota reported that in case of Glaucoma scintillans, a max. of 2×10^6 individuals/ml and an average of 1×10^6 - 1.5×10^6 individuals/ml can be obtained easily.

Also, in this method, it is possible to substitute milk by other organic matters. It is a simple, convenient and quite effective method. However, due precautions should be taken against the multiplication of poor bacteria. Especially, blue or red color bacteria colony is not suitable for this culture.

(5) Culture media of Rotifera

Umezawa (1952) employed Knop's medium and R. Pourriot (1957) as well as Ito (1960) phyto-plankton culture solution. On the other hand, R. Adachi (1963) emplyed the following Haematococcus culture medium as the primary inorganic culture solution for Lecane tenuiseta:

25)	$MgSO_4$	1 M, 1.0 ml
	NaCl	1 m, 1.0 ml
	$CaCl_2$-Ca	2.0 mg
	KNO_3-N	20.0 mg
	KH_2PO_4-P	5.0 mg
	$FeCl_2$-Fe	200 r
	D. W.	1000 ml

Adjusted to PH 6.0 through addition of about 5 ml of 1 M/15 KH_2PO_4 and 3 M/20 $NaHCO_3$. Culture solution is used after heating, sterilization, cooling and subsequently leaving as it is a whole day and night.

26) Peptone . . . . . 0.5 g
Saccharose . . . . . 2.0 g
Potasium Sodium Tartrate 0.5 g
D. W. . . . . 100 ml

Diluted properly (about 100 times) by means of inorganic culture solution (for instance, xxv solution) in case of use.

27) Liver extract . . . . Liver 90 g ;

extracted by means of 300 ml of alcohol.

Heated for evaporation of alcohol content and D.W. added subsequently to make the total volume 270 ml or liver extract 30% solution, which is heated, sterilized and applied.

(6) Culture Media for Cladocera

There are many culture methods of Cladocera and they have been tried by many scholars. In this section, some culture methods of Cladocera is introduced in the following. These are quoted from "Some studies on Cladocera" by A. Shirota (1966).

28) Banta method ..... It was planned out by A. M. Banta. This culture method has been used in every country, in laboratories and fields because it is the simplest and easiest method.

(a) Garden mud ..... 2 pound
Dry horse dung..... 6 ounce
Pond water ..... 12.5 gallon

↓

(b) Keep it for a few days
(propagation of Bacteria)

↓

(c) And then, put Cladocera in (b) solution

The dung of cattle, goat and sheep, rice bran and compost, even dregs of Nuoc-Mam (soy of Viet-Nam) can be used instead of the dry horse dung.

Therefore, it is available for big rough culture, such as the hatched larvae cultures of the fish culture stations.

29) Bond method ..... R. M. Bond reported that in the experiment in which the yeast is used as food for Cladocera the growth of Cladocera is better than that by the Banta method (1934).

(a) Water ..... 60 - 70 l

↓

(b)
Bread yeast ..... 1/4 of one bread yeast mass
Water ..... 50 - 100 ml

When this method is used, add the solution (b) in the (a), every 5 - 7 days. In the other method like this, the water rinsed out of the milk bottles is also used for the culture of Cladocera.

30) Hymann method ..... L. H. Hymann cultured the Cladocera in this medium.

(a) Lettuce

↓

(b) Boiling

↓

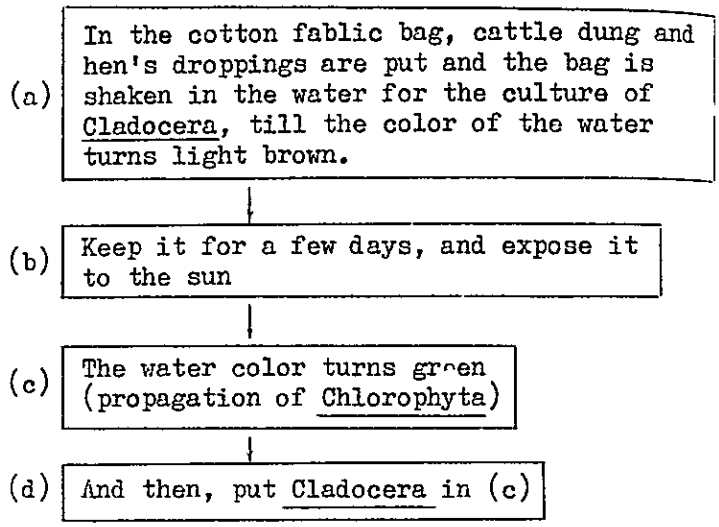
(c) Boiled lettuce is covered with the bottom of culture bottles and kept for a few days

↓

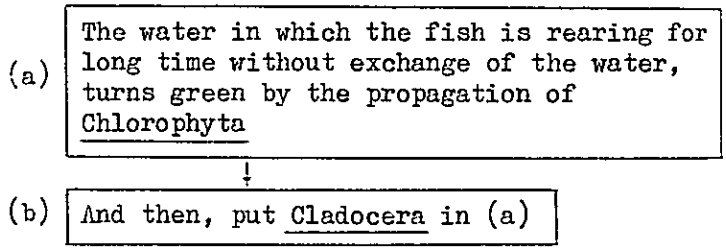
(d) And then, put Cladocera in (c)

And, sometimes the viscera of a rat and a tadpole are added to (d).

31) Ito method ..... The method of the following is by T. Ito.



32) Aquarium water method ..... The method was tried by A. D. Hasler.



33) Leaves juice method ..... This method was planned out by C. Matsudaira (1943).

The leaves juice which the leaves, such as clover, lettuce, leaves of radish and cabbage etc., is grinded down into small pieces is added in the water of culture. And then, put Cladocera. The method is shown as follows.

(a)
Water .... 10 L
The leaves which were grinded down into small pieces .... Clover leaves of one handful

↓

(b)
Keep it for a few days
Propagation of Scenedesmus obliquus

↓

(c)
And then, put Cladocera in (b)

For the experiment at the laboratory, the cultural medium as follows, is used.

(a)
Water for culture of Cladocera .... 1 L

(b)
Clover (wet weight) .... 1 g
Water ,,,,,,,,,,,,,,,,,,,,,,,,,,,, 100 ml

(c)
And 20 ml of solution (b) in (a), at that time PH of the water is controlled. PH is 7.

34) Treillard method (1) ..... It seems that M. Treillard first cultured Cladocera purely (1924)

(a)
Sterilize one Daphnia magna which has some eggs.

↓

(b)
The Daphinia magna is moved to a test tube, and then the sterilization is repeated every few days.

— Eggs are batched
— Excretion and ecdysis skin are removed

↓

(c)
One Daphnia put through into the water that includ·s much oxygen (10 times more than common water) for a short time.

— At that time, adult die

— Only larvae are living

(d) And then, Daphnia magna are cultured using unicellular algae which is increased by pure culture as food.

35) Treillard method (2) .... This is a pure culture.

(a) 1 % Glucose ..... 10 ml
Blood of rabbit which is washed by critric acid ..... 1 drop

(b) And then, put Cladocera in (a)

36) Culture of Moina affinis using Scenedesmus dimorphus, as food.

(a) Prepare the culture medium of Scenedesmus dimorphus, which is used in Matsudaira's medium 4).

(b) The culture of Scenedesmus

(c) After one week or 10 days Scenedesmus reaches a maximum growth (maximum of the number of individuals).

(d) And after 10 or 20 days, the solution (c) is used as food of Moina affinis

The cells of increasing term of Scenedesmus (younger cells) are not well digested compared

with the cells of after two or three weeks at most (old cells); therefore, the old cells are used for the culture of Moina ffinis.

This method is the one by A. Shirota (1966). First the culture of Scenedesmus dimorphus (see Le-thi-Ngoc-Anh and A. Shirota, 1966b, unpublished) and then put the concentration of Scenedesmus (30-60 x 10^6 cells/L) in the natural water boiled and filtered, as food of Moina affinis.

MARINE PLANKTON

(1) Elements (dissolved) in the sea water.

Before explaining the methods of culturing marine-plankton and of making the artificial sea-water, the following table is give to show the elements (dissolved) in the sea water.

Elements	mg/kg Cl --- 19.00 °/oo	mg-atoms/L Cl --- 19.00 °/oo
Chlorine	18980	548.30
Sodium	10561	470.15
Magnesium	1272	53.57
Sulphur	884	28.24
Calcium	400	10.24
Potassium	380	9.96
Bromine	65	0.83
Carbon	28	2.34
Strontium	13	0.15
Boron	4.6	0.43
Silicon	0.02-4.0	0.0007-0.14
Fluorine	1.4	0.07
Nitrogen (comp.)	0.01-0.7	0.001-0.05
Aluminum	0.5	0.02
Rubidium	0.2	0.002
Lithium	0.1	0.014
Phosphorus	0.001-0.10	0.00003-0.003
Barium	0.05	0.0004
Iodine	0.05	0.0004
Arsenic	0.01-0.02	0.00015-0.0003
Iron	0.002-0.02	0.00003-0.0003
Manganese	0.001-0.01	0.00002-0.0002
Copper	0.001-0.01	0.00002-0.0002

Elements	mg/kg Cl --- 19.00 °/oo	mg/atoms/L Cl --- 19.00 °/oo
Zinc	0.005	0.00008
Lead	0.004	0.00002
Selenium	0.004	0.00005
Cesium	0.002	0.00002
Uranium	0.0015	0.00001
Molybdenum	0.0005	0.000005
Thorium	0.0005	0.000002
Cerium	0.0004	0.000003
Silver	0.0003	0.000003
Vanadium	0.0003	0.000006
Lanthanum	0.0003	0.000002
Yttrium	0.0003	0.000003
Nickel	0.0001	0.000002
Scandium	0.00004	0.0000009
Mercury	0.00003	0.0000001
Gold	0.000006	0.00000002
Radium	$0.2\text{-}3\times10^{-}$	$0.8\text{-}12\times10^{-}$
Cadomium		
Chromium		
Cobalt		
Tin		

Table 23. Elements (dissolved) in the sea water (Dissolved gas not included) (cited from "The Oceans", 1961)

(2) Artificial sea water

(a) Vant Hoff's water

NaCl	100.0 mol
KCl	2.2 mol
$MgCl_2$	7.8 mol
$MgSO_4$	3.8 mol
$CaCl_2$	1.0 mol

In case of preparing the artificial sea water with Cl = 19.4 °/oo (Specific gravity 1.0260) in the above proportions, the volume of each salt to be dissolved in one liter is as follows:

$NaCl$	26.75 g
KCl	0.75 g
$MgCl_2$	3.42 g
$CaCl_2$	0.51 g
$MgSO_4$	2.10 g
D. W.	$\frac{966.47}{1000.00}$ g

To make this sea water alkaline, Allen added 2.4 ml of M/2 Na_2CO_3 to a liter of the sea water, but later E.J. Allen (1914) employed $NaHCO_3$ as the artifical sea water for the culture of Diatoms.

(b) McClendon's water

$CaCl_2$	1.220 g
$MgCl_2 \cdot H_2O$	5.105 g
$MgSO_4 \cdot H_2SO_4$	7.035 g
KCl	0.763 g
$NaCl$	28.270 g
$NaBr \cdot 2H_2O$	0.082 g
$NaHCO_3$	0.210 g
Na_2SiO_3	0.003 g
H_3BO_3	0.062 g
$Al_2Cl_6 \cdot 12H_2O$	0.026 g
$LiNO_3$	0.001 g
D. W.	1000.00 ml

Of the above components, Na_2SiO_3 becomes non-soluble unless it is first dissolved in water. These salts are intended for providing SiO_2 required by Diatoms and instead of Na_2SiO_3, $Na_2Si_4O_9$ may be employed. If however, soft glass is used for the culture, silica coming out of glass in dissolved condition eliminates the need of addition.

(c) Umebayashi's water

NaCl	24.0 g
$MgSO_4 \cdot 7H_2O$	8.0 g
KCl	0.7 g
$CaCl_2 \cdot 2H_2O$	0.368 g
$NaNO_3$ . . . (20g/100ml)	0.5 ml
$Na_2HPO_4 \cdot 12H_2O$ . .(5g/100ml)	0.2 ml
$NaHCO_3$ . . . (16.8g/L)	10.0 ml
Na_2SiO_3 . . (2g/L)	2.0 ml
D. W.	1000.0 ml

The artificial sea water employed by Umebayashi in 1961 for the culture of Chaetoceros simplex, which is similar to the artificial sea water for Skeletonema developed by Sudo (1959), but is applicable quite extensively.

(d) Lyman & Fleming's water

NaCl	23.5 mg
$MgCl_2 \cdot 6H_2O$	10.6 mg
$Na_2SO_4 \cdot 10H_2O$	8.9 g
$CaCl_2 \cdot 6H_2O$	2.18 g
KCl	0.66 g
$NaHCO_3$	0.19 g
KBr	0.1 g
H_3BO_3	0.026 g
NaF	0.003 g
$SrCl_2$	0.024 g

(Cl . . . 19.00 $^{o}/_{oo}$ S . . 34.5 $^{o}/_{oo}$
PH ... . 8.1)

Of the above chemicals, Br, F and Sr salts seem to be unnecessary for most Diatoms while a small quantity of H_3BO_3 is sufficient in this case. According to H. Takano (1963), H_3BO_3 may be omitted in that it is included in his nutrient salts while

Br, F and Sr can be omitted similarly.

Addition of the above volume to D. W. 21 results in 17 ‰ which is suitable for use. In the case of culture of Diatoms, 0.1 g/L of Na_2SiO_3 is added, which, however, is hardly soluble and it is better to employ $Na_2Si_4O_9$.

(e)

NaCl	28.3 g
$MgSO_4 \cdot 7H_2O$	7.0 g
$MgCl_2 \cdot 6H_2O$	5.1 g
$CaCl_2 \cdot 2H_2O$	2.4 g
KCl	0.74 g
$NaHCO_3$	0.21 g
NaBr	80.0 mg
H_3BO_3	60.0 mg
Na_2SiO_3	3.8 mg
$AlCl_3 \cdot 6H_2O$	2.6 mg
$LiNO_3$	0.14 mg
H_3PO_4 (85%)	0.24 mg
NH_4OH	0.06 mg
D. W.	1000 ml

(f) Natural dry salts

In case of applying salts obtained through evaporation and drying of the sea water to the artificial sea water, manganese, oxide of iron, $CaSO_4$, SiO_2 , $Ca_3(PO_4)_2$, $CaCO_3$, CaFe, $Ca(BO_2)_2$, Al_2O_3, $Ba(BO_2)_2$, $BaSO_4$, etc. become unsoluble and, therefore, should be dissolved through the addition of hydrochloric acid. The solution can be used after subsequent neturalization by means of $NaHCO_3$.

(g) Natural and the artificial sea water

Though it is considered that the natural sea

water contains all the elements existing on the earth, the number of elements so far discovered is 61.

The total concentration of salts in the sea water slightly varies with the place and depth, but the relative proportions among the main constituents are approximately constant. This is one of the most distinctive characteristics of the chemical constituents of the sea water and is called the "law of constant sea salt composition".

Accordingly, in the case of research or investigation, the main constituents of the sea water are generally not estimated individually. Instead, only the chlorinity (Cl $^{o}/_{oo}$) is measured to let it represent the concentration of salts.

In respect of culture, the artificial sea water has so far been employed frequently as the primary liquid for application to phyto-plankton and Flagellata or Dinoflagellata, to which nutrient salts were added for the purpose of culture, but the result was inferior to the case of the natural sea water. However it is well known long since that the addition of small quantity of the natural sea water to the artificial sea water entails a result quite similar to the case or the natural sea water, which is, according to the report of H. Harvey (1925), due to the oxidation promotion effect of catalytic substances in the natural sea water.

Recently, the studies of the artificial sea water and nutrient requirements for phyto-plankton and zoo-plankton have made considerable progress and it has become possible to achieve satisfactory results of culture nearly equivalent to the case of the natural sea water, though not yet complete, by a method to add chelated metals or traces of metallic salt, etc. to the artificial sea water.

Especially the culture of marine Diatoms has recently attained a remarkable progress, as described in the report of L. Provasoli et al. (1957), in the form of addition of EDTA, vitamins, TRIS, NTA or glycerophosphate, etc. and its significance as the feed for zoo-plankton and zoo-larva or in relation to the survey of primary productivity has come to be

recognized anew.

(3) Culture media of marine plankton

(a)

$NaNO_3$	0.1 g
$Na_2HPO_4 \cdot H_2O$	0.02 g
Sea water	1000 ml

Employed for the culture of phyto-plankton.

(b) Fresh water culture solution such as Molish's, Benecke's or Sach's medium can be applied, by addition of traces of KI, KBr, NaBr, etc., to the culture of marine Diatoms and Dinoflagellata too.

(c) Eerdschreiber's medium

KNO_3	0.20 g
K_2HPO_4	0.10 g
K_2SiO_3	0.01 g
$Fe_2(SO_4)_3$	0.005 g
Soil extract	5.0 ml
Sea water	955 ml

This liquid was developed by B. Foyn (1934) by improving Schreiber's (1937) phyto-plankton medium.

(d) Erdschreiber's medium

$NaNO_3$	100 mg
$Na_2HPO_4 \cdot 12H_2O$	20 mg
Soil extract	50 mg
Sea water	1000 ml

(e) Schreiber's medium (improve)

$NaNO_3$	42.5 mg
$Na_2HPO_4 \cdot 12H_2O$	10.75 mg

$FeSO_4 \cdot 7H_2O$	0.278 mg
$MnCl_2 \cdot 4H_2O$	0.0198 mg
Na_2-EDTA$\cdot 2H_2O$	3.72 mg
SiO_2	12.0 mg
Cobalamin	0.7 r
Aneurin, HCl	8.6 r
Biotin	6.1 r

Suited to the culture of Diatoms.

(f) Miquel's medium

A solution	$MgSO_4$	1.0 g
	NaCl	1.0 g
	Na_2SO_4	5.0 g
	NH_4NO_3	1.0 g
	KNO_3	2.0 g
	$NaNO_3$	2.0 g
	KBr	0.2 g
	KI	0.1 g
	D. W.	100 ml
B solution	$Na_2HPO_4 \cdot 7H_2O$ . . .	4.0 g
	$CaCl_2$	4.0 g
	HCl	2.0 ml
	$FeCl_3$	2.0 ml
	D. W.	80.0 ml

These solutions were orginally intended for fresh water Diatoms, but in the case of culturing marine Diatoms, 40 drops of A solution and 10-20 drops of B solution are added to a liter of sea water, which is used after sterilization for 20 minutes at 70°C.

(g) Miquel-Allen-Nelson's medium

A solution	KNO_3	20.0 g
	D. W.	100 ml
B solution	$Na_2HPO_4 \cdot 12H_2O$	4.0 g
	$CaCl2 \cdot 6H_2O$	2.0 g
	$FeCl_3$	2.0 ml
	HCl	2.0 ml
	D. W.	80 ml

Allen-Nelson regarded certain components in the above Miquel's medium as being unnecessary in that they are already contained in the sea water, and prepared the medium (vii) by quite simplifying the A-solution.

In the above solution, 2 ml of $FeCl_3$ are obtained by heating and resolving the water of crystallization containing it. 2 cc of A-solution and 1 cc of B-solution are added to a liter of the sea water, which is sterilized at 70°C, cooled and supernatant liquid of which is utilized. Suited to the culture of Diatoms.

(h)

$NaNO_3$	0.1 g
$Na_2HPO_4 \cdot H_2O$	0.02 g
*Provasoli solution	1 - 10 ml
Sea water	1000 ml

* Provasoli solution

$FeCl_3$	0.4 g
$MnCl_2$	0.4 g
$ZnCl_2$	0.03 g
$CuSO_4$	0.0005 g
$CoCl_2$	0.001 g
Boracic acid	3.43 g
D. W.	1000 ml

(4) Marine culture media for plankton using artificial sea water

(i)

$NaCl$	24.0 g
$MgSO_4$	8.0 g
$CaCl_2$	0.4 - 1.4 g
KCl	0.7 g
$NaHCO_3$	1.7 g
Na_2SiO_3 . . (only Diatoms culture)	0.002 g
* Provasoli solution . .	1 - 10 ml
D. W.	1000.0 ml

Provasoli solution is as indicated under (h). The above solution is suitable for general Algae, Diatoms and Dinoflagellata.

(j)

A solution	Na_2-EDTA	3.0 g
	$FeCl_3 \cdot 6H_2O$ . . .	0.39 g
	$ZnCl_2$	0.03 g
	$MnCl_2 \cdot 4H_2O$ . . .	0.43 g
	$CoCl_2 \cdot 6H_2O$ . . .	12.10 mg
	$CuSO_4 \cdot 5H_2O$ . . .	4.70 mg
	H_3BO_3	3.43 mg
	D. W.	1000.0 ml
B solution	Vitamin B_{12} . .	0.015 r

This solution was prepared by Umebayashi (1961) and applied to the culture of Chaetoceros simplex, but it is also applicable to other Diatoms, etc. extensively. In practical application, 1 ml of A-solution and B-solution are added to Umebayashi's water.

(k)

A solution	$NaNO_3$	15.0 g
	D. W.	500.0 ml

B solution	K_2HPO_4	0.4 g
	D. W.	200.0 ml
C solution	$FeSO_4 \cdot 7H_2O$	0.3 g
	Citric acid	0.3 g
	H_3BO_3	0.15 g
	$MnCl_2 \cdot 4H_2O$	0.1 g
	D. W.	100 ml
D solution	Na_2-EDTA	0.25 g
	$CuSO_4 \cdot 5H_2O$	79.0 mg
	NH_4VO_3	23.0 mg
	$ZnSO_4 \cdot 7H_2O$	22.0 mg
	$(NH_4)6Mo_7O_{24} \cdot 4H_2O$ . .	15.0 mg
	$CoCl_2 \cdot 6H_2O$	15.0 mg
	D. W.	100.0 ml

In the case of practical application, 10 ml of A-solution, 5 ml of B-solution, 1 ml of C-solution, 0.1 ml of D-solution and 0.015 r/L of vitamin B_{12} are added to a liter of Lyman & Fleming's artificial sea water.

This medium was prepared by H. Takano (1963), but A and B solutions originate in the solution developed by S. Osterlind (1949) for the culture of fresh water Scenedesmus by adding 1 g of $Ca(NO_3)_2 \cdot 4H_2O$ and 1.25 g of $MgSO_4 \cdot 7H_2O$ to A-solution. C-solution and D-solution were employed together with A and B solutions by E. G. Jorgensen (1962) for the culture of Chlorella and Scenedesmus, but they are also applicable to Cyclotella meneghiniana of fresh water Diatoms if Na_2SiO_3 and soil extract were added thereto.

In the meantime, for the purpose of culturing marine Diatoms, EDTA may be used instead of Na_2-EDTA.

(1) Culture medium for Phyllopoda (Artemia)

NaCl	14.0 g
*Chelated metals solution .	5.0 ml
**Artificial sea water . .	500.0 ml

*Chelated metals solution (contains of 5 ml)

Na_2-EDTA·$2H_2O$	10.0 mg
$ZnSO_4 \cdot 7H_2O$	5.0 mg
$MnSO_4 \cdot nH_2O$	1.5 mg
$FeSO_4 \cdot 7H_2O$	500.0 r
$Na_2MoO_4 \cdot 2H_2O$	250.0 r
$CoSO_4 \cdot 7H_2O$	15.0 r
$CuSO_4 \cdot 5H_2O$	5.0 r

**Artificial sea water (e) to be employed

This medium was developed by K. Teramoto and S. Kinoshita (1961). Employing the artificial sea water as the culture solution and by addition of chelated metals, satisfactory result was obtained in the culture of Artenia. They report that chelated metals improve survival ratio and growth rate and further have prominent effect to promote and strengthen egg production as well as hatching.

They recognize that as for the feed for Artemia, dried waste fermentation liquid is most satisfactory in the aspects of practical advantage.

D. UTILIZATION OF PLANKTON

The phyto-plankton living in the oceans, lakes, marshes and rivers, etc. are receiving much interest in respect of their ecology or physiology or physiology for reason of their being primary producers while zoo-plankton too are being studied by a number of research workers. Though it has been known long since that the volume of resources in both the ocean and the lake can be estimated by deterning plankton biomass produced there, the application of planktology has recently been expand remarkably with the establishment of the methods of plankton

culture and it has come to be exerting influences upon people's living directly or indirectly.

The information pertaining to the utilization of plankton is itemized as follows:

1. The production of phyto-plankton controls the production of zoo-plankton living on the former as well as that of pisces, crustacea, mollasca, etc. living on the latter plankton. Accordingly, part of the sea, the lake or the marsh in which many plankton are living can be determined to be the water area suitable for breeding (for instance, oyster, pearl-oyster, shrimp and larvae of pisces).

2. Current rip (refer to Frontispiece) is abundant in plankton and larvae of pisces, etc. gather there. Therefore, pisces which eat these plankton and larvae gather there, thus constituting a good fishing-ground. In Japan, an efficient method to search for current rip from an aircraft and notify the fishing vessels thereof is being adopted.

3. Owing to the development of the fish finders, the relation between the daily cyclic movement of DSL (daily changes in the zoo-plankton community) and the fish groups has been made clear and the fact that comparatively good fishing-ground is formed where DSL exists has been confirmed. The fish finders are thus contributing greatly to a scientific research into fishing-grounds.

4. Phyto-planktons are utilized for the breeding of Tilapia mossambica or Chanos chanos which utilize them directly. As a more positive method of breeding, phyto-plankton are grown artificially and fed to these pisces.

5. In Japan, it is planned to grow Chlorophyta and Cyanophyta (Oscillatoria, Anabaena and Anabenopsis, etc.) in general fresh water fishponds thereby increase dissolved oxygen and the number of pisces accommodation per unit area (by photosynthesis). By this method, it is possible to accommodate and breed 2 to 5 times as many as the normal cases.

6. In the ocean where upwelling exists or at places (as small-scale examples) in the ocean where an island or a bank exists and upwelling appears in the leeward portion thereof, the propagation of plankton is promoted locally, providing a good fishing-ground there. Accordingly, the detection of upwelling or knowing a place where the condition related

thereto arise leads to the detection of fishing-ground.

7. As each water mass involves the inherent resident species of plankton such plankton as the indicators make it possible to induce the distribution of the water area, estimate the origin or range of water mass and know the process of water mass mixture, etc. and thus delicate assumption which cannot be deduced from water temperature and salinity, etc. in water mass analysis can be established. For utilization as an indicator, the following conditions are required:

   (1) Correct evaluation of species.

   (2) Definite division of the species' production and non-production waters.

   (3) Speci s to be sensible to the environmental changes.

   (4) Species possessing strong adaptability can be utilized for estimating the origin of metamorphic water mass.

   (5) Certain species of zoo-plankton apply to different water mass depending on their developing stages, sex, etc.

   (6) Even the same species involves different forms and sizes depending on the living water area, referring to different water mass accordingly.

   In the case of strongly indicative species, the appearance of even a type of species makes possible the determination of the water mass concerned. For instance, the water basin where Physalia, Velella of Hydrozoa, Sapphirina opalina, S. Gemma, Copilia mirabilis of Copepoda or Trichodesmium tiebautie of Cyanophyta, etc. appear can be regarded as Kuroshio warm current and where Calanus plumchrus, C. cristatus of Copepoda appear, as Oyashio cold current.

8. The egg of marine Artemia salina sustains the storage of over several years as dried egg and can be quite conveniently used for the culture of larvae of crustacean or pisces at all times.

9. In the past, Euglene gracilis belonging to phyto-mastigophora was utilized for the estimation of vitamin B_{12} under the Euglena method in Japan.

10. Some of marine Mysidacea are utilized directly as human foodstuff.

11. Since it has been confirmed that phyto-plankton contain protein of good quality and vitamins abundantly, especially Chlorella of fresh water phyto-plankton is mixed into various foodstuffs and, in Japan, into milk, fermented soybean and various cookies.

12. Powder and tablets made of phyto-plankton are utilized in the form of "instant" foodstuff and space food.

13. As Chlorophyta of Chlorella, Scenedesmus, Golenkinia, etc. of fresh water phyto-plankton grows promptly and absorbs nutrient quickly, it is serving for the solution of the problems of pollution and isotope concentration.

14. Plankton is useful for medico-legal judgement. That is, by observing the difference in plankton distribution (species and distribution differ depending on fresh water, brackish water, bay, coast, ocean, etc.), miniature size of plankton and Diatom's cell membrance possessing silicate hard to be destructed, it is possible to determine the cause and place of death, for instance, whether a man was thrown into the water after killing or the cause is mere drowning can be judged from the species and conditions of plankton existing in various organs of the body.

15. The relation between the larvae production of useful aquatic animals and plankton is a very important problem for aquatic breeding. In the case of most of the useful fresh water aquatic animals, cycle of Adult-Artificial egg collection-Artificial spat collection-breeding can be repeated and, though not sufficient, Protozoa and Cladocera of plankton are being fed to them. On the other hand, the study of artificial food has made considerable progress, but the greater part of larvae of marine aquatic animals being utilized are natural larvae and such a cycle as is applied to fresh water ones can be applied to only the few. Accordingly, the supply of larvae to a nursery is often unstable, causing impediments in not a few cases.

However, if hatched larvae obtained under the artificial management are given proper food according to their species, the breeding of larvae is possible by means of such food as shown in Table 16.

A. Shirota (1959a), employing 5 types of feed, that is, hatched larvae (A. Shirota, 1960, 1962) of Moina macrocopa belonging to Cladocera, Artemia salina of Phyllopoda, Anguillula silusiae (A. Shirota, 1958), Chironomus dorsalis of Diptera and particles of hard-boiled hen's egg as a typical artificial feed, compared two species of fresh water fish, that is, Carassius auratus and Cyprinus carpio in respect of their growth and weight increment rate (proportion of weight increase), etc. from the time of hatching out until the time they reached a length of some 20 mm and as a result of this experiment, drew the following conclusions concerning the best feed conditions for larvae:

(1) To be suited to the size of mouth of the aquatic animal to be bred (in that the diameter of mouth of larvae varies according to the species).

(2) To have the moving power (To be moving at all times)

(3) To be floaty or to have floating capacity (The one which has the moving power, but is sinking at the bottom is not desirable)

(4) To be nutritive.

(5) To be digestible and absorbtive. (High nutritive value with poor digestibility is not suitable)

(6) To be preferrably colored. (Feed having reddish tone is preferrable to the transparent or white ones).

(7) Utilization of substances not utilized in the past. Rice, wheat, bean, pisces, etc. are often included among artificial foods, but the author recommends the utilization of waste materials.

(8) To be low in production cost.

(9) To be obtainable (to be able to be produced) in large quantities. These conditions are applicable not only to natural feed, but also to artificial feed. Though certain plankton (Cladocera of Moina, etc. and marine Artemia or Chironomus as larvae of insect) meet these conditions and can be said to be the best feed, but some problems are left behind in respect of the condition (9), above. The advantage of artificial feed lies herein, but it does not fully meet the above

conditions and is inferior to natural feed in respect of growth rate.

Object	(Aquatic animal)	Food	Author
Annelida	Echiuroidea	Diatom: Skeletonema costatum Thalassiosira sp.	Sakiyama (1957)
Echinodermate	Echinoidea	Mastigophora without colour:	
		Monas sp.	Imai (1943)
	Holothurioidea	Monas sp.	Imai & Inaba (1950)
Mollusca	Ostrea	Monas sp.	Imai etc. (1947)
	Venerupis	Monas sp.	Imai (1942)
	Meretrix	Monas sp.	Imai (1942)
	Pinctada	Monas sp.	Yuki (1950)
	Pecten	Diatom: Nitzschia sp. and Skeletonema	Yamamoto etc. (1954)
	Mytilus	Mastigophore: Chlamydomonas sp.	Hirano & Ooshima (1960)
	Haliotis	Monas sp.	Ino (1953)
	Haliotis	Diatom: Chaetoceros simplex	Sagara (1960)
Crustacea	Eriocheir	Diatom: Skeletonema	Ishikawa & Yatsuzuka (1961)
	Neptunus	Phyllopoda: Artemia salina (nauplius)	Maekawa (1961)
	Paralithodes	Polydra: Trochophora	Sato & Tanaka (1947)
	Penaeus	Diaton & Phyllopoda: Skeletonema - Artemia	Fujinaga etc. (1942)
	Copepoda	Skeletonema costatum	Matsue (1954)
	Balanus	Skeletonema costatum	Hirano (1953)

Object	(Aquatic animal)	Food	Author
Pisces	Plecoglosus	Protozoa-Rotifera-Cladocera: Protozoa - Oxyrrhis marina Stylonychia sp. -Cypris larva - -Phyllopoda: Artemia	Kasahara, Hirano and Ooshima (1960)
	Limanda	Lamellibranchia post larva and Trochophora - Artemia	Kurata (1956)

Table 24 Aquatic animals can be breeding and the feed (from The Handbook of Fisheries in Japan, 1962)

Table 24 lists the aquatic animals which could be bred from larvae as well as their feeds. If these feeds are examined with reference to the above conditions for feed, they seem to be generally satisfying the said conditions. Some of them have been tested in the laboratory only and all of them are not on production line (due to the feed condition the problem of quantity, No. 9) but their contribution is significant in that feeding culture has become practicable in this way. And yet, plankton account for nearly the whole of feeds utilized for such breeding and it would be unnecessary to emphasize anew their significance here.

E. APPENDIXES

1. Development of Cladocera, Moina affinis Birge and the adult.

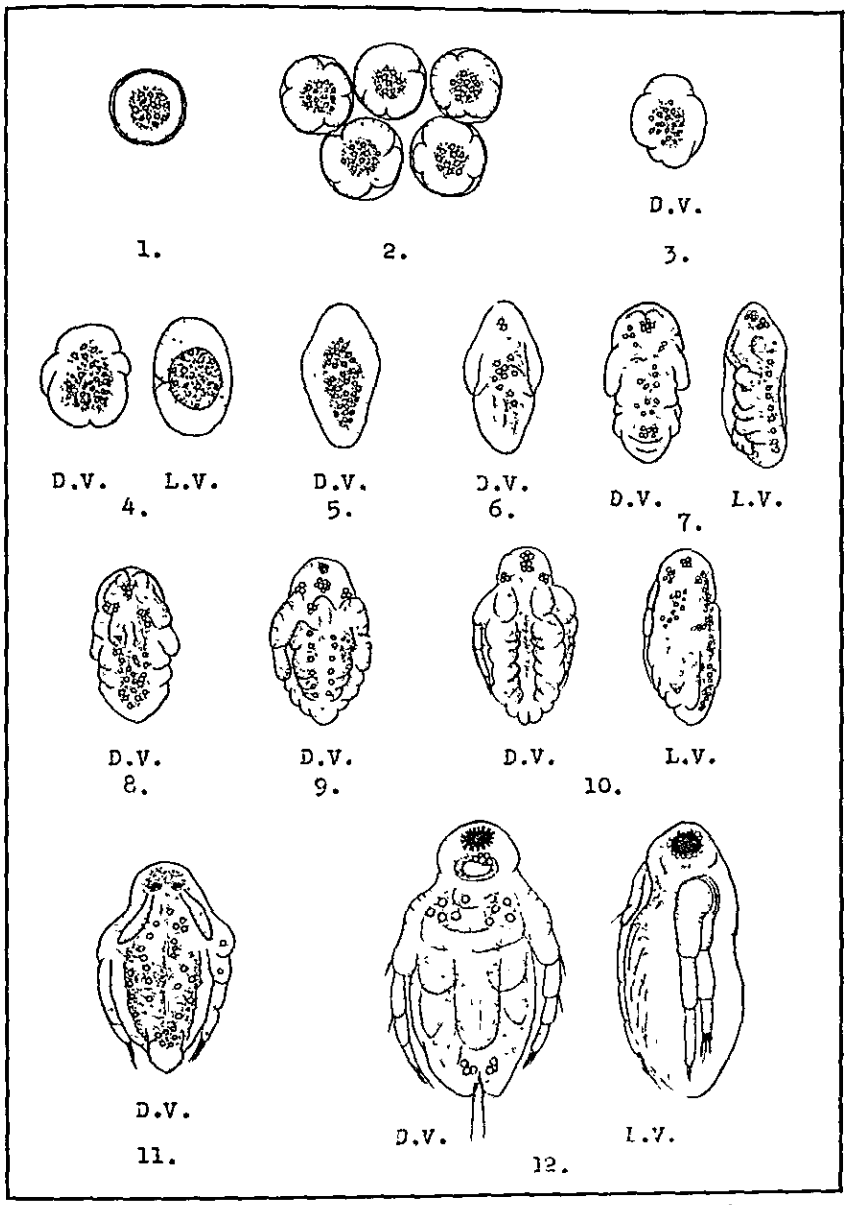
2. Development of Phyllopoda, Artemia salina Linnaeus and the adult.

3. Development of Mysidae, Mesopodopsis slabberi P. J. van Bened and the adult.

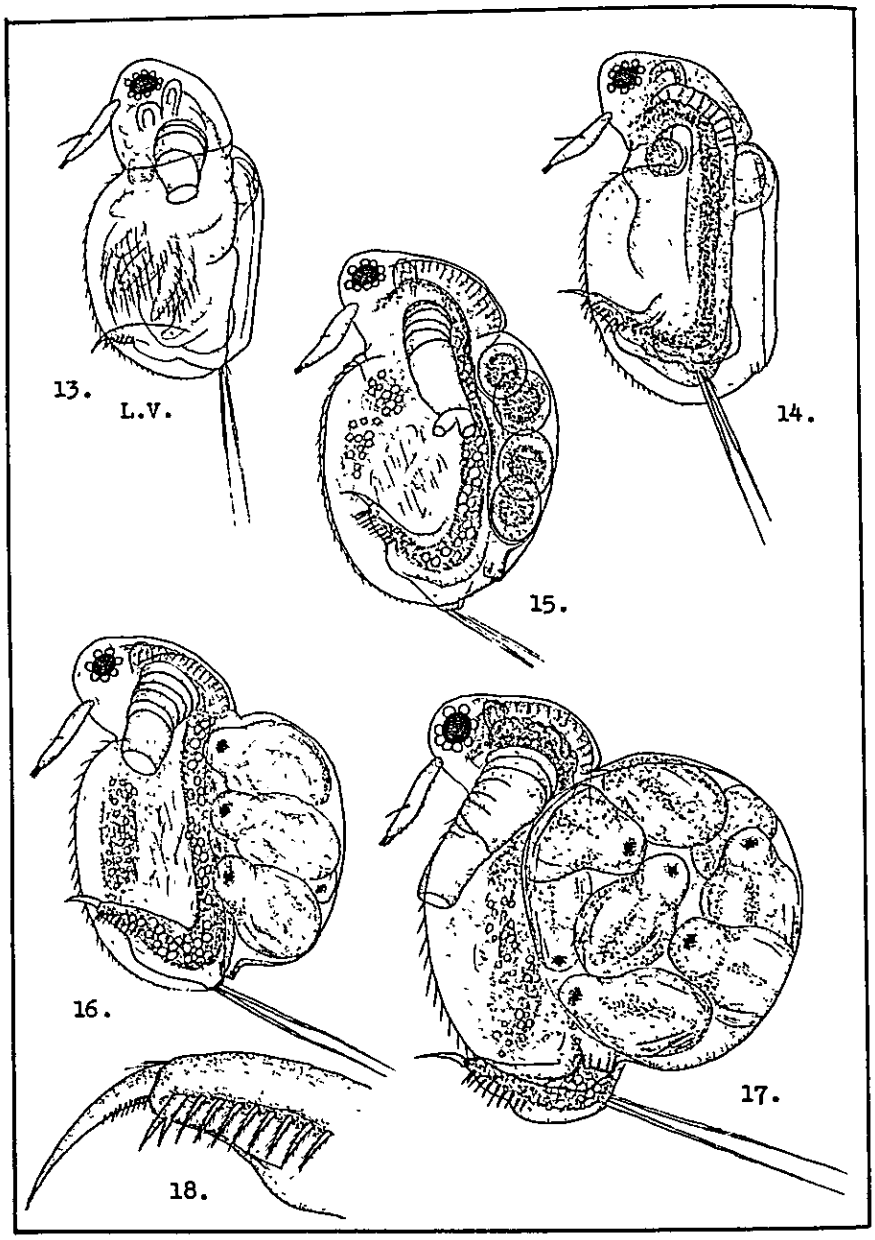
1. Development of Cladocera, Moina affinis Birge and the adult. (from A.Shirota, 1966, in press)

D.V. -------- Dorsal view

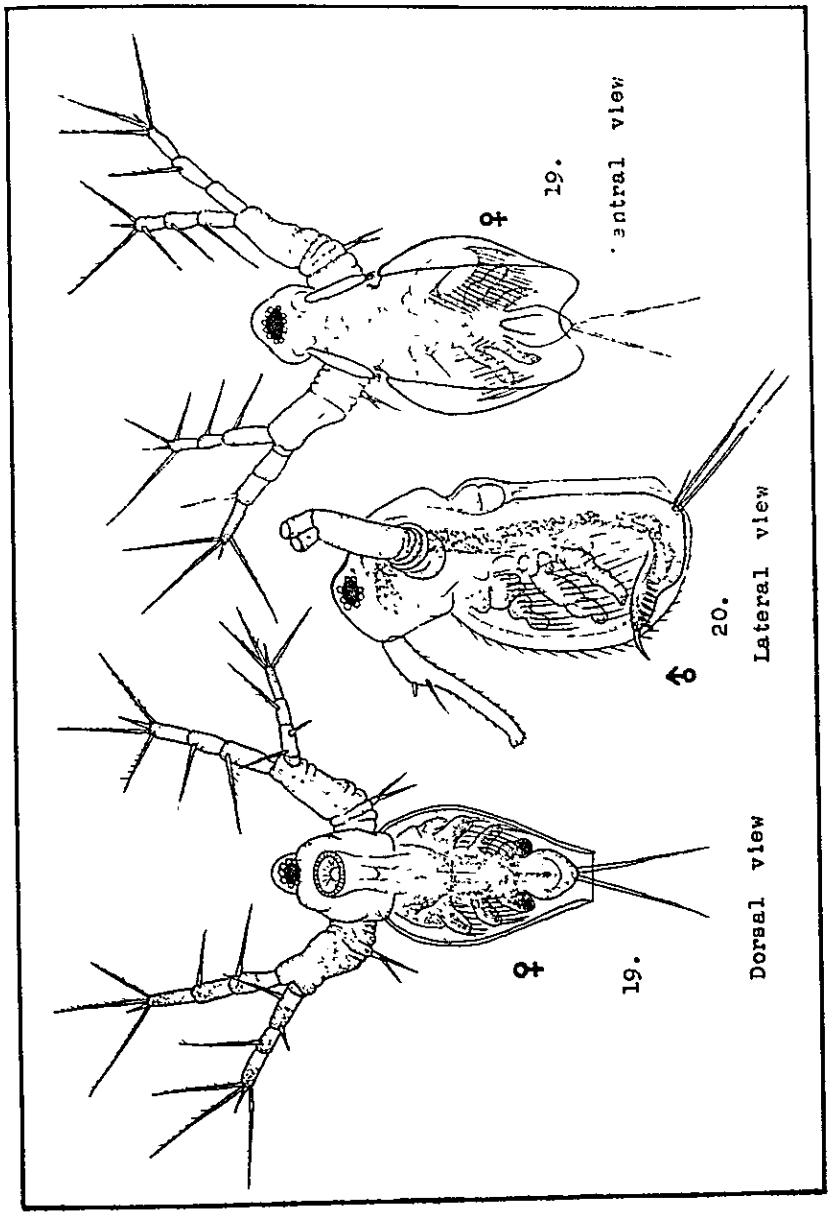
L.V. -------- Lateral view



1.	Egg, Diameter	94 - 94.5µ	7.	Body Length	270µ
2.	" "	109 - 140µ	8.	"	275µ
3.	" Length	126µ	9.	"	295µ
4.	" "	157µ	10.	"	314 - 330µ
5.	Body Length	200µ	11.	"	345 - 377µ
6.	"	250µ	12.	"	470 - 503µ



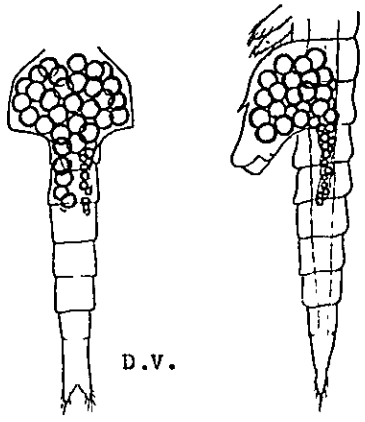
13. Hatched larva, Body Length 0.58 mm
14. Larva, Body Length 0.63 mm
15. Adult, Body Length 0.70 - 0.75 mm (Biological minimum)
16. " 1.08 mm
17. " 1.15 mm
18. Apex of postabdomen


♂
19. Ventral view
♀
20. Lateral view
♂
19. Dorsal view

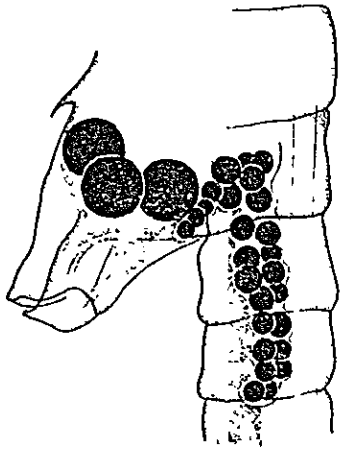
2. Development of Phyllopoda, Artemia salina Linnaeus and the adult. (from A.Shirota, 1965, unpublished)

D.V. --------- Dorsal view

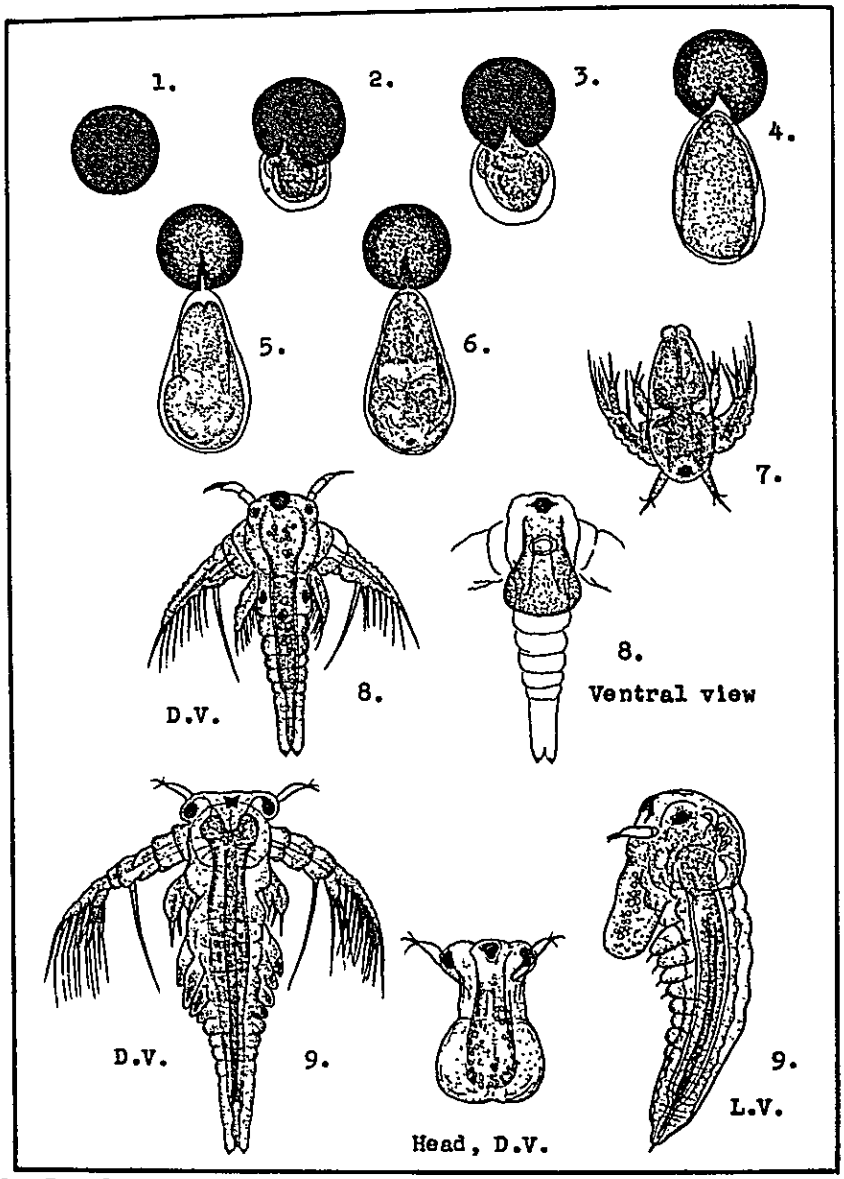
L.V. --------- Lateral view



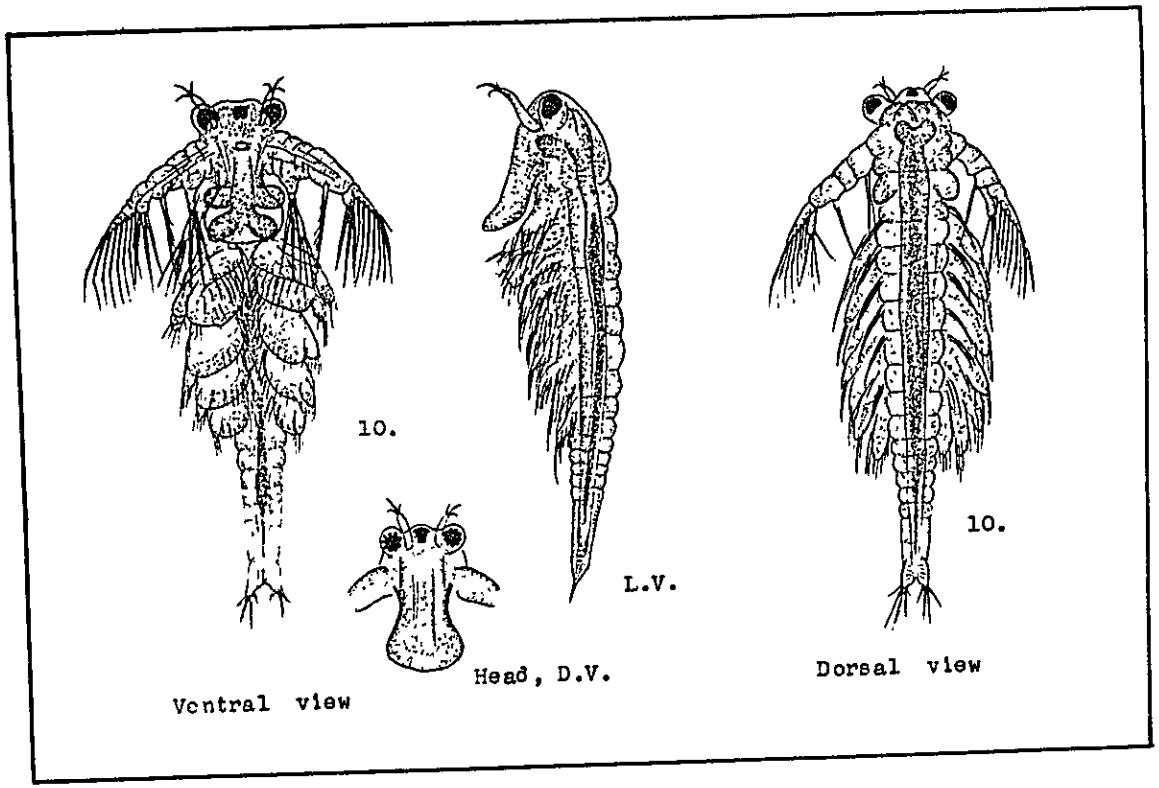
Posterior part of female and the eggs in the brood chamber.



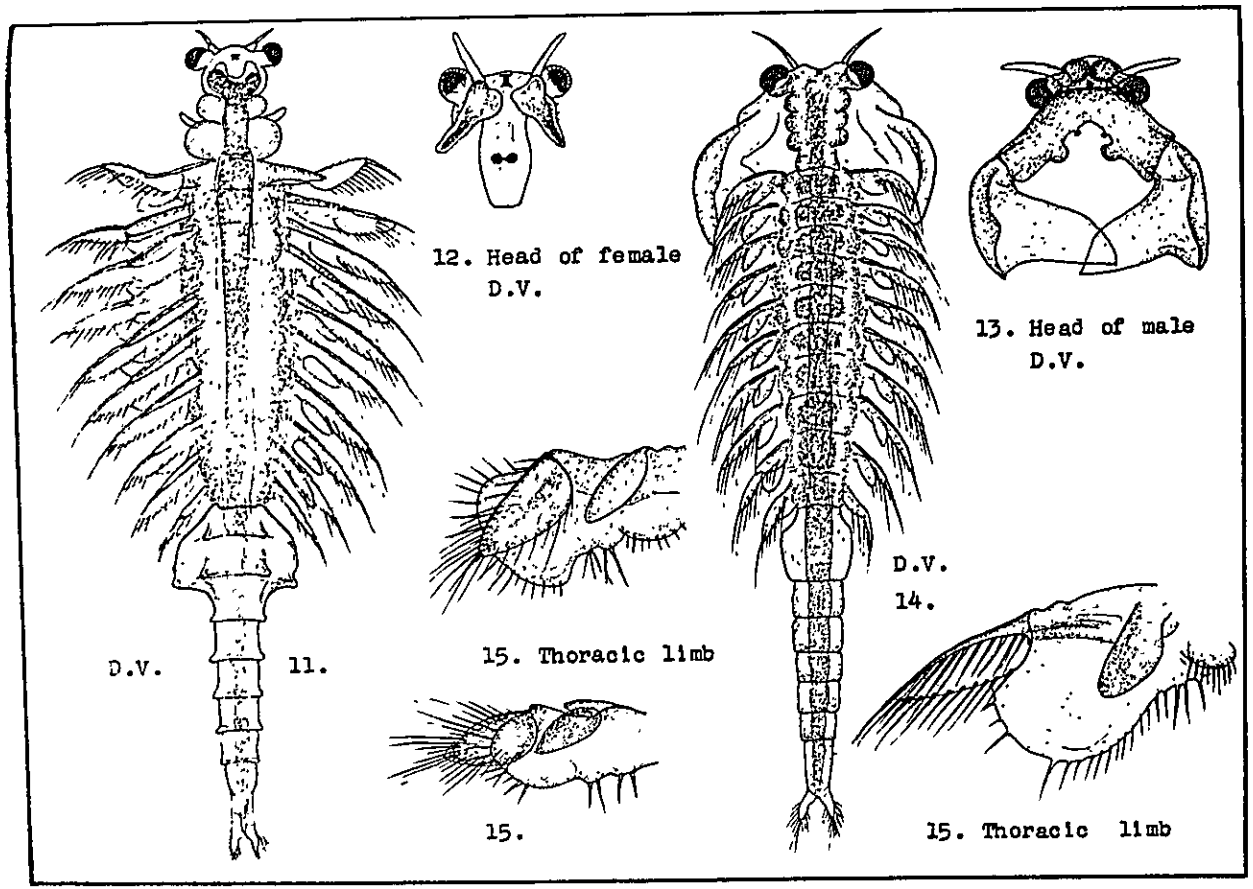
The eggs in brood chamber.



1. Egg, Diameter 208 - 240μ
2. Hatching, Diameter of egg 256μ
3. "
4. " , Body Length 300μ
5. " , " 352μ
6. " , " 416μ
7. Hatched larva, Body Length 0.46 mm
8. Larva, Body Length 0.72 mm
9. " , " 1.22 mm

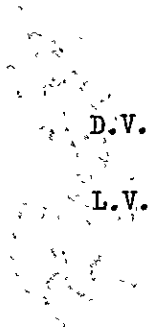


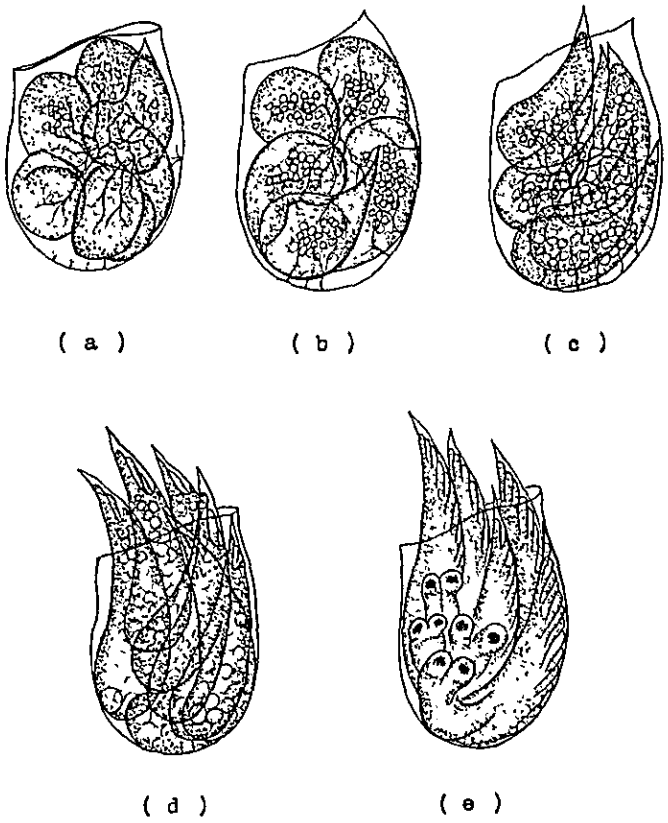
10. Larva, Body Length 1.84 mm



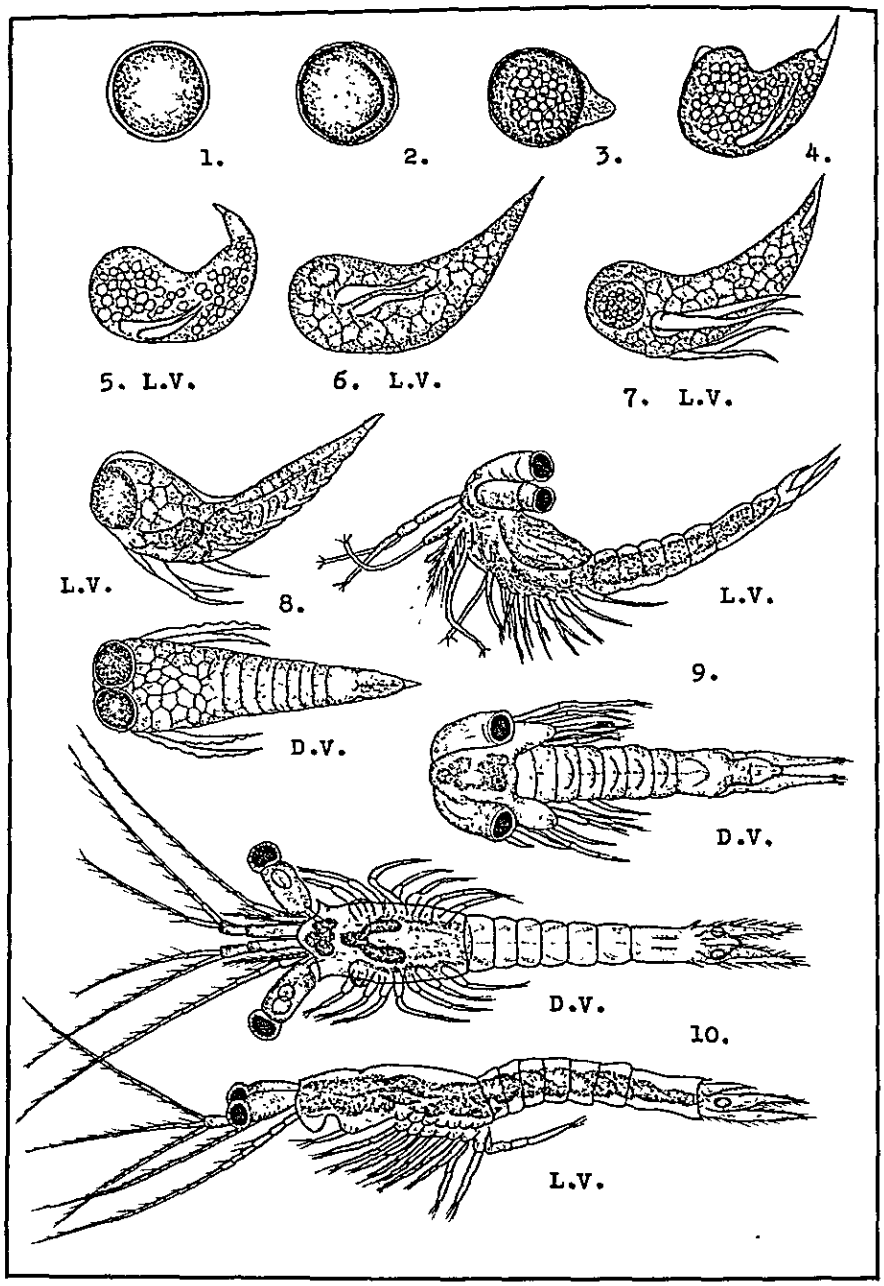
11. Dorsal view of female, Body Length 12.0 mm
12. Head of female, Dorsal view
13. Head of male, Dorsal view
14. Dorsal view of male, Body Length 10.06 mm
15. Thoracic limb

3. Development of Mysidae, Mesopodopsis slabberi P.J.van Bened and the adult. (from A.Shirota, 1965, unpublished).

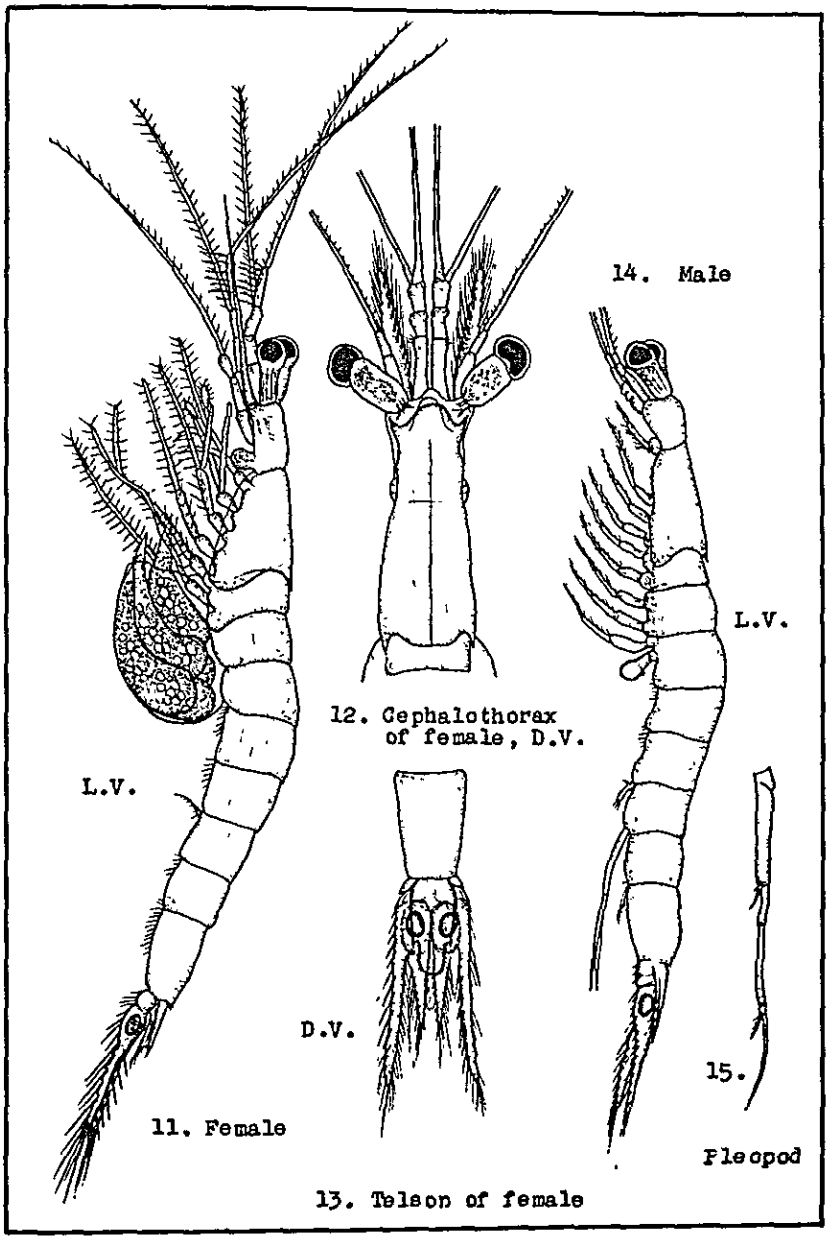




Development of egg in the brood chamber.
(a) - (e)



1.	Egg, Diameter	0.38 mm	6.	"	0.87 mm
2.	"		7.	"	1.08 mm
3.	"		8.	"	1.20 mm
4.	Body Length	0.78 mm	9.	"	1.65 mm
5.	"	0.84 mm	10.	Hatched larva, Body Length	1.95 mm (swim out)



11. Lateral view of female, Body Length 7.0 - 8.5 mm
12. Cephalothorax of female, Dorsal view
13. Telson of femal, Dorsal view
14. Lateral view of male, Body Length 6.5 - 7.5 mm
15. Pleopod of male

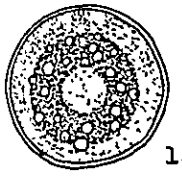
CHAPTER IX. PLATES OF PLANKTON

A. FRESH WATER PLANKTON

Note: ♀ ---------- Female

♂ ---------- Male

Leg. 5 ---------- 5th Leg



1.
Melosira Agussizii

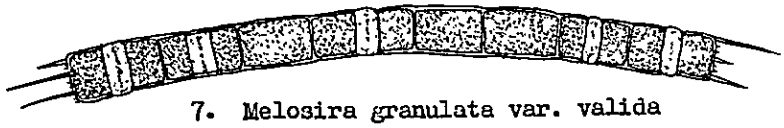
2. Melosira distans

3. Melosira granulata

4. Melosira granulata var.angustissima

5.
Melosira granulata var. angu. fo. spiralis

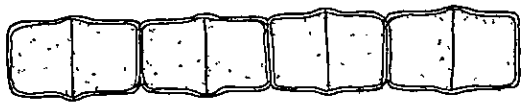
6.
Melosira granulata var. muzzanensis



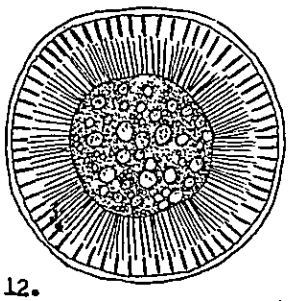
7. Melosira granulata var. valida

8. Melosira islandica

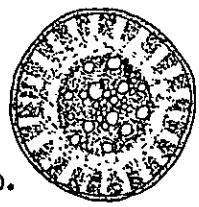
9. Melosira italica



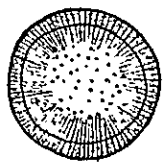
11. Melosira varians



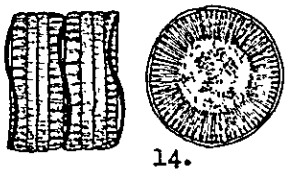
12.
Cyclotella comta



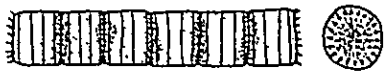
10.
Melosira malayensis



13.
Cyclotella Kutzingiana

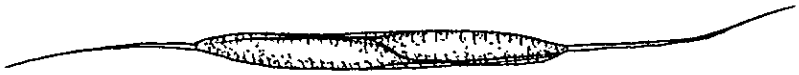


14. Cyclotella Meneghiniana

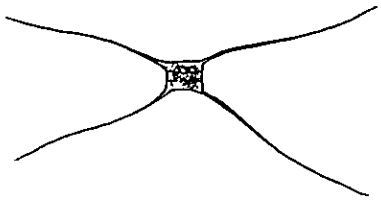


15. Stephanodiscus Hantzschii

16. Rhizosolenia eriensis

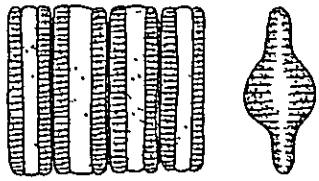


17. Rhizosolenia longiseta



18. Chaetoceros Muelleri

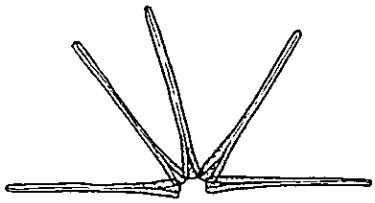
19. Attheya Zachariasi



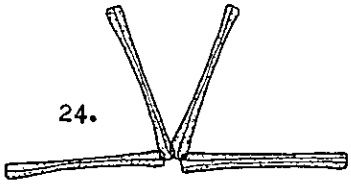
20. Fragilaria construens

21. Fragilaria capucina

22. Fragilaria crotonensis



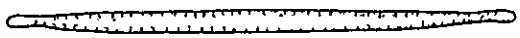
23. Asterionella formosa



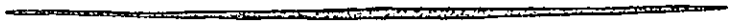
24. Asterionella gracillima

25. Synedra acus var. angustissima

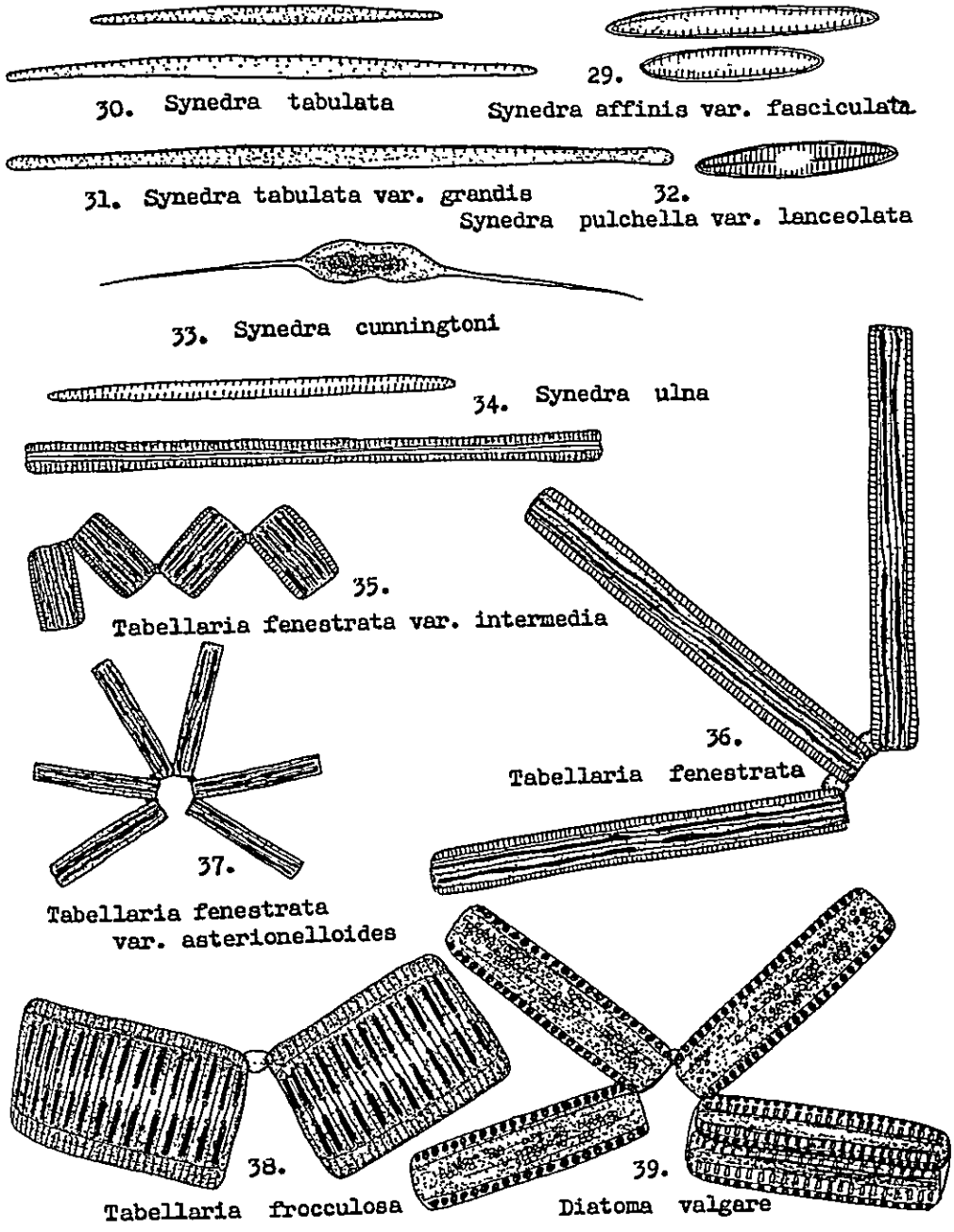
26. Synedra acus var. radians



27. Synedra affinis



28. Synedra acus



30. Synedra tabulata

29. Synedra affinis var. fasciculata

31. Synedra tabulata var. grandis

32. Synedra pulchella var. lanceolata

33. Synedra cunningtoni

34. Synedra ulna

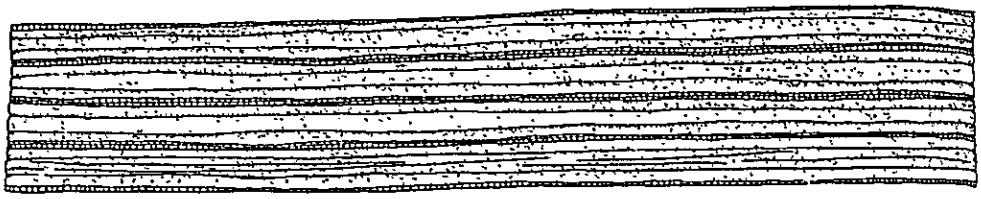
35. Tabellaria fenestrata var. intermedia

36. Tabellaria fenestrata

37. Tabellaria fenestrata var. asterionelloides

38. Tabellaria frocculosa

39. Diatoma valgare

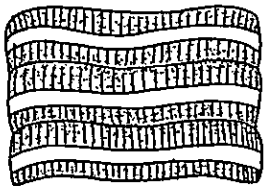


40. Diatoma elongatum

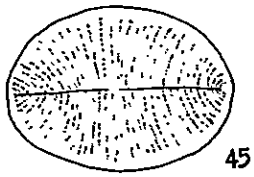
42. Diatoma valgare var. brevis

41. Diatoma linearis

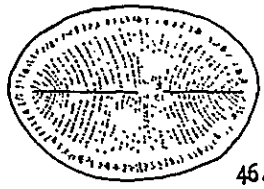
43. Achnanthes lanceolata



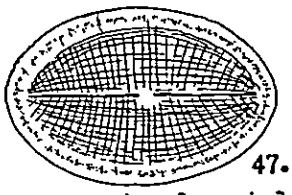
44. Achnanthes coarctata



45. Cocconeis pediculus



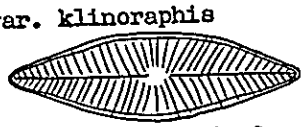
46. Cocconeis placentula



47. Cocconeis placentula var. klinoraphis

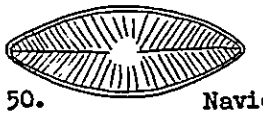
48. Navicula cuspidata

49. Navicula gracilis



51 Navicula placentula form jenisseyensis

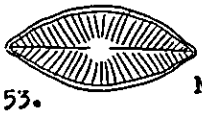
52. Navicula placentula fo. lanceolata



50. Navicula placentula

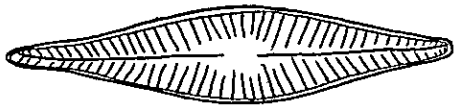
54. Navicula placentula fo. rostrata

55. Navicula gastrum



53. Navicula placentula fo. latiuscula

56. Navicula radiosa



57. Navicula rhynchocephala

58. Stauroneis anceps

59. Amphipleura pellucida

60. Pinnularia gibba

61. Pinnularia nobilis

62. Pinnularia splendida

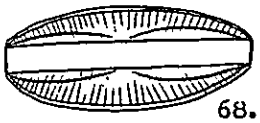
63. Frustulia rhomboides

64. Neidium affine

66. Gyrosigma attenuatum

67. Mastogloia danseii

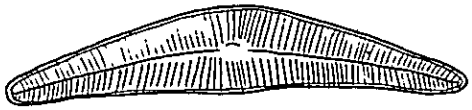
65. Neidium affine var. amphirhynchus



68.

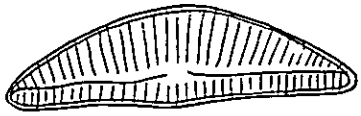
69. Cymbella cistula

Amphora hendeyi n. sp.

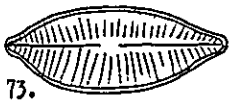


70. Cymbella lanceolata

71. Cymbella naviculiformis



72. Cymbella turgida



73. Cymbella obtusiuscula

74. Cymbella ventricosa

75. Cymbella parva

76. Gomphonema acuminatum

77. Epithemia argus

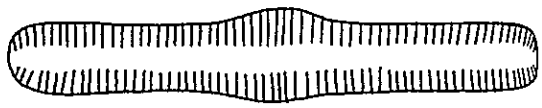
79. Epithemia argus var. alpestris

78. Epithemia turgida

80. Epithemia zebra

81. Epithemia zebra var. porcellus

82. Epithemia zebra var. saxonica



83. Rhopalodia gibba

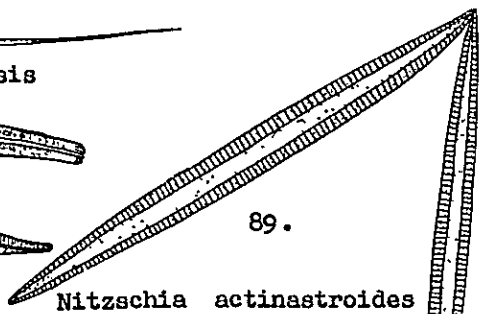
84. Rhopalodia ventricosa

85. Nitzschia acicularis

86. Nitzschia nyassensis

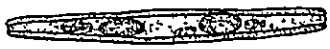
87. Nitzschia filiformis

88. Nitzschia Brebissonii

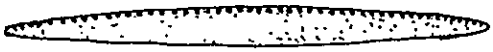


89. Nitzschia actinastroides

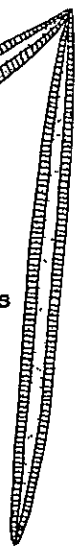
90. Nitzschia ricta



91. Nitzschia philippinarum

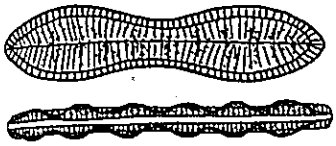


92. Nitzschia subrostrata

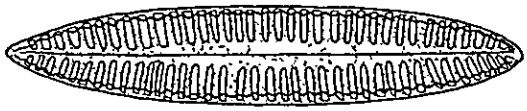


94. Hantzschia amphioxys

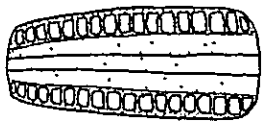
93. Nitzschia vermicularis



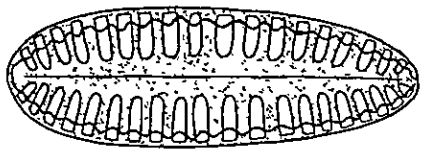
95. Cymatopleura solea



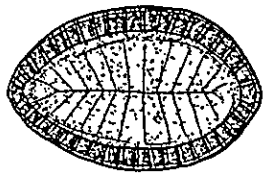
96. Surirella biseriata



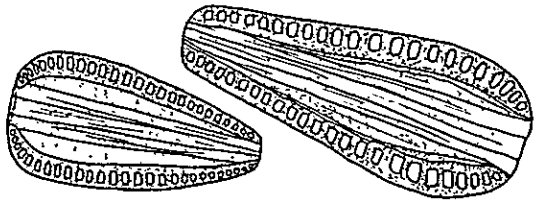
98. Surirella elegans



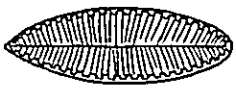
97. Surirella robusta



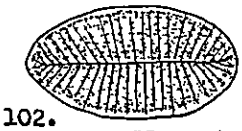
99. Surirella ovalis



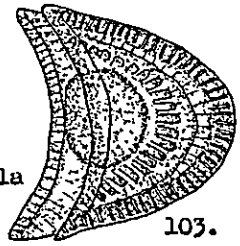
100. Surirella robusta var. splendida



101. Surirella tenera



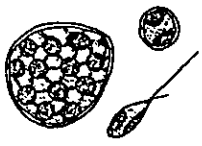
102. Surirella striatula



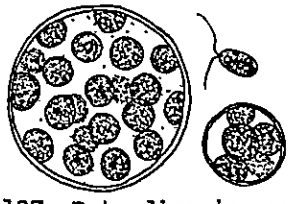
103. Campylodiscus hibernicus

104. Bumilleria sicula

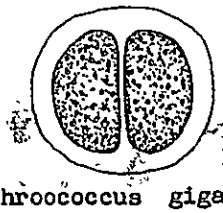
105. Tribonema bombycinum



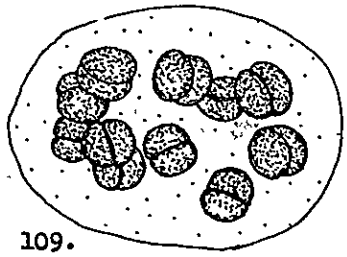
106. Leuvenia natans



107. Botrydiopsis arhiza

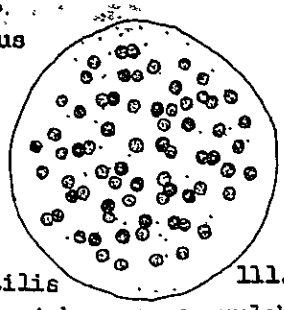


108. Chroococcus giganteus

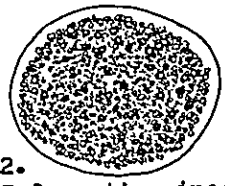


109. Chroococcus limneticus

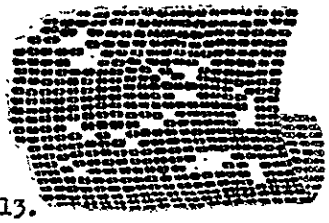
110. Synechocystis aquatilis



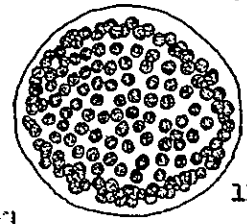
111. Aphanocapsa pulchra



112. Polycystis incerta



113. Merismopedia elegans



114. Coelosphaerium Kutzingianum

115. Spirulina major

116. Spirulina princepus

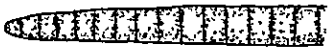
119. Oscillatoria princeps

118. Oscillatoria limosa

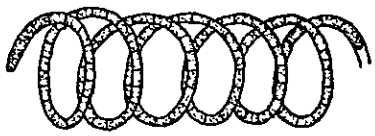
121. Phormidium autumnale

117. Arthrospira Jenneri

122. Trichodesmium lacustre

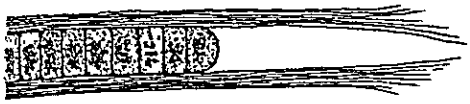


120. Oscillatoria formosa



123. Lyngbya contorta

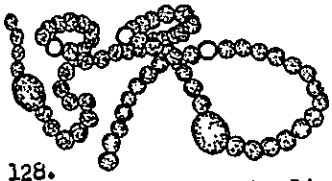
124. Lyngbya Birgei



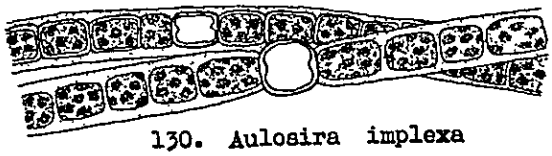
125. Phorphyrosiphon Notarisii

126. Symploca muscorum

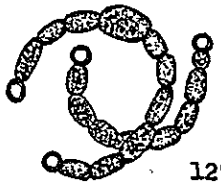
127.



128. Anabaena circinalis



130. Aulosira implexa

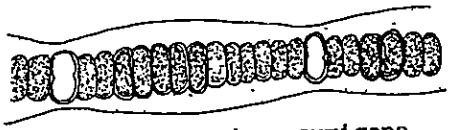


129. Anabaenopsis Elenkinii

131. Nostoc sphaericum

133. Aphanizomenon flos-aquae

132. Nostoc Linckia

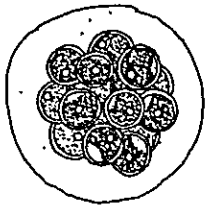


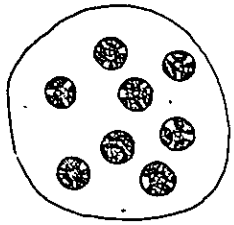
134. Nodularia spumigena

135. Nodularia spumigena var. minor

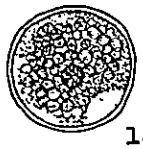
136. Plectonema Tomasiniana

Palmella miniata var. aequalis
137.



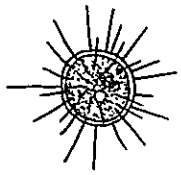


139.
Asterococcus limneticus



138.
Sphaerocystis Schroeteri

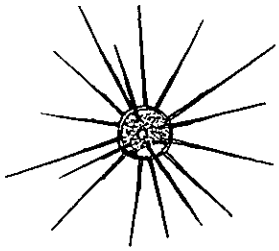
140.
Chlorococcum humicola



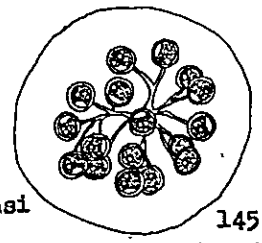
143.
Golenkinia paucispina

141.
Trebouxia Cladonie

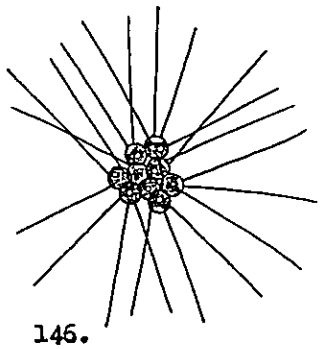
142.
Oophila Amblystomatis



144.
Acanthosphaera Zachariasi

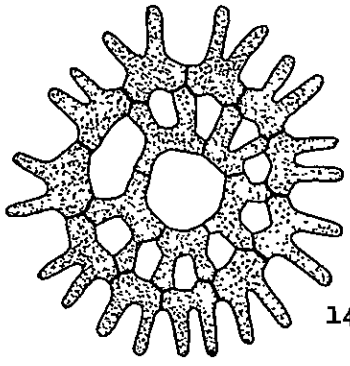


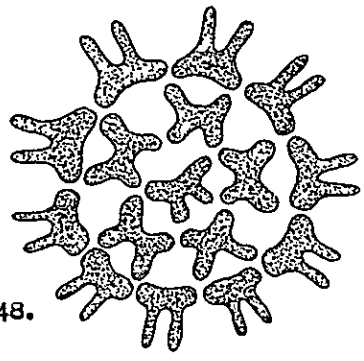
145.
Dictyosphaerium pulchellum



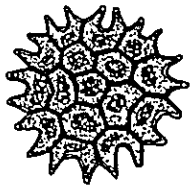
146.
Micractinium pusillum

147.
Schroederia setigera

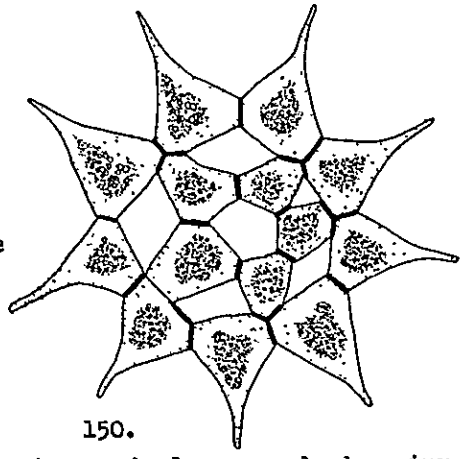




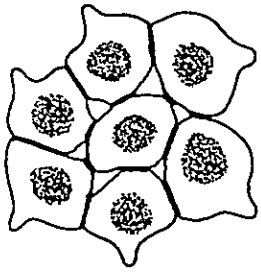
148.
Pediastrum biradiatum



149.
Pediastrum Boryanum var. longicorne



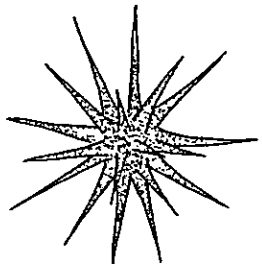
150.
Pediastrum simplex var. duodenarium



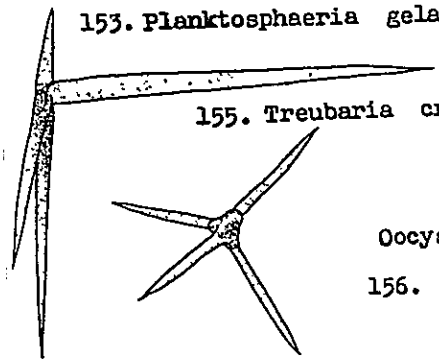
151. Coelastra cambricum

152.
Chlorella variegatus

153. Planktosphaeria gelatinosa



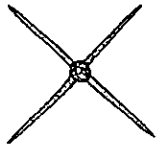
154.
Echinosphaerella limnetica



155. Treubaria crassispina

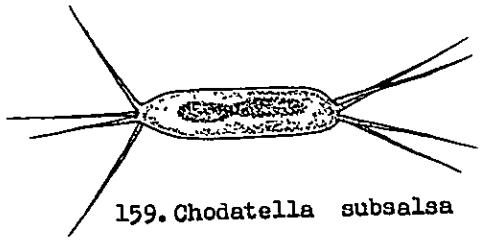
Oocystis Eremosphaeria

156.

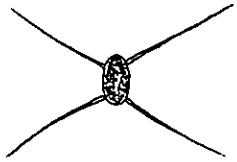


157.
Pachycladon umbrinus

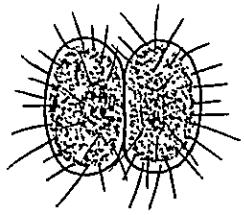
158.
Oocystis Borgei



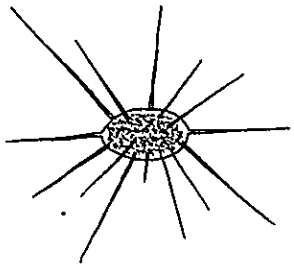
159. Chodatella subsalsa



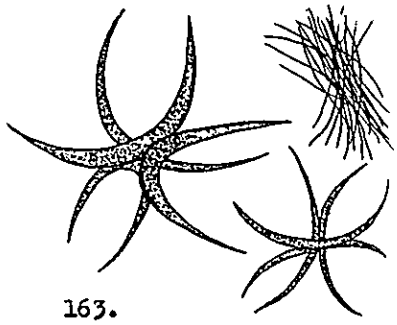
160. Chodatella quadriseta



161. Franceia tuberculata



162. Franceia Droescheri

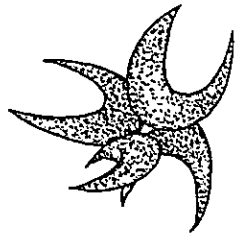


163. Ankistrodesmus falcatus

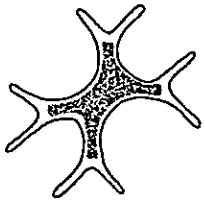
164. Closteriopsis longissima var. tropica

165. Closteridium lunula

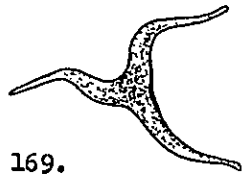
166. Selenastrum gracile



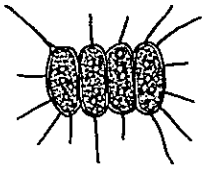
167. Selenastrum Bibraianum



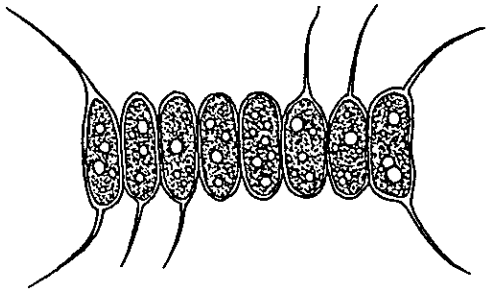
168. Tetraedron lobatum var. subtetrraedricum



169. Cerasterias irregulare

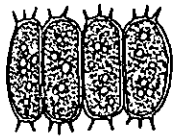


170. Scenedesmus abundans

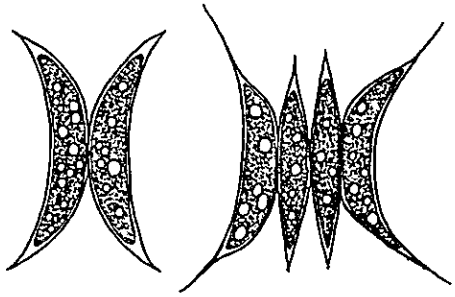


171. Scenedesmus armatus

172. Scenedesmus bijuga



173. Scenedesmus denticulatus var. linearis



174. Scenedesmus dimorphus

175. Scenedesmus hystrix

176. Scenedesmus quadricauda

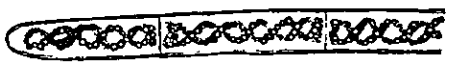
177. Scenedesmus obliquus

178. Crucigenia fenestrata

179. Crucigenia quadrata

180. Crucigenia rectangularis

181. Crucigenia tetrapedia

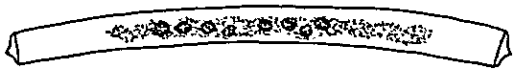


182. Spirogyra ahmedabadensis

183. Spirogyra azygospora

184. Spirogyra ionia

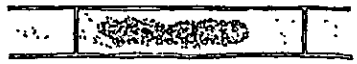
185. Spirogyra ionia



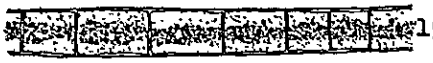
186. Spirogyra prolifica

187. Spirogyra protecta

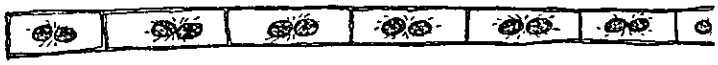
188. Mougeotia viridis



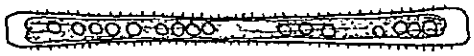
189. Mougeotia scalaris



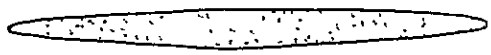
190. Mougeotiopsis calospora



191. Zygnemopsis americana

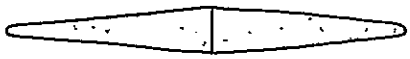


192. Gonatozygon aculeatum

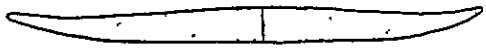


193. Closterium acerosum fo. rectum

194. Closterium moniliforme



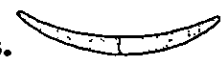
Closterium rectimarginatum



195. Closterium gracile

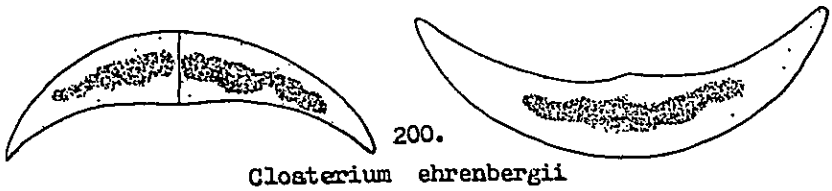
196. Closterium calosporum

197. Closterium cornu var. javanicum

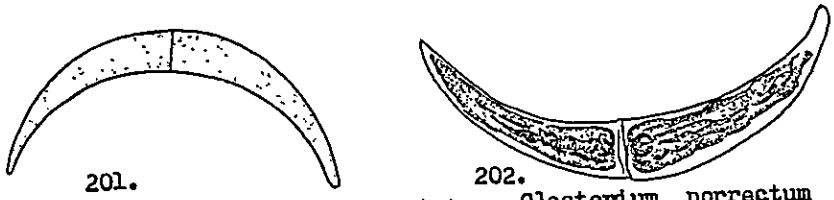


198. Closterium dianae var. minus

199. Closterium setaceum



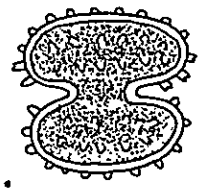
200. Closterium ehrenbergii



201. Closterium porrectum var. angustatum

202. Closterium porrectum

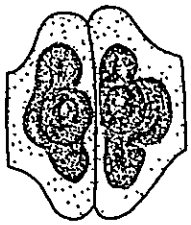
203. Pleurotaenium baculoides



206. Cosmarium exasperatum

204. Cosmarium granatum var. rotundatum

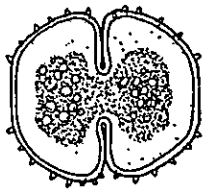
205. Cosmarium indentatum var. ellipticum



207. Cosmarium nymanninum

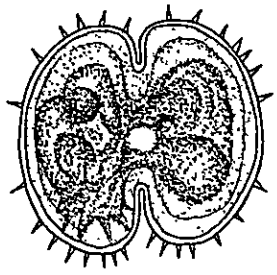
208. Cosmarium phaseolus var. omphalum

209. Cosmarium pseudopyramidatum var. oculatum

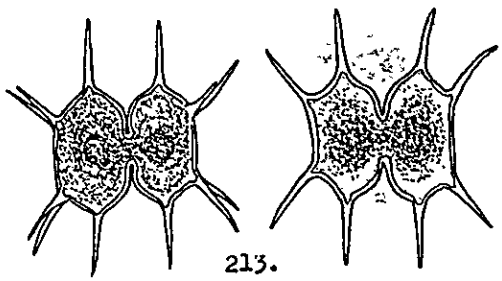


210. Cosmarium vitiosum var. oriental

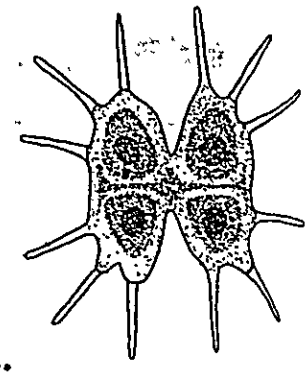
211. Xanthidium burkillii



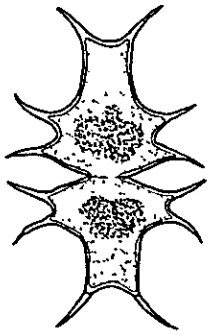
212. Xanthidium spinosum



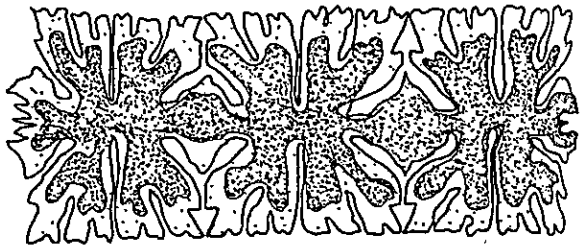
213.
Xanthidium sansibarense fo. asymmetricum



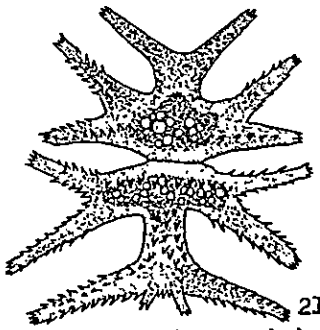
214.
Xanthidium sexmamillatum var.pulneyense



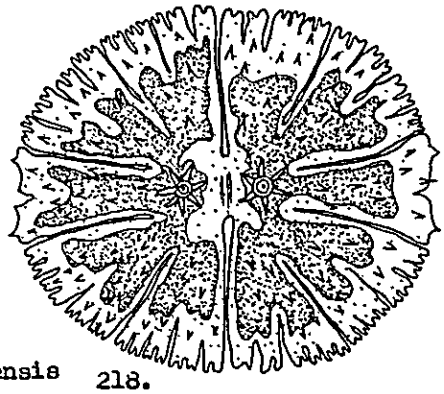
215. Micrasterias ceratofera



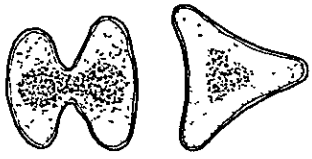
216. Micrasterias foliacea



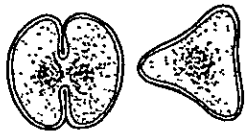
217.
Micrasterias mahabuleshwarensis var. surculifera



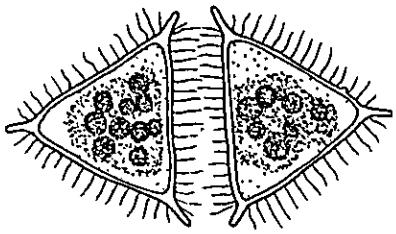
218.
Micrasterias torreyi var. crameri



219. Staurastrum pseudopachyrhyncum

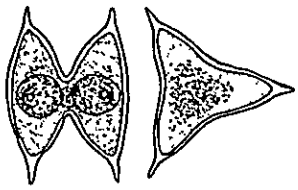


220.
Staurastrum orbiculare var.depressum

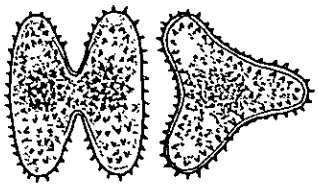


221. Staurastrum smithii ?

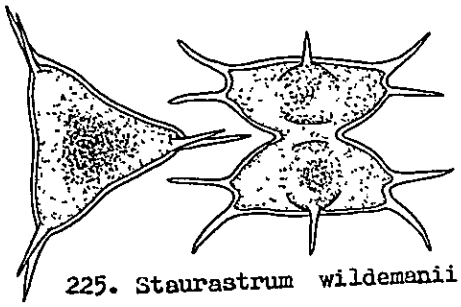
222. Staurastrum corniculatum var. variabile



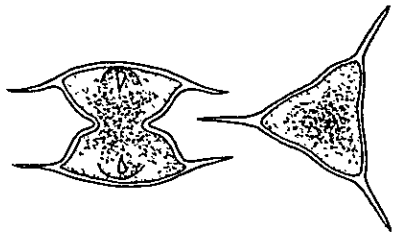
223. Staurastrum megacanthum



224. Staurastrum punctulatum

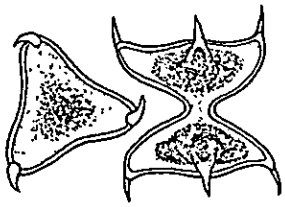


225. Staurastrum wildemanii

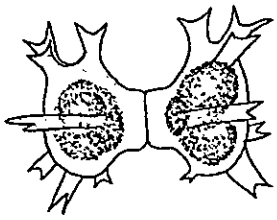


226. Staurastrum wildemanii var. unispiniferum

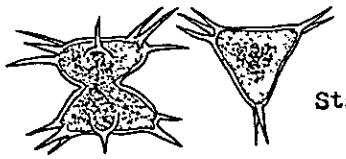
227. Staurastrum dejectum



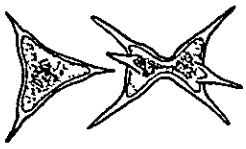
228. Staurastrum connatum



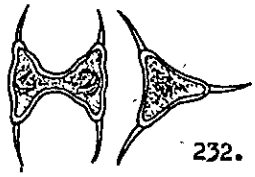
229. Staurastrum tohopekaligense fa. minus



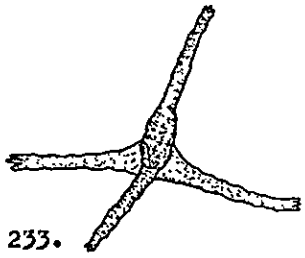
230. Staurastrum trissacanthum var. dissacanthum



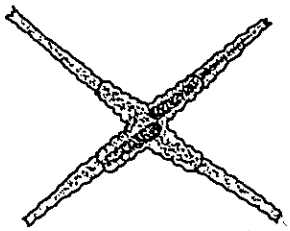
231.
Staurastrum cuspidatum var. divergens fa.minus



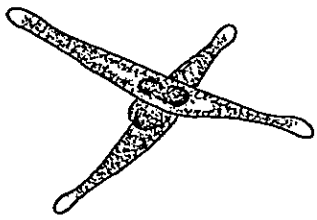
232.
Staurastrum cuspidatum



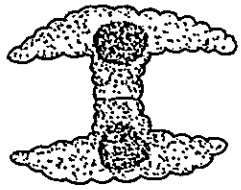
233.
Staurastrum amithii



234.
Staurastrum rhynchoceps var. curvatum

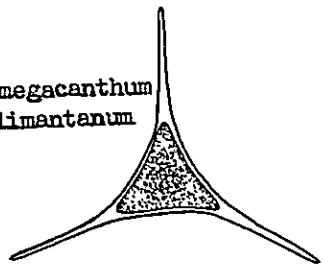


235.

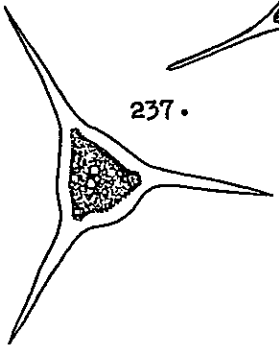


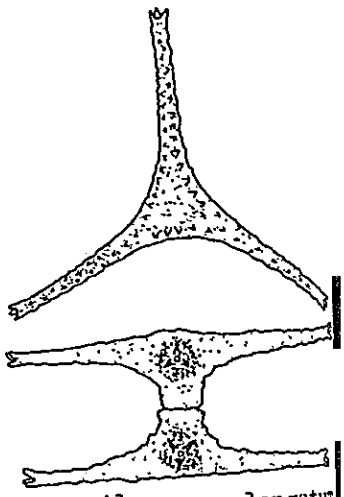
236. Staurastrum indentatum

Staurastrum megacanthum var.kalimantanum

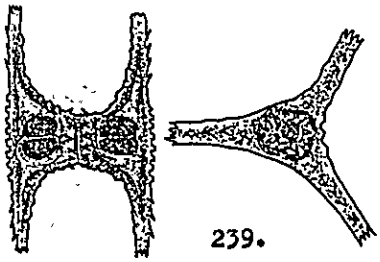


237.

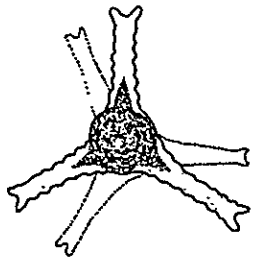




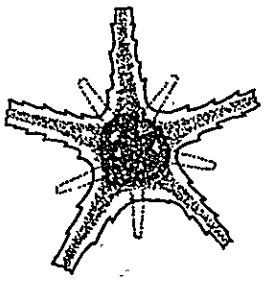
238.
Staurastrum gracile var. elongatum



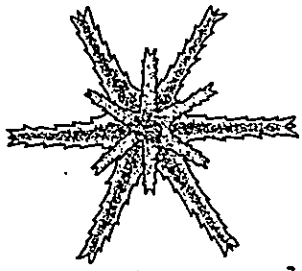
239. Staurastrum anatinoides var.javanicum



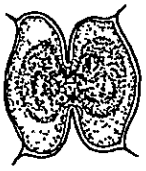
240. Staurastrum woltereckii



241. Staurastrum acanthastrum

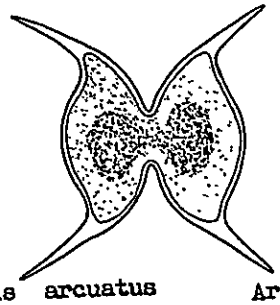


242. Staurastrum zonatum var.ceylanicum



243. Arthrodesmus apiculatus

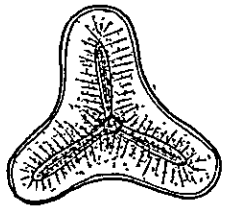
244. Arthrodesmus convergens



245. Arthrodesmus arcuatus

246. Arthrodesmus curvatus var. latus

247. Onychonema laeve var.micracanthum



248. Sphaerozosma nitens var.triangulare fa. Javanicum

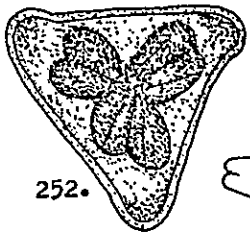
249. Sphaerozosma granulatum

250. Spondylosium planum

251. Hyalotheca mucosa

254. Hyalotheca dissiliens

Desmidium bengalicum



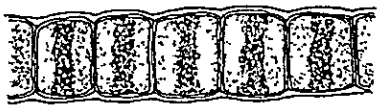
252.

253.

Desmidium swartzii

Desmidium Aptogonum

255.



256. Ulothrix zonata

257. Protococcus viridis

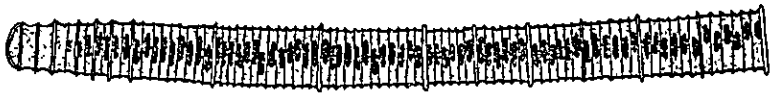
258. Microspora Willeana

259. Sphaeroplea annulina

260.

Trentepohlia aurea var. polycarpa

261. Schizogonium murale



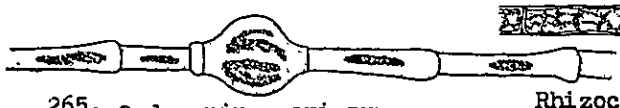
262. Schizomeris Leibleinii

263. Oedogonium crassum

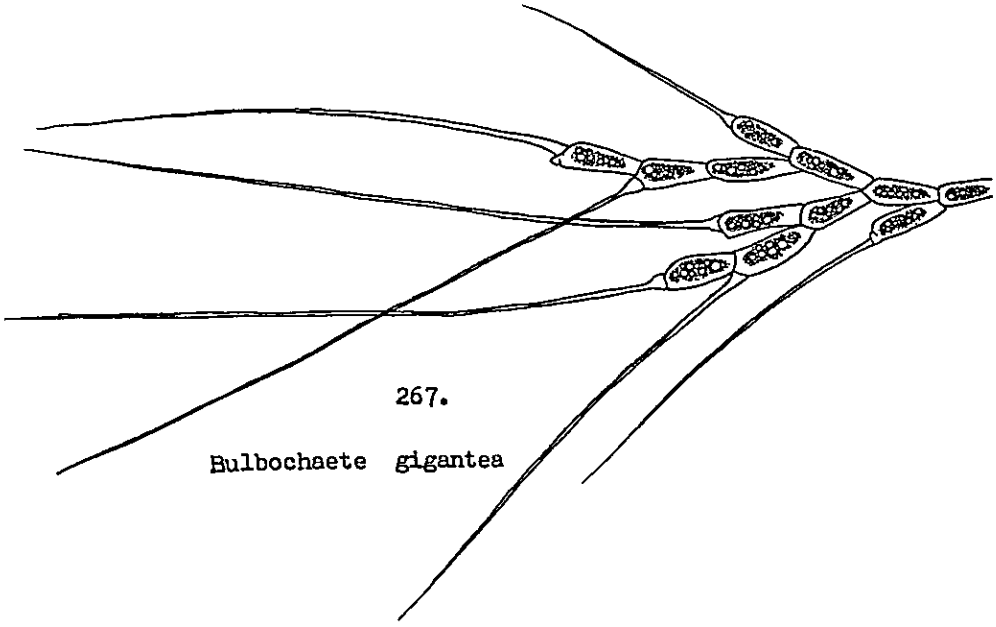
264. Basicladia Chelonum

266.

Rhizoclonium hieroglyphicum

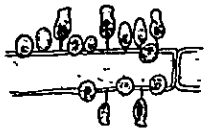


265. Oedogonium crispum

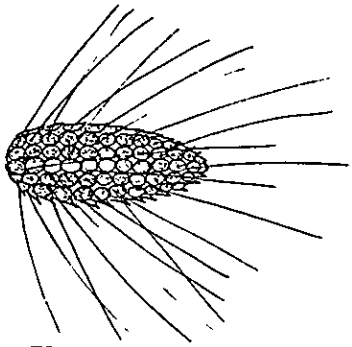


267.

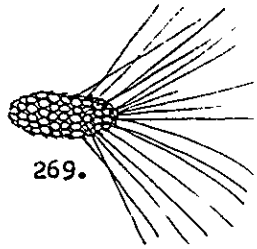
Bulbochaete gigantea



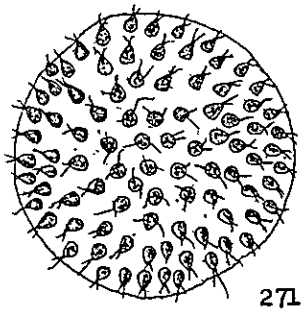
268. Stipitococcus urceolatus



270. Mallomonas caudata

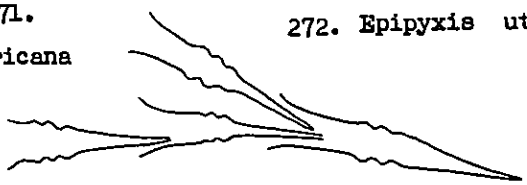


269. Mallomonas producta

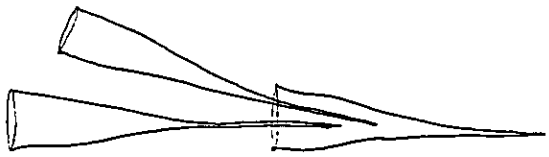


271. Uroglenopsis americana

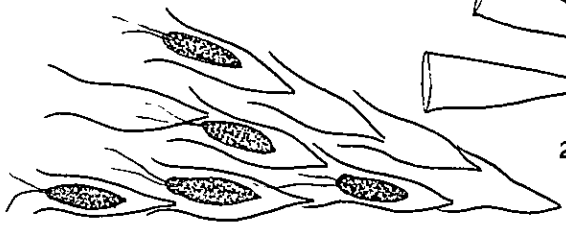
272. Epipyxis utriculus



273. Dinobryon divergens

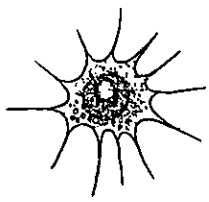


274. Dinobryon stipitatum

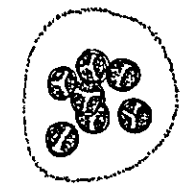


275. Dinobryon sertularia

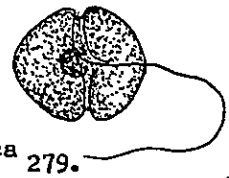
276. Chrysochromulina parva



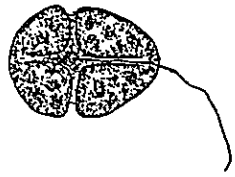
277. Chrysamoeba radians



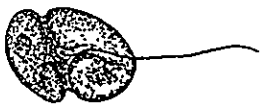
278. Chrysocapsa planktonica



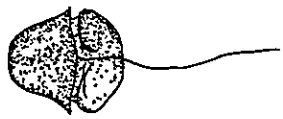
279. Gymnodinium neglectum



280. Gymnodinium aeruginosum



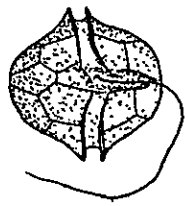
281. Gyrodinium pusillum

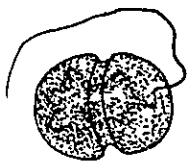


282. Massartia Musei

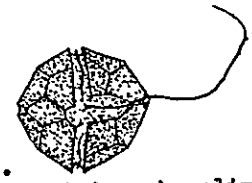
283. Massartia vorticella

284. Sphaerodinium cinctum





285. Glenodinium uliginosum

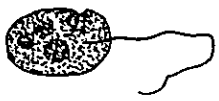


286. Glenodinium berolinense

287. Glenodinium penardiforme

288. Glenodinium kulczynskii

289. Glenodinium quadridens



290. Hemidinium nasutum

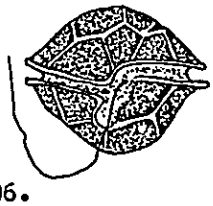
291.
Bernardinium bernardinense

292. Gonyaulax apiculata

293.
Gonyaulax palustre ?

294.
Peridinium aciculiferum

295.
Peridinium africanum ?



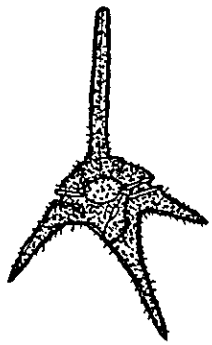
296.
Peridinium gatunense

297.
Peridinium spiniferum

298. Peridinium palatinum

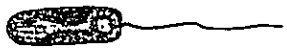
299.
Peridinium umbonatum

300.
Peridinium striolatum ?

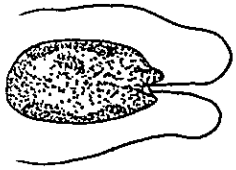


301.
Ceratium hirundinella

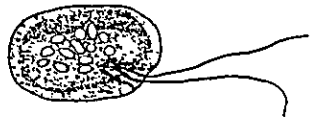
302.
Hypnodinium sphaericum



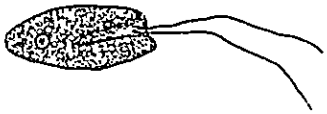
303. Monomastix opisthostigma



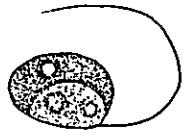
305. Cryptochrysis commutata



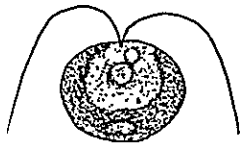
304. Cryptomonas erosa



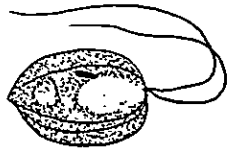
306. Chilomonas Paramaecium



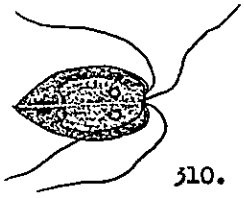
307. Pedinomonas minor



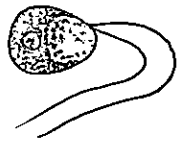
308. Heteromastix angulata



309.
Stephanoptera gracilis

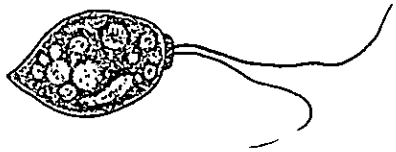


310.
Pyrami omonas tetrarhynchos

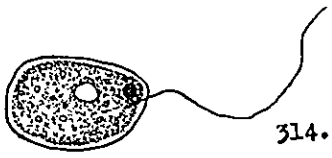


311. Dunaliella salina

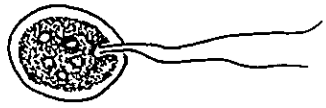
312.
Chlamydomonas chrysomonadis



313. Chlamydomonas completa

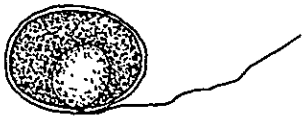


314. Chlamydomonas inhabilis

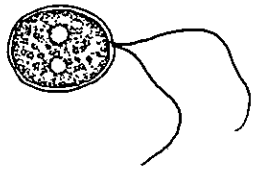


315. Chlamydomonas kvildensis

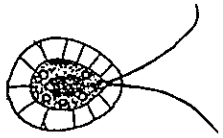
316. Chlamydomonas Rodhei



317. Chlamydomonas praecox



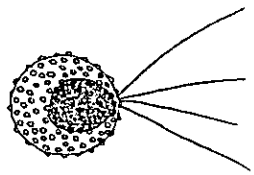
318. Chlamydomonas cingulata



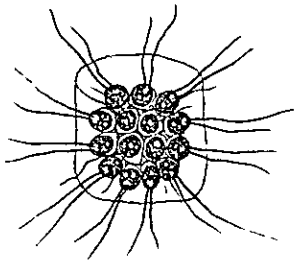
319. Haematococcus lacustris

320. Polytoma uvella

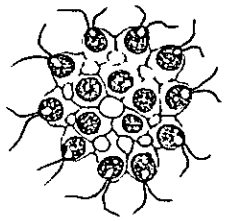
321. Chlorogonium elongatum



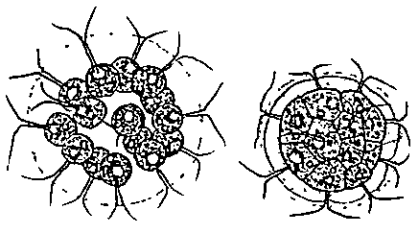
322. Pedinopera granulosa



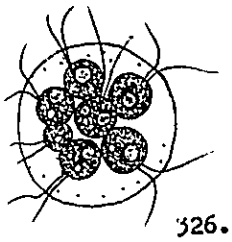
323. Gonium pectorale



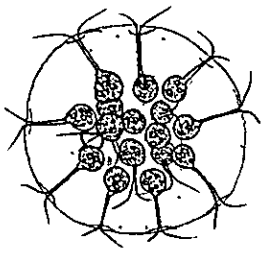
324. Gonium formosum



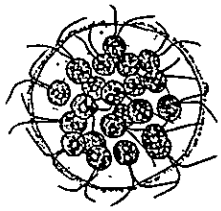
325. Pandorina morum



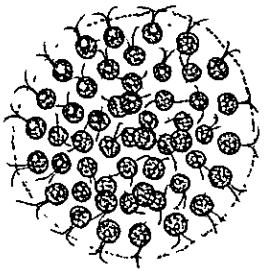
326.
Pandorina minodi



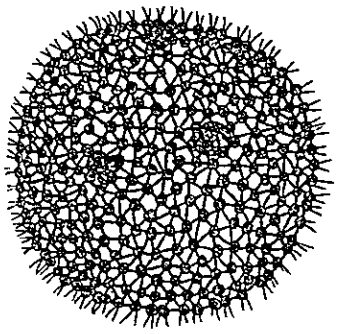
327. Eudorina elegans



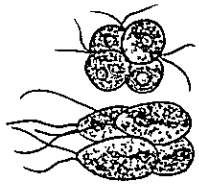
328.
Eudorina unicocca



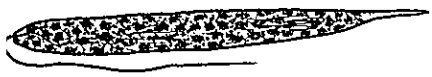
329. Pleodorina californica



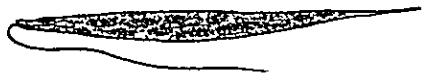
330. Volvox aureus



331. Pascheriella tetras

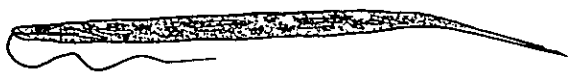


332. Euglena acus



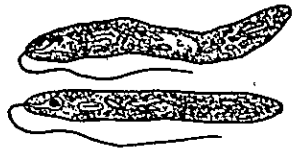
333. Euglena acus var. rigida

334. Euglena acutissima

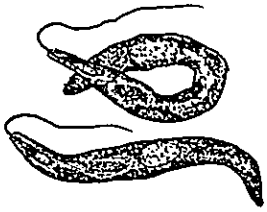


335. Euglena acutissima var. longa n. var.

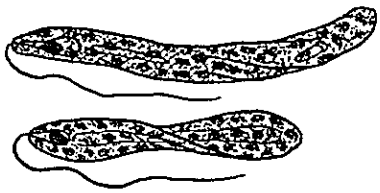
336. Euglena caudata



337. Euglena deses

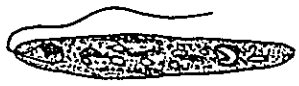


338. Euglena deses var. tenuis

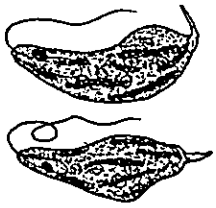


339. Euglena ehrenbergii

340. Euglena geniculata



341. Euglena gracilis

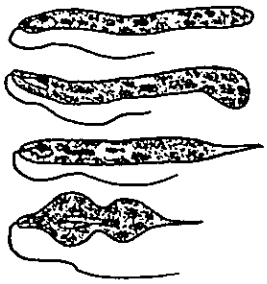


343. Euglena granulata

342. Euglena hyalina

344. Euglena intermedia

345. Euglena oblonga



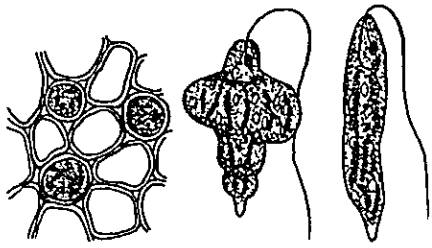
346. Euglena klebsii

347. Euglena oxyuris

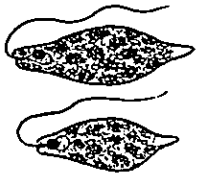
348. Euglena pisciformis

349. Eulena anabaena var. minor

350. Euglena minima

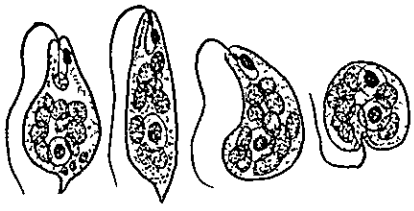


351. Euglena polymorpha

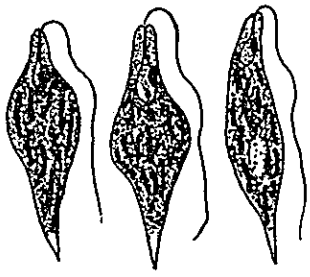


352. Euglena proxima

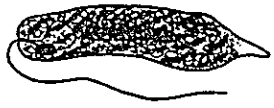
353.
Euglena pseudospiroides



354. Euglena pseudoviridis



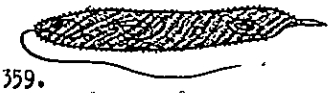
355. Euglena rostrifera n. sp.



356. Euglena rubra

357. Euglena sociabilis

358. Euglena spirogyra

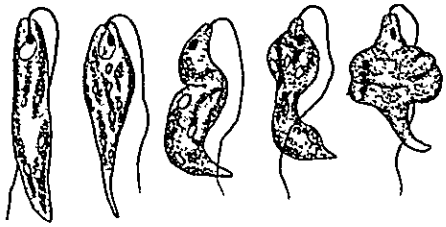


359.
Euglena spirogyra var. abrupte-acuminata

360.
Euglena spirogyra var. marchica

361. Euglena spiroides

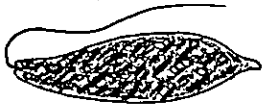
362. Euglena splendens



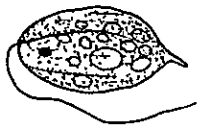
364. Euglena terricola
(Series showing metabolic movement)

363. Euglena tripteris

365. Lepocinclis fusiformis



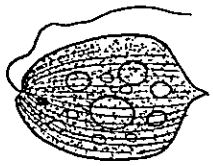
366. Euglena velata



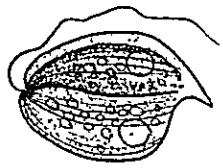
367. Phacus acuminata var. iowensis

368. Lepocinclis ovum

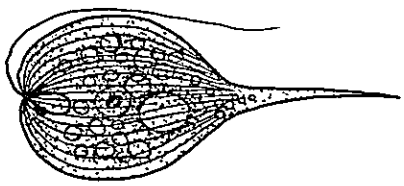
369. Lepocinclis ovum var. globula



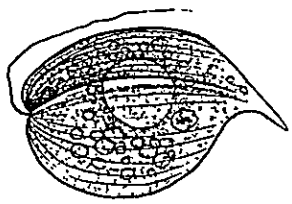
370. Phacus acuminata



371. Phacus alata

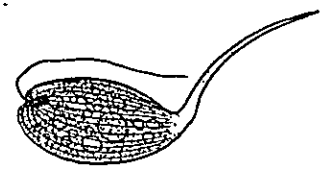


372. Phacus longicauda



373. Phacus pleuronectes

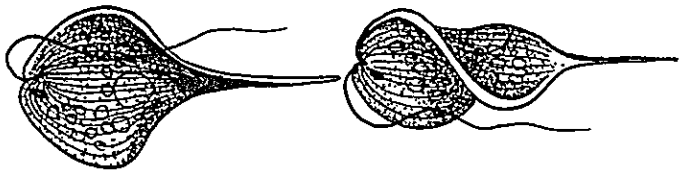
374. Phacus quinquemarginatus



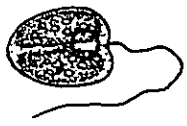
375. Phacus rostafinskii

376. Phacus lismorensis

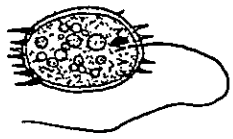
377.



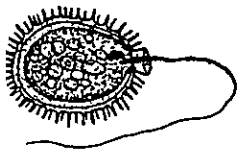
378. Phacus torta



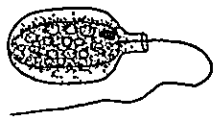
379. Cryptoglena pigra



380. Trachelomonas armata

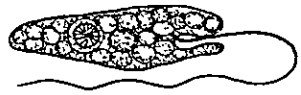


381. Trachelomonas hispida



382. Trachelomonas lagenella

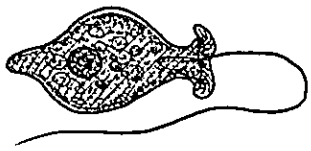
383. Trachelomonas volvocina



384. Astasia Dangeardii

385. Peranema trichophorum

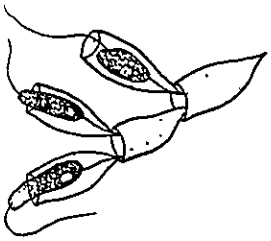
386. Anisonema ovale



Petalomonas abscissa

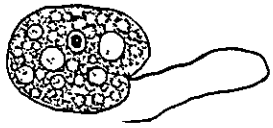
387.

388. Urceolus cyclostomus

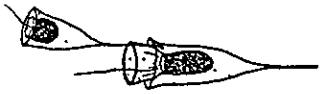


389. Codonodendron ocellatum

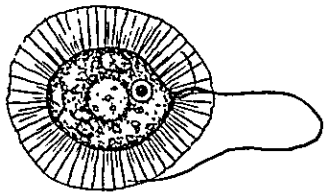
390. Monas vivipara



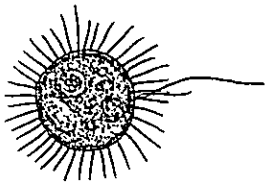
391. Oicomonas termo



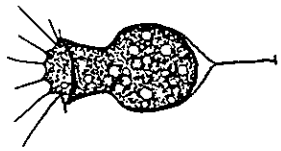
392. Polyoeca dumosa



393. Monas coronifera



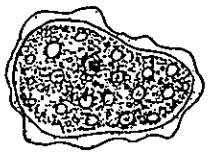
394. Physomonas vestita



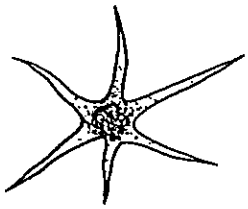
395. Salpingorhiza pascheriana

396. Amoeba guttula

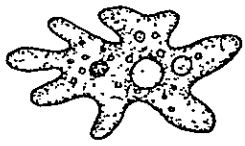
397. Pelomyxa villosa



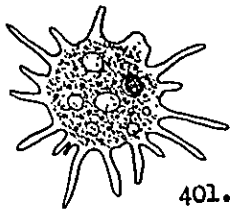
398. Pelomyxa palustris



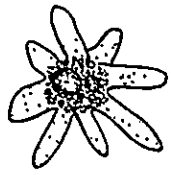
399. Astramoeba radiosa



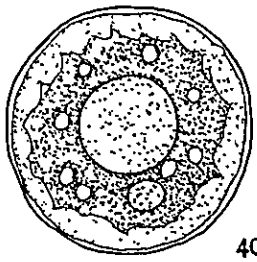
400. Chaos diffluens



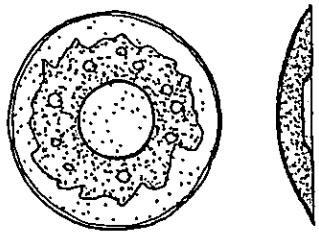
401.
Amoeba polypoidia



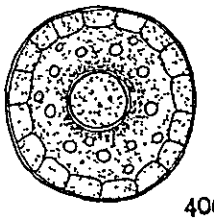
402.
Rugipes bilzi



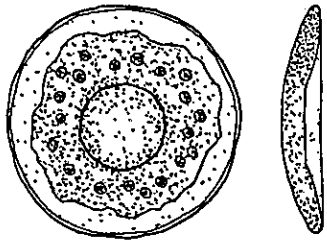
403.
Arcella vulgaris



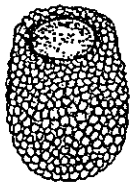
404. Arcella discoides



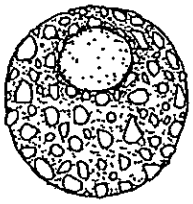
406.
Arcella polypora



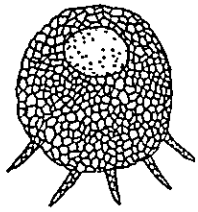
405. Arcella megastoma



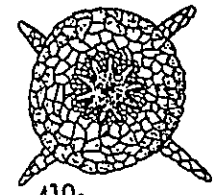
407.
Centropyxis constricta



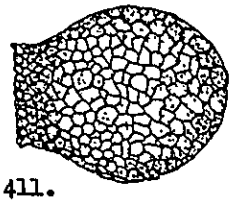
408.
Centropyxis ecornis



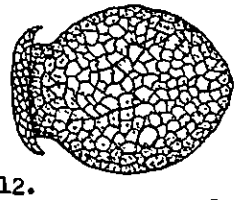
409. Centropyxis aculeata



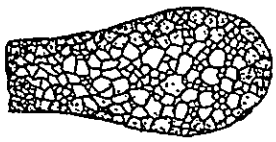
410. Difflugia corona



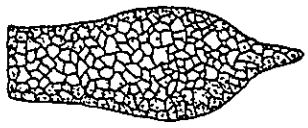
411. Difflugia lebes



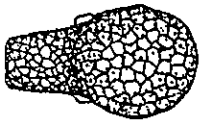
412. Difflugia urceolata



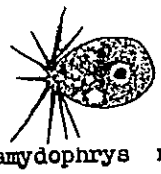
413. Difflugia oblonga



414. Difflugia acuminata

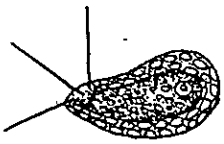


415. Pontigulasia vas

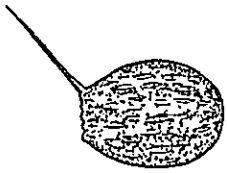


416. Chlamydophrys minor

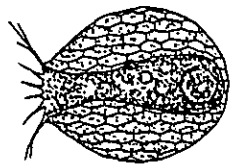
417. Lesquereusia modesta



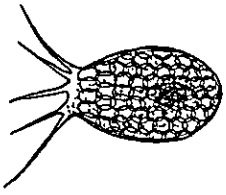
418. Trinema enchelys



419. Assulina muscorum

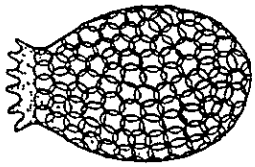


420. Assulina seminulum

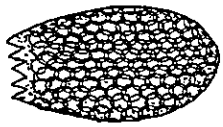


421. Euglypha laevis

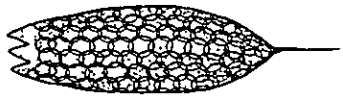
422. Euglypha cristata



423. Tracheleuglypha dentata

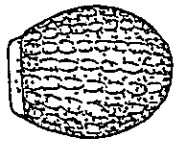


424. Euglypha tuberculata

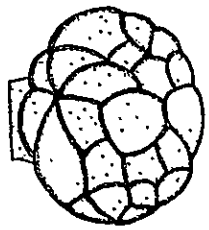


425. Euglypha mucronata

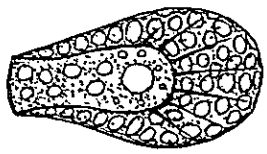
426. Nebela flabellulum



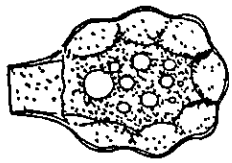
427. Heleopera rosea



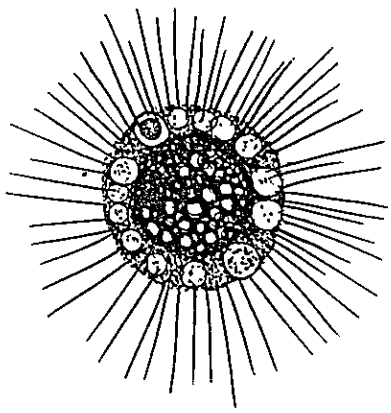
428. Sphenoderia macrolepis



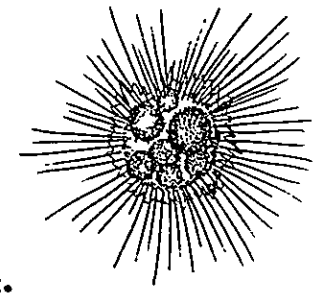
429. Nebela collaris



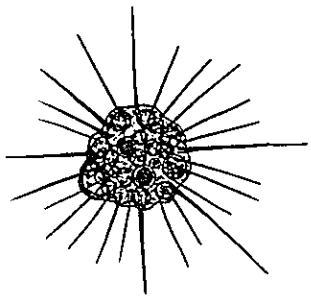
430. Hyalosphenia elegans



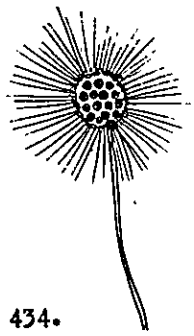
431. Actinosphaerium eichhornii



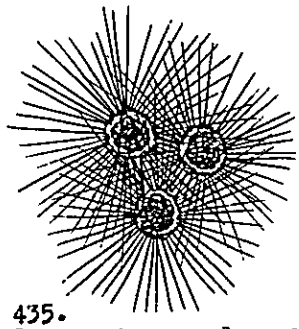
432. Acanthocystis chaetophora



433. Actinophrys sol

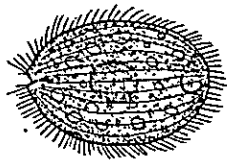


434. Clathrulina elegans



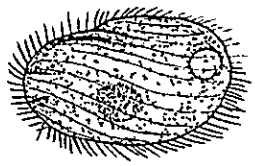
435. Raphidiophrys elegans

436. Enchelys simplex



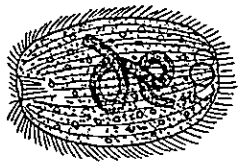
437. Holophrya simplex

438. Platyophrya vorax

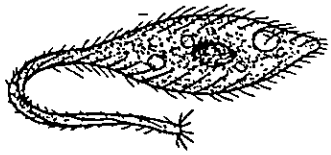


439. Placus luciae

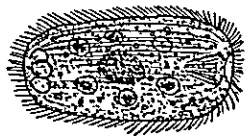
440. Enchelyodon elegans



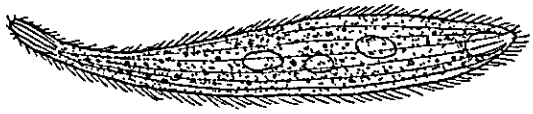
441. Pseudoprorodon ellipiticus



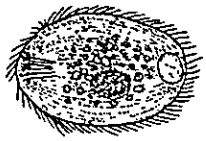
442. Lacrymaria olor



443. Prorodon teres

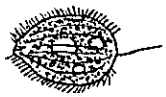


444. Trachelophyllum apiculatum

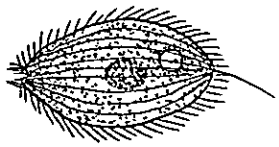


445. Prorodon discolor

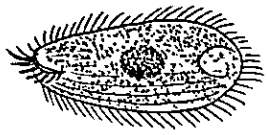
446. Ileonema ciliata



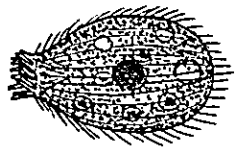
447. Urotricha farcta



448. Microregma auduboni

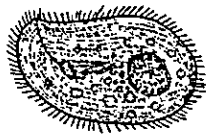


449. Plagiocampa mutabilis



450. Spasmostoma viride

451. Amphileptus claparedei

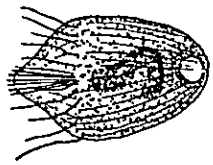


452. Chilodonella uncinata

453. Acineria incurvata

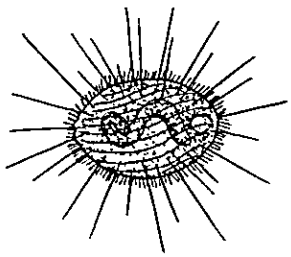
454. Trochilioides recta

455. Loxophyllum helus

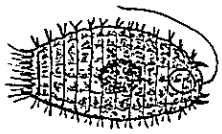


456. Didinium balbianii

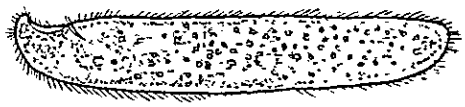
457. Coleps elongatus



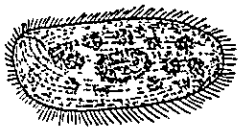
459. Actinobolina radians



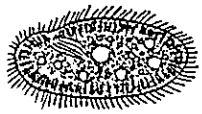
458. Coleps hirtus



460. Loxodes magnus



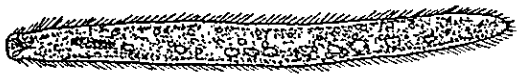
461. Chilodontopsis depressa



462. Cyclogramma trichocystis

463. Nassula ornata

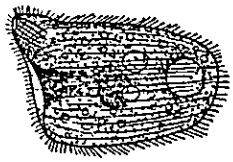
464. Orthodon hamatus



465. Homalozoon vermiculare

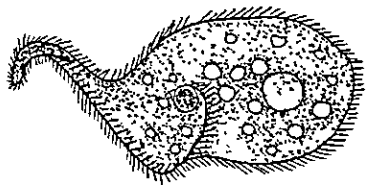
466. Spathidium spathula

467. Lionotus fasciola

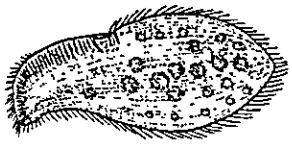


469. Spathidioides sulcatum

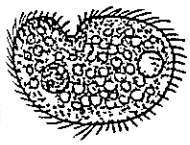
468. Dileptus anser



470. Paradileptus robustus

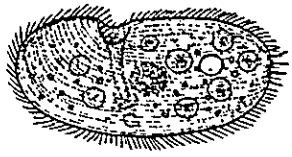


471. Branchioecetes gammari

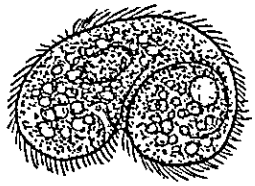


472. Colpoda cucullus

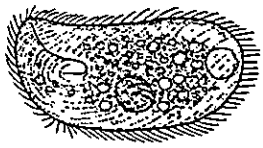
473. Bresslaua vorax



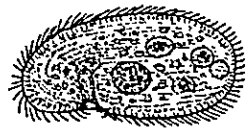
474. Conchophthirus anodontae



475. Tillina magna

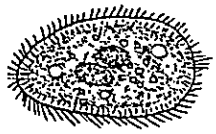


476. Bryophrya bavariensis

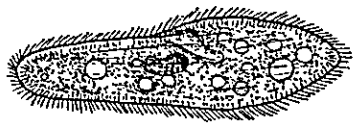


477. Plagiopyla nasuta

478. Pseudomicrothorax agilis

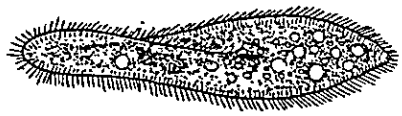


479. Paramecium trichium

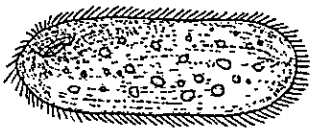


480. Paramecium caudatum

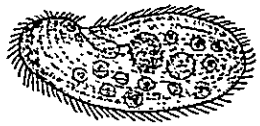
481. Paramecium aurelia



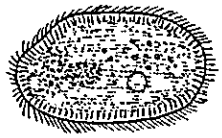
482. Paramecium multilicronucleatum



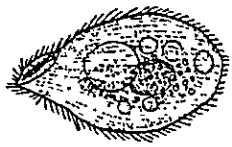
483.
Physalophrya spumosa



484. Colpidium colpoda



485. Frontoniella complanata



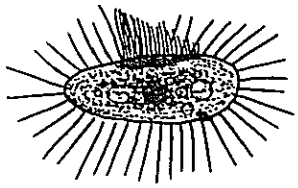
486.
Leucophrydium putrinum

487. Leucophrys patula

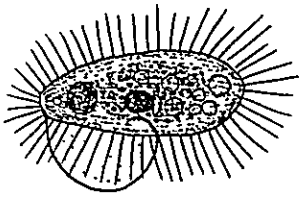
488. Tetrahymena pyriformis

489. Glaucoma scintillans

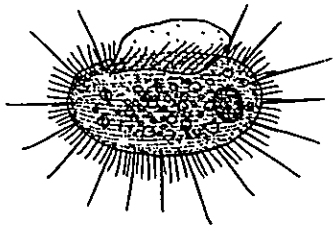
490. Uronemopsis kenti



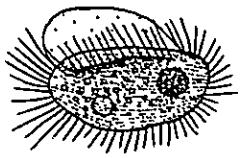
491. Ctedoctema acanthocrypta



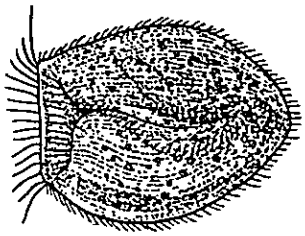
492. Cyclidium glaucoma



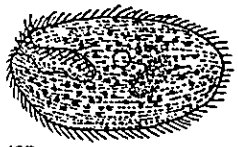
493. Histiobalantium natans



494. Pleuronema coronatum



497. Bursaria truncatella

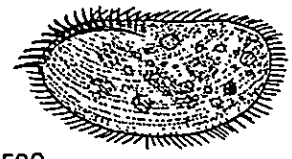


495. Thylacidium truncatum

496. Bursaridium schewakoffi

498. Metopus es

499. Bryometopus sphagni



500.
Balantidioides bivacuolata

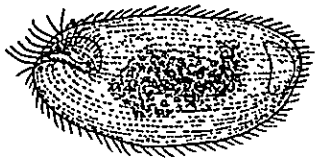
501.
Phacodinium metchnikoffi

502. Blepharisma lateritum

503.
Pseudoblepharisma crassum

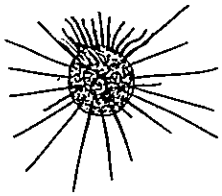
504. Spirostomum teres

505. Spirostomum minus

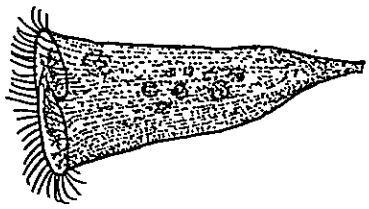


506. Climacostomum virens

507. Stentor ignaeus

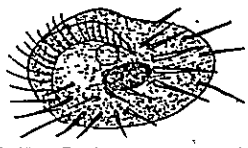


509. Halteria grandinella

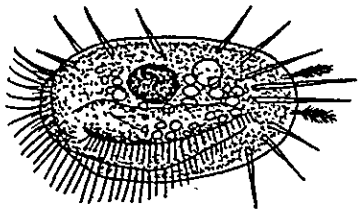


508. Stentor roesali

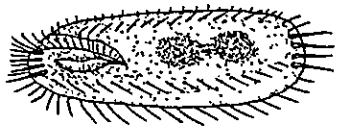
510. Aspidisca costata



511. Euplotes eurystomus

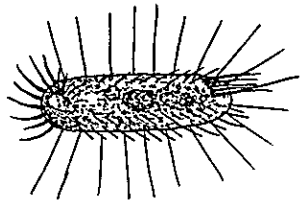


512. Euplotes patella

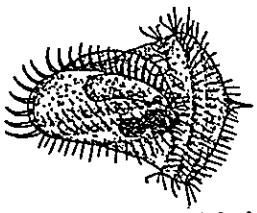


513. Amphisiella oblonga

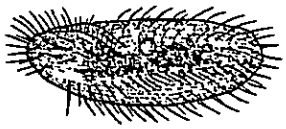
514. Holosticha vernalis



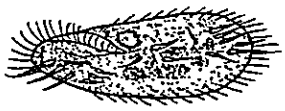
515. Balladyna elongata



517. Hypotrichidium conicum



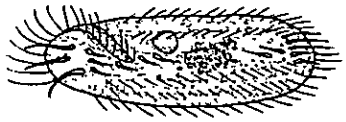
516. Kahlia acrobates



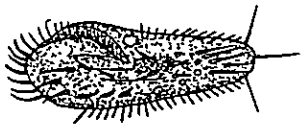
518. Oxytricha fallax

519. Kerona polyporum

520. Paraholosticha herbicola

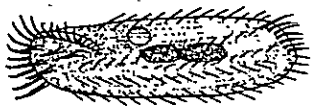


521. Onychodromopsis flexilis



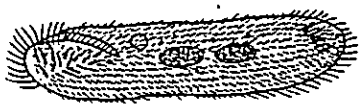
522. Stylonychia mytilus

523. Steinia candens



524. Trichotaxis fossicola

525. Uroleptus piscis



526. Urostyla grandis

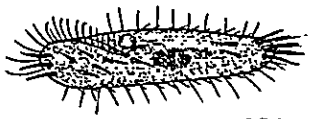
527. Urostyla trichogaster

528. Strongylidium crassum

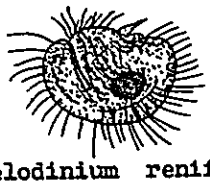
529. Histrio histrio

530. Opisthotricha procera

531. Pleurotricha grandis

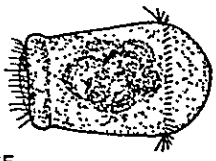


532. Tachysoma pellionella

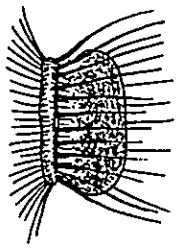


534. Pelodinium reniforme

533. Discomorpha pectinata

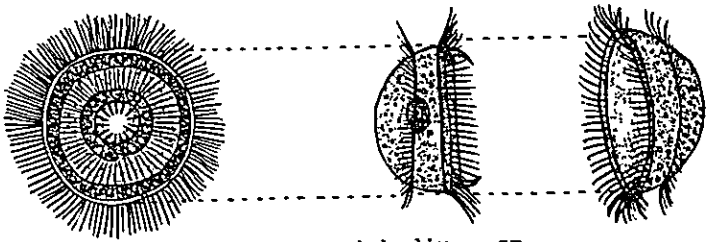


535. Opisthonecta henneguyi

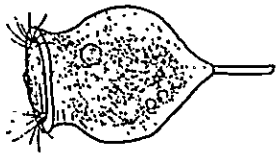


536. Cyclochaeta spongillae

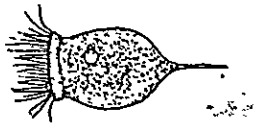
537. Astylozoon faurei



538. Trichodina sp.



539. Campanella umbellaria

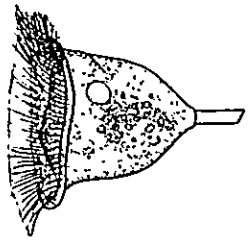


540. Rhabdostyla pyriformis

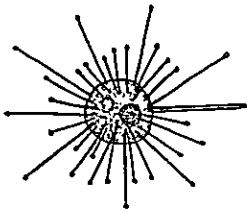
541. Vaginicola ingenita

542. Cothurnia imberbis

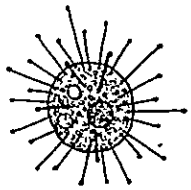
543. Ophrydium eichhorni



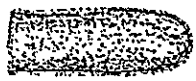
544. Vorticella campanula



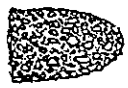
545. Podophrya fixa



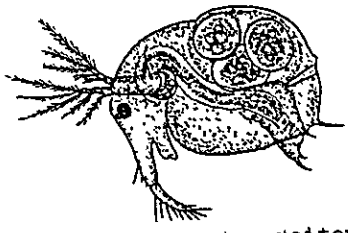
546. Sphaerophrya magna



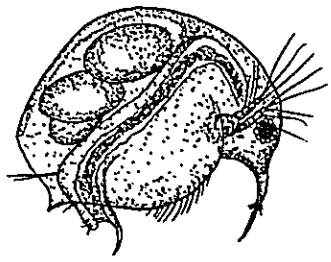
547. Tintinnidium fluviatile



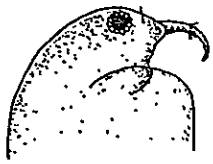
548. Tintinnopsis cylindrata



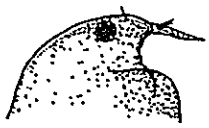
549. Bosminopsis deitersi



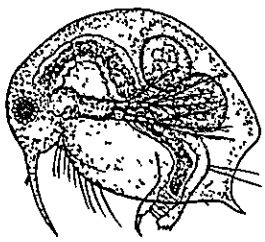
550. Bosmina longirostris



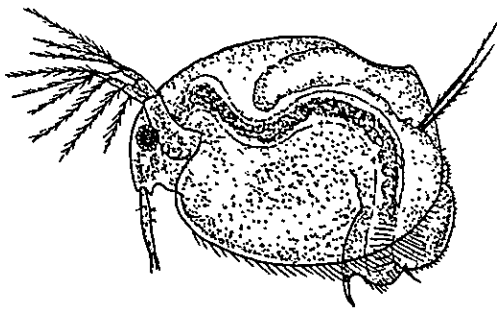
551.
Bosmina longirostris var. cornuta



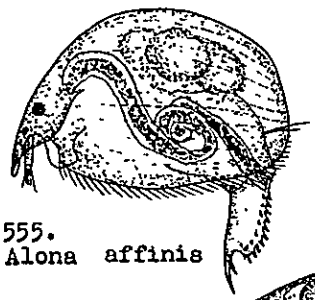
552.
Bosmina longirostris
var. brevicornis



553. Bosmina coregoni

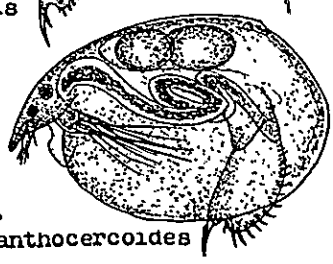


554. Grimaldina brazzai

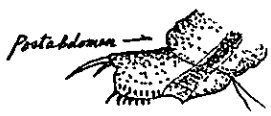


555.
Alona affinis

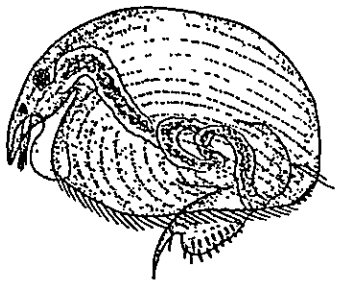
557.
Ophryoxus gracilis



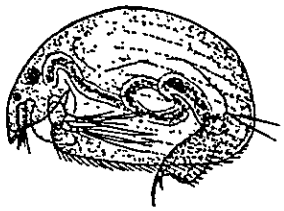
556.
Leydigia acanthocercoides



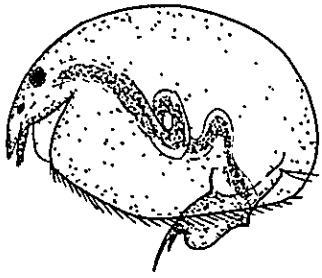
558. Alona costata



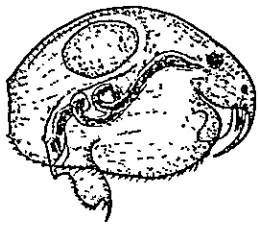
559. Alona karau



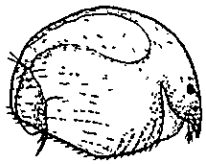
560. Alona monacantha



561. Alona rectangula

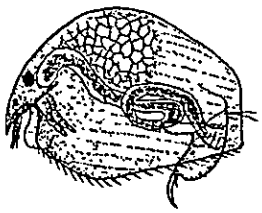


562. Alonella dadayı

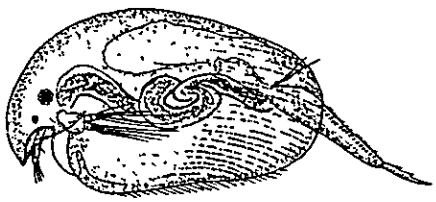


563. Alonella diaphana

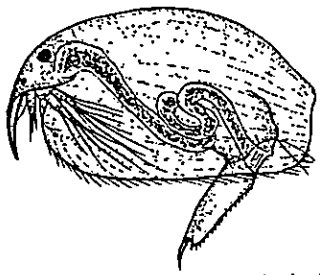
564. Alonella globulosa



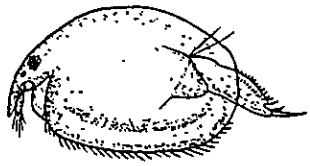
565. Alonella dentifera



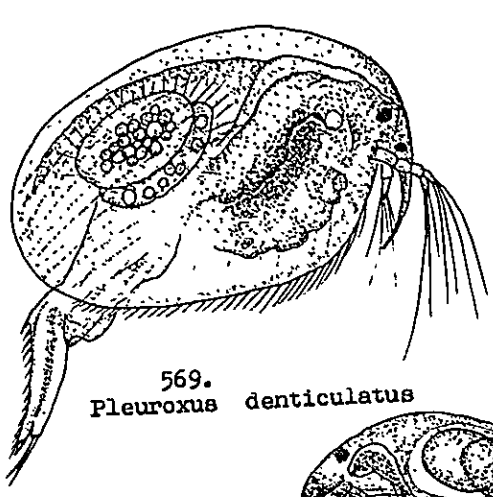
566. Camptocercus rectirostris



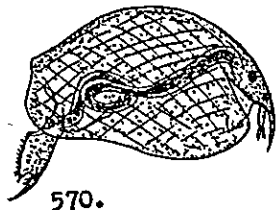
567. Pleuroxus striatus



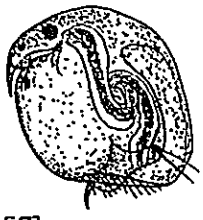
568. Oxyurella longicaudis



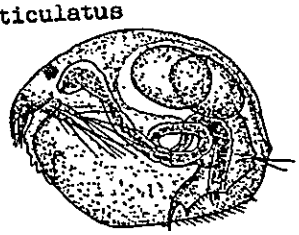
569.
Pleuroxus denticulatus



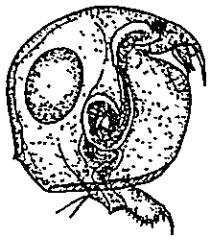
570.
Pleuroxus hamulatus



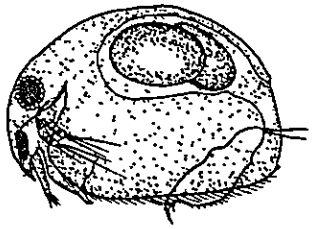
571.
Chydorus gibbus



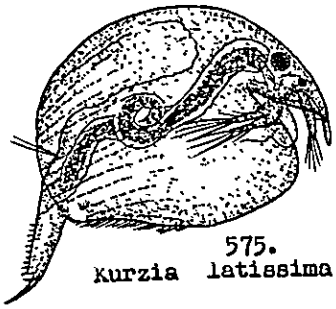
572. Chydorus barroisi



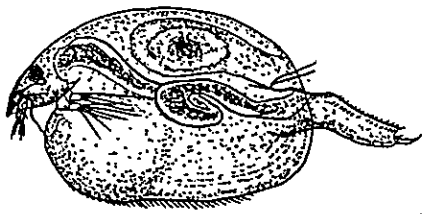
573. Chydorus sphaericus



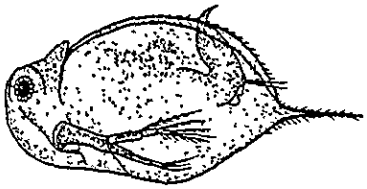
574. Dadaya macrops



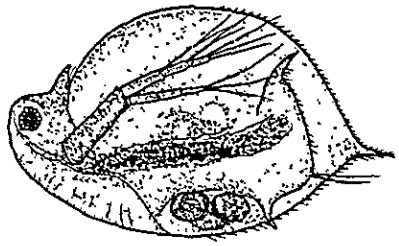
575.
Kurzia latissima



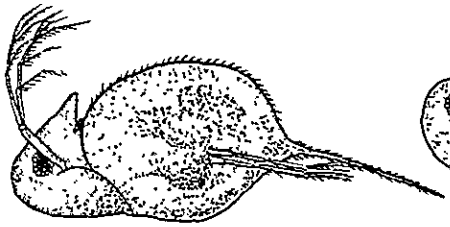
576. Euryalona occidentalis



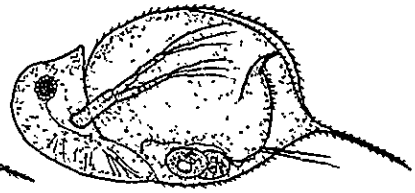
577. Daphnia rosea



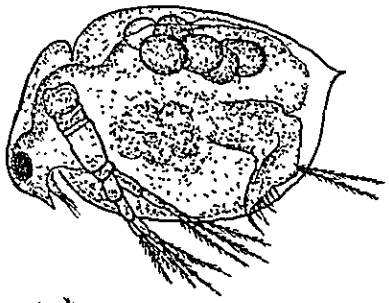
578. Daphnia pulex



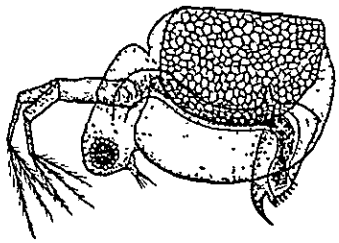
579. Daphnia longispina



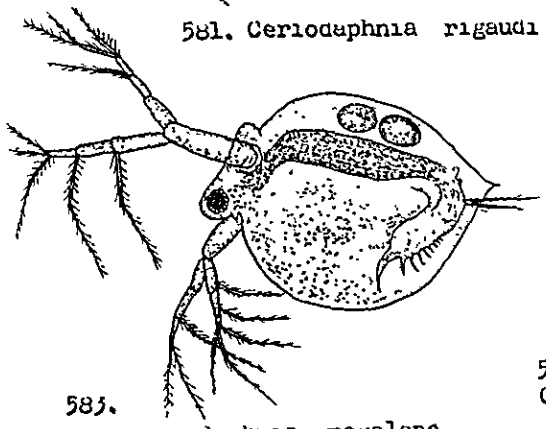
580. Daphnia catawba



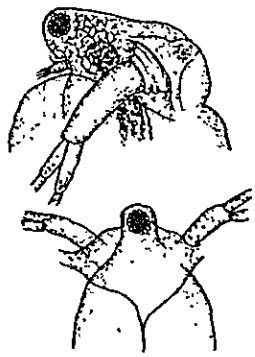
581. Ceriodaphnia rigaudi



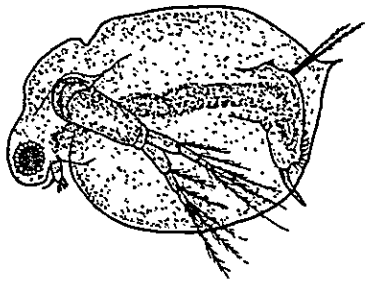
582. Ceriodaphnia reticulata



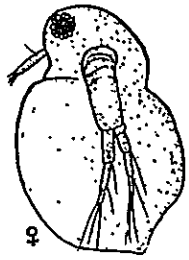
583. Ceriodaphnia megalops



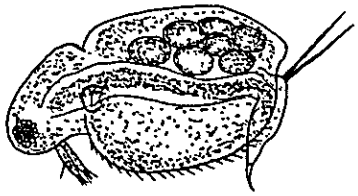
584. Ceriodaphnia lacustris



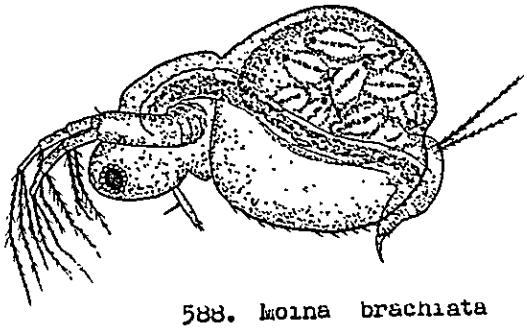
585. Ceriodaphnia quadrangula



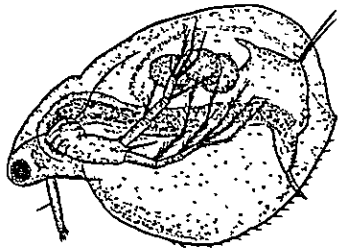
586. Moina macrocopa



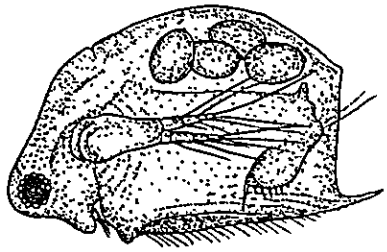
587. Moina rectirostris



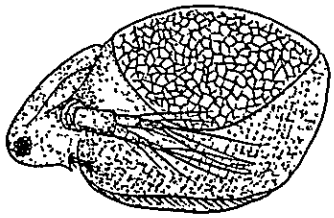
588. Moina brachiata



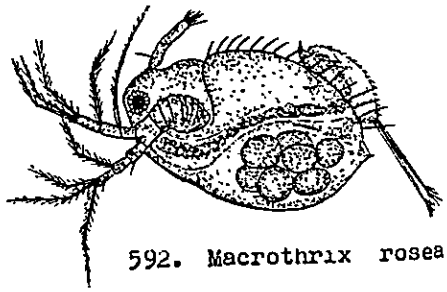
589. Moinodaphnia macleayii



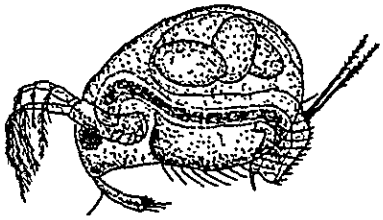
590. Scapholeberis kingi



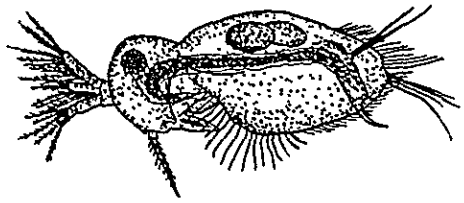
591. Simocephalus vetulus



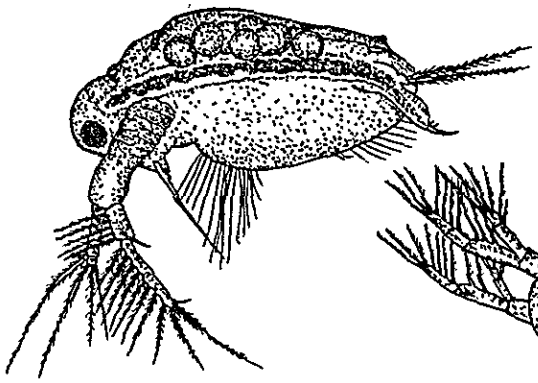
592. Macrothrix rosea



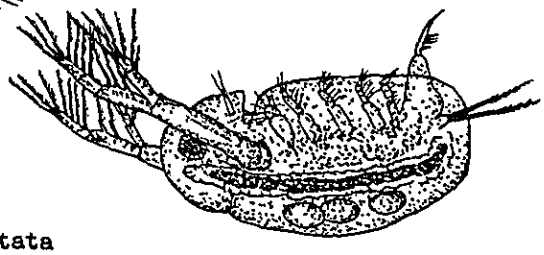
593. Macrothrix laticornis



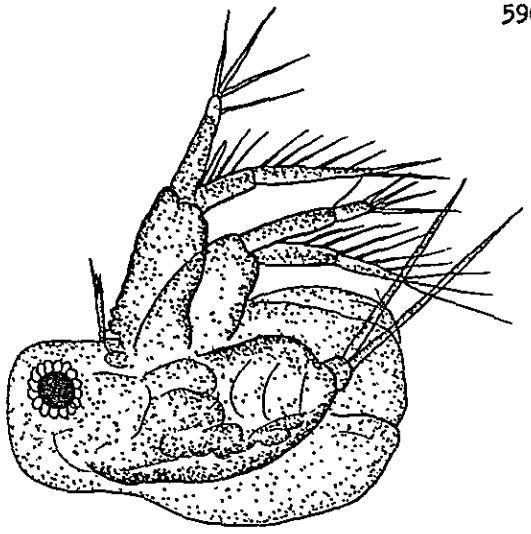
594. Latona setifera



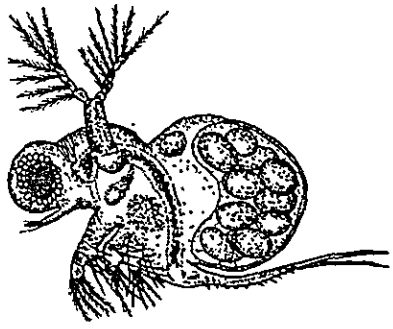
595. Pseudosida bidentata



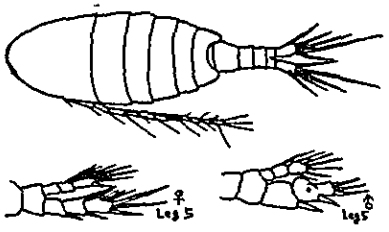
596. Sida crystallina



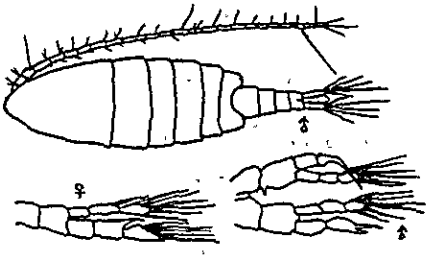
597. Diaphanosoma brachyurum



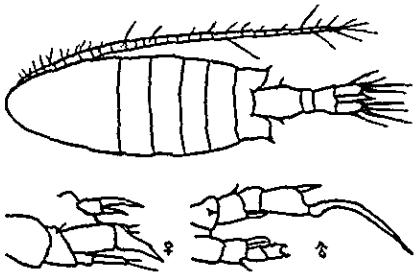
598. Polyphemus pediculus



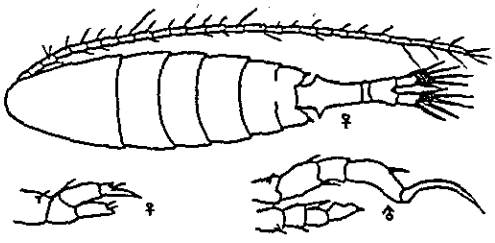
599. Osphranticum labronectum



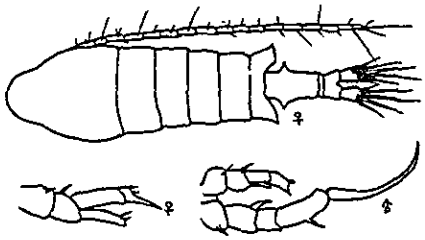
600. Sinocalanus sinensis



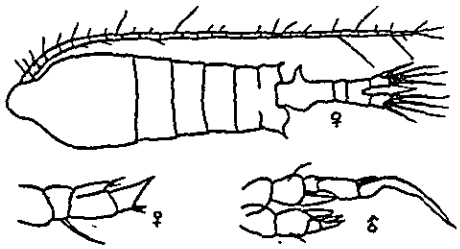
601. Diaptomus kenai



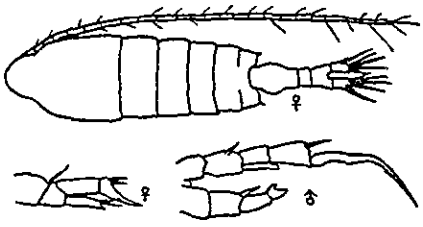
602. Diaptomus siciloides



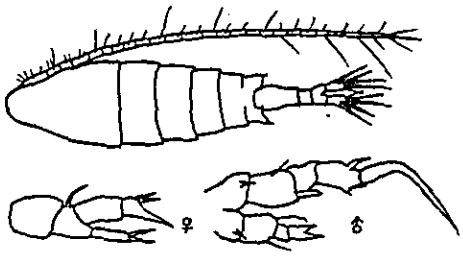
603. Diaptomus connexus



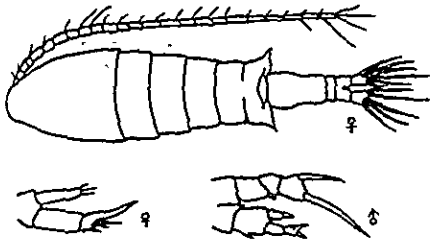
604. Diaptomus mississippiensis



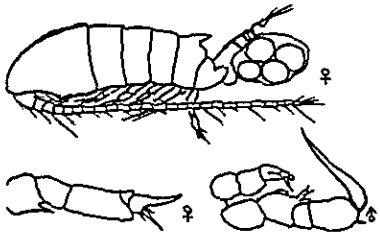
605. Diaptomus pygmaeus



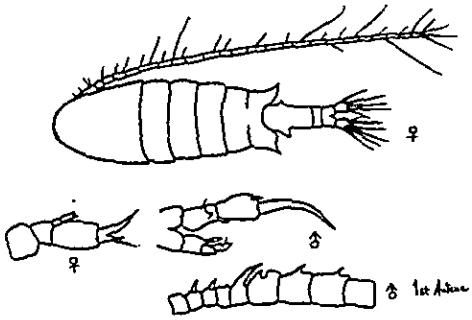
606. Diaptomus reighardi



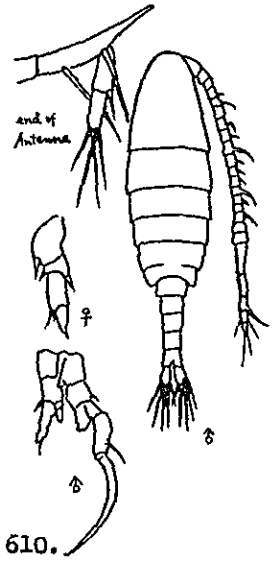
607. Acanthodiaptomus pacificus



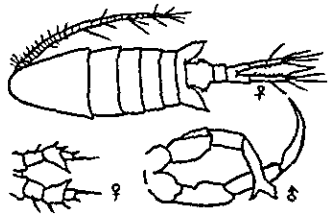
608. Sinodiaptomus chaffanjoni



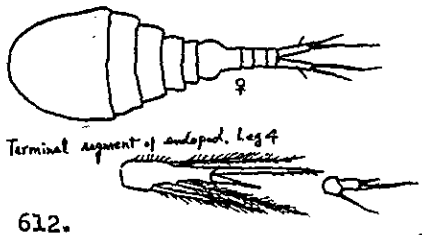
609. Sinodiaptomus Sarsi



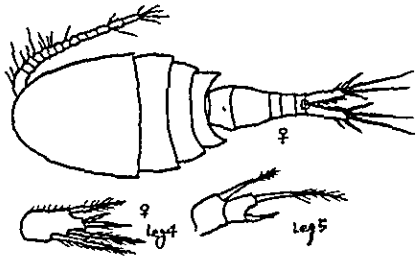
610. Eodiaptomus japonicus



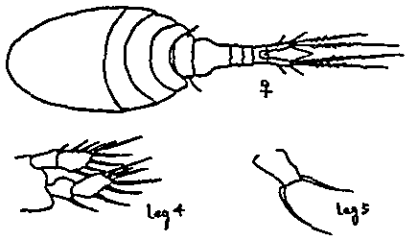
611. Eurytemora affinis



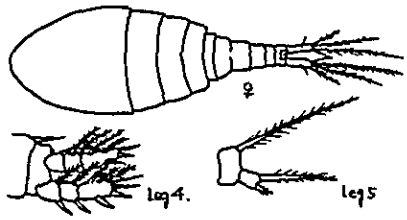
612. Cyclops bicuspidatus-thomasi



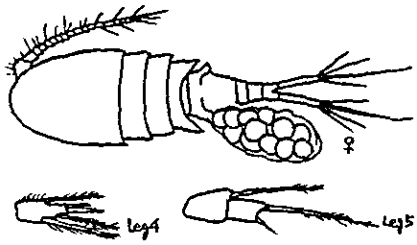
613. Cyclops strnuus



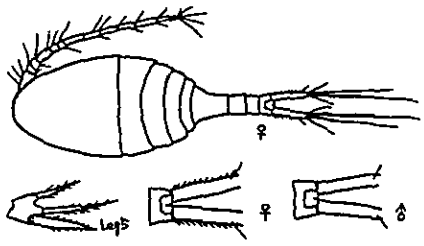
614. Cyclops varicans-rubellus



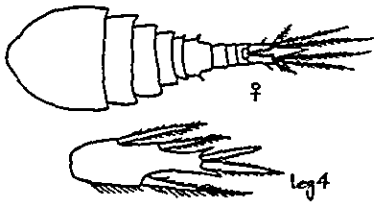
615. Cyclops vernalis



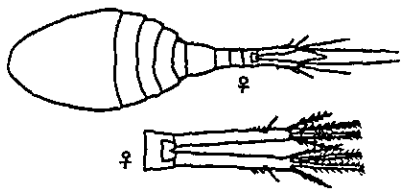
616. Cyclops vicinus



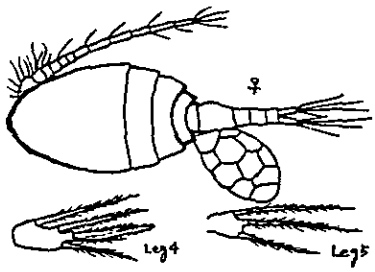
617. Eucyclops agilis



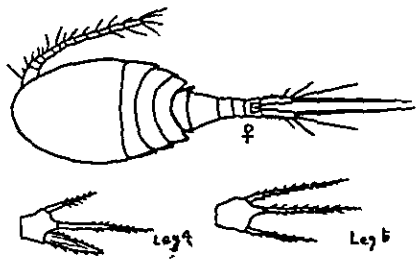
618. Cyclops magnus



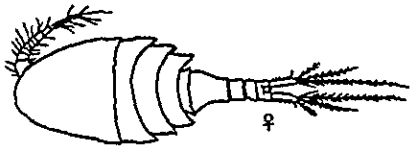
619. Eucyclops macrurus



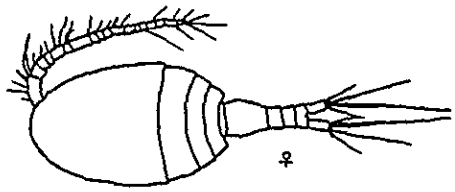
620. Eucyclops parasinus

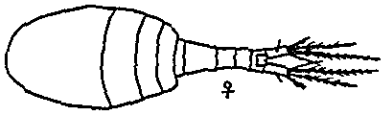


621. Eucyclops serrulatus

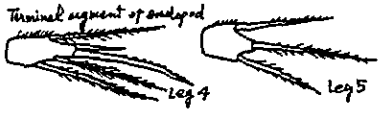


622. Eucyclops prionophorus

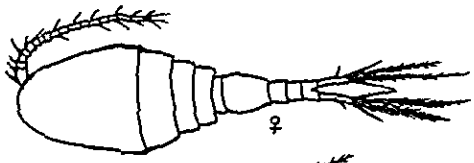


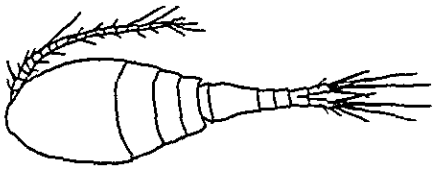


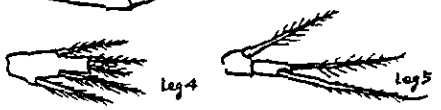
624. Macrocyclops fuscus



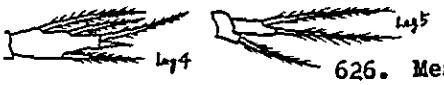
623. Tropocyclops prasinus



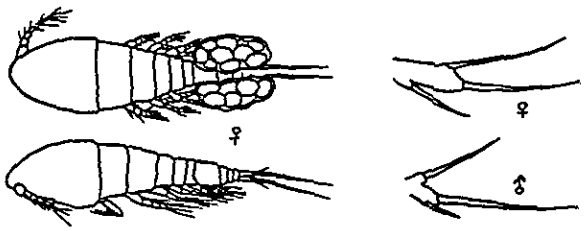




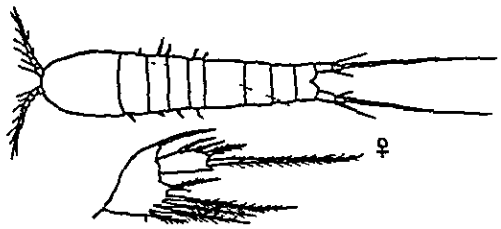
625. Mesocyclops Leuckarti



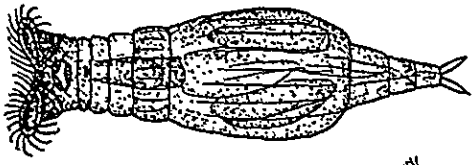
626. Mesocyclops oithonoides



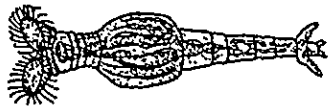
627. Limnoncaea genuina



628. Canthocamptus staphylinus

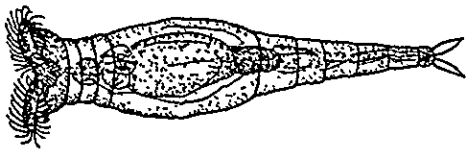


629.
Macrotrachela
quadricornifera

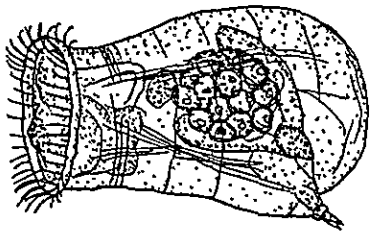


630. Embata commensalis

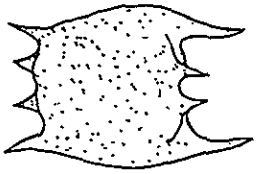
631. Rotaria citrinus



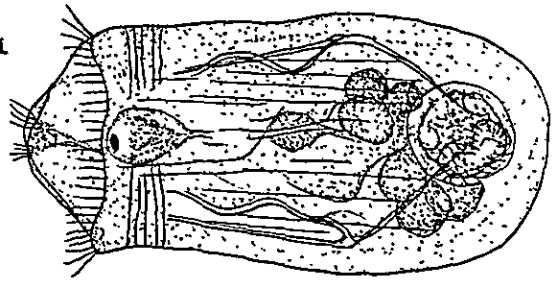
632. Philodina roseola

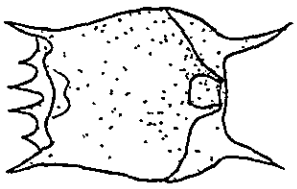


633. Asplanchnopus myrmeleo



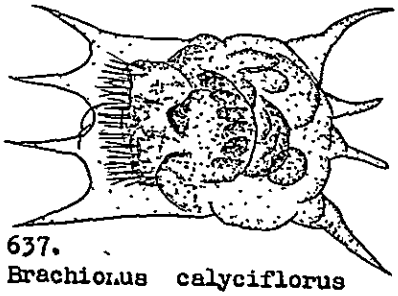
634. Brachionus bakeri



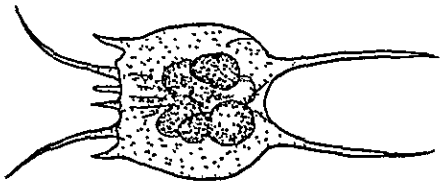


635. Brachionus bidentata

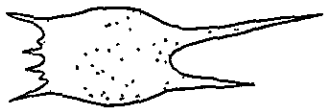
636. Asplanchna priodonta



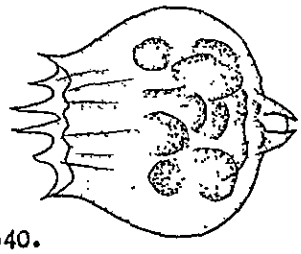
637.
Brachionus calyciflorus



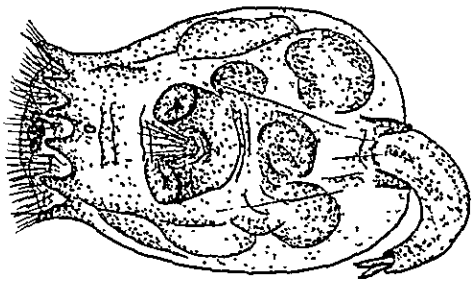
638. Brachionus falcatus



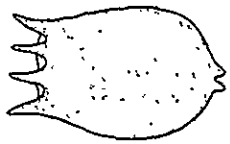
639. Brachionus havanaensis



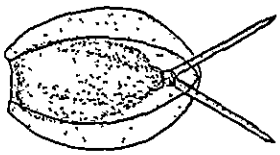
640. Brachionus plicatilis



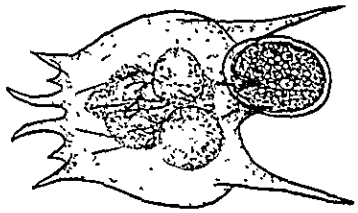
641. Brachionus plicatilis



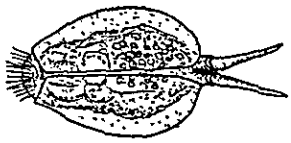
642. Brachionus pala



643. Dipleuchlanis propatula

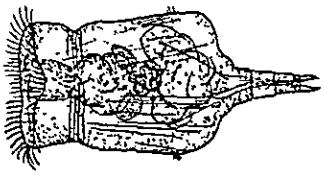


644. Brachionus quadridentata

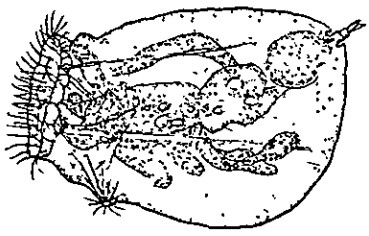


645. Diplois davisiae

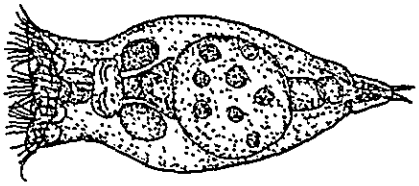
646. Colurella adriatica



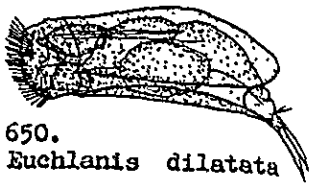
647. Epiphanes clavulata



648. Epiphanes brachionus



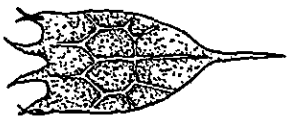
649. Epiphanes (Hydatina) senta



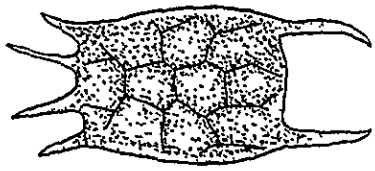
650. Euchlanis dilatata

651. Kellicottia bostoniensis

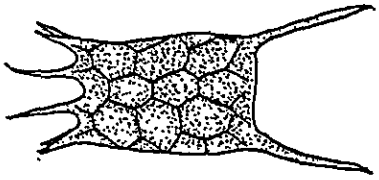
652. Kellicottia longispina



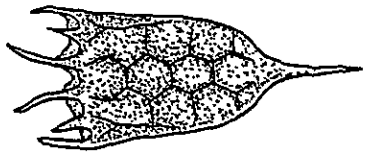
653. Keratella cochlearis



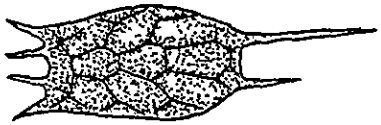
654. Keratella hiemalis



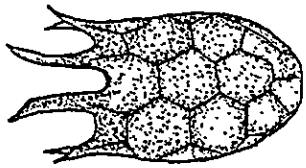
655. Keratella quadrata



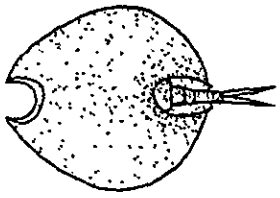
656. Keratella stipitata



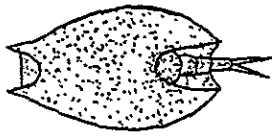
657. Keratella valga



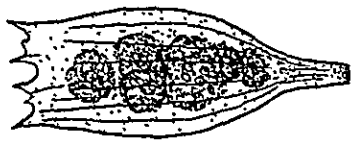
658. Keratella serrulata



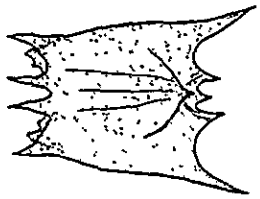
659. Lepadella ovalis



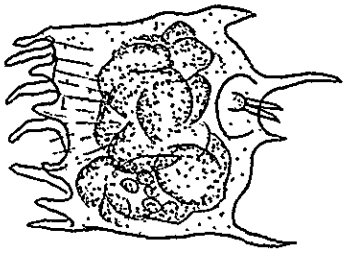
660. Lepadella patella



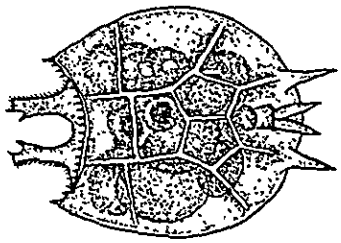
661. Notholca acuminata



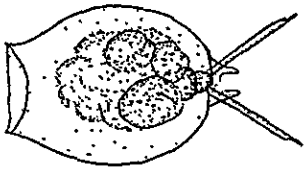
662. Platyias polyacanthus



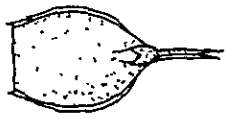
663. Platyias patulus



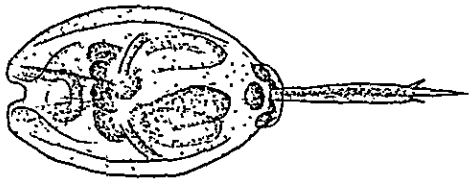
664. Platyias quadricornis



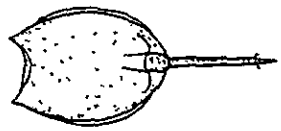
665. Lecane luna



666. Lecane elasma

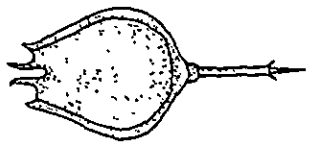


667. Monostyla bulla



668. Monostyla lunaris

670. Proales decipiens

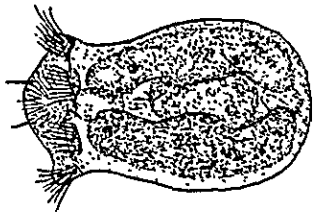


669. Monostyla quadridentata

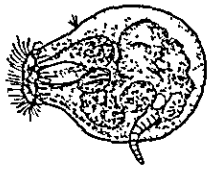
671. Albertia typhylina

672. Dicranophorus forcipatus

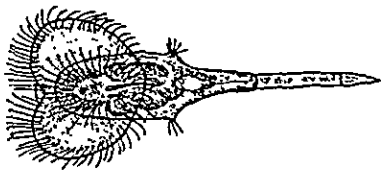
673. Encentrum felis



674. Ascomorpha ecaudis



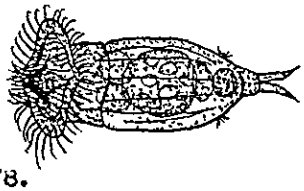
675. Gastropus stylifer



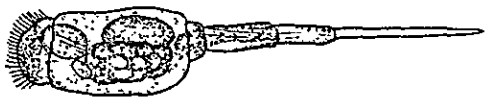
676. Microcodon clavus

677. Cephalodella megalocephala

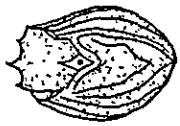
679. Resticula melandocus



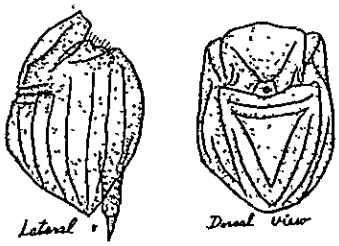
678. Cephalodella auriculata



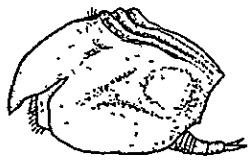
680. Scaridium longicaudum



681. Ploesoma triacanthum

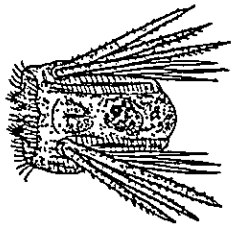


682. Ploesoma truncatum

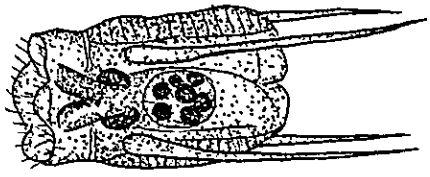


683. Ploesoma lenticulare

684. Polyarthra euryptera

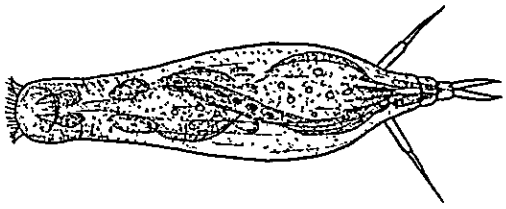


685. Polyarthra vulgaris

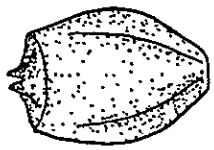


686. Polyarthra sp.

687. Ascomorphella volvocicola



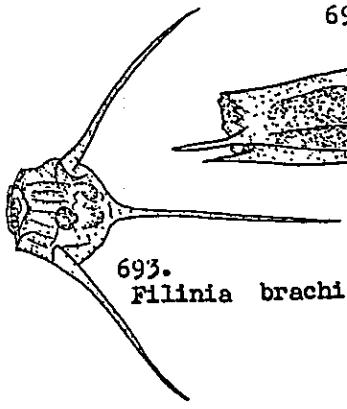
688. Tetrasiphon hydrocora



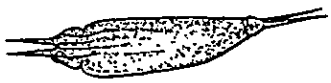
689. Elosa woralli

690. Trichocerca cylindrica

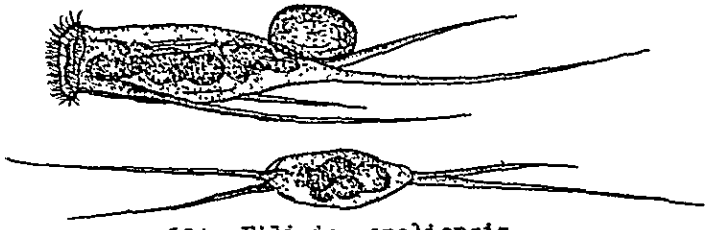
691. Trichocerca longiseta



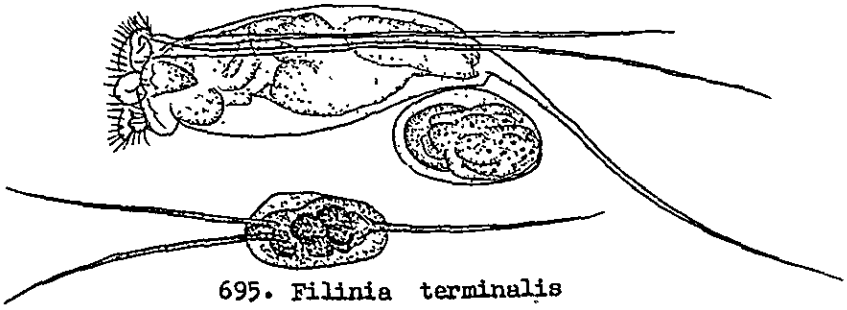
693. Filinia brachiata



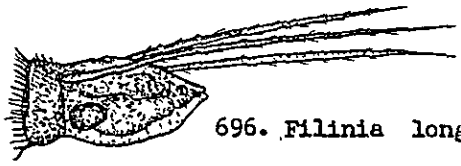
692. Trichocerca similis



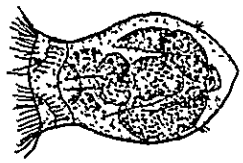
694. Filinia opoliensis



695. Filinia terminalis

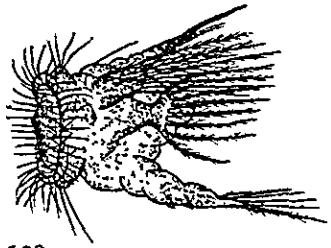


696. Filinia longiseta

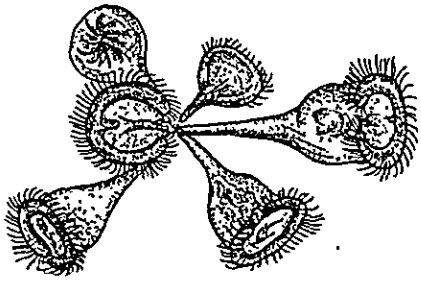


697. Pompholyx sulcata

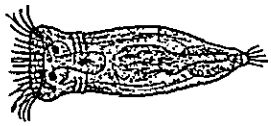
698. Voronkowia mirabilis



699. Hexarthra (Pedalia) mira

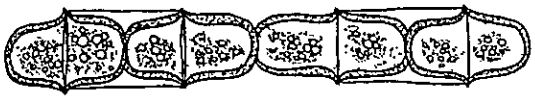


700. Conochilus unicornis



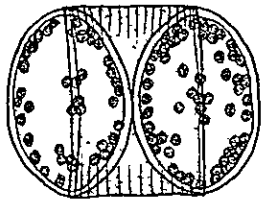
701. Collotheca gracilipes

B. MARINE PLANKTON



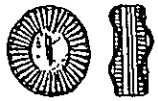
702. Melosira Juergensii

703. Melosira nummuloides

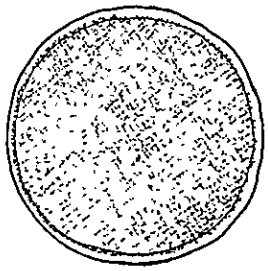


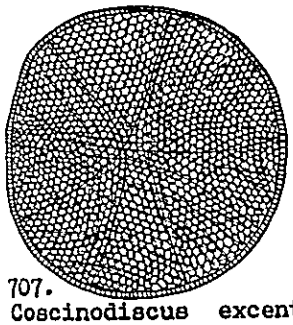
704. Hyalodiscus stelliger

705. Cyclotella striata

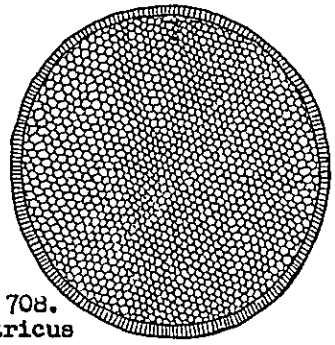


706. Cyclotella striata var. ambigua

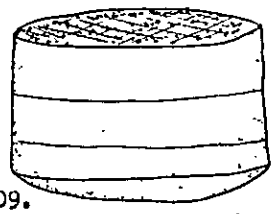




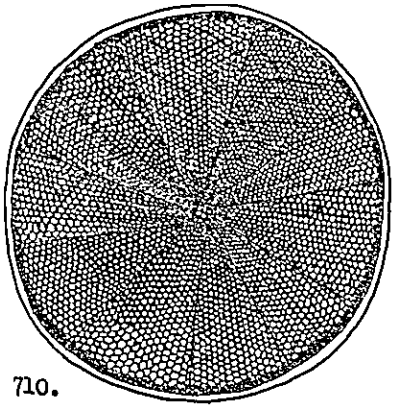
707. Coscinodiscus excentricus



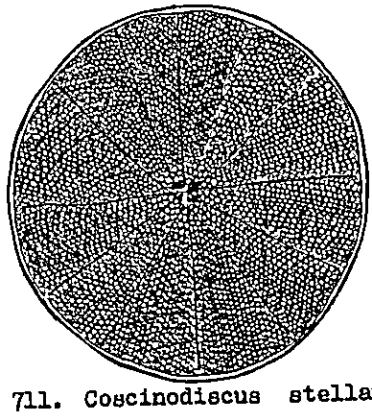
708. Coscinodiscus lineatus



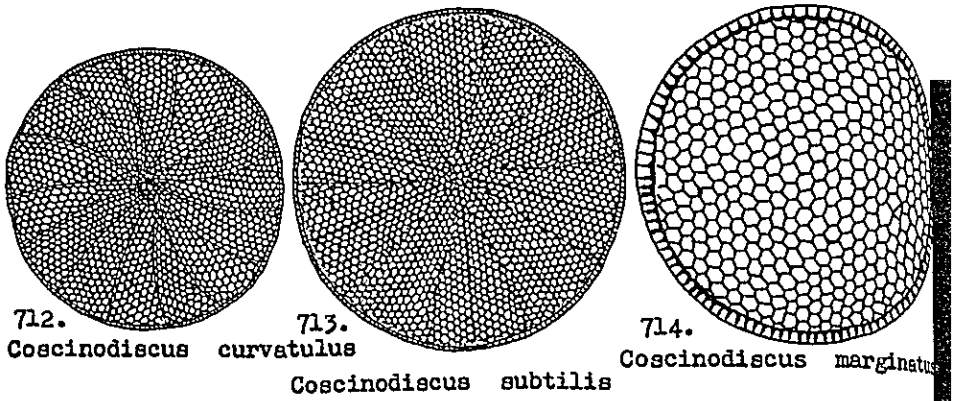
709. Ethmodiscus Gazellae



710. Coscinodiscus Rothii



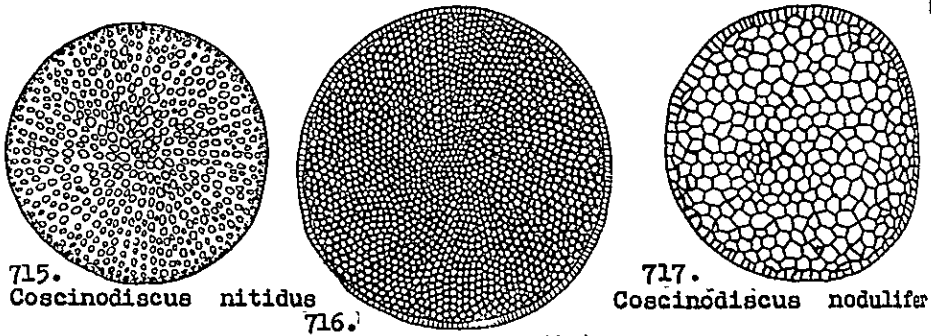
711. Coscinodiscus stellaris



712. Coscinodiscus curvatulus

713. Coscinodiscus subtilis

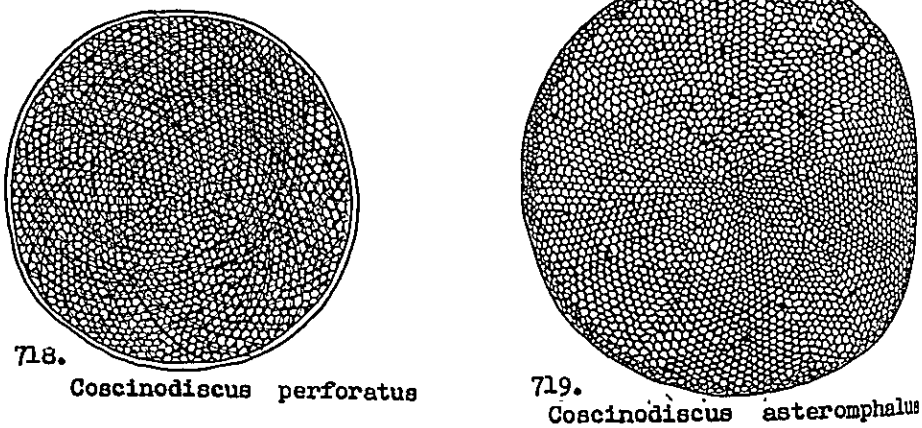
714. Coscinodiscus marginatus



715. Coscinodiscus nitidus

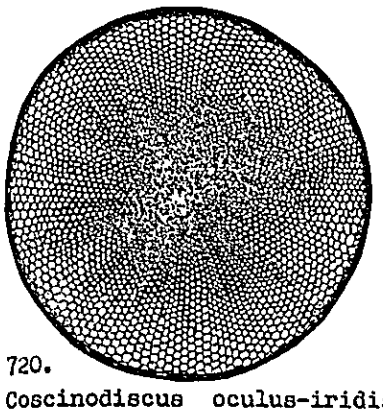
716. Coscinodiscus radiatus

717. Coscinodiscus nodulifer

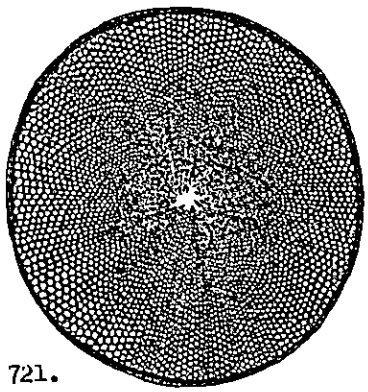


718. Coscinodiscus perforatus

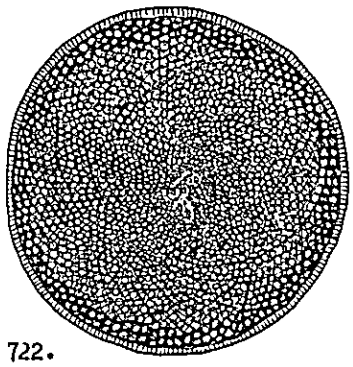
719. Coscinodiscus asteromphalus



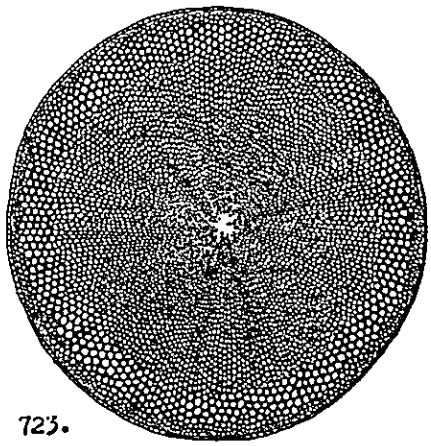
720. Coscinodiscus oculus-iridis



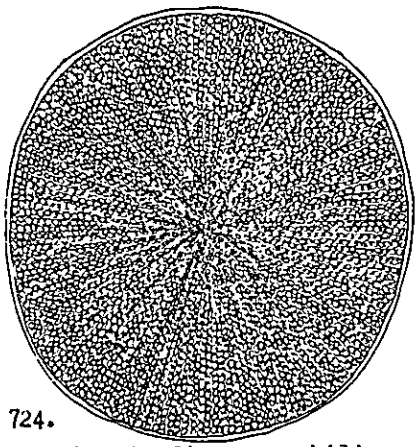
721. Coscinodiscus gigas



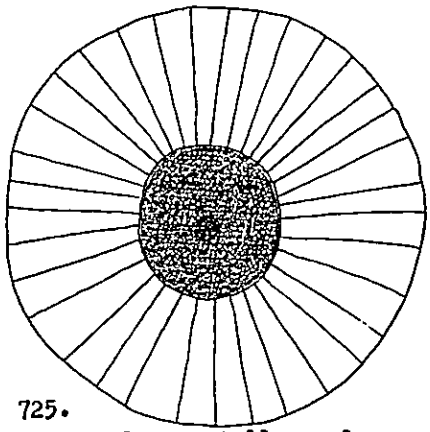
722. Coscinodiscus Janischii



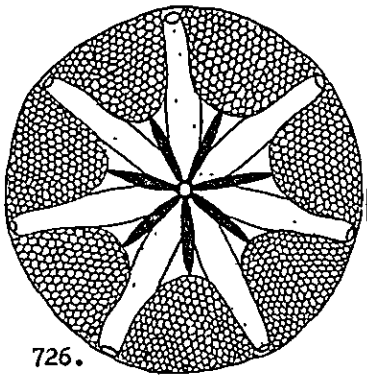
723. Coscinodiscus gigas var. praetexta



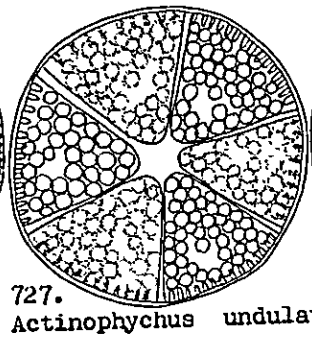
724. Coscinodiscus nobilis



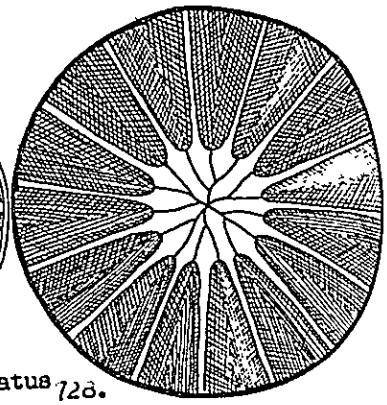
725. Planktoniella sol



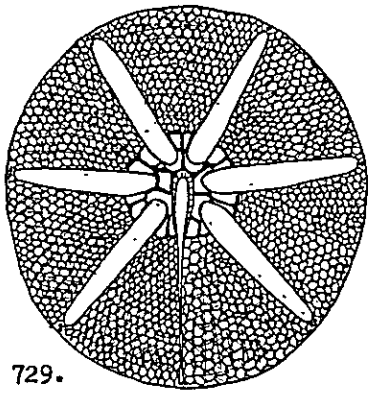
726. Asterolampra marylandica



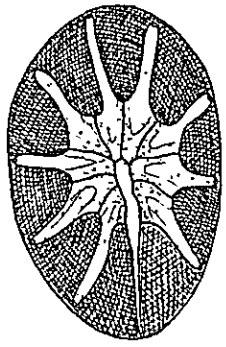
727. Actinophychus undulatus



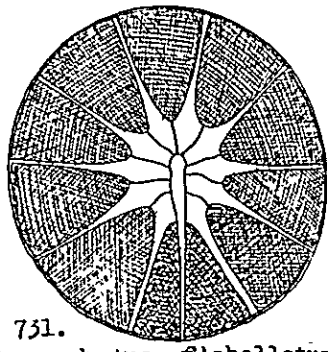
728. Asterolampra Grevillei



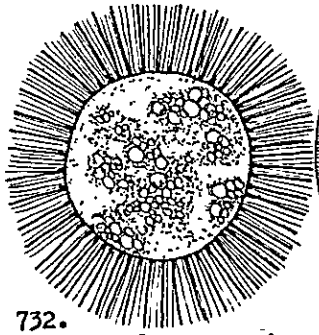
729. Asteromphalus hepaticus



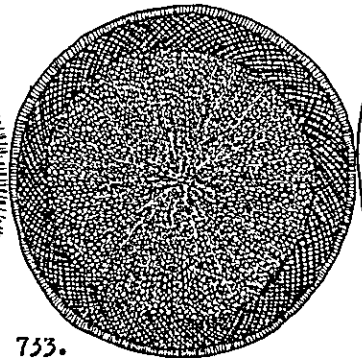
730. Asteromphalus Cleveanus



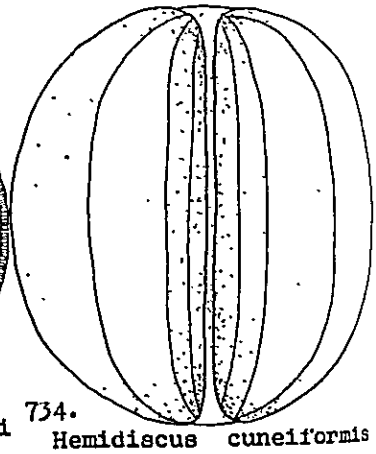
731. Asteromphalus flabellatus



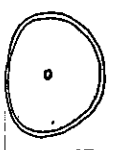
732. Gossleriella tropica



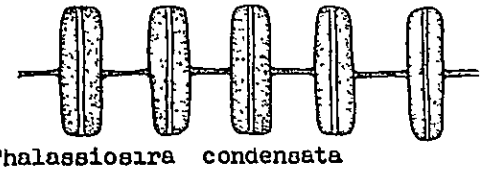
733. Actinocyclus Ehrenbergi

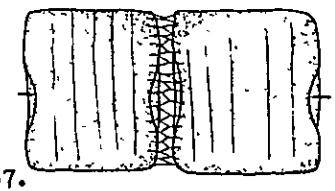


734. Hemidiscus cuneiformis

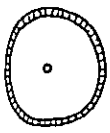


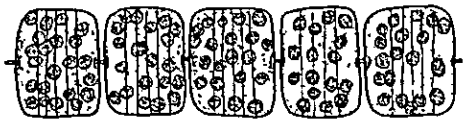
735. Thalassiosira condensata



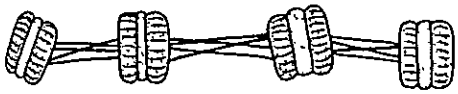


737. Schrodella schroderi

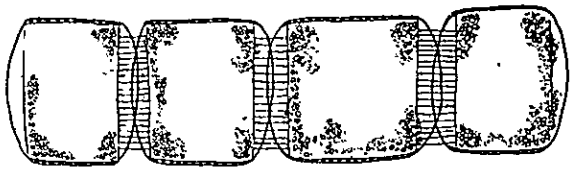




736. Thalassiosira rotula

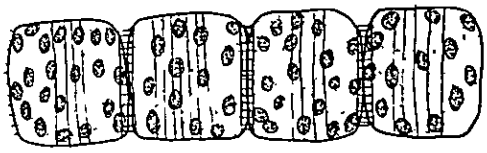


738. Coscinosira Oestrupi



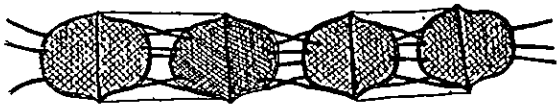
739.

740. Schrodella delicatula

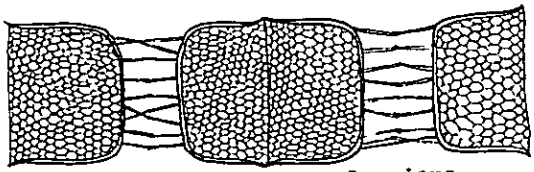


739. Lauderia borealis

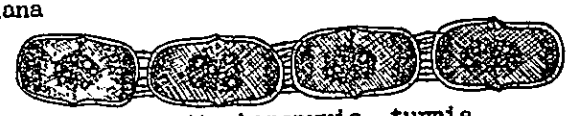
741. Skeletonema costatum



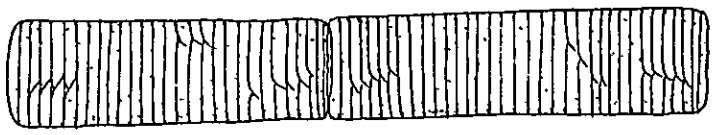
742. Stephanopyxis nipponica



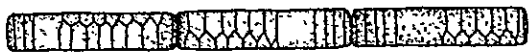
743. Stephanopyxis palmeriana



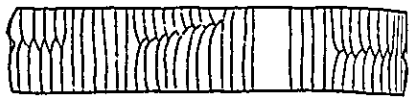
744. Stephanopyxis turris



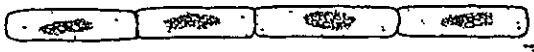
745. Dactyliosolen antarcticus



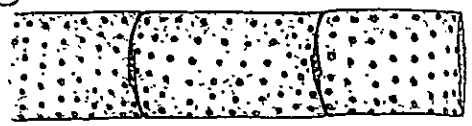
746. Dactyliosolen mediterraneus



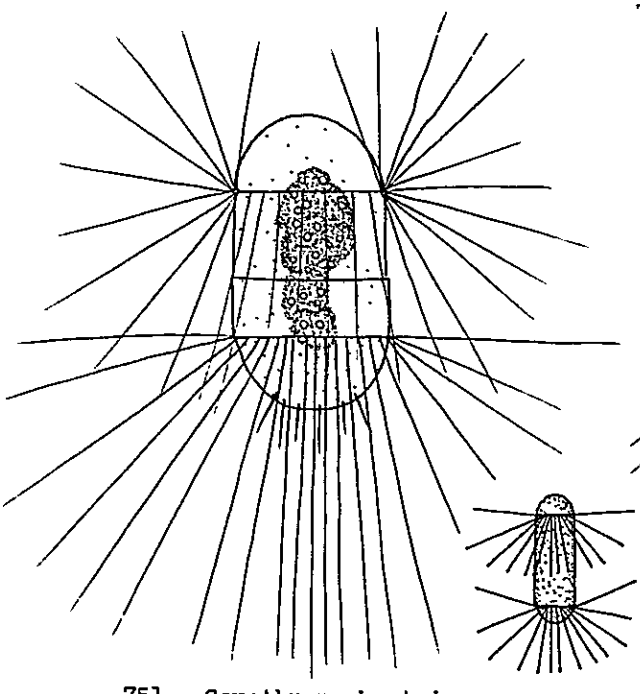
747. Guinardia Blavyana



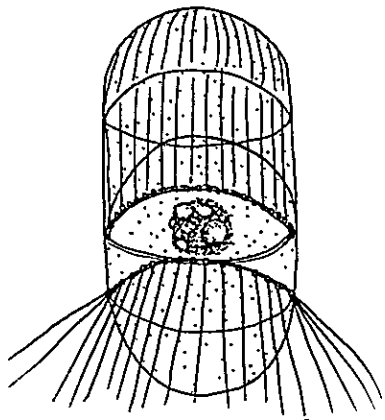
748. Leptocylindrus danicus



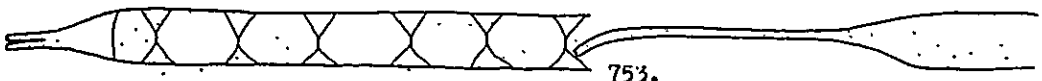
749. Guinardia flaccida



751. Corethron hystrix

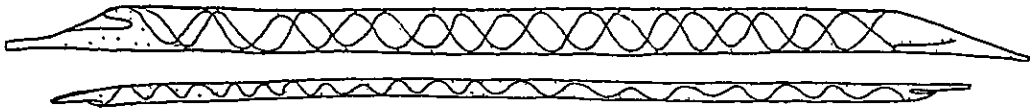


750. Corethron pelagicum

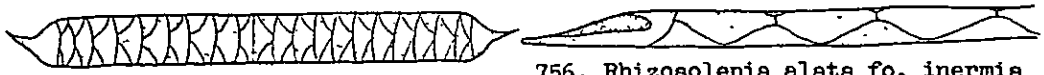


752. Rhizosolenia alata

753. Rhizosolenia alata fo. curvirostris

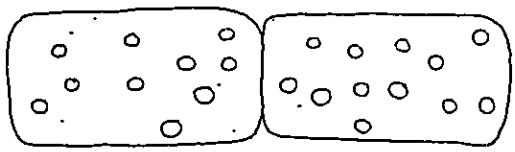


754. Rhizosolenia alata fo. gracillima

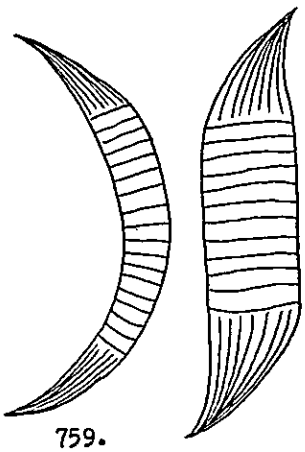


755. Rhizosolenia alata fo. indica

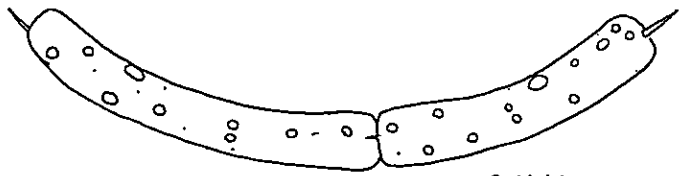
756. Rhizosolenia alata fo. inermis



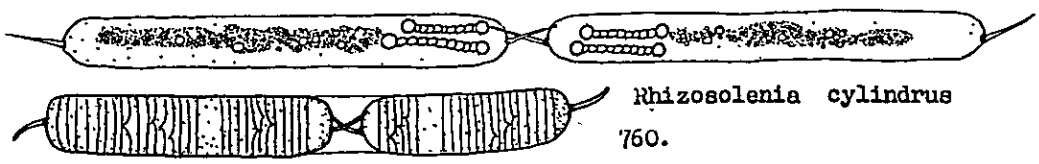
757. Rhizosolenia delicatula



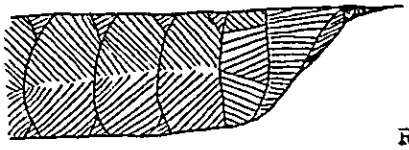
759. Rhizosolenia robusta



758. Rhizosolenia Stolterfothii



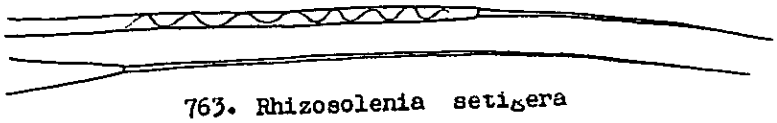
760. Rhizosolenia cylindrus



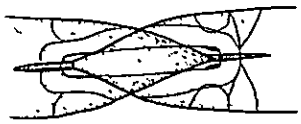
761. Rhizosolenia imbricata

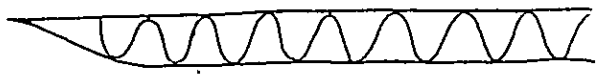
762.

Rhizosolenia imbricata var. Schrubsolei

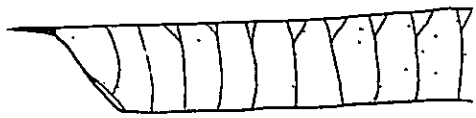


763. Rhizosolenia setigera

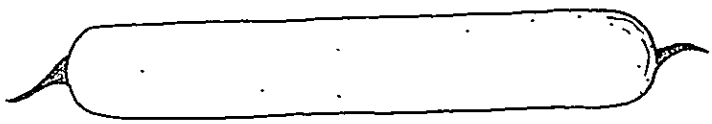


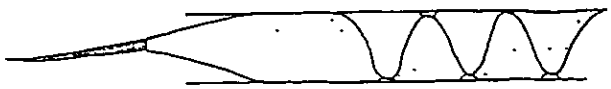


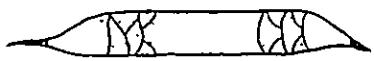
764. Rhizosolenia styliformis



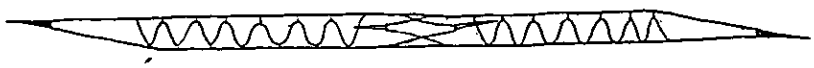
765. Rhizosolenia styliformis var. latissima



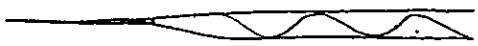


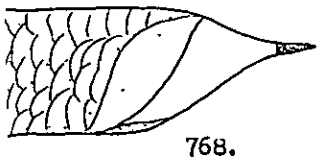


766. Rhizosolenia calcar-avis

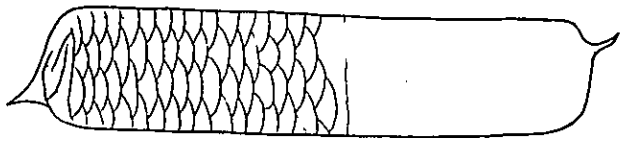


767. Rhizosolenia hebetata fo. semispina

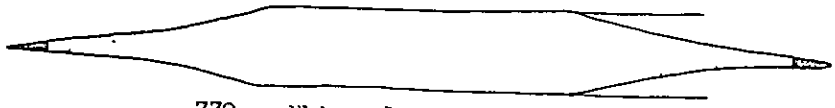




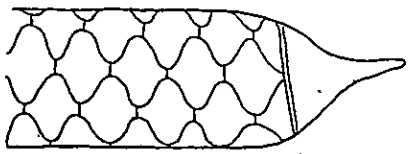
768.
Rhizosolenia acuminata



769. Rhizosolenia castracanei

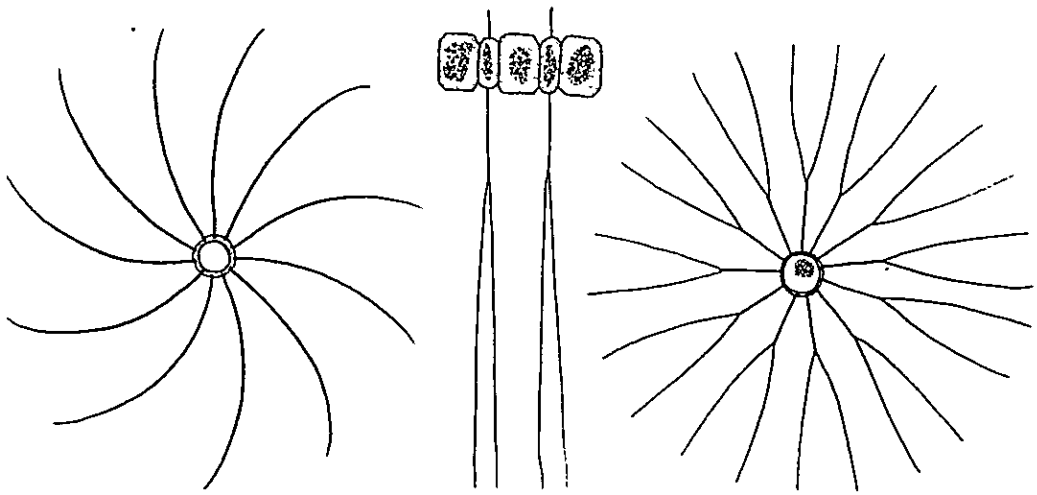


770. Rhizosolenia Bergonii

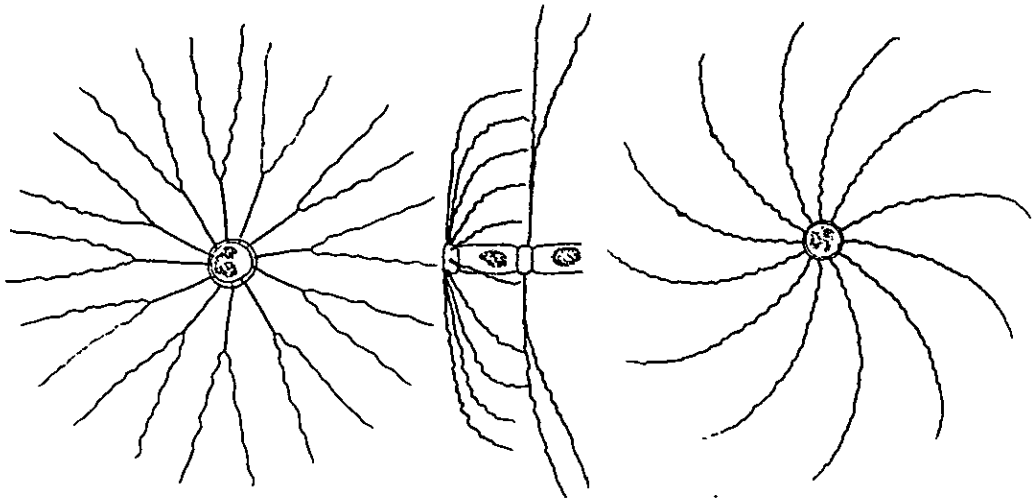


771.
Rhizosolenia arafurenris

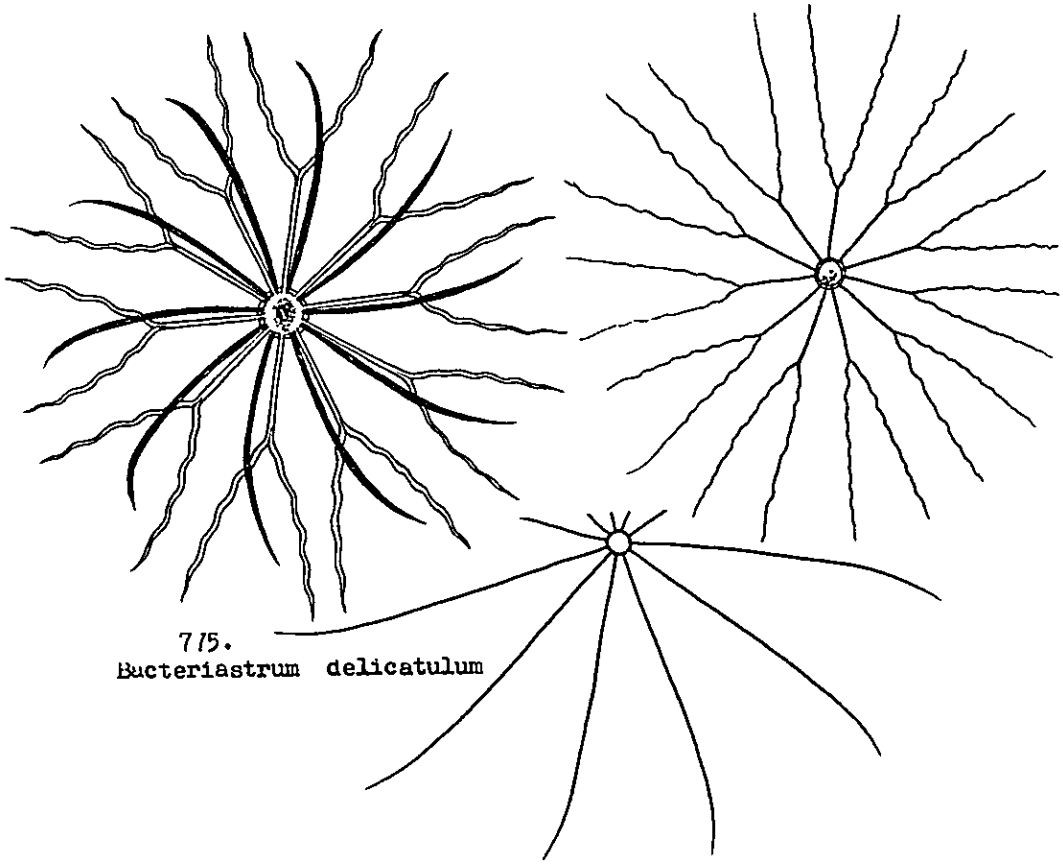
772. Rhizosolenia clevei



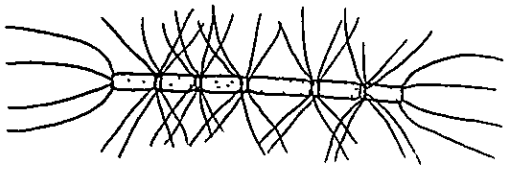
773. Bacteriastrum hyalinum



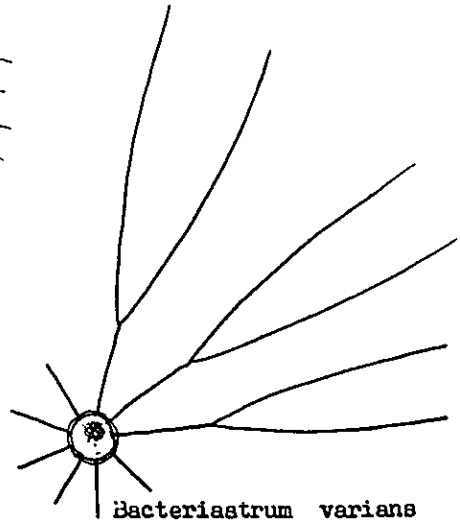
774. Bacteriastrum hyalinum var. princeps



775.
Bacteriastrum delicatulum

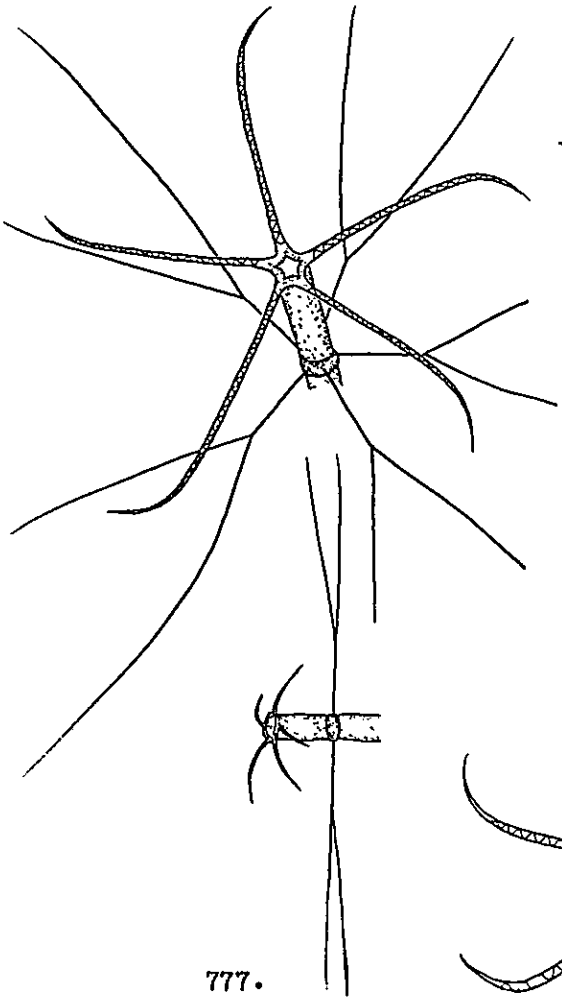


776. Bacteriastrum elongatum



Bacteriastrum varians

777.



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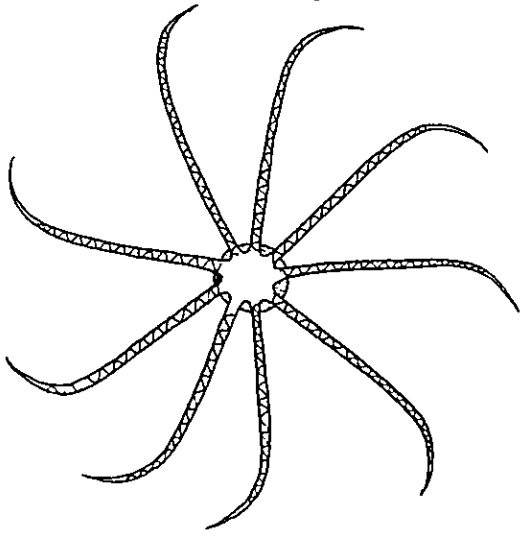
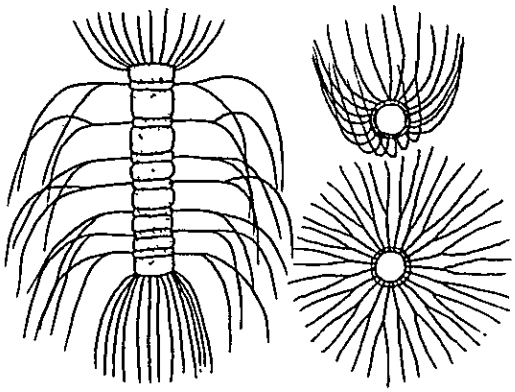
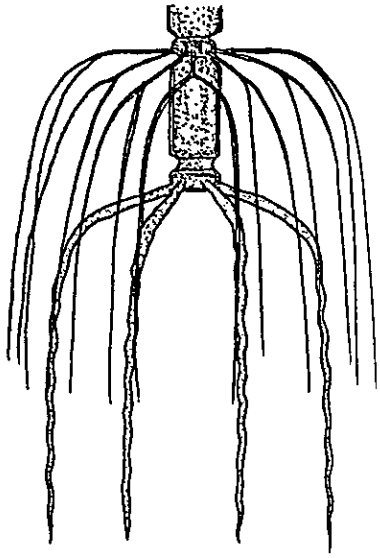
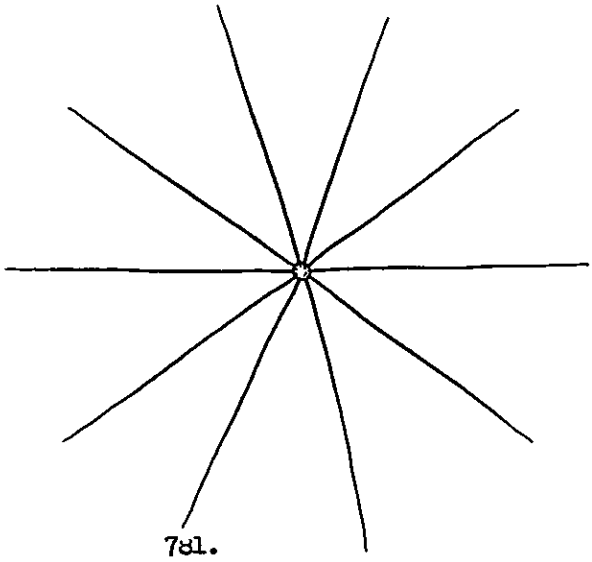




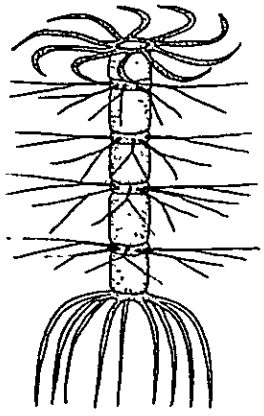
778 . Bacteriastrum mediterrananeum



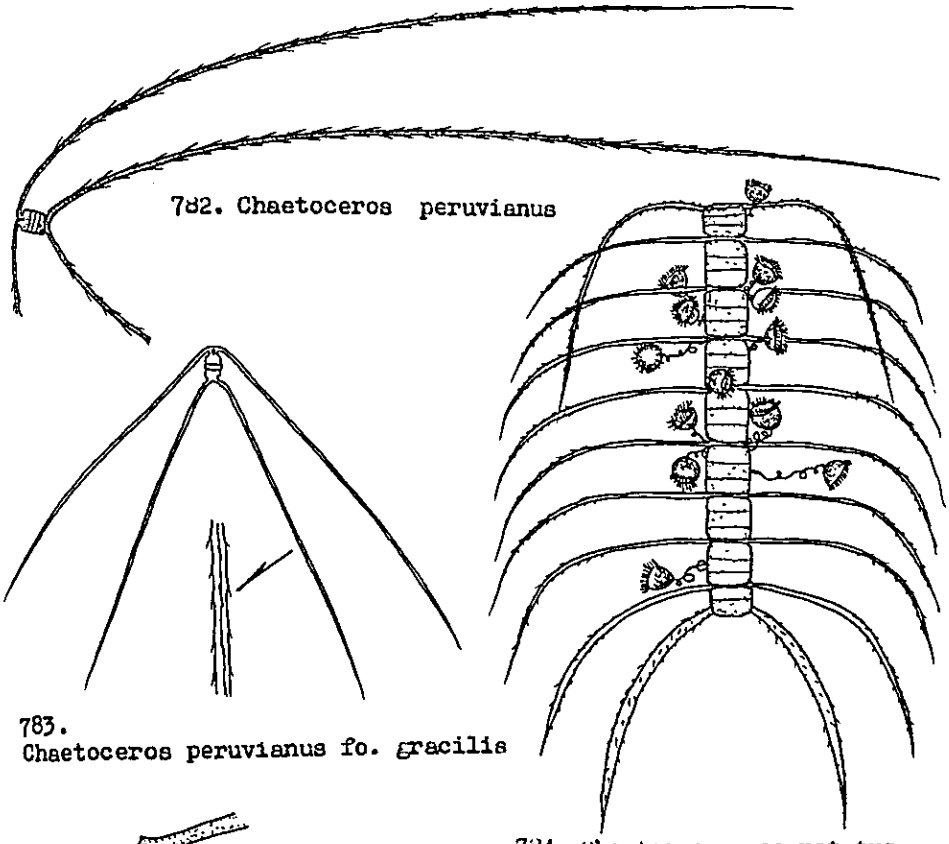
779. Bacteriastrum comosum



781.
Bacteriastrum sp.



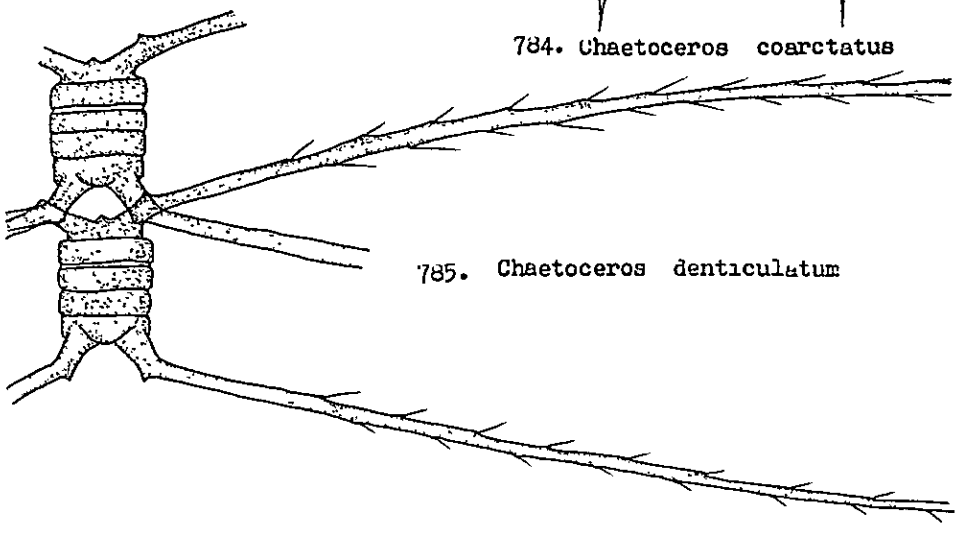
780.
Bacteriastrum elegans



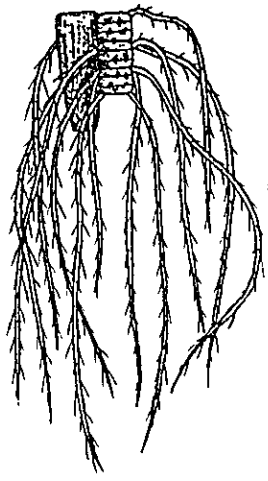
782. Chaetoceros peruvianus

783.
Chaetoceros peruvianus fo. gracilis

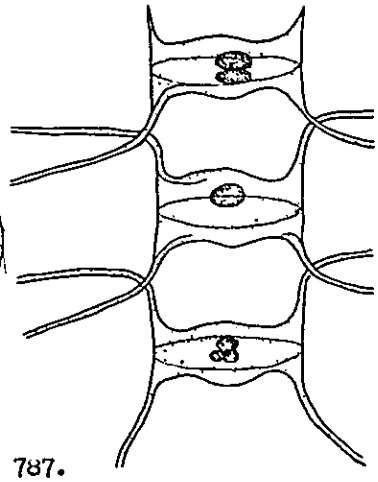
784. Chaetoceros coarctatus



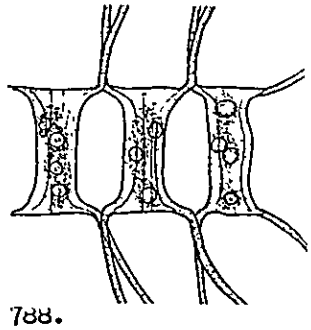
785. Chaetoceros denticulatum



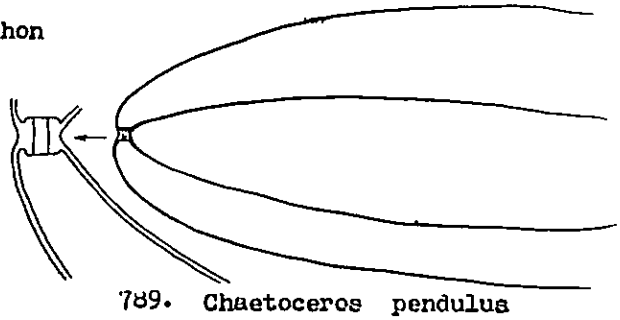
786. Chaetoceros tetrastichon



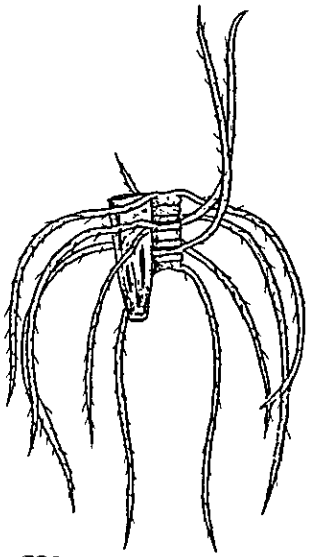
787. Chaetoceros Lorenzianus



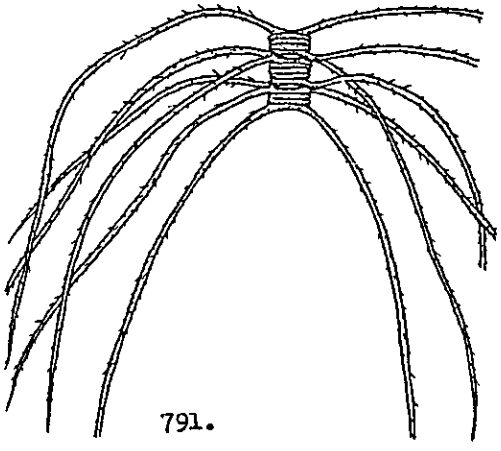
788. Chaetoceros decipiens



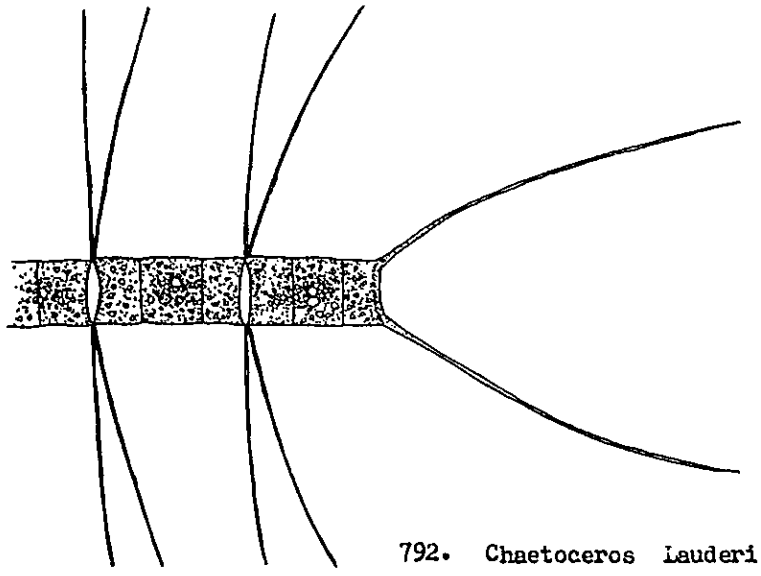
789. Chaetoceros pendulus



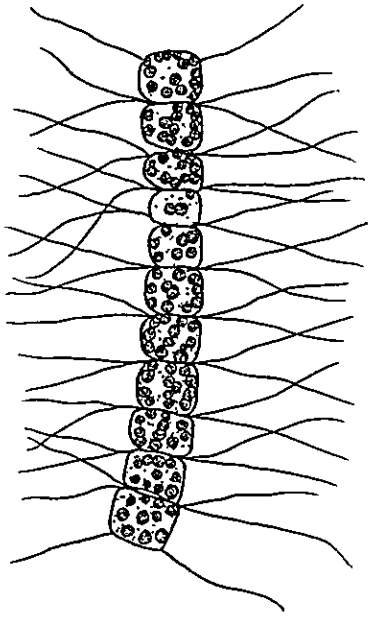
790. Chaetoceros dadayi



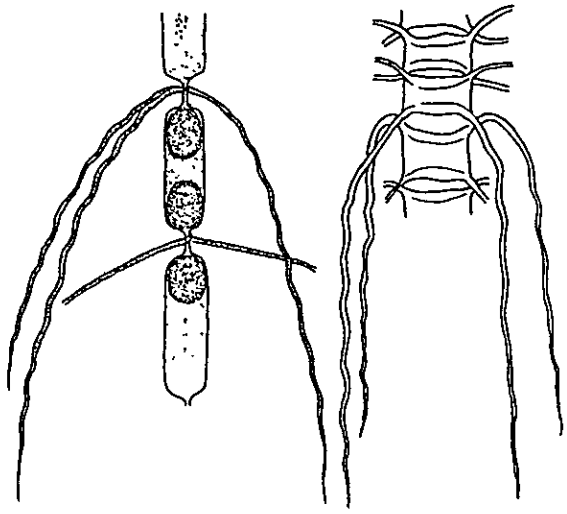
791. Chaetoceros indicum



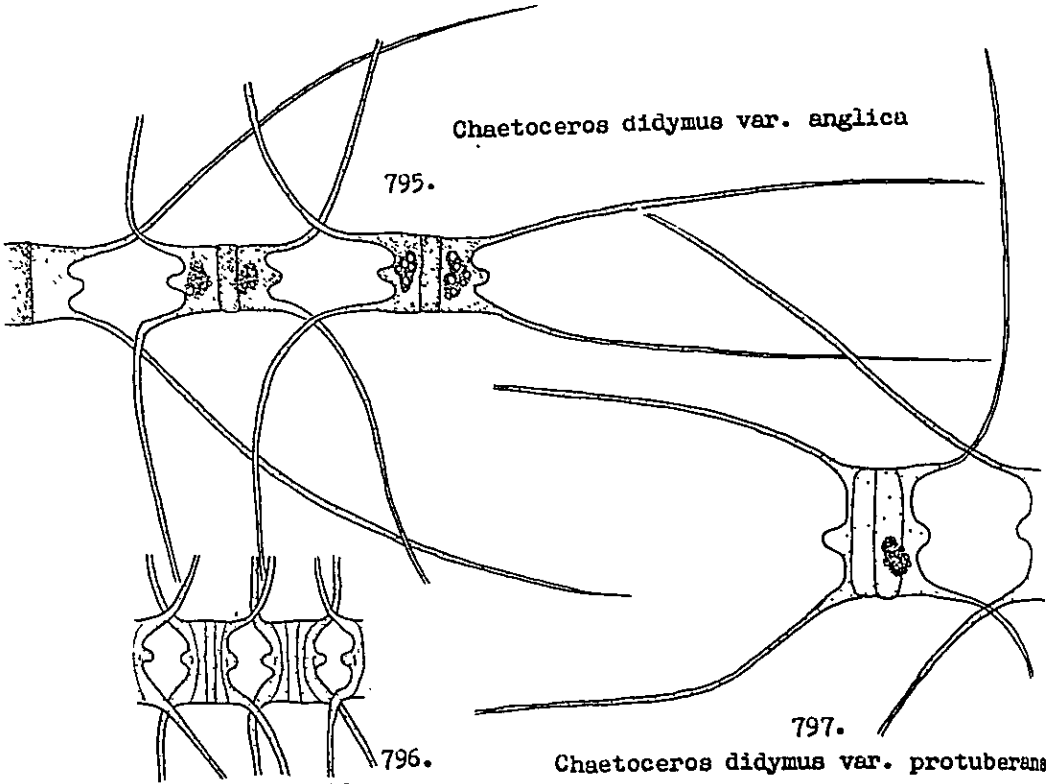
792. Chaetoceros Lauderi



793. Chaetoceros Weissflogii



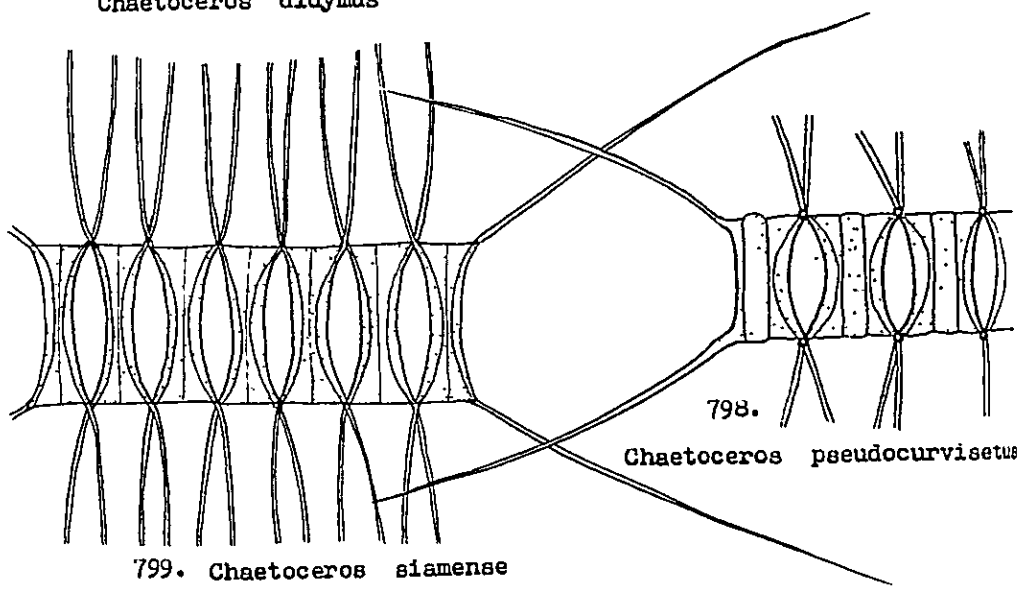
794. Chaetoceros compressus



795. Chaetoceros didymus var. anglica

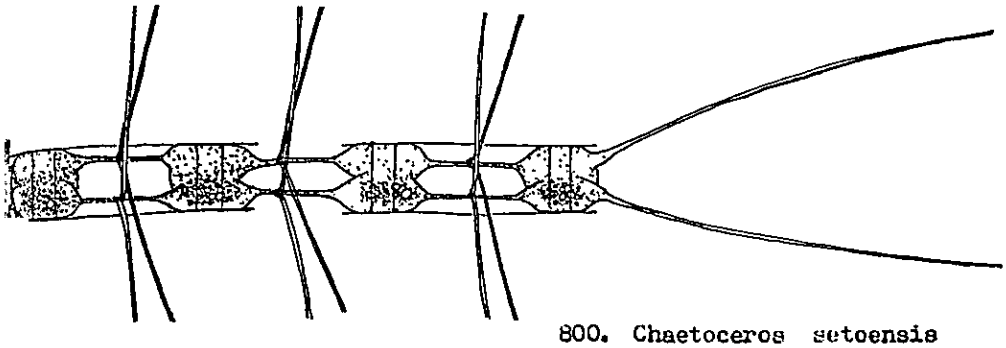
796. Chaetoceros didymus

797. Chaetoceros didymus var. protuberans

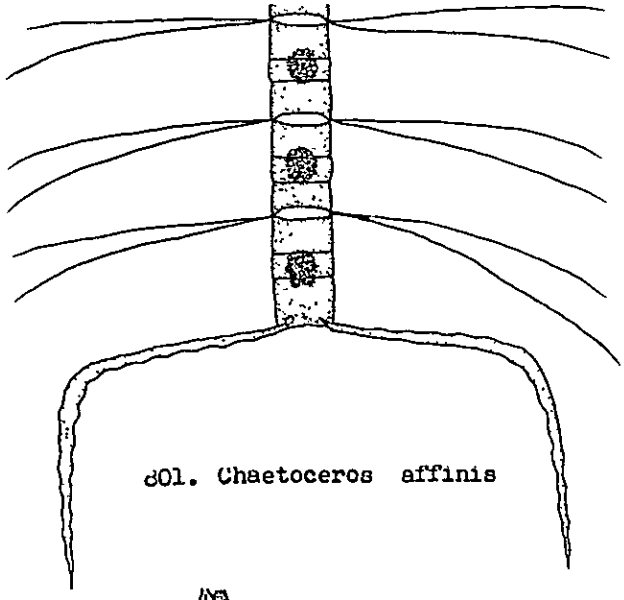


798. Chaetoceros pseudocurvisetus

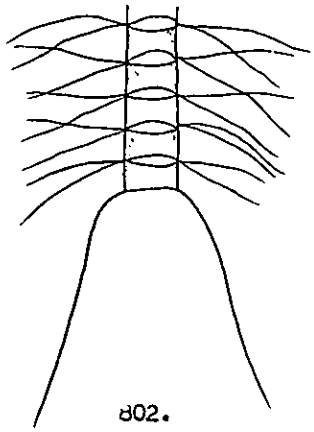
799. Chaetoceros siamense



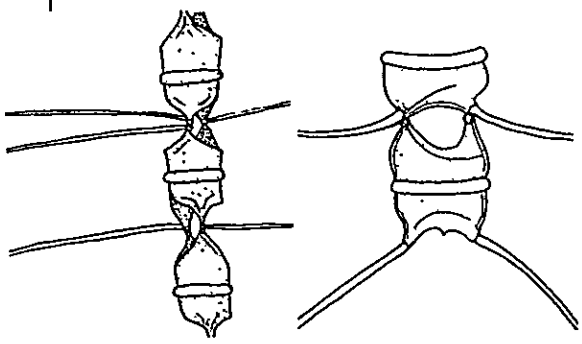
800. Chaetoceros setoensis



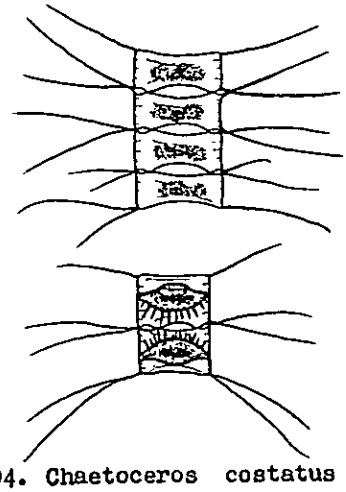
801. Chaetoceros affinis



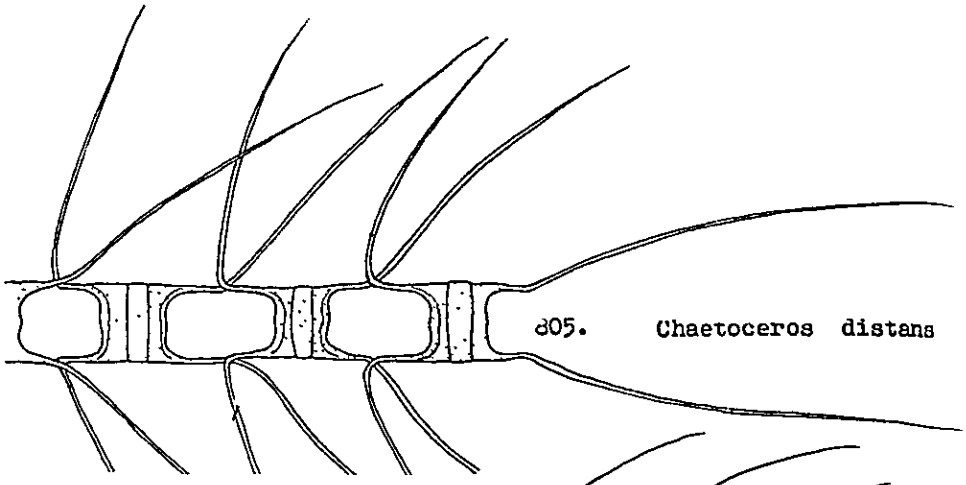
802. Chaetoceros hispidum



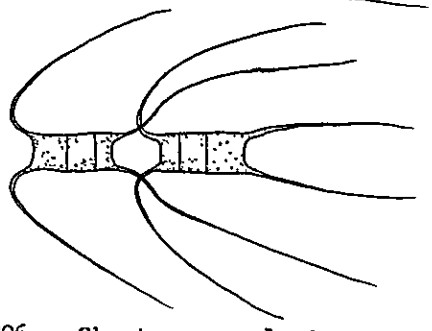
803. Chaetoceros paradoxum



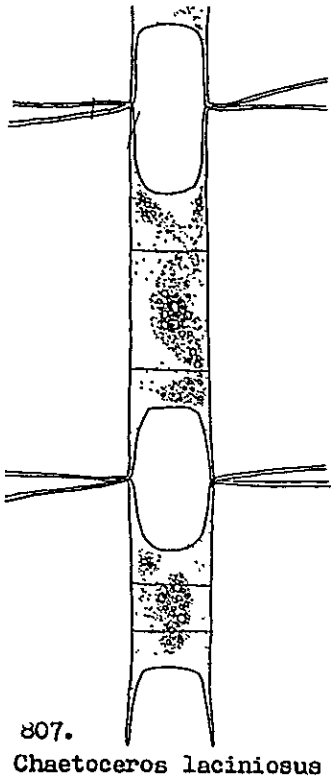
804. Chaetoceros costatus



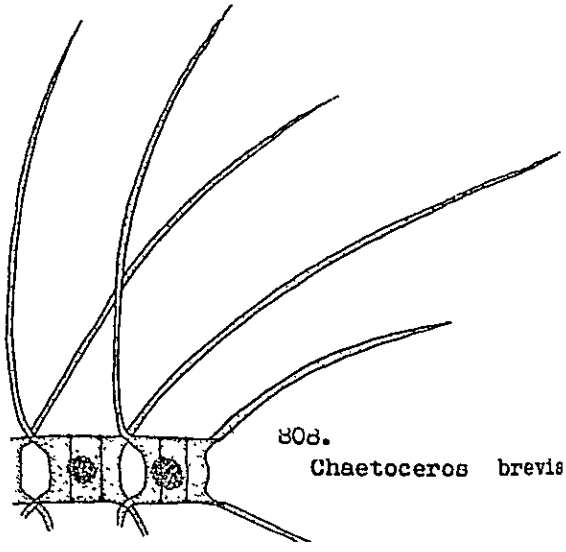
805. Chaetoceros distans



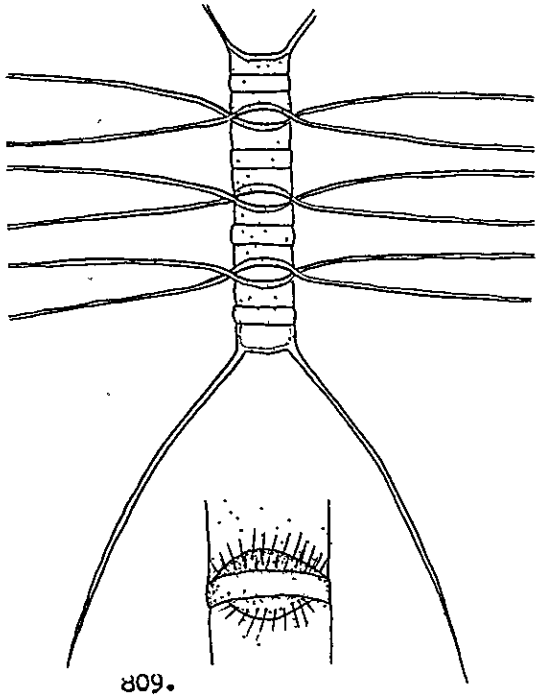
806. Chaetoceros laciniosus



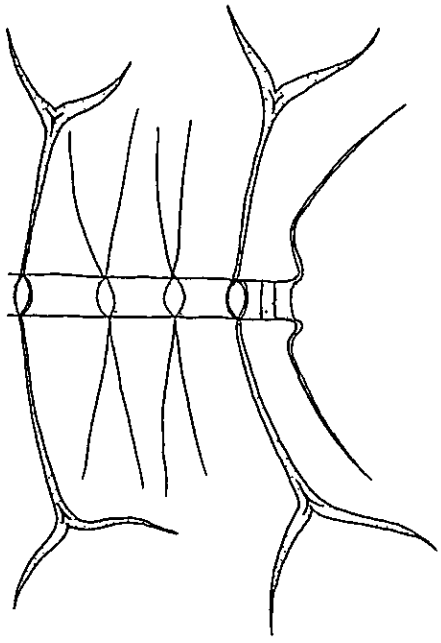
807. Chaetoceros laciniosus var. peragicus



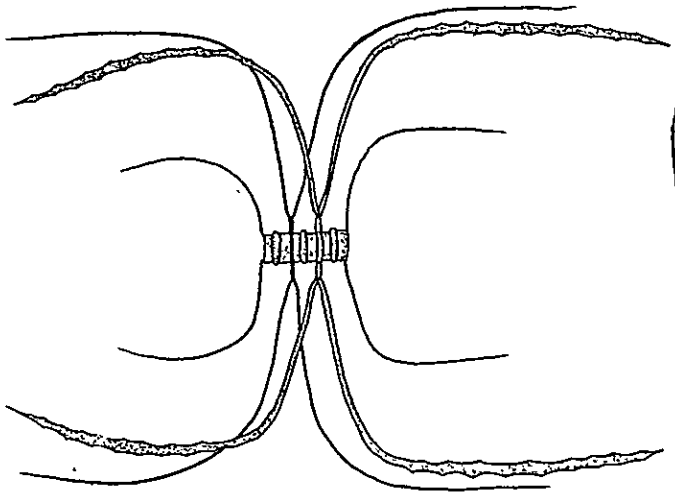
808. Chaetoceros brevis



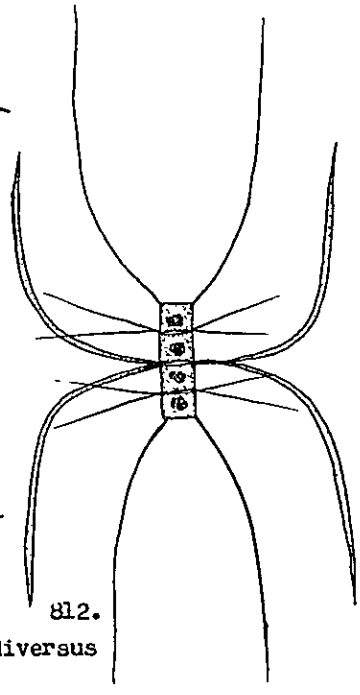
809. Chaetoceros seiracanthus



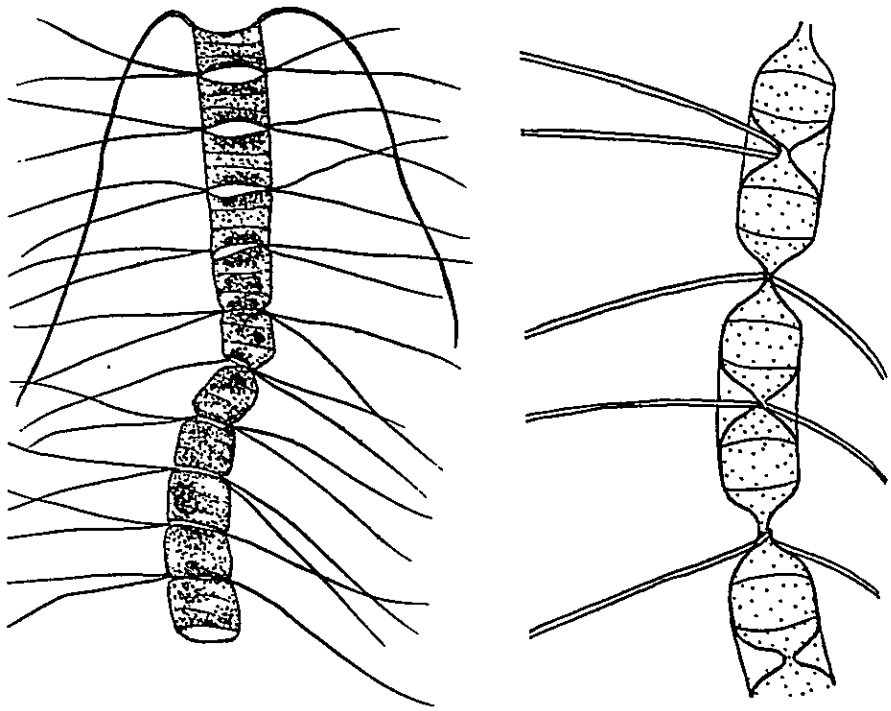
810. Chaetoceros messanensis



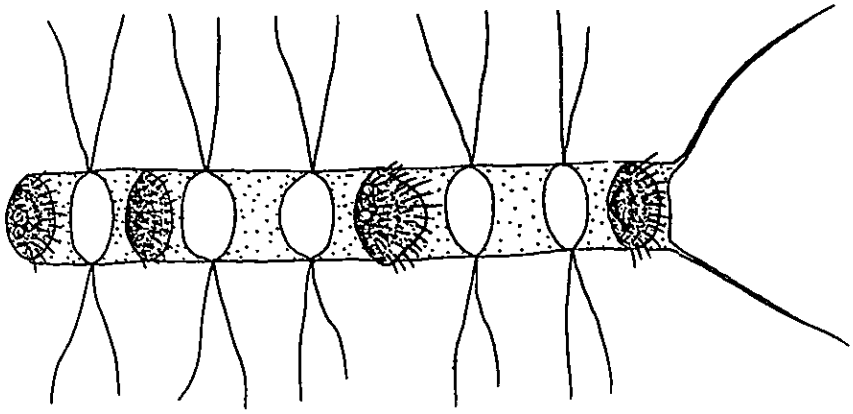
811. Chaetoceros leavis



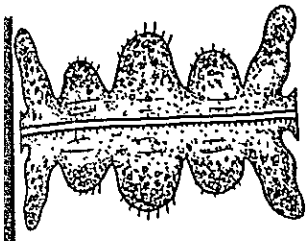
812. Chaetoceros diversus

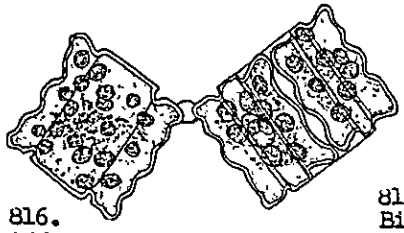


813. Chaetoceros curvisetus

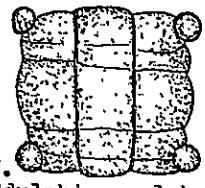


814. Chaetoceros sp.



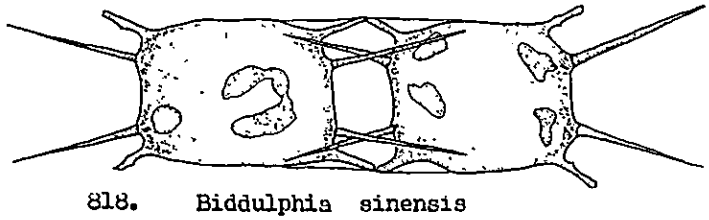


816. Biddulphia aurita var. obtusa

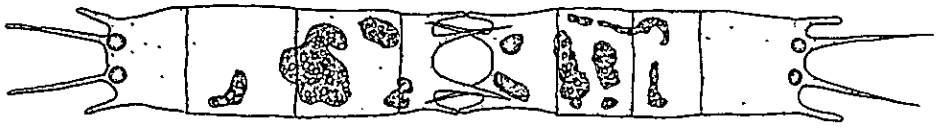


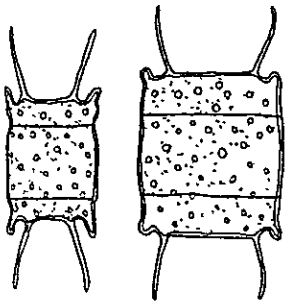
817. Biddulphia pulchella

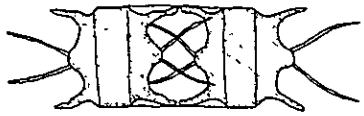
815. Biddulphia Thuomeyi



818. Biddulphia sinensis

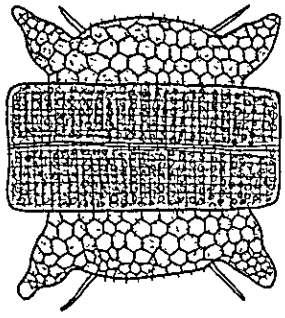




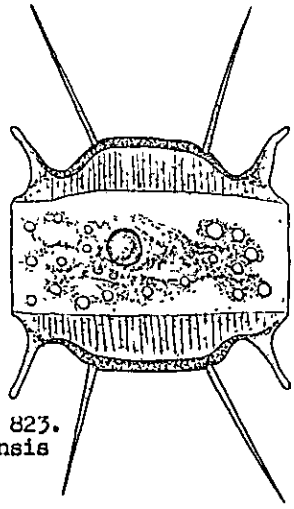


819. Biddulphia longicruris

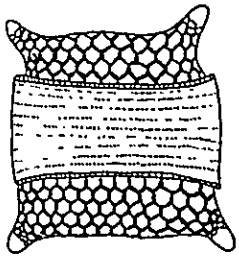
820. Biddulphia regia



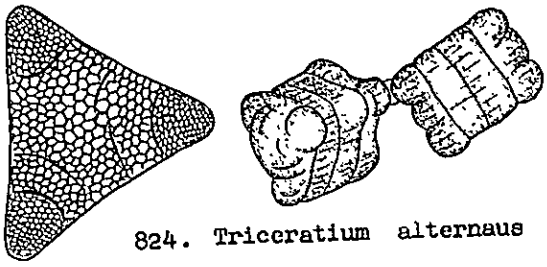
821. Biddulphia dubia



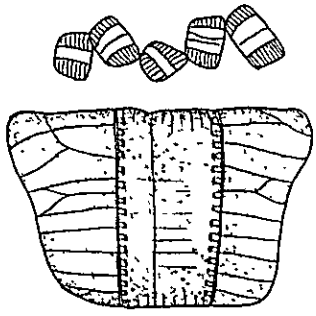
823. Biddulphia mobilensis



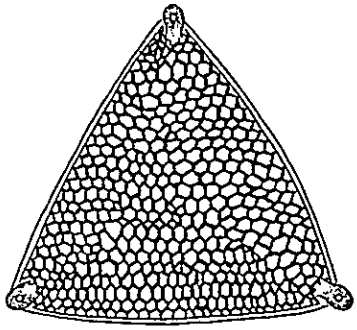
822. Biddulphia reticulata



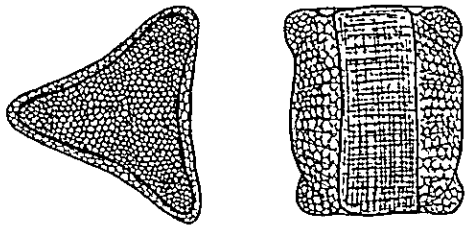
824. Triceratium alternaus



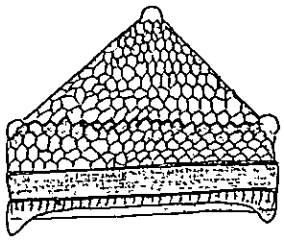
825. Isthmia nervosa



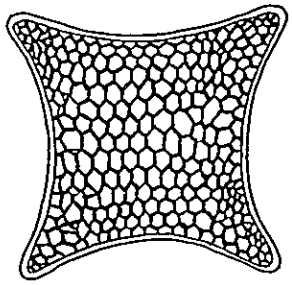
826.



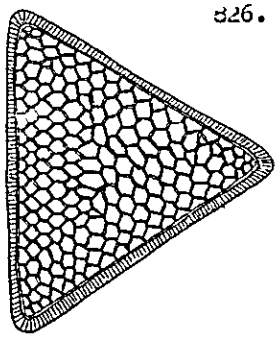
827. Triceratium reticulum

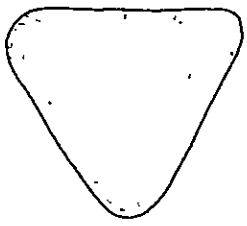


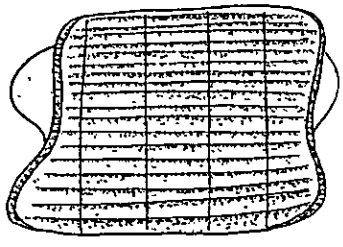
Triceratium favus
826.



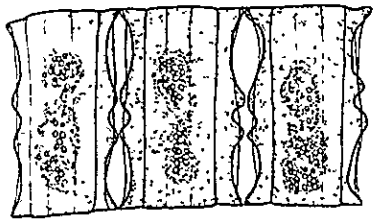
828. Triceratium revale







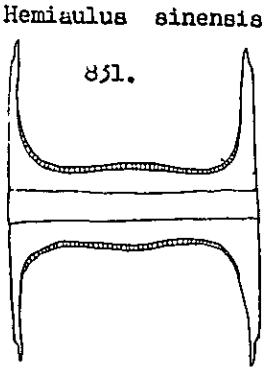
829. Triceratium arcticum

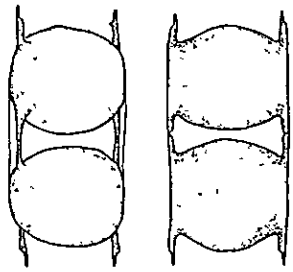


830. Bellerochea malleus

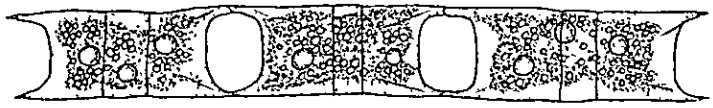
Hemiaulus sinensis

851.





832. Hemiaulus indicus



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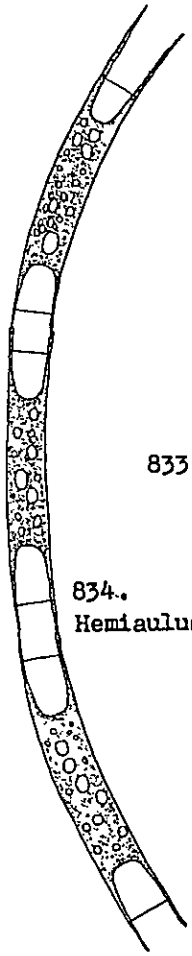
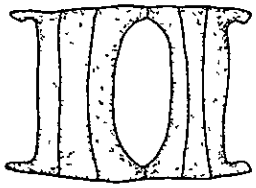
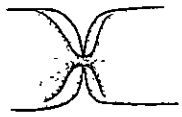


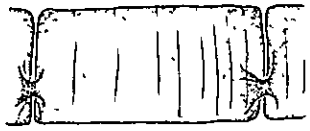


833. Hemiaulus membranacus

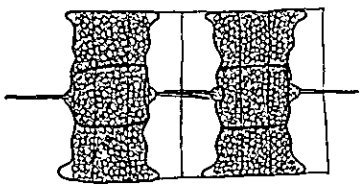


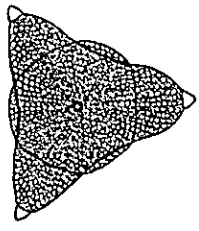
835. Cerataulina Bergonii

834.
Hemiaulus Hauckii

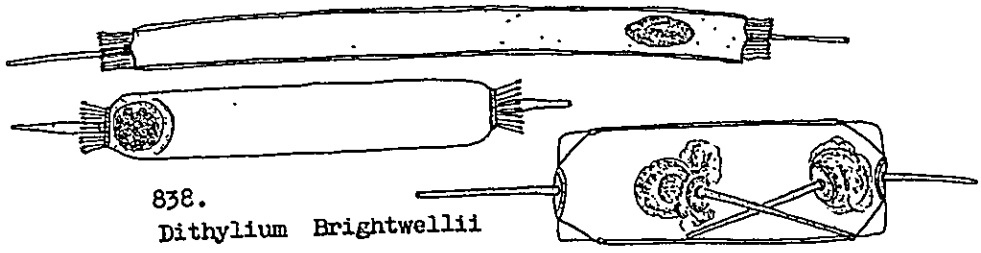


836. Cerataulina compacta

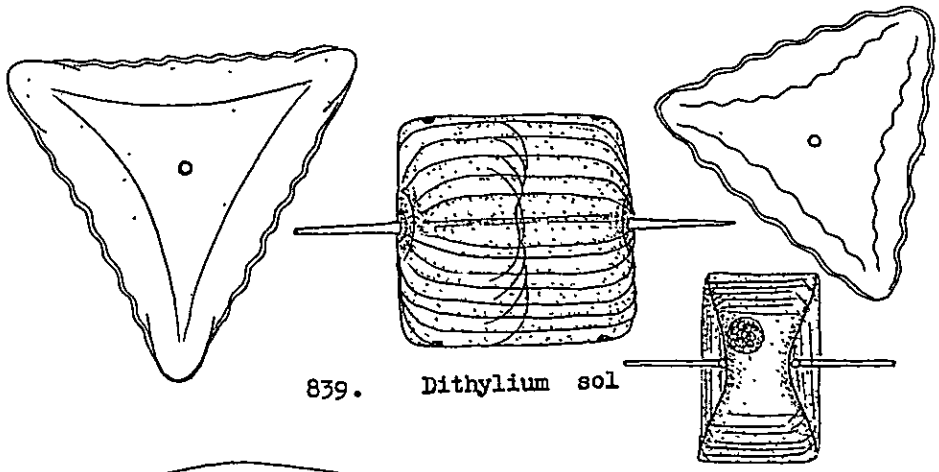




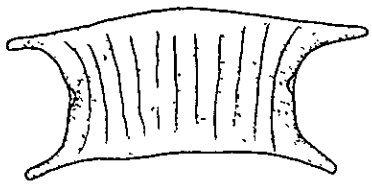
837. Lithodesmium undulatum



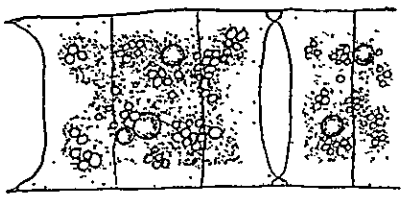
838.
Dithylium Brightwellii

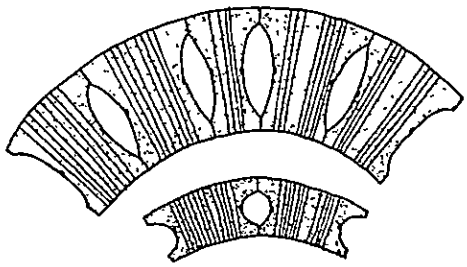


839. Dithylium sol

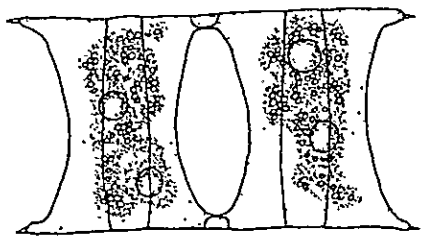


840. Eucampia cornuta

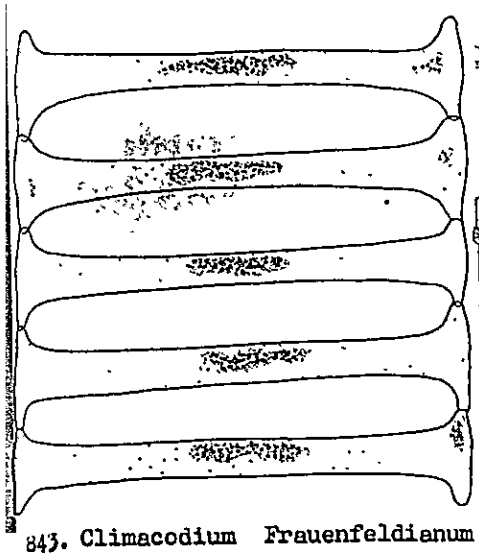




841. Eucampia zoodiacus

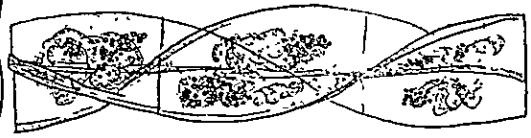


842. Climacodium biconcavum

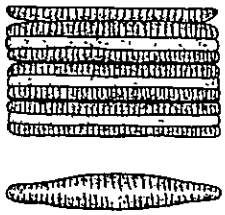


843. Climacodium Frauenfeldianum

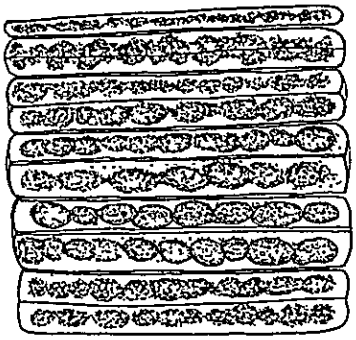
844. Streptotheca thamesis



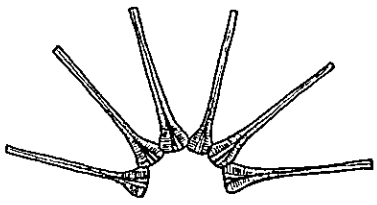
845. Streptotheca indica



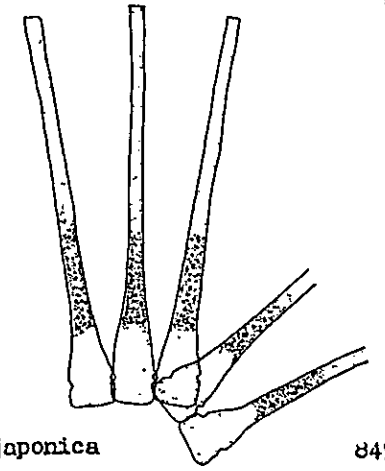
846. Fragilaria intermedia



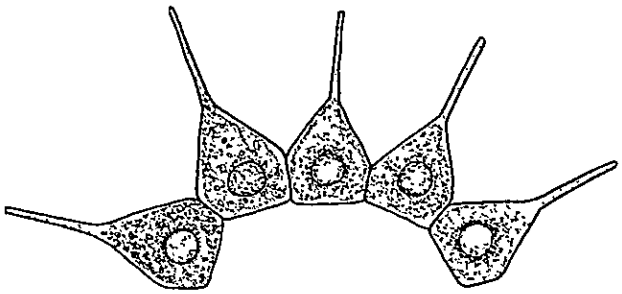
847. Fragilaria oceanica fo. typica



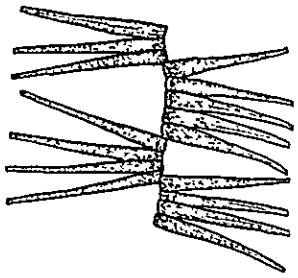
848. Asterionella japonica



849.



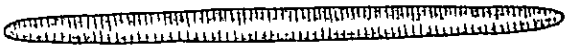
850. Asterionella sp.



851. Asterionella notata

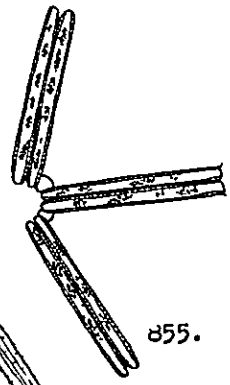
852. Synedra fulgens

853. Synedra fulgens var. mediterranea

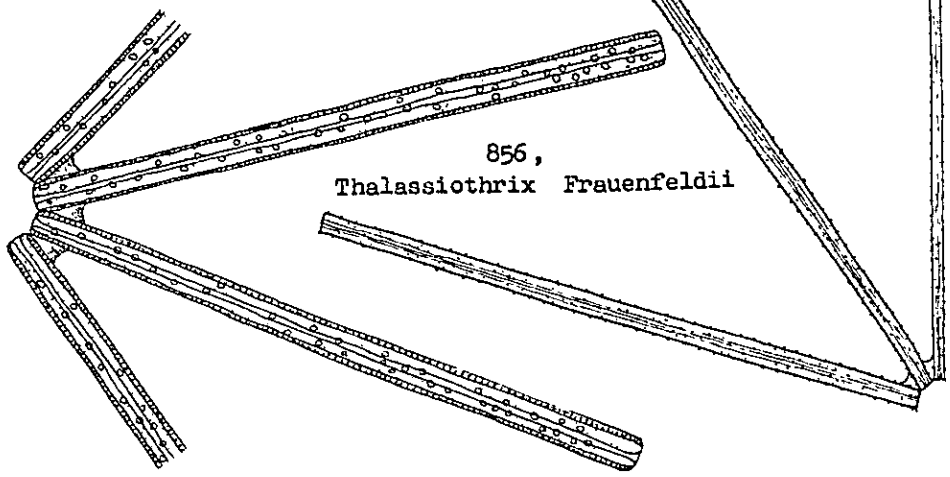


854. Synedra Gaillonii

855. Thalassionema nitzschioides



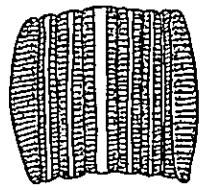
855.



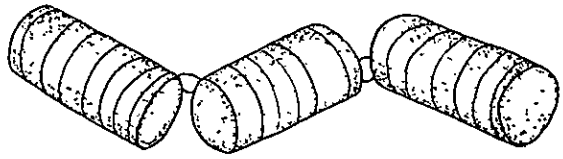
856,
Thalassiothrix Frauenfeldii

857. Thalassiothrix delicatula

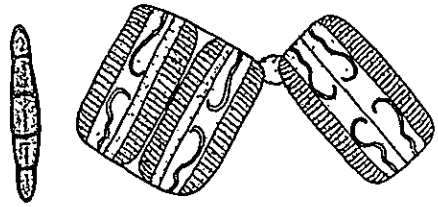
858.
Thalassiothrix mediterranea var. pacifica



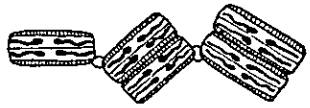
859.
Pseudoeunotica doliolus



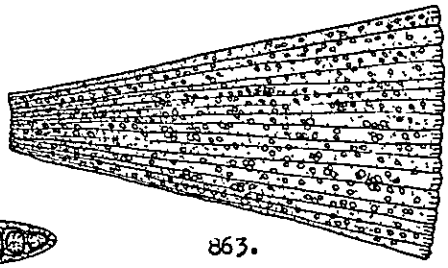
860. Striatella unipunctata



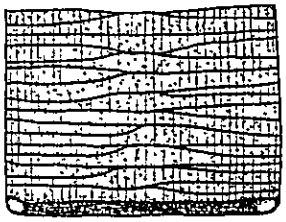
862. Grammatophora angulosa



861. Grammatophora marina

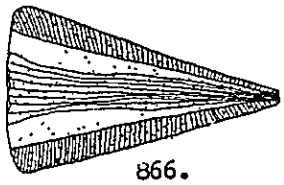


863.
Licmophora flabellata

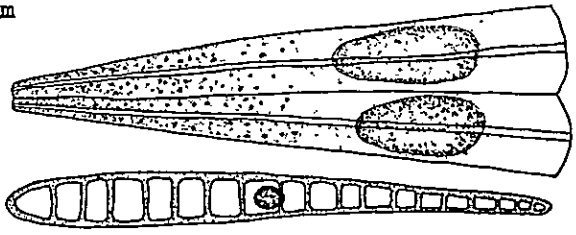


865.
Gramatophora serpentina

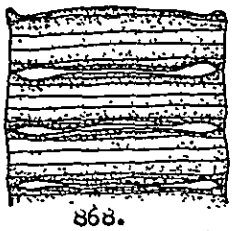
864. Rhabdonema adriaticum



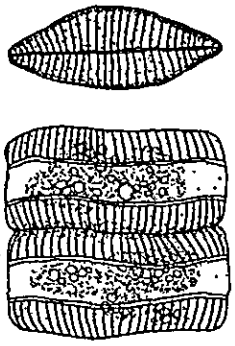
866.
Licmophora abbreviata



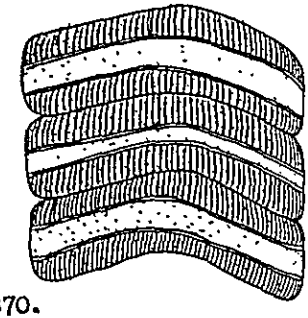
867. Climacosphenia moniligera



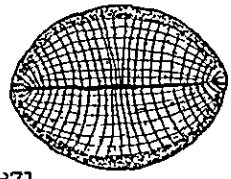
868. Plagiogramma vanheurckii



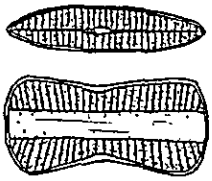
869. Achnanthes brevipes



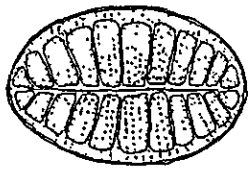
870. Achnanthes longipes



871. Cocconeis scutellum

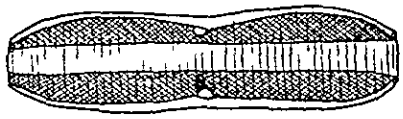


873. Navicula cancellata

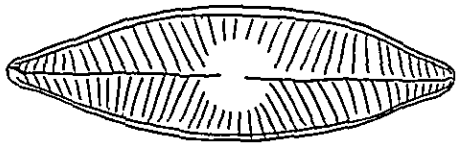


872. Campyloneis Grevillei

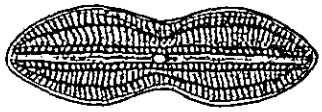
874. Navicula lyra



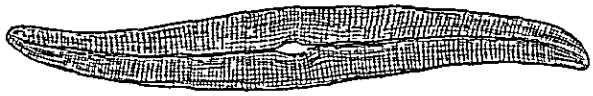
876. Trachyneis aspera



875. Navicula elegans

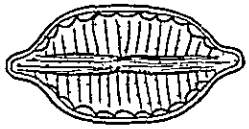


877. Diploneis crabro



879. Gyrosigma acuminatum

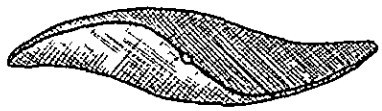
880. Gyrosigma balticum



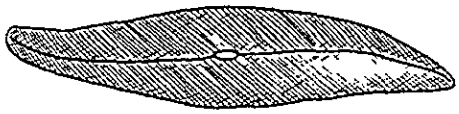
878. Mastogloia minuta

881. Gyrosigma spenceri

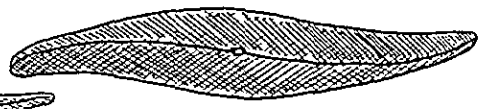
882. Gyrosigma strigile



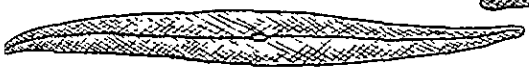
883. Pleurosigma compactum



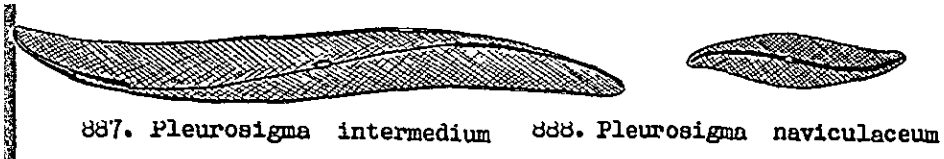
884. Pleurosigma affine



886. Pleurosigma elongatum



885. Pleurosigma angulatum



887. Pleurosigma intermedium

888. Pleurosigma naviculaceum

889. Pleurosigma nicobaricum

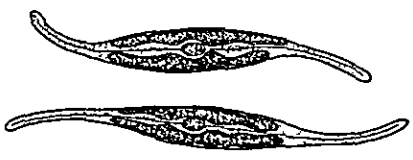
890. Pleurosigma Normanii

891. Pleurosigma pelagicum

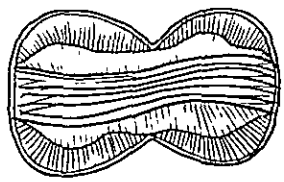
892. Pleurosigma rectum

893. Pleurosigma rigidum var. incurvata

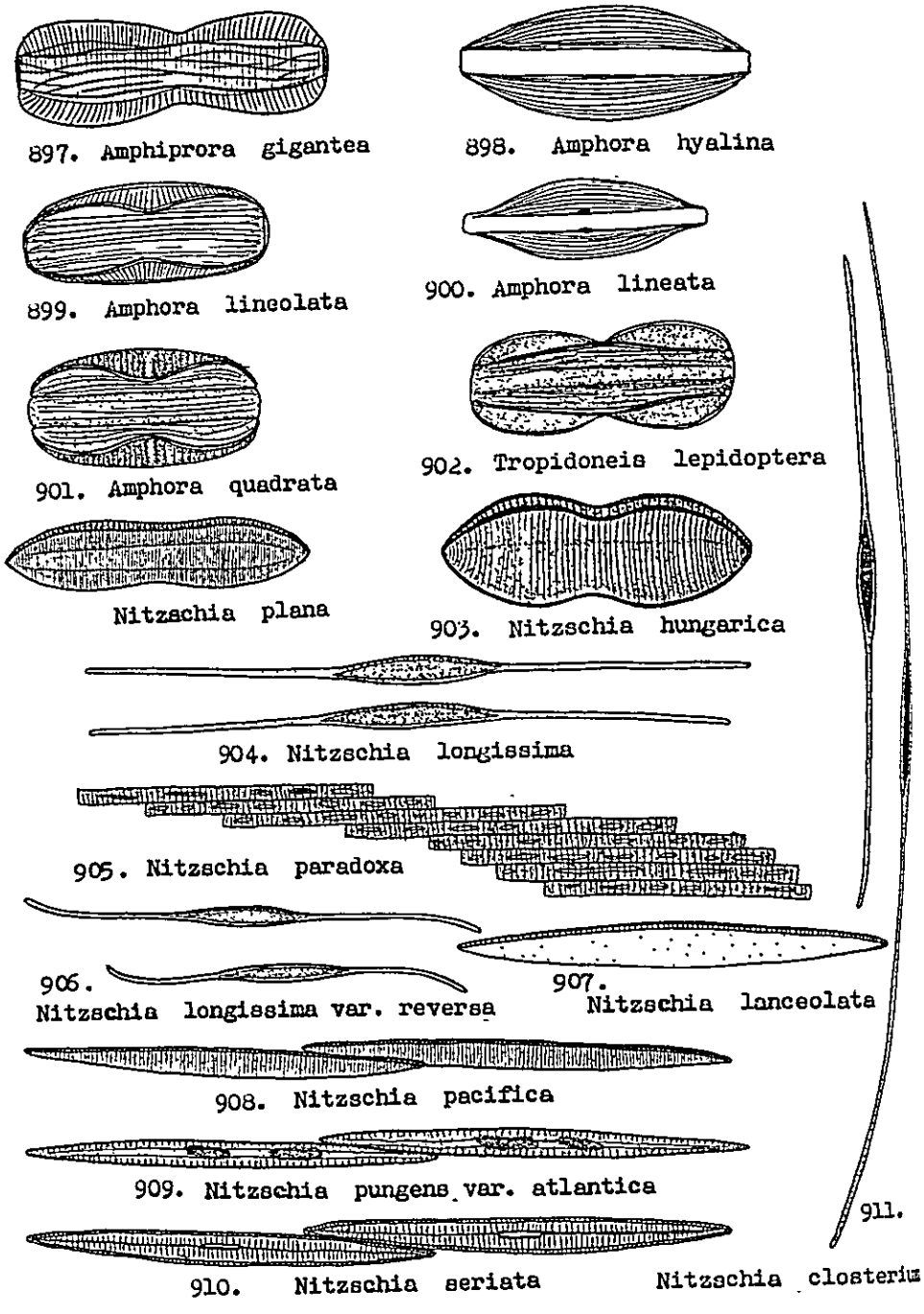
894. Pleurosigma salinarum

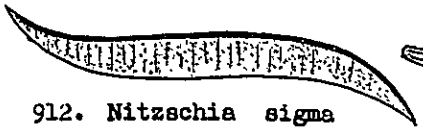


895. Pleurosigma fasciola



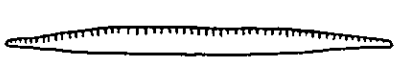
896. Amphiprora alata


897. Amphiprora gigantea
898. Amphora hyalina
899. Amphora lineolata
900. Amphora lineata
901. Amphora quadrata
902. Tropidoneis lepidoptera
Nitzschia plana
903. Nitzschia hungarica
904. Nitzschia longissima
905. Nitzschia paradoxa
906. Nitzschia longissima var. reversa
907. Nitzschia lanceolata
908. Nitzschia pacifica
909. Nitzschia pungens var. atlantica
910. Nitzschia seriata
911. Nitzschia closterium



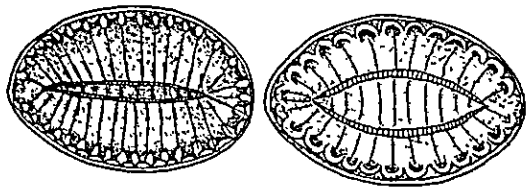
912. Nitzschia sigma

913. Nitzschia sigma var. intercedens

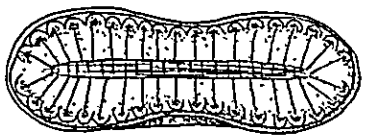


914. Nitzschia spectabilis

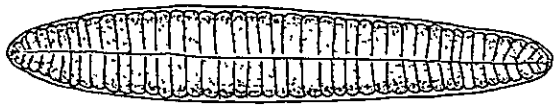
915. Nitzschia vitrea



916. Surirella fastuosa

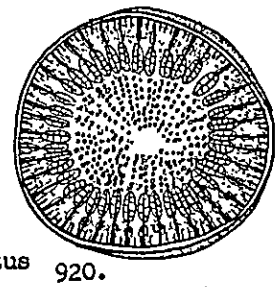


917. Surirella javanica

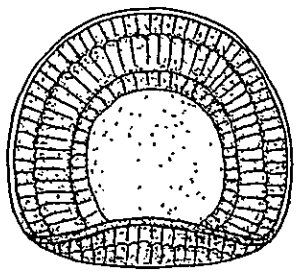


918. Surirella norvegica

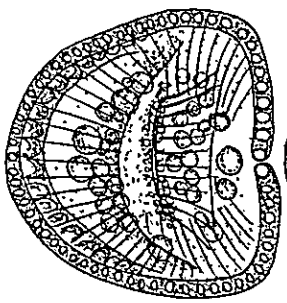
919. Campylodiscus biangulatus

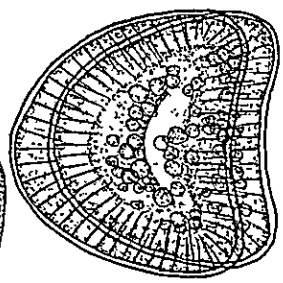


920. Campylodiscus daemelianus

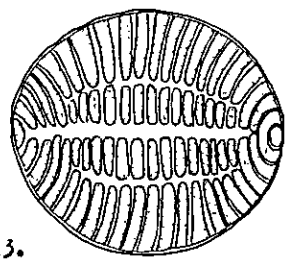


921. Campylodiscus ornatus

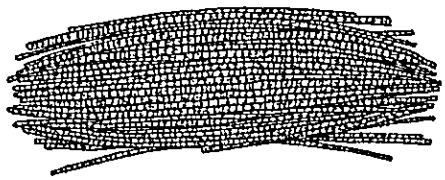




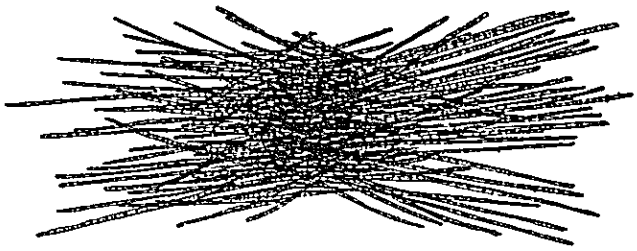
922. Campylodiscus echeneis



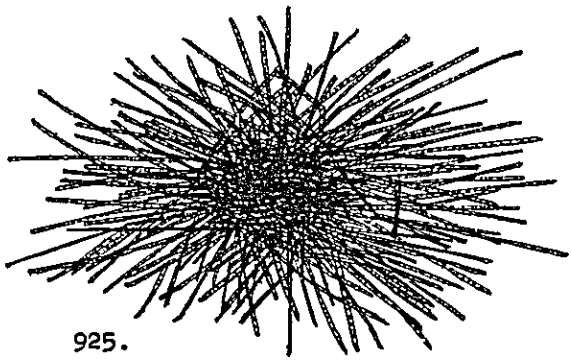
923. Campylodiscus undulatus



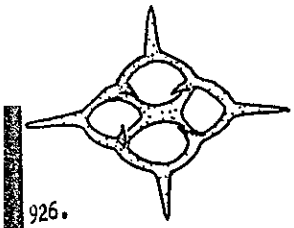
924. Trichodesmium erytheraeum



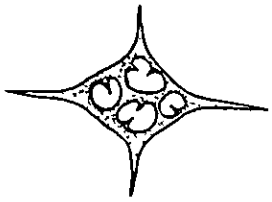
925. Trichodesmium Thiebauti



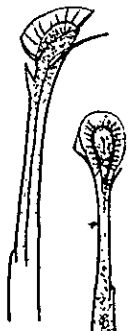
925.



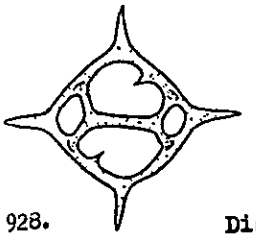
926.
Dictyocha fibula



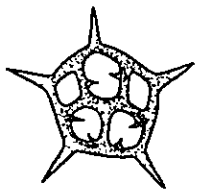
927.
Dictyocha fibula var. stapedia



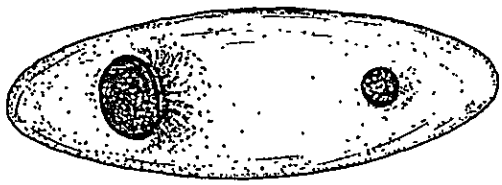
936.



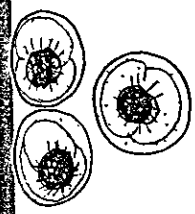
928.
Dictyocha fibula var. major



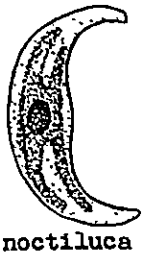
929.
Distephanus speculum var.pentagona



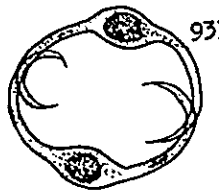
930. Pyrocystis fusiformis



931. Pyrocystis noctiluca

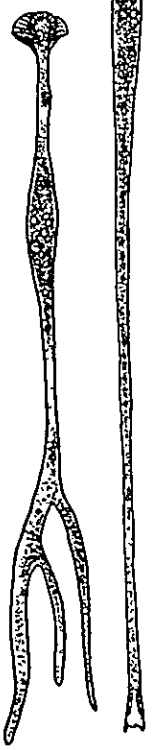


932. Pyrocystis elegans



933. Pyrocystis hamulus var.inacqualis

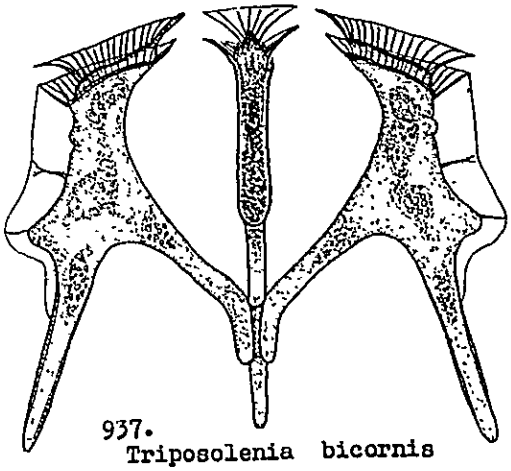
933.



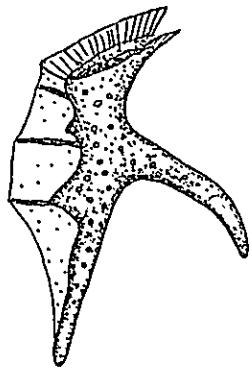
935.
Amphisolenia thrinax

Prorocentrum micans ?
934.

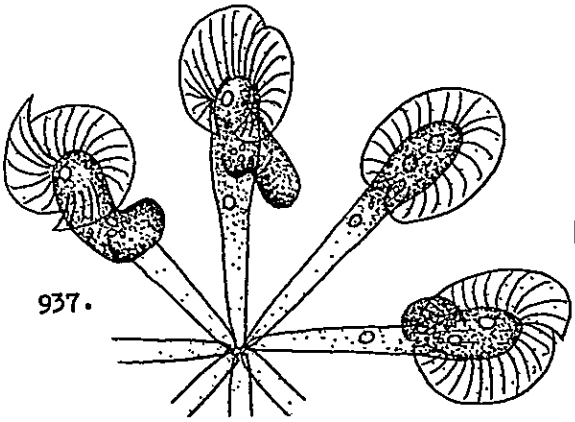
936. Amphisolenia bidentata



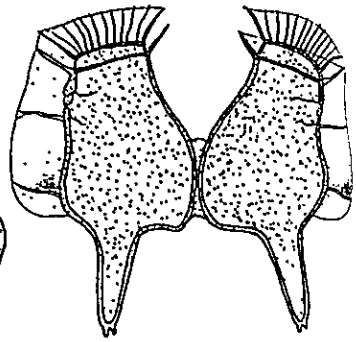
937.
Triposolenia bicornis



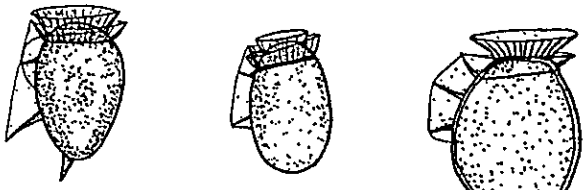
938.
Triposolenia truncata



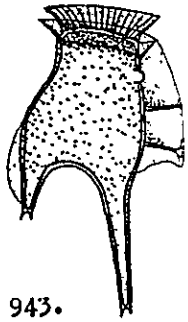
937.



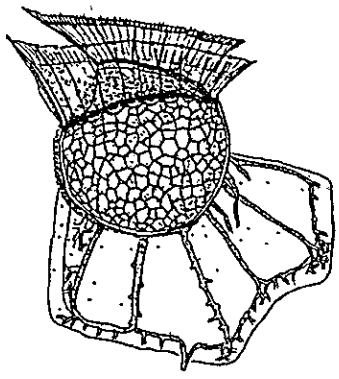
939. Dinophysis homunculus



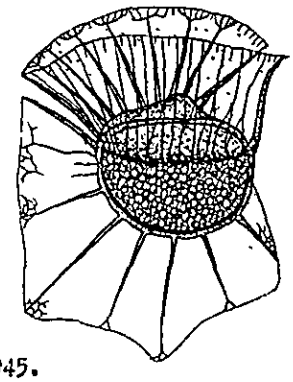
940. Dinophysis hastata
941.
Dinophysis sphaerica
942.
Dinophysis ovum



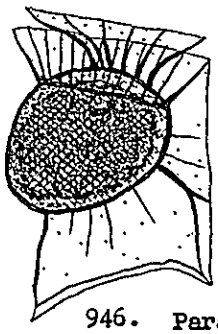
943.
Dinophysis tripos



944. Orinthocercus magnificus



945. Orinthocercus splendicus



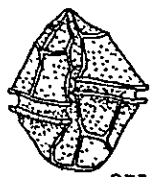
946. Parahistioneis sphaeroidea

947. Phalacroma circumsutum

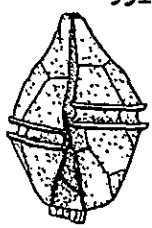
948. Phalacroma doryphorum

949. Phalacroma parvulum

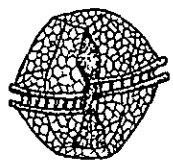
950. Phalacroma porodictyum



951. Goniaulax polyedra



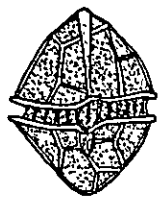
952. Goniaulax polygramma

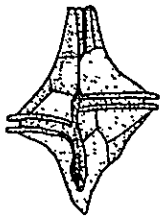


953. Protoceratium reticulatum

954.
Heterodinium de tonii

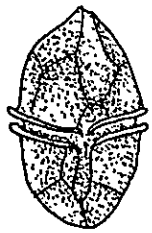
Amphidoma steini
955.



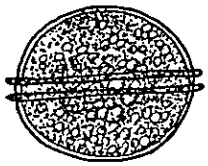


956. Spiraulax jollifei

957. Heterodinium mediterraneum

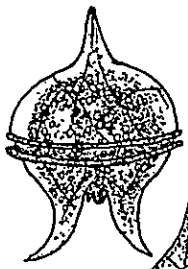


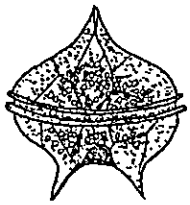
958. Pachydinium mediterraneum



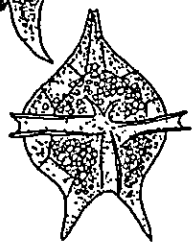
959.
Diplopsalis lenticula

960.
Diplopsalis lenticula fo. asymmetrica

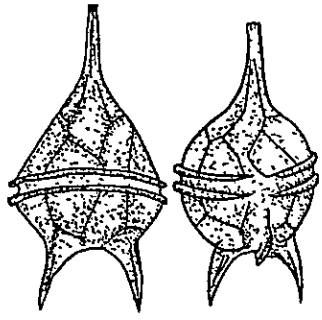




961.
Peridinium Granii
fo. mite

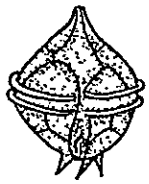


962.
Peridinium Brochi

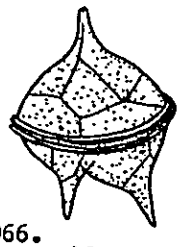


963. Peridinium diabolus

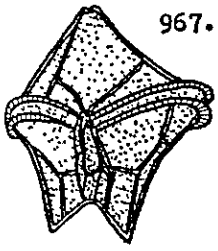
964. Peridinium breve



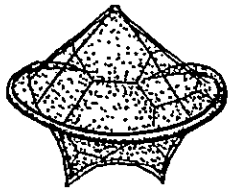
965. Peridinium pellucidum



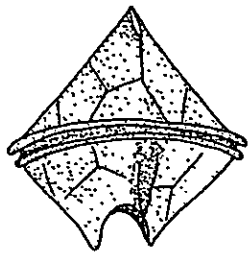
966. Peridinium oceanicum var. oblongum



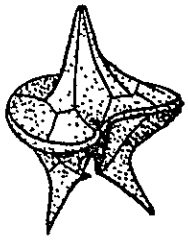
967. Peridinium conicum



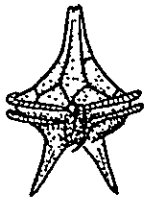
968. Peridinium pentagonum



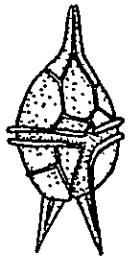
969. Peridinium leonis



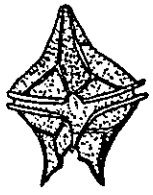
970. Peridinium depressum



971. Peridinium paulseni

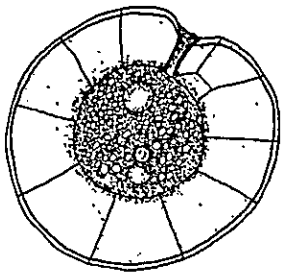


972. Peridinium steini

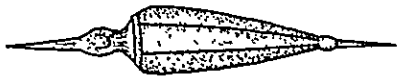


973. Peridinium divergens

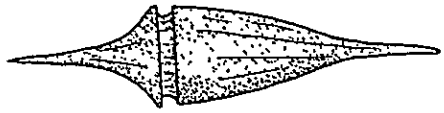
974. Ptychodiscus inflatus



975. Phrophacus horologicum

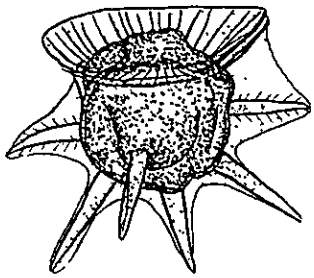


976. Oxytoxum scolopax

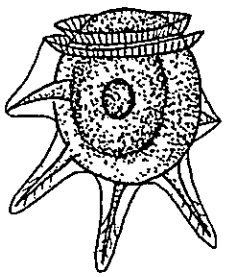


977. Oxytoxum milneri

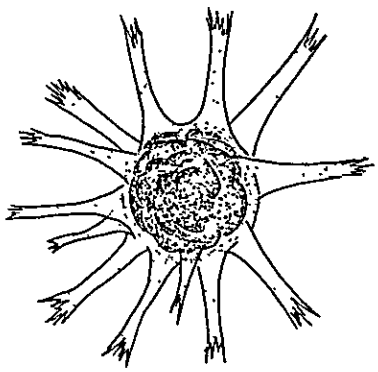
978. Oxytoxum tesselatum



979. Ceratocorys horrida



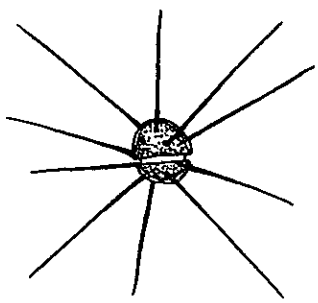
980. Ceratocorys gourreti



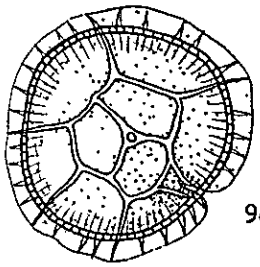
981. Cladopyxis brachiolatum

982. Podolampas palmipes

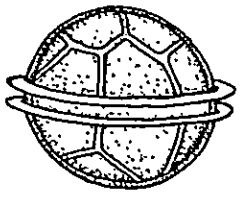
983. Podolampas elegans

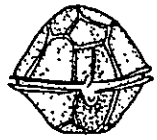


984. Micracanthodinium setiferum

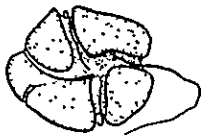


985. Goniodoma sphaericum

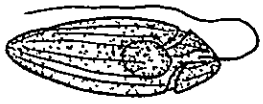




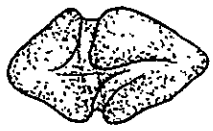
986. Goniodoma polyedricum



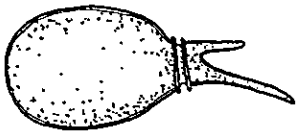
987. Gymnodinium maguelonnense ?



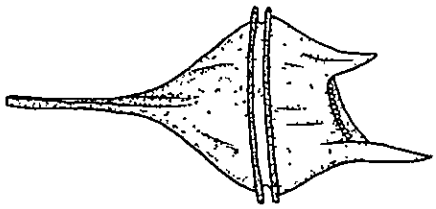
988. Gyrodinium glaucum



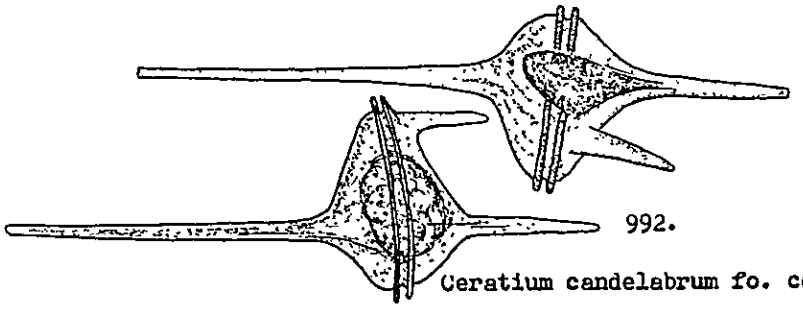
989. Gymnodinium gracile



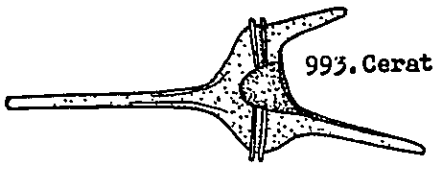
990. Ceratium gravidum



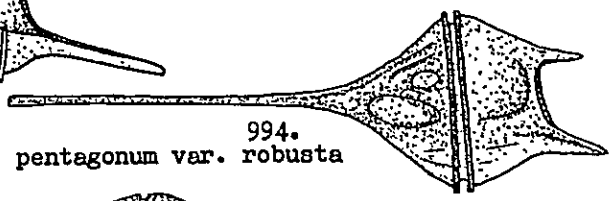
991. Ceratium candelabrum



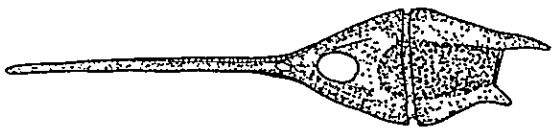
992. Ceratium candelabrum fo. commune



993. Ceratium candelabrum fo. curvatulum



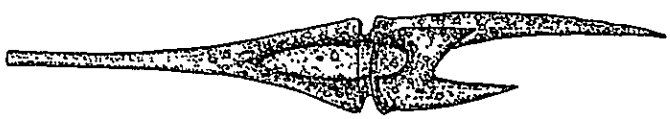
994.
Ceratium pentagonum var. robusta



995. Ceratium teres

996. Ceratium strictum

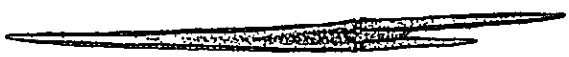
997. Ceratium furca var. berghia



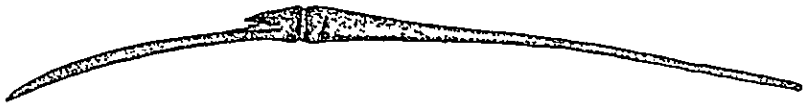
998. Ceratium furca var. eugramma

999. .Ceratium fusus var. seta

999.



1000. Ceratium belone

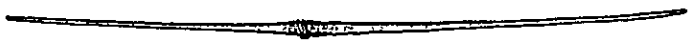


1001. Ceratium pennatum var. scapiforme

1002. Ceratium falcatum

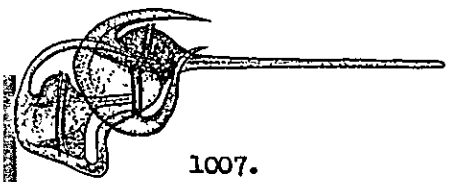
1003. Ceratium inflexum

1004. Ceratium longirostrum

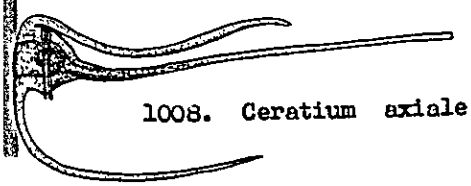


1005. Ceratium setaceum

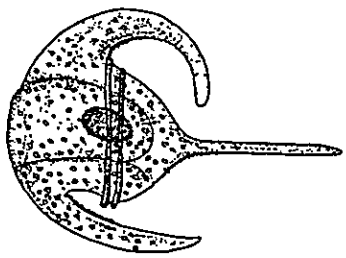
1006. Ceratium extensum



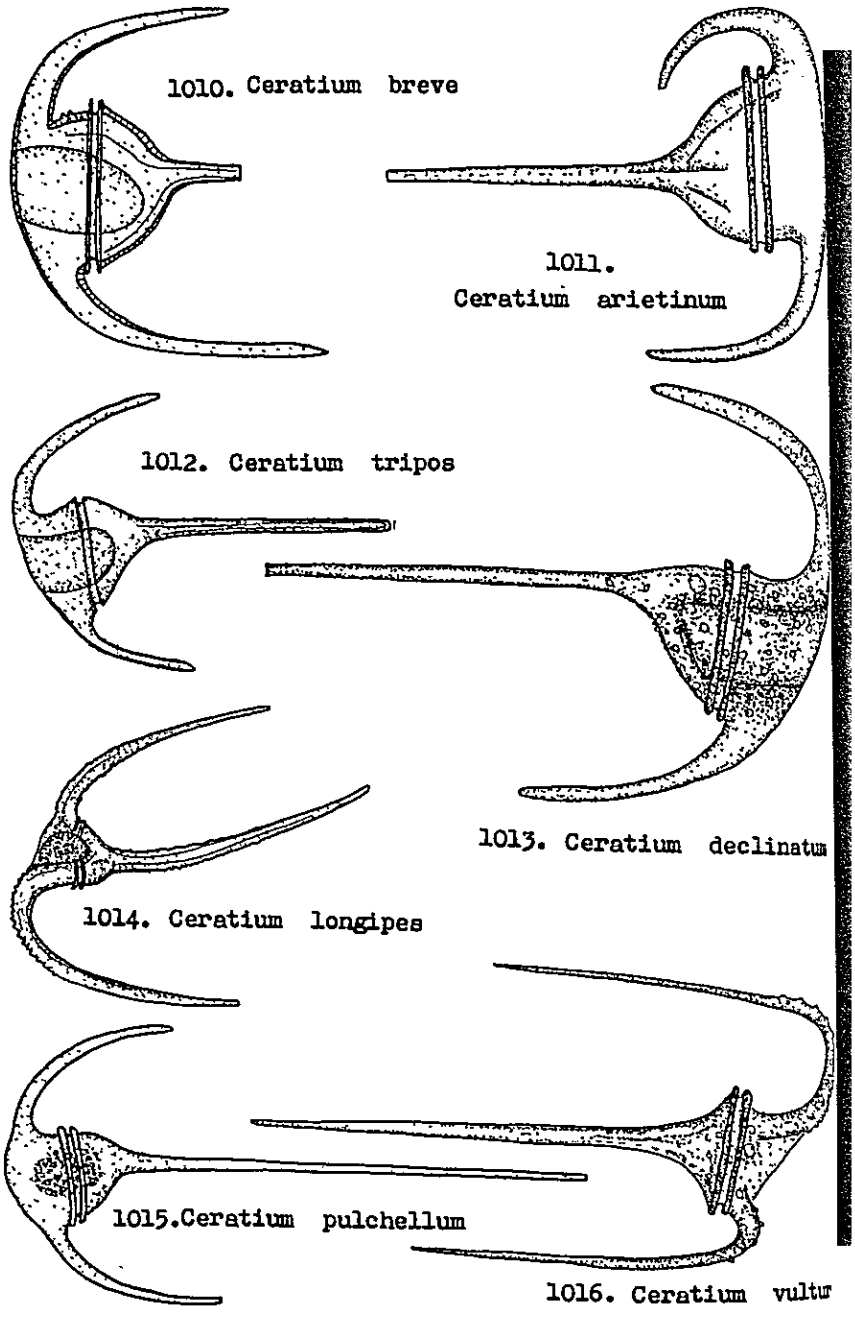
1007.
Ceratium gibberum fo. sinistrum

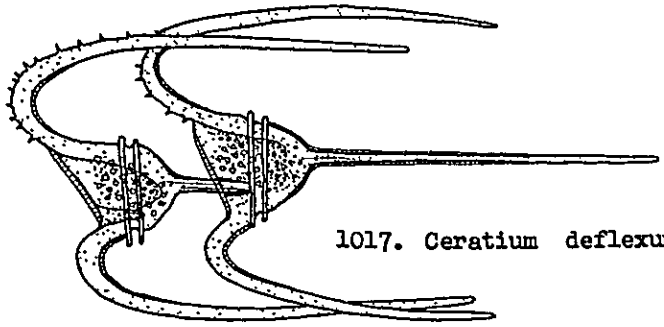


1008. Ceratium axiale

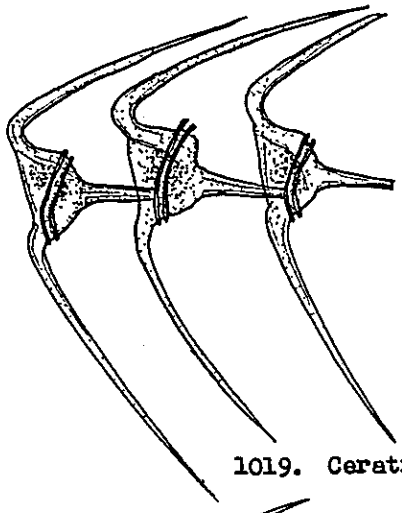


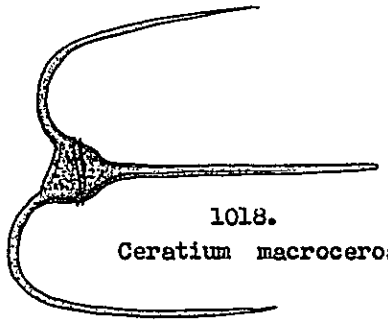
1009. Ceratium gibberum


1010. Ceratium breve
1011.
Ceratium arietinum
1012. Ceratium tripos
1013. Ceratium declinatum
1014. Ceratium longipes
1015.Ceratium pulchellum
1016. Ceratium vultur



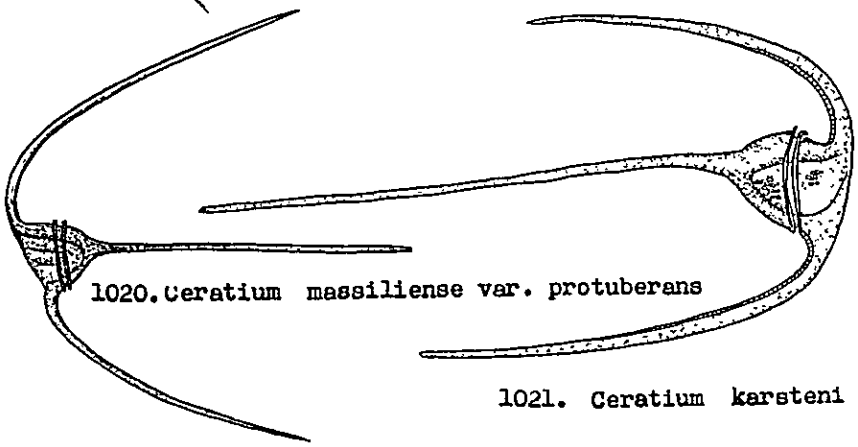
1017. Ceratium deflexum





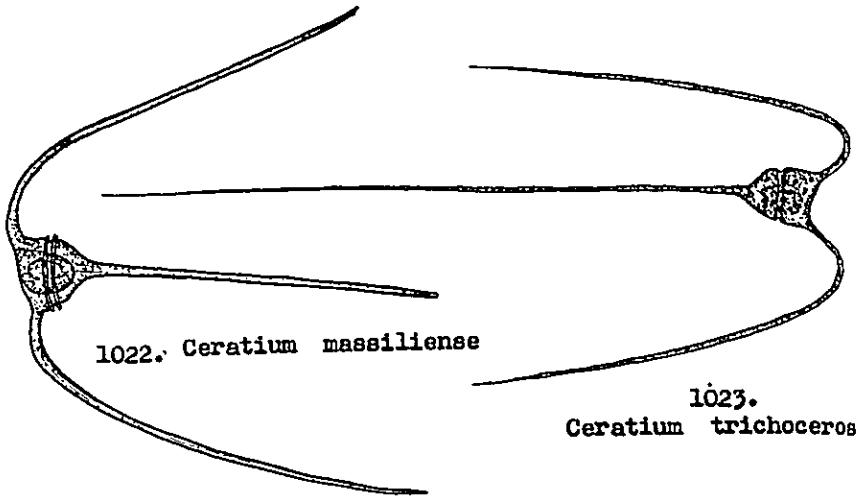
1018.
Ceratium macroceros

1019. Ceratium sumatranum



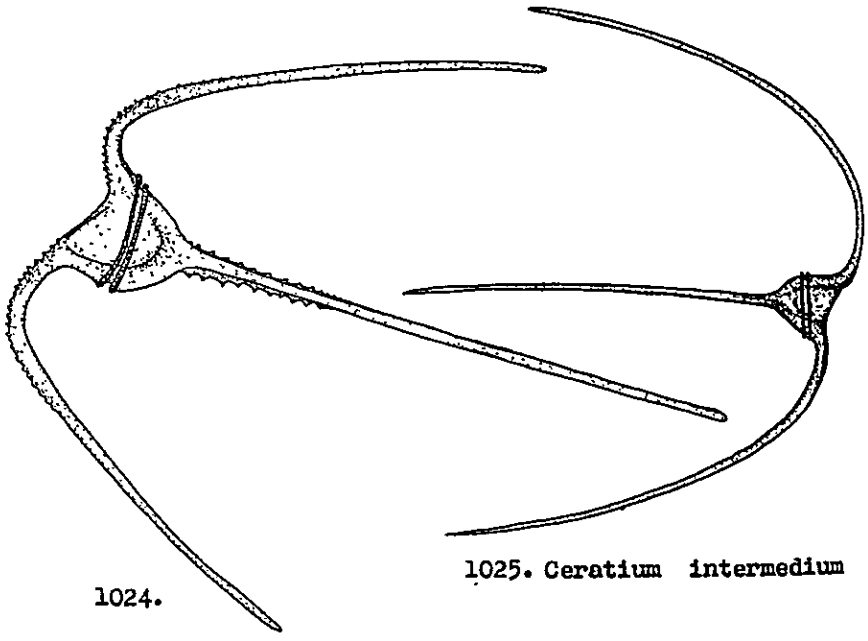
1020. Ceratium massiliense var. protuberans

1021. Ceratium karsteni



1022. Ceratium massiliense

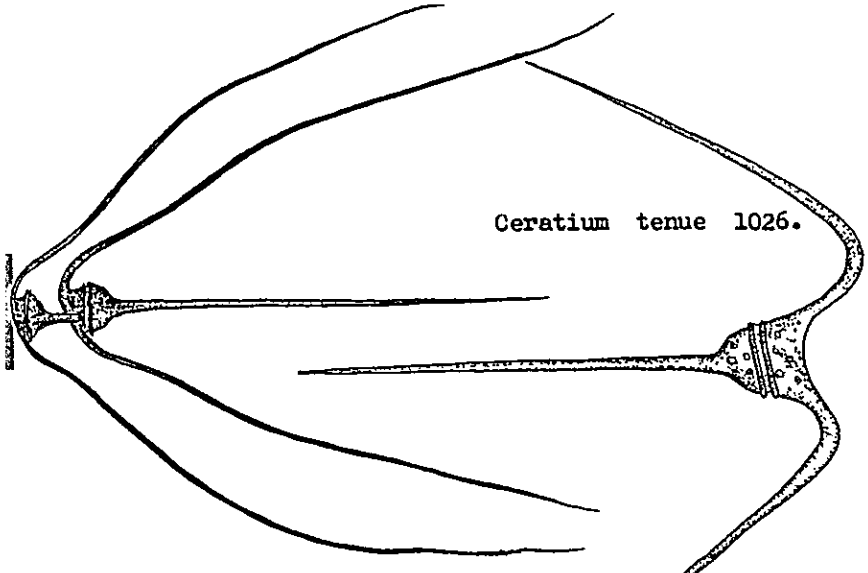
1023.
Ceratium trichoceros



1024.

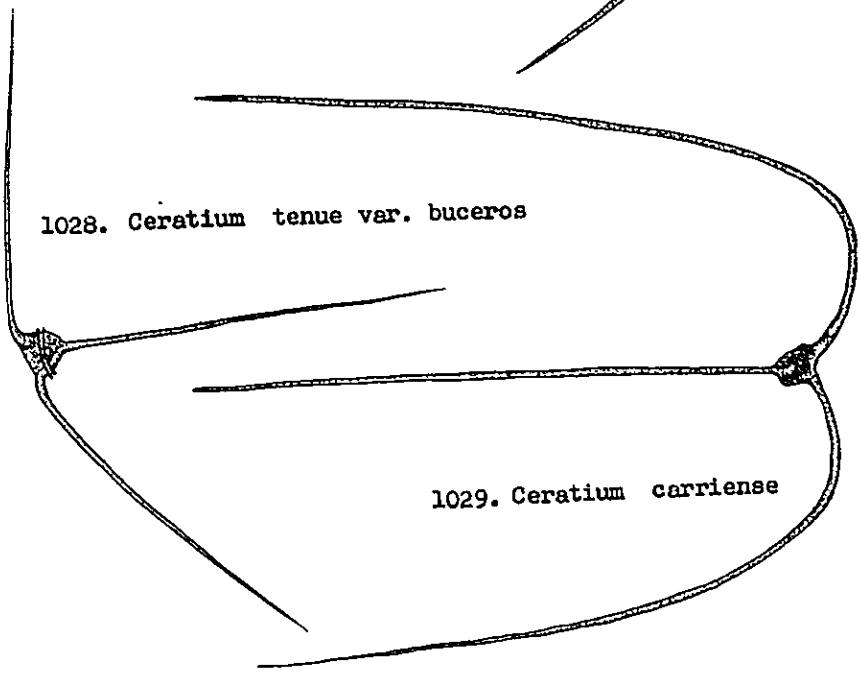
Ceratium molle

1025. Ceratium intermedium



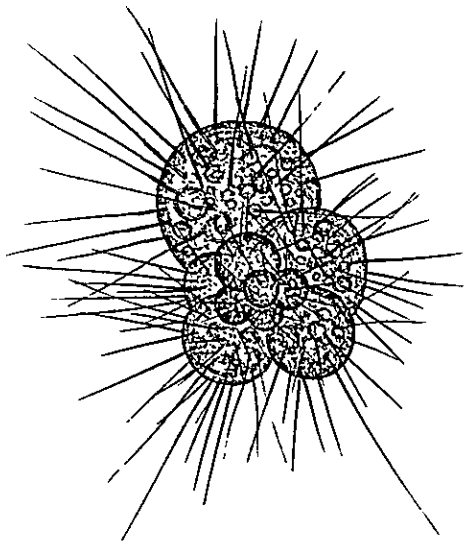
Ceratium tenue 1026.

1027. Ceratium sumatranum var. recurvum

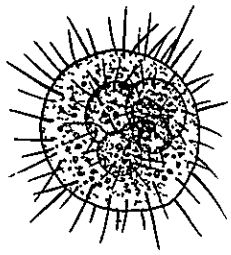


1028. Ceratium tenue var. buceros

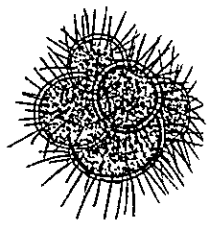
1029. Ceratium carriense



1031. Globigerina bulloides

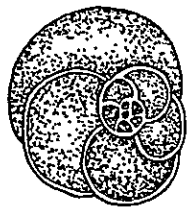


1030. Orbulina univers

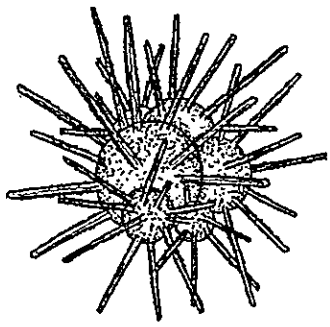


1032. Globigerinoides conglobat

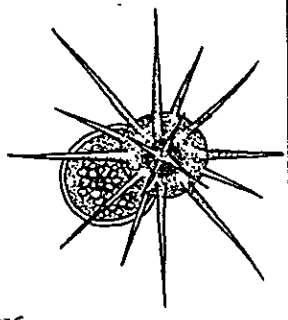
1033. Globigerinella aequilateralis



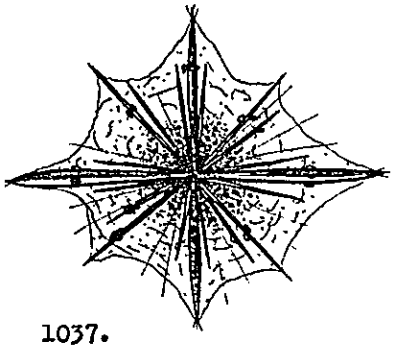
1034. Tretomphalus bulloide



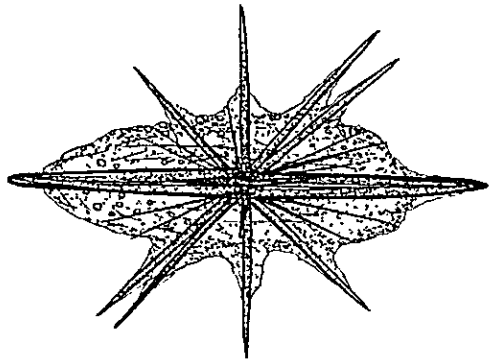
1035. Hastigerina pelagica



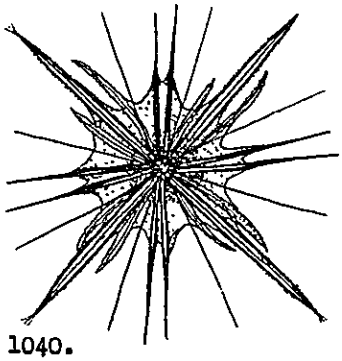
1036. Amoebophrya acanthometr



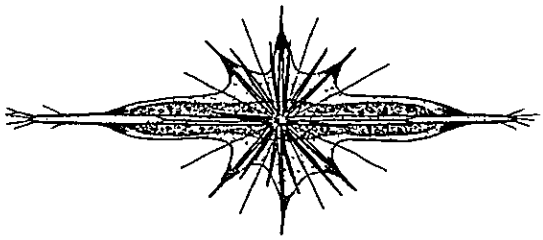
1037.
Acanthocolla cruciata



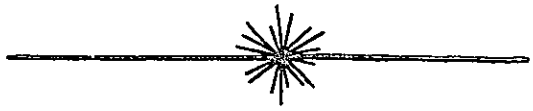
1038. Amphibelone hydrotomica



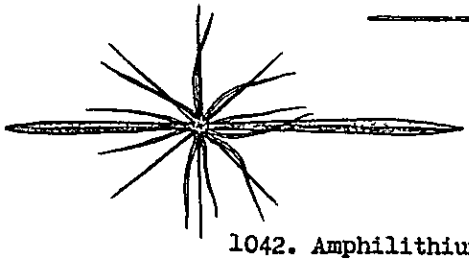
1040.
Gigartacon mulleri



1039. Amphilonche elongata

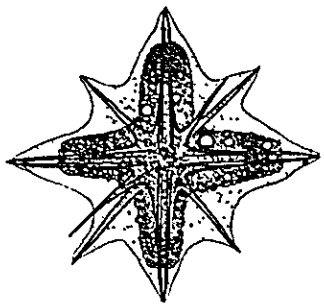


1041.
Amphilonche belonoides

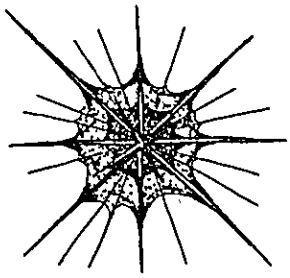


1042. Amphilithium clavarium

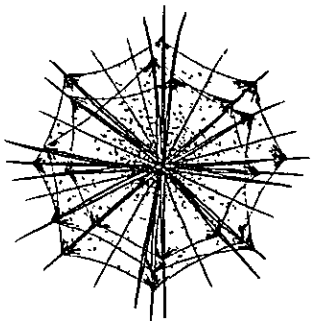
1043. Amphiacon denticulatus



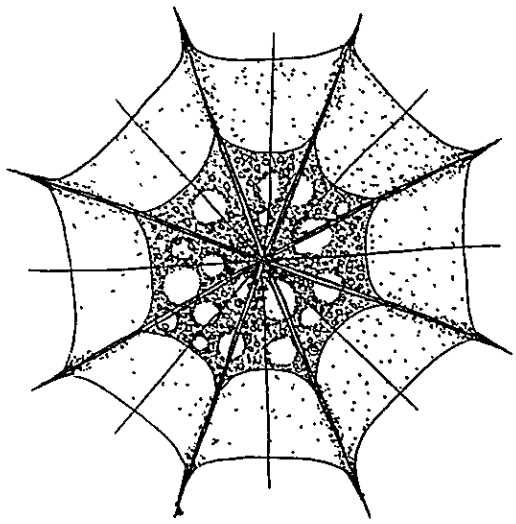
1044. Acanthonia crux



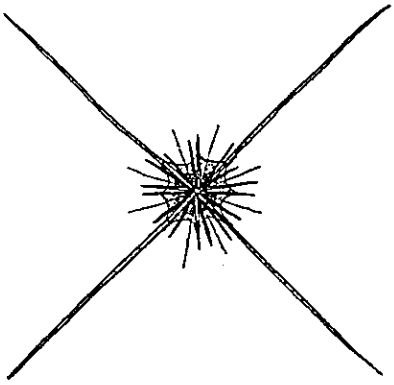
1045. Acanthometron pellucidum



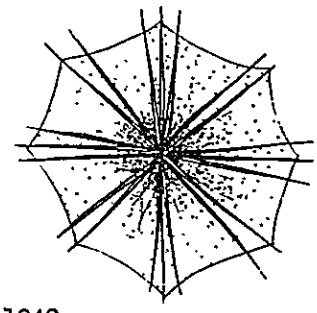
1046.
Acanthoplegma krohni



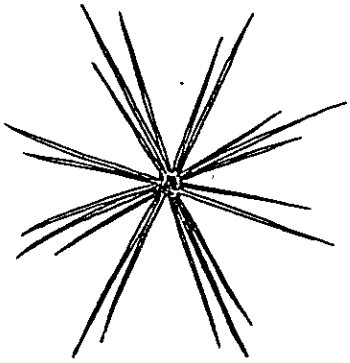
1047. Anchylometra pellucida



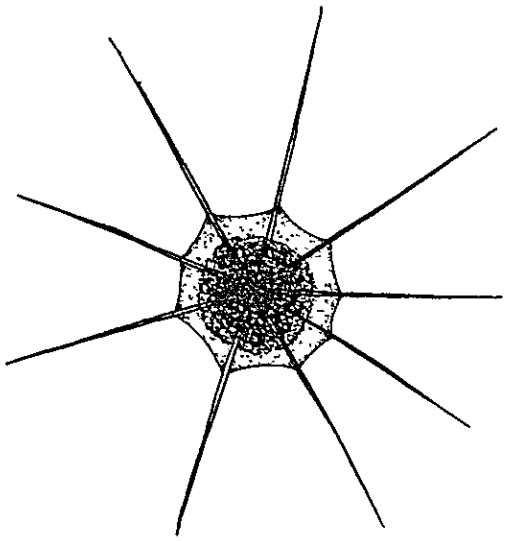
1048. Stauracon pallidus



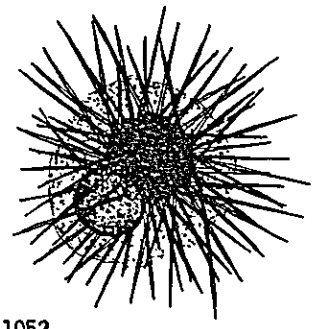
1049.
Acanthochiasma rubescens



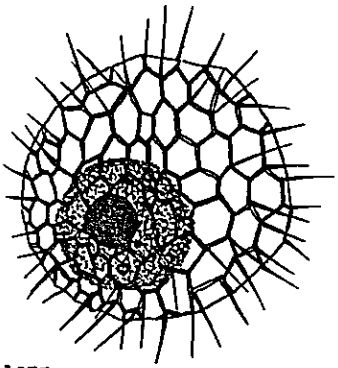
1050.
Heliolithium aureum



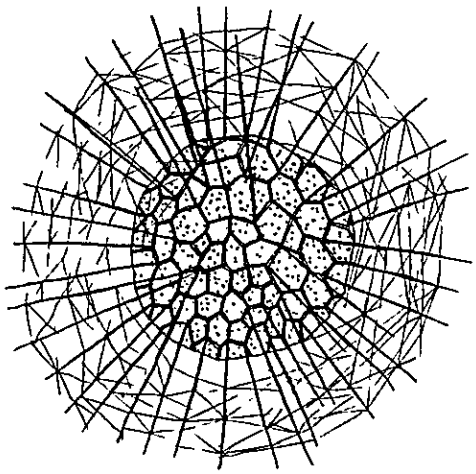
1051.
Dromosphaera polygonalis



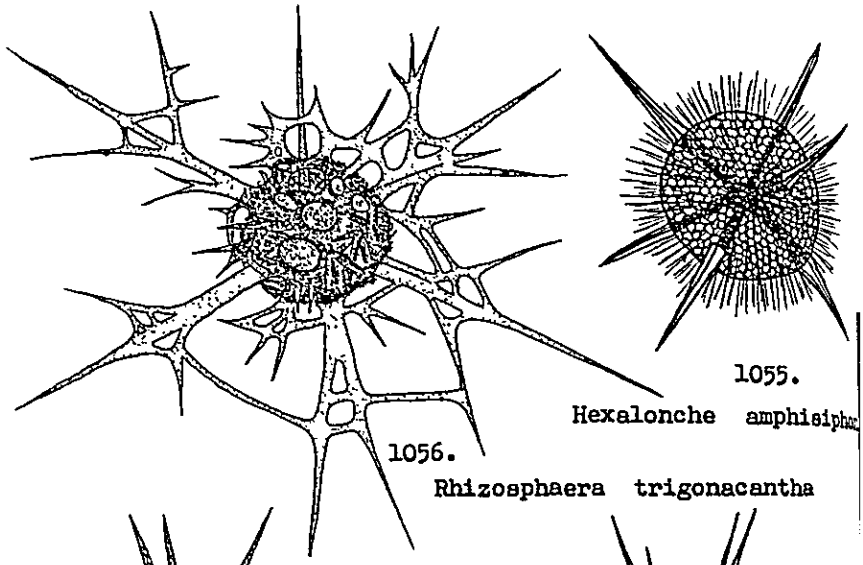
1052.
Aulacantha scolymantha



1053.
Haliomma capillaceum

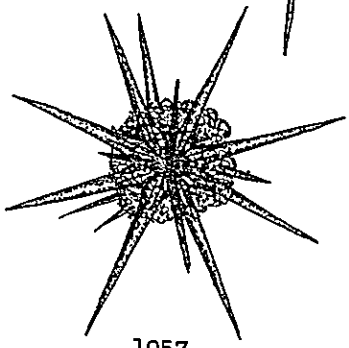


1054. Arachnosphaera myriacantha

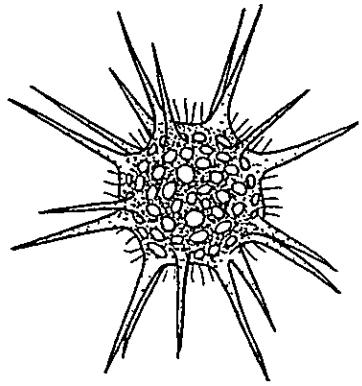


1055.
Hexalonche amphisiphon

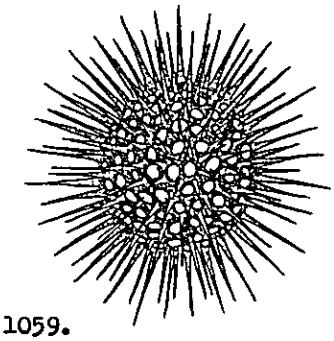
1056.
Rhizosphaera trigonacantha



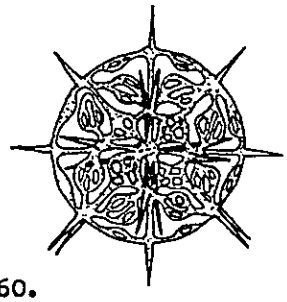
1057.
Trizona brandti



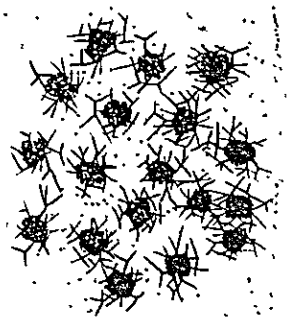
1058. Lychnaspis undulata



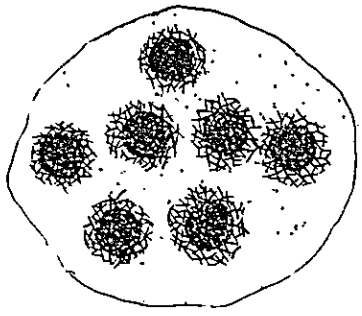
1059.
Acanthosphaera acufera



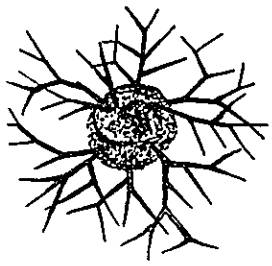
1060.
Stauraspis stauracantha



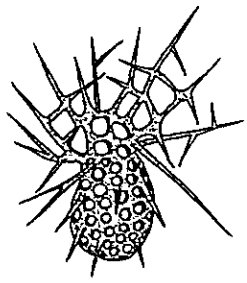
1061. Collozoum inerme



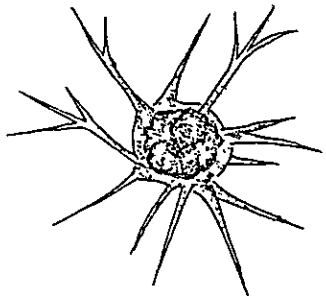
1062. Sphaerozoum geminatum



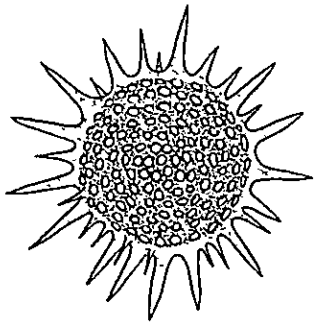
1063. Coelodendrum gracillimum



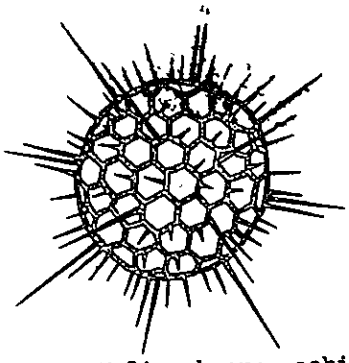
1064. Acanthocorys umbellifera



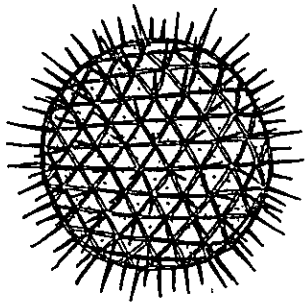
1065. Plectacantha sp.



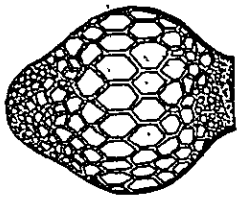
1066. Heliocladus asteriscus



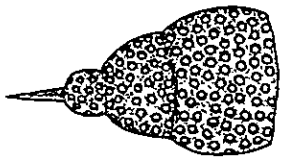
1067. Heliosphaera echinoides



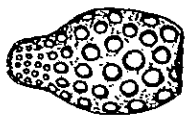
1068.
Aulosphaera trigonopa



1069.
Cyrtocalpis urceolus

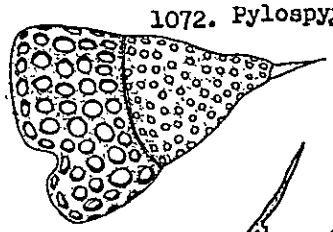


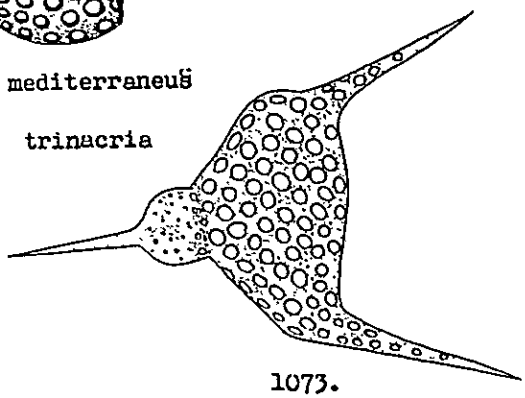
1070. Theoconus zancleus



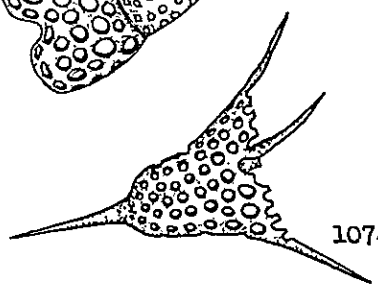
1071.
Dictyocephalus mediterraneus

1072. Pylospyris trinacria

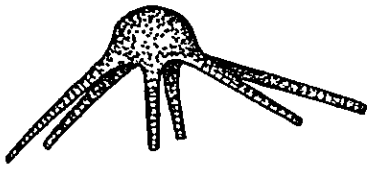




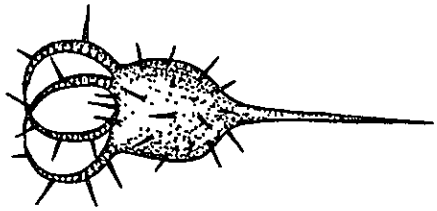
1073.
Lychnocanium sp.



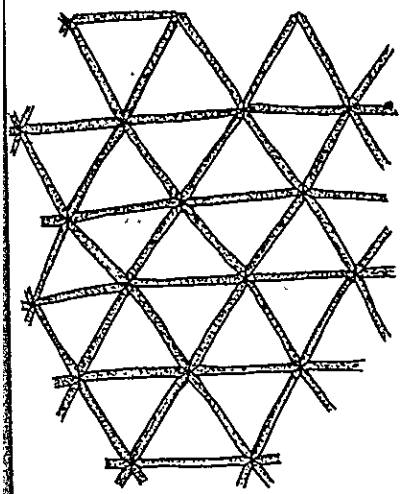
1074. Dictyophimus tripus



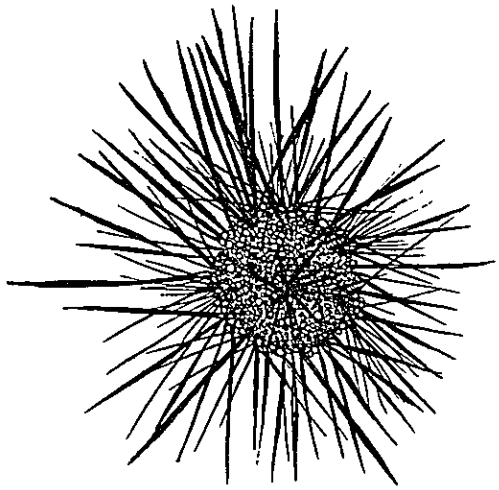
1075. Gazeletta hexanema



1076. Medusetta armata

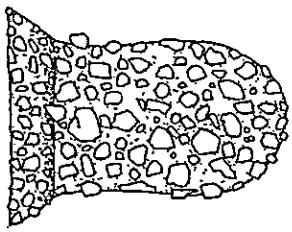


1077. Sagena tenaria

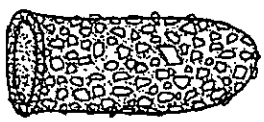


1078. Sticholonche zanclea

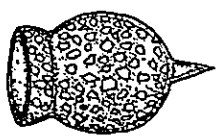
1079. Zoothamnium pelagicum



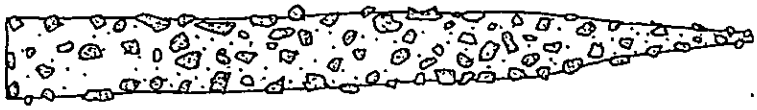
1080. Codonella aspera



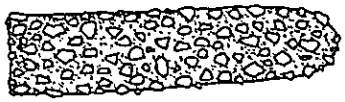
1082. Tintinnidium neapolitanum



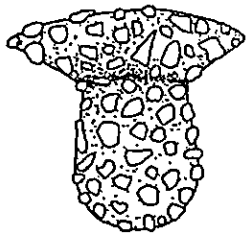
1081. Codonella amphorella



1083. Tintinnopsis cylindrica



1084. Tintinnopsis lobiancoi

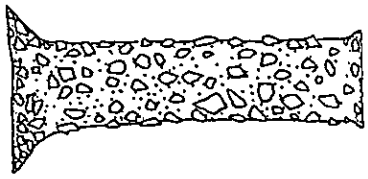


1085. Tintinnopsis mortenseni

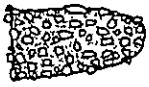
1086. Tintinnopsis nucula

1087. Tintinnopsis gracilis

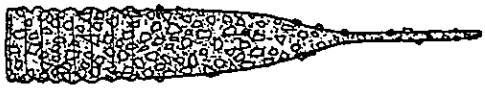
1088. Tintinnopsis angulata



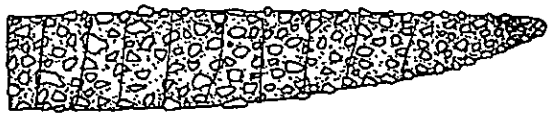
1090. Tintinnopsis nordguisti



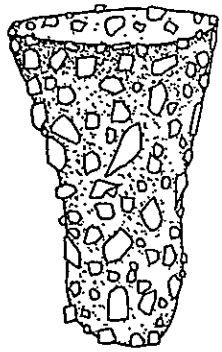
1089. Tintinnopsis beroidea



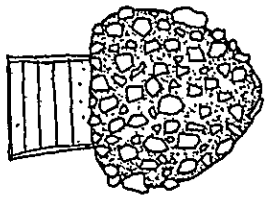
1091. Tintinnopsis radix



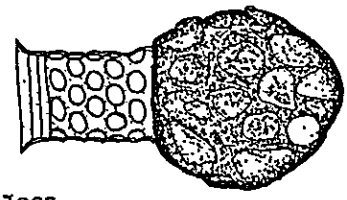
1093. Coxliella faciata



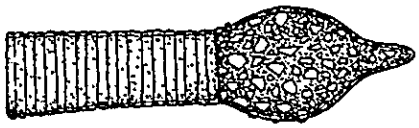
1092. Tintinnopsis butschlii



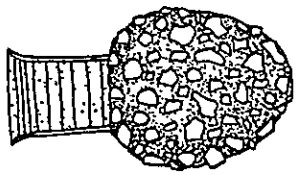
1094. Codonellopsis morchella



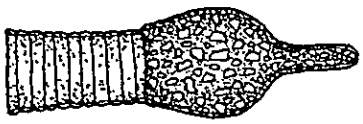
1095. Codonellopsis ostenfeldi



1096. Codonellopsis parva

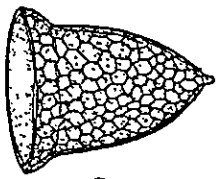


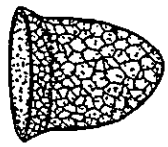
1097. Codonellopsis americana



1098. Codonellopsis orthoceras

1099. Stenosemella ventricosa

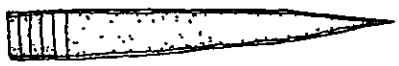




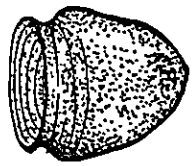
1101. Cyttarocylis cassis

1100. Stenosemella nivalis

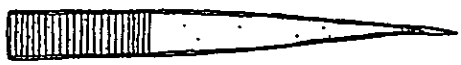
1102. Cyttarocylis plagiostoma



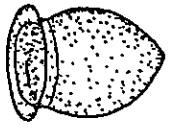
1104. Helicostomella edentata



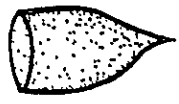
1103. Metacylis pontica



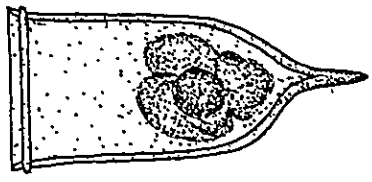
1105. Helicostomella subulata



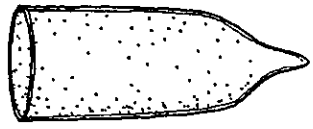
1106. Petalotricha ampulla



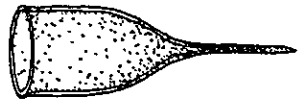
1107. Favella azorica



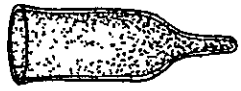
1108. Favella campanula



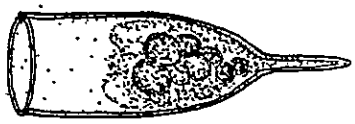
1109. Favella ehrenbergi



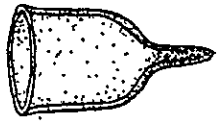
1110. Favella fistulicauda



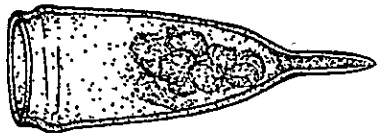
1114. Poroecus apiculatus



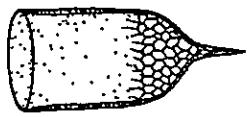
1111. Favella markuzowskii



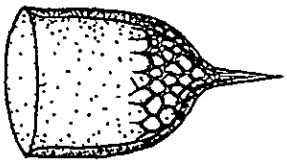
1112. Favella adriatica



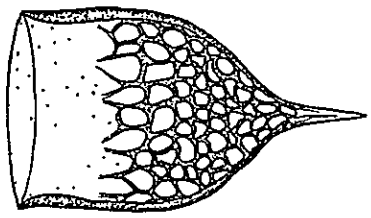
1113. Favella taraikaensis



1115. Epiplocylis undella



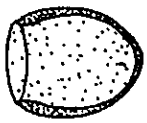
1116. Epiplocylis blanda



1117. Epiplocylis undella var. constricta

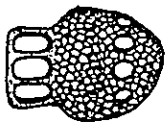
1118. Proplectella angustior

1119. Proplectella acuta

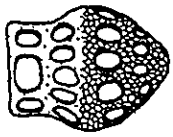


1120. Undella hemispherica

1121. Undella attenuata



1122. Dictyocysta lepida

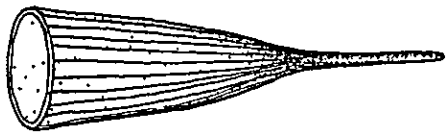


1123. Dictyocysta mulleri

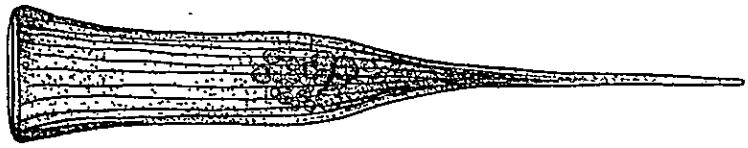
1124. Protorhabdonella simplex

1125. Rhabdonella amor

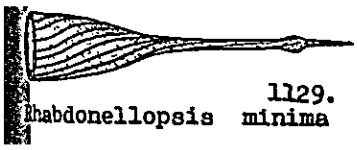
1126. Rhabdonella elegans



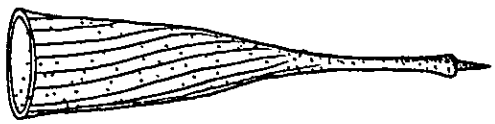
1127. Rhabdonella striata



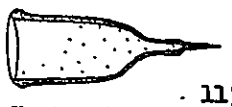
1128. Rhabdonella spiralis



1129. Rhabdonellopsis minima



1130. Rhabdonellopsis apophysata



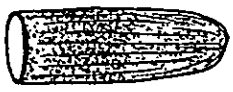
1131. Xystonellopsis scyphium

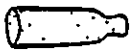
1132. Xystonellopsis heros

1133.
Xystonella treforti

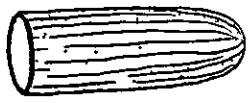
1134. Xystonella longicauda

1135. Xystonella lohmanni



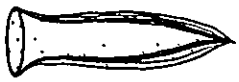


1136.
Tintinnus inquilinus



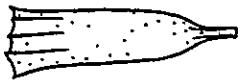
1137.
Tintinnus punctatostriata

1138.
Tintinnus striata

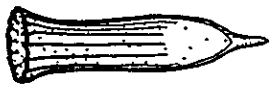


1139. Amphorellopsis tetragona

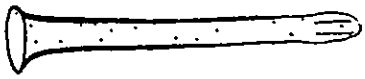
1140. Ormosella trachelius



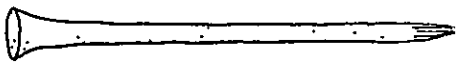
1141. Dadayiella ganymedes



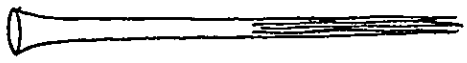
1142. Dadayiella pachytoecus



1143. Steenstrupiella steenstrupii



1144.
Salpingella attenuat

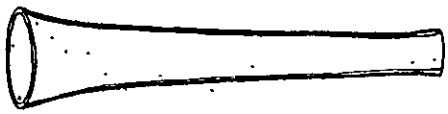


1145. Salpingella acuminata

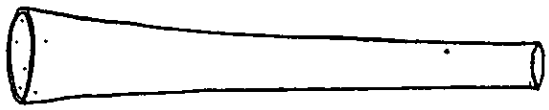
1146. Eutintinnus elegans

1147. Eutintinnus latus

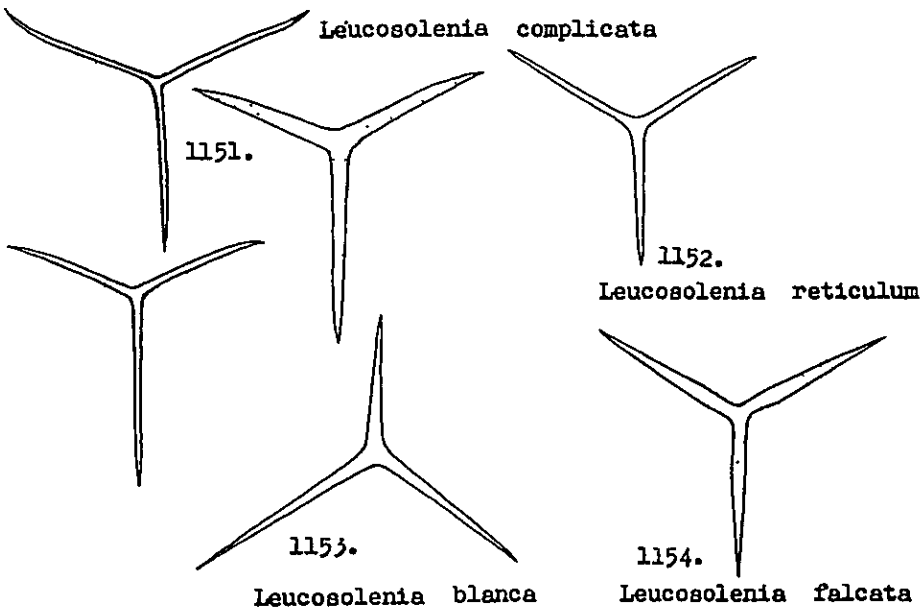
1148. Eutintinnus lusus-undae



1149. Eutintinnus stramentus



1150. Eutintinnus fraknoi



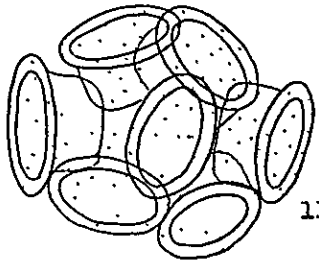
Leucosolenia complicata

1151.

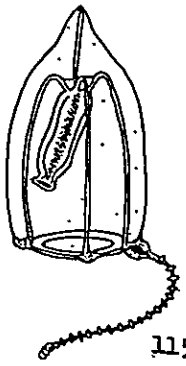
1152. Leucosolenia reticulum

1153. Leucosolenia blanca

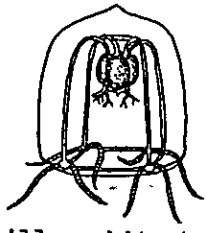
1154. Leucosolenia falcata



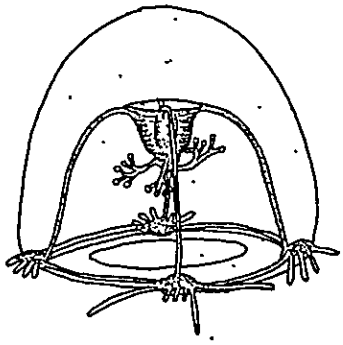
1155.
Alectona millari



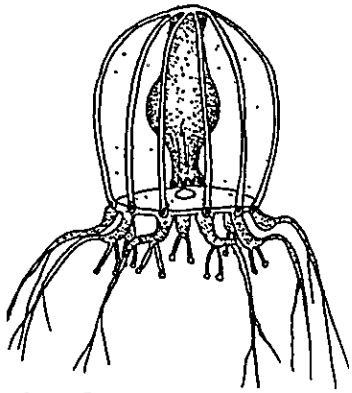
1156.
Corymorpha nutans



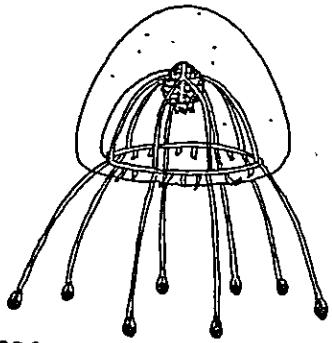
1157.
Bougainvillea bitentaculata



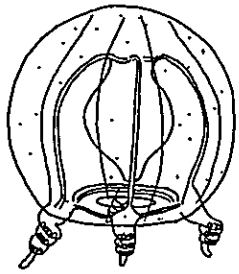
1158. Bougainvillea ramosa



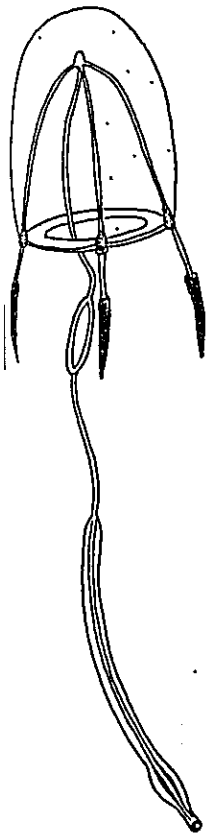
1159. Cladonema radiatum



1160. Bythotiara murrayi

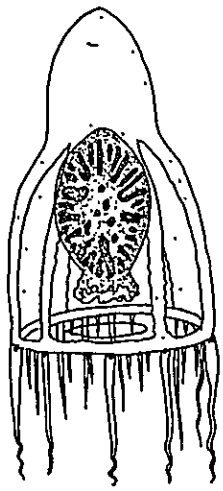


1161.
Ectopleura dumortieri

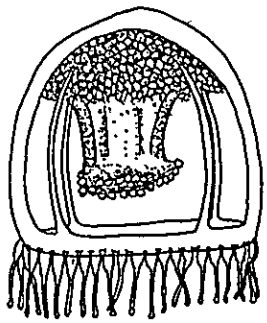


1162.

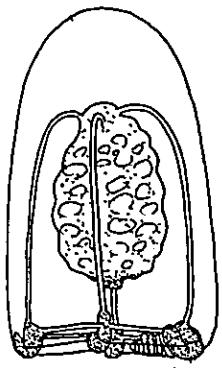
Leuckartiara nobilis



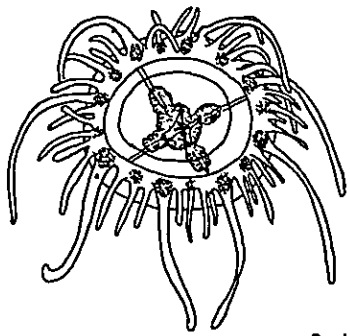
1163. Dipurena ophiogaster



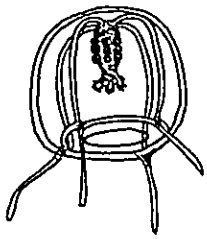
1164. Oceanica coccinea



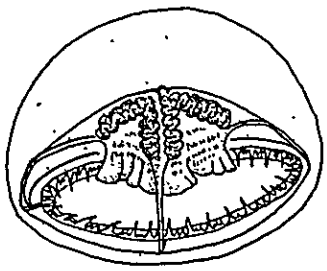
1165. Euphysa aurata



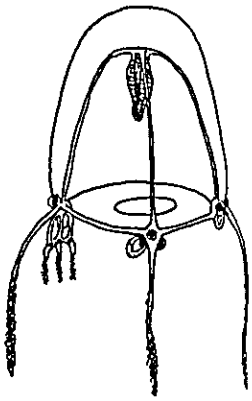
1166. Podocoryne areolata



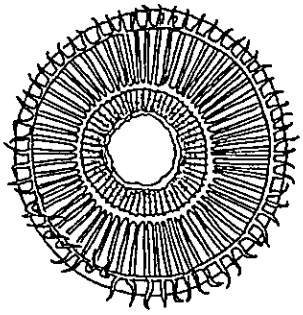
1167. Podocoryne carnea



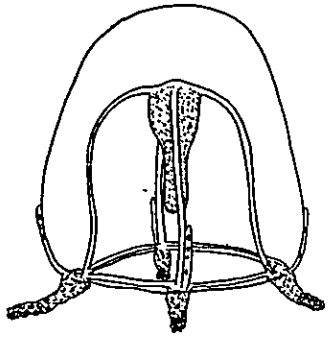
1168. Tiaranna rotunda



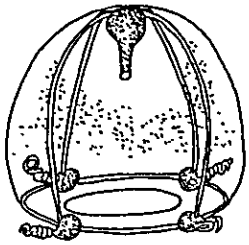
1169. Sarsia prolifera



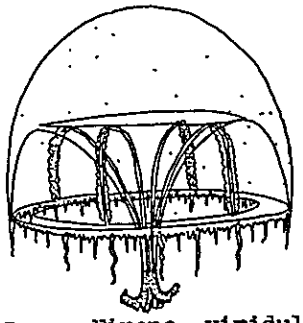
1170. Aequorea pensilis



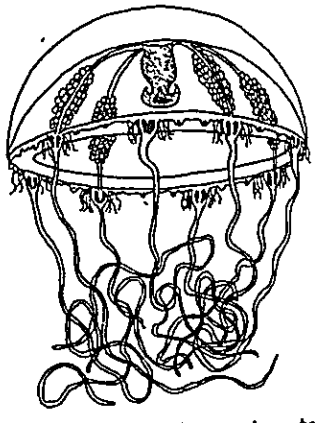
1171. Zanclea sessilis



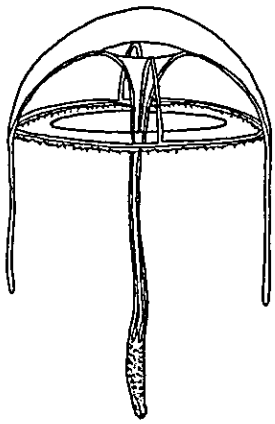
1172. Clytia noliformis



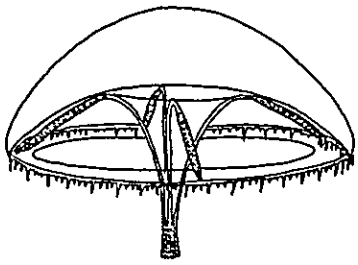
1173. Eirene viridula



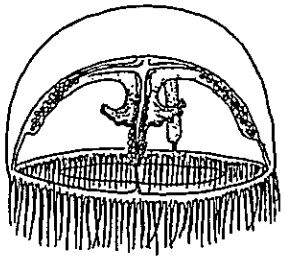
1174. Eucheilota cirrata



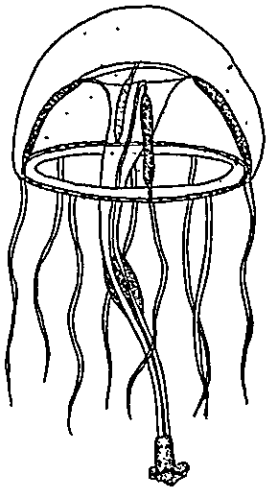
1175. Eutima bitentaculata



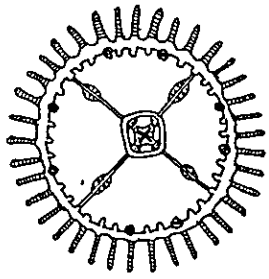
1177. Helgicirra schulzei



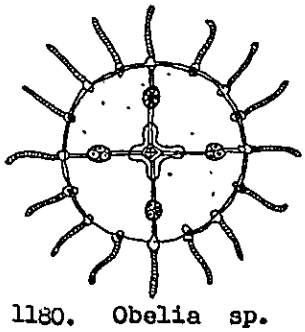
1178. Laodicea undulata



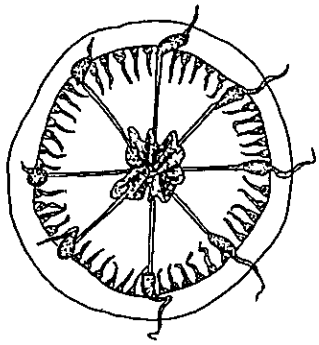
1176. Octorchis gegenbauri



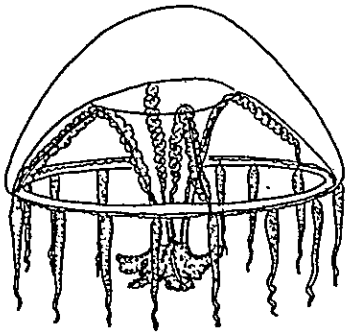
1179. Obelia geniculata



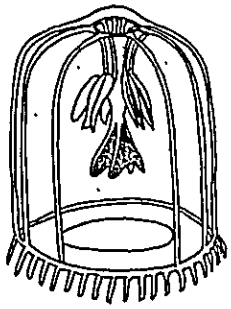
1180. Obelia sp.



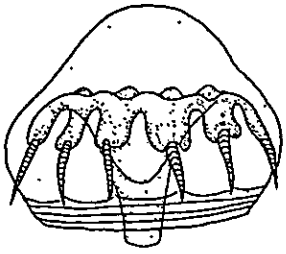
1181. Octocanna funeraria



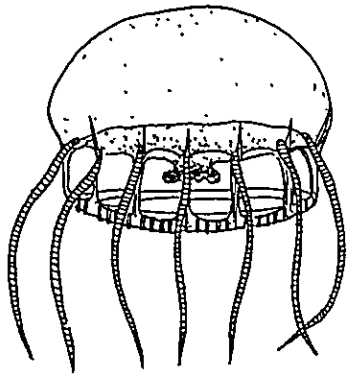
1182. Tima lucullana



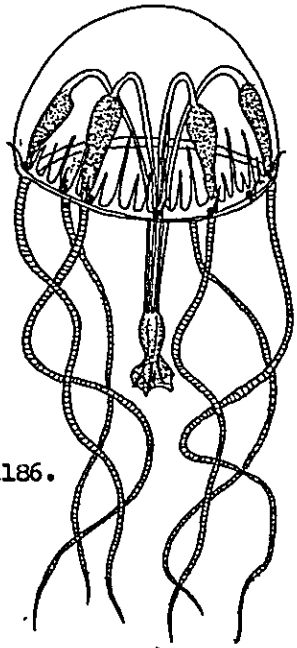
1183. Agulaura hemistoma



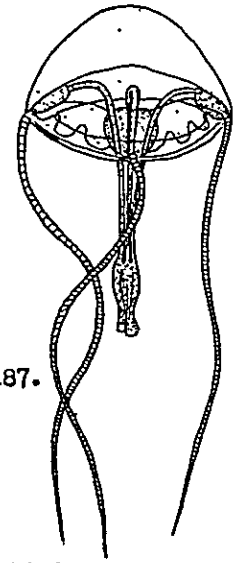
1184. Cunina vitrea



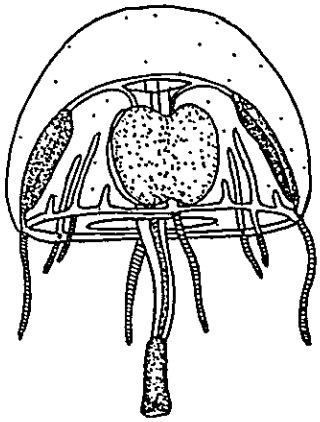
1185. Cunina rubiginosa



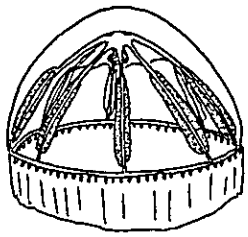
1186. Geryonia proboscidalis



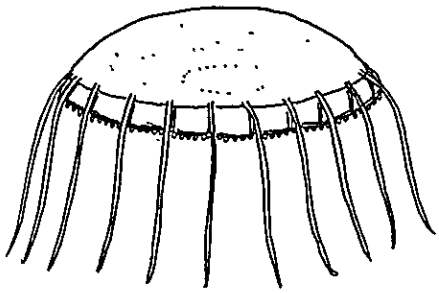
1187. Liriope rosanea



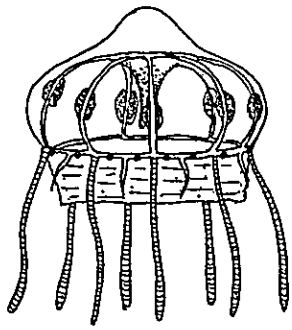
1188. Liriope tetraphylla



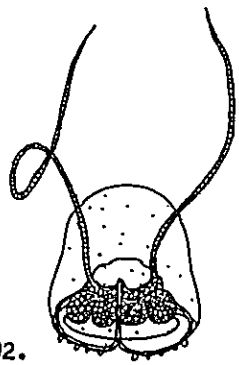
1189. Rhopalonema funerarium



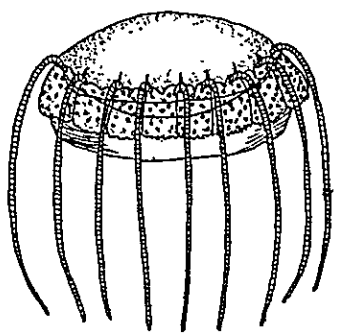
1190. Solmaris solmaris



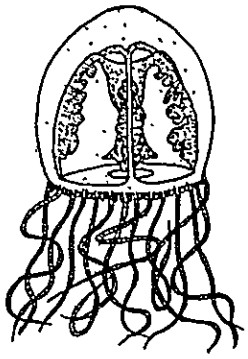
1191. Rhopalonema velatum



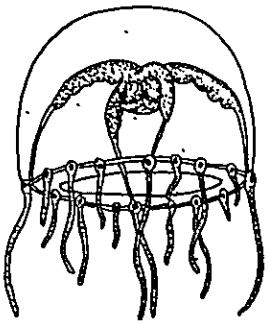
1192. Solmundella bitentaculata



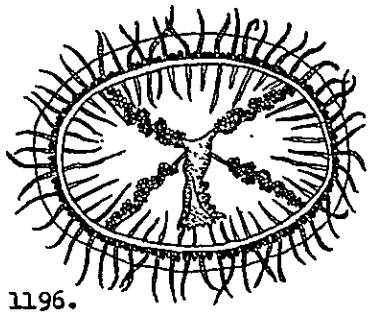
1193. Solmissus albescens



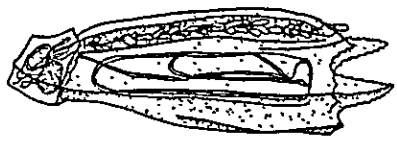
1194. Gonionemus vertens



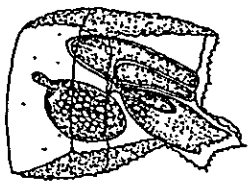
1195. Odessia maeotica

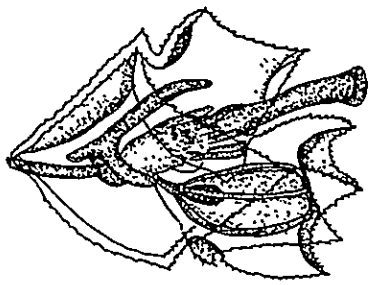


1196. Olindias phosphorica

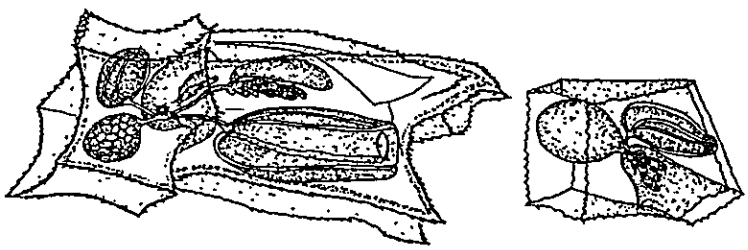


1197. Abylopsis tetragona

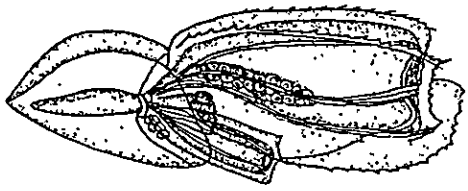




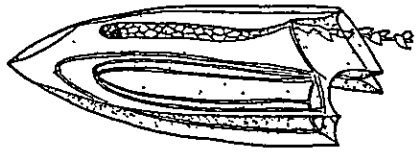
1198. Abylopsis eschscholtzi



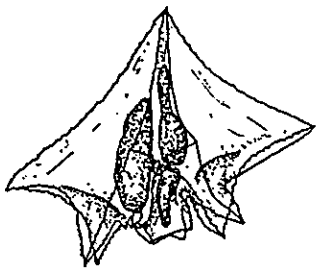
1199. Bassia bassensis



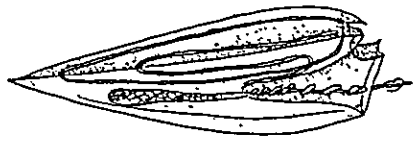
1200. Chelophyes appendiculata



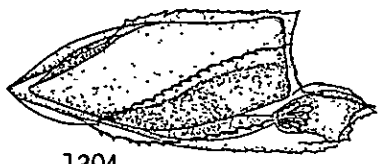
1201. Diphyes appendiculata



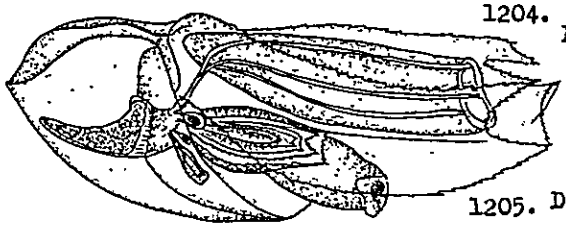
1203. Euneagonum hyalinum



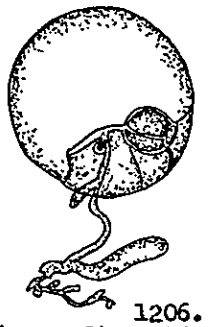
1202. Diphyes bojani



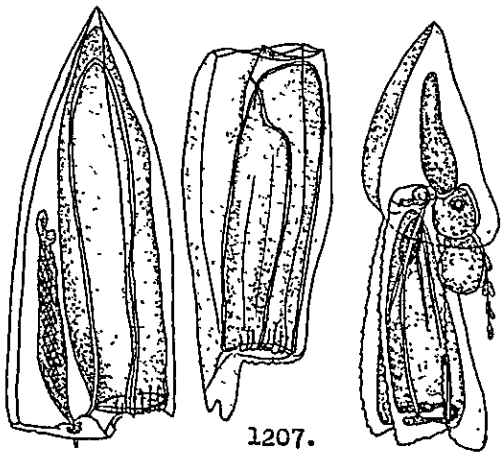
1204. Eudoxoides spiralis



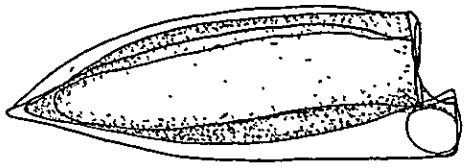
1205. Diphyes dispar



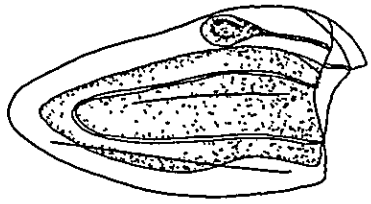
1206. Hippopodius hippopus



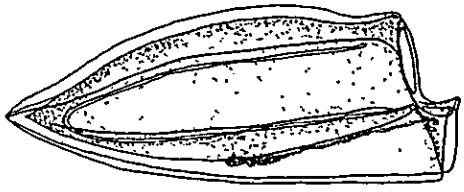
1207. Lensia conoidea



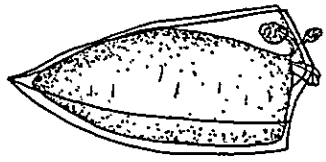
1208. Lensia fowleri



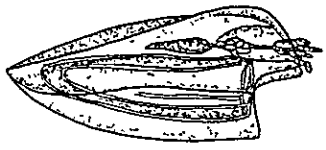
1209. Lensia subtilis



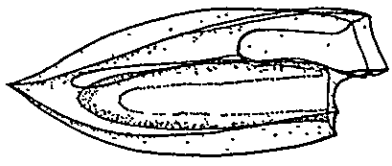
1210. Lensia multicristata



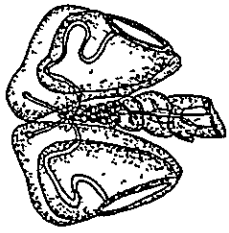
1211. Lensia subtiloides



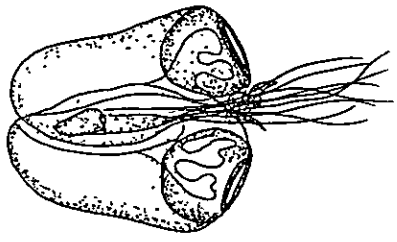
1212. Muggiaea Kochi



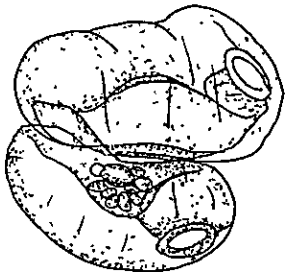
1213. Muggiaea atlantica



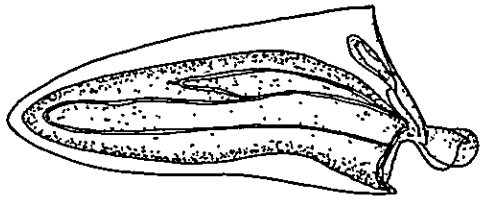
1214. Lilyopsis rosea



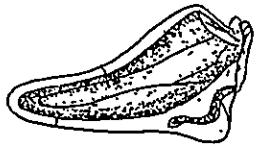
1215. Rosacea cymbiformis



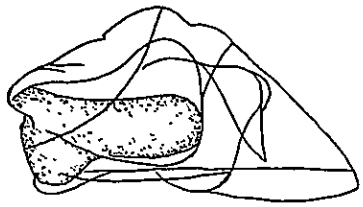
1216. Rosacea plicata



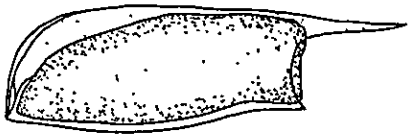
1217. Sulculeoria biloba



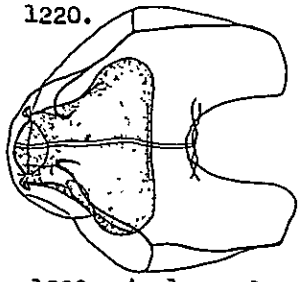
1218. Sulculeoria quadrivalvis



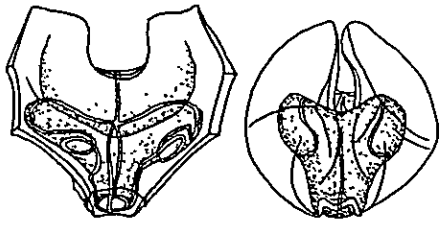
1220.



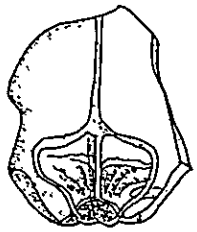
1219. Sulculeoria turgida



1220. Agalma elegans

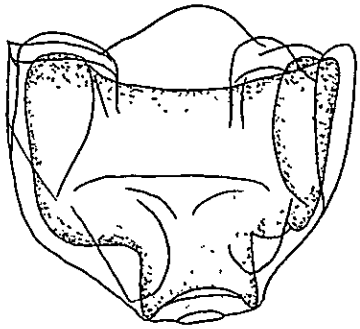


1221. Agalma okeni

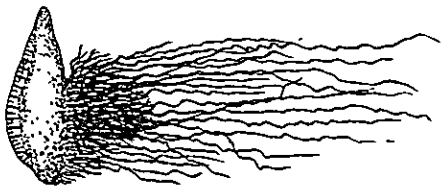


1222. Forskalia contorta

1224. Physophora hydrostatica

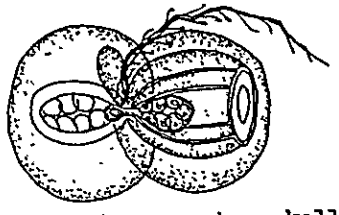


1223. Halistemma rubra

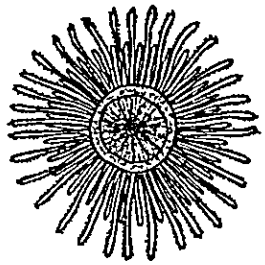


1225. Physalia physalis

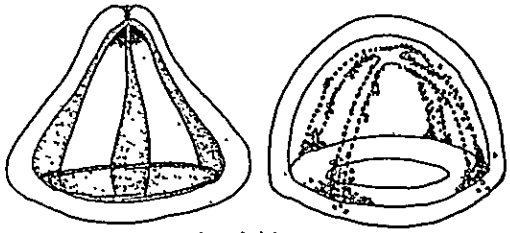
1226. Rhizophysa filiformis



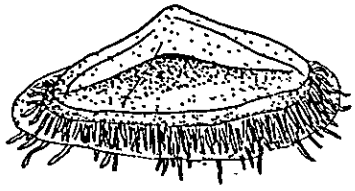
1227. Sphaeronectes kollikeri



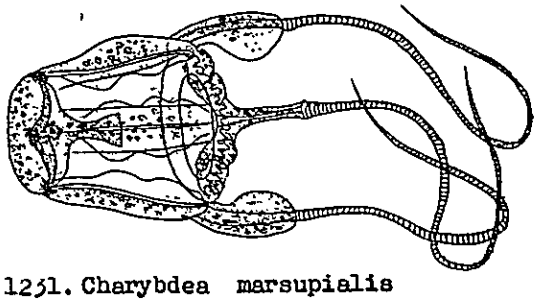
1228. Porpita umbela



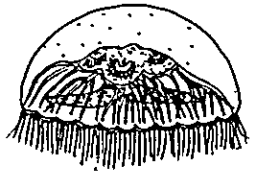
1229. Porpita sp.



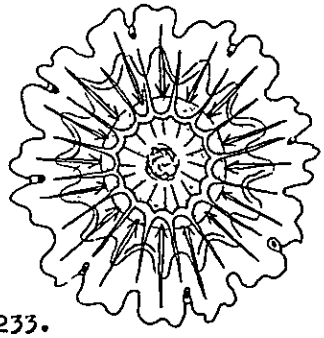
1230. Velella lata



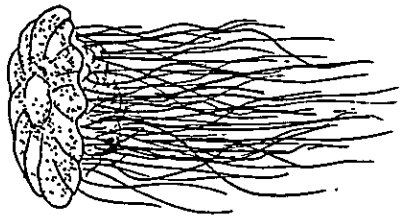
1231. Charybdea marsupialis



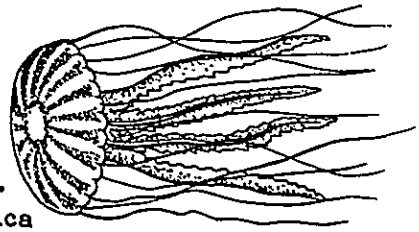
1232. Aurellia aurita



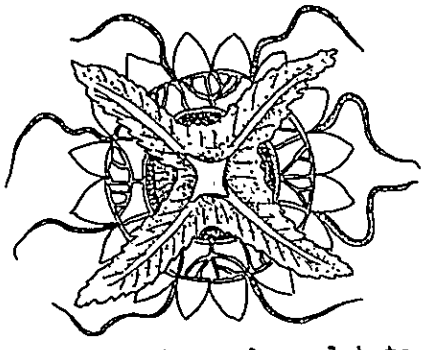
1233. Cyanea capillata



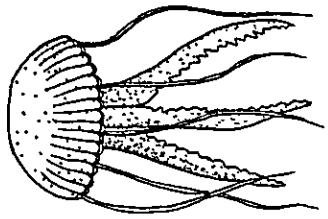
1234. Cyanea nozakii



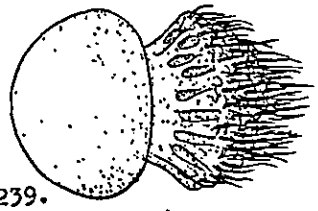
1235. Dactylometra pacifica



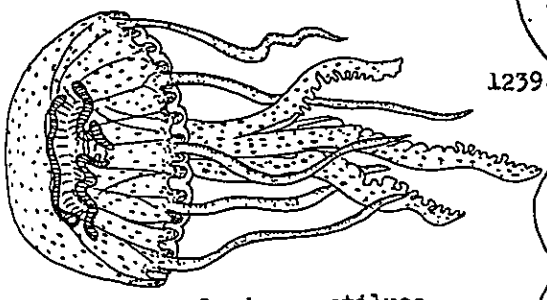
1236. Discomedusa lobata



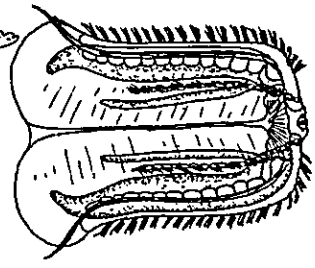
1237. Pelagia panophra



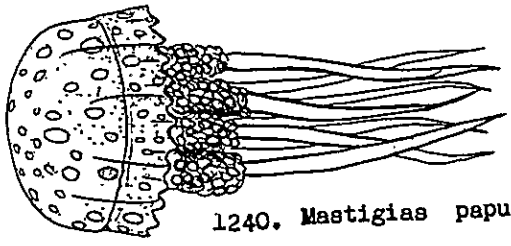
1239. Rhopilema esculenta



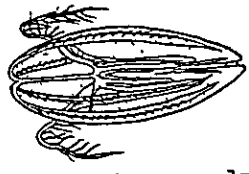
1238. Pelagia noctiluca



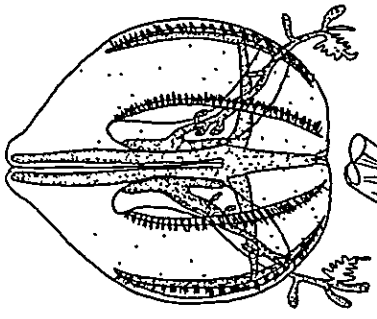
1241. Euchlora rubra



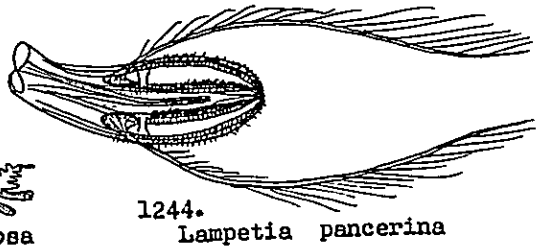
1240. Mastigias papua



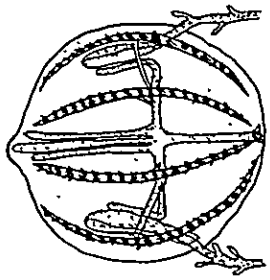
1242. Hormiphora palmata



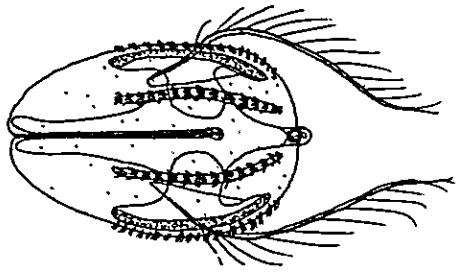
1243. Hormiphora plumosa



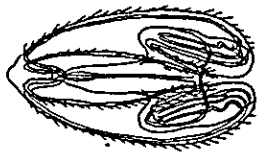
1244. Lampetia pancerina



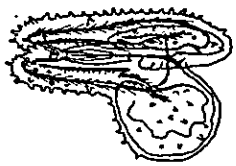
1245. Pleurobranchia pileus



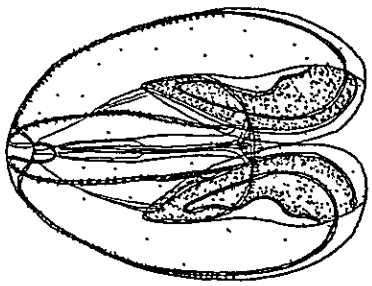
1246. Pleurobranchia rhodopis



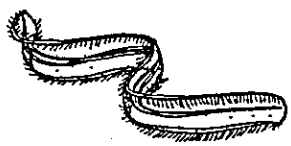
1247. Bolinopsis mikado



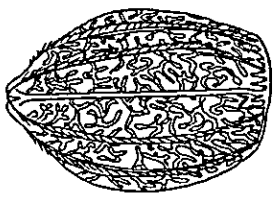
1249. Leucothea japonica



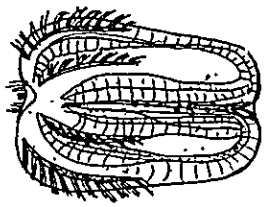
1248. Bolina hydatina



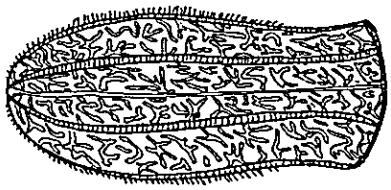
1250. Cestus amphitrites



1252. Beroe cucumis

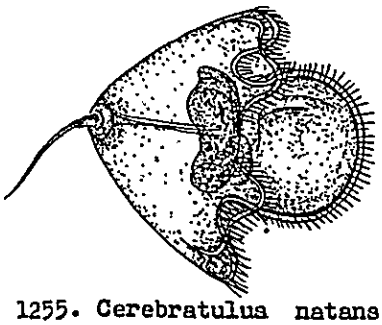


1251. Beroe forskalii

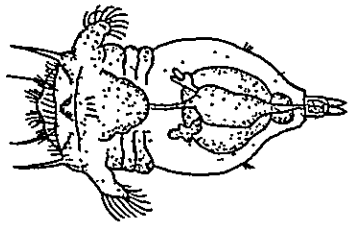


1253. Beroe ovata

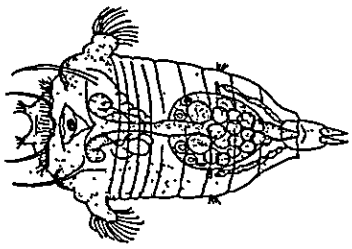
1254. Planocera pellucida



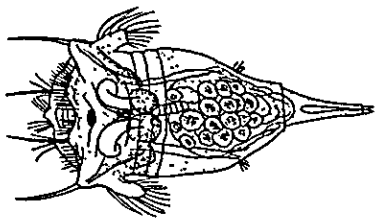
1255. Cerebratulus natans



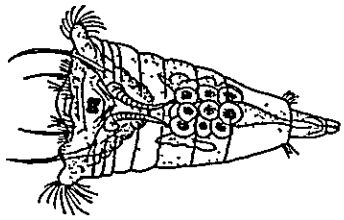
1256. Synchaeta oblonga



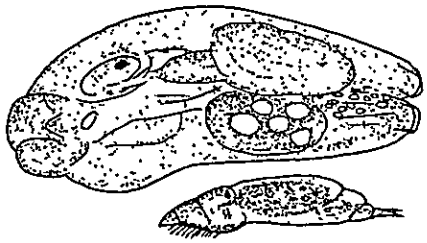
1258. Synchaeta pectinata



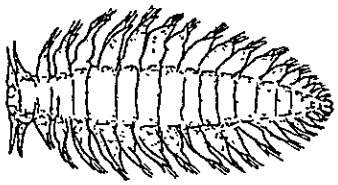
1257. Synchaeta stylata



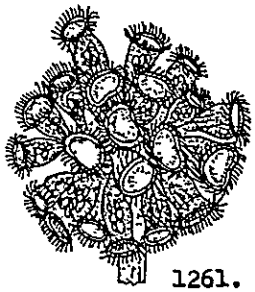
1259. Synchaeta tremula



1260. Eucentrum felis

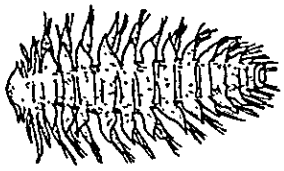


1262. Lopadorhynchus appendiculatus

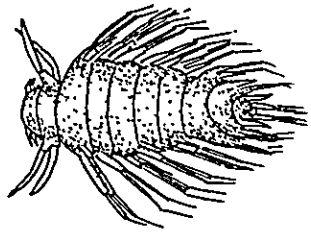


1261. Megalotrocha socialis

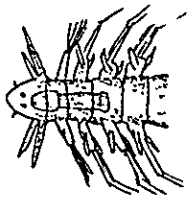
1263. Lopadorhynchus uncinatus



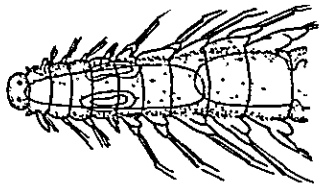
1264. Maupasia coeca



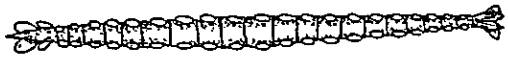
1265. Pedinosoma curtum



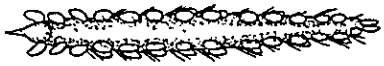
1266. Pelagobia longicirrata



1267. Phalacrophorus pictus

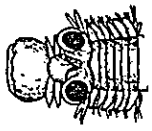


1268. Sagitella kovalevskyi

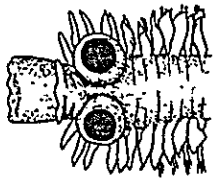


1269. Typhloscolex mulleri

1270. Alciopa cantraini



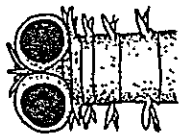
1271. Callizona japonica



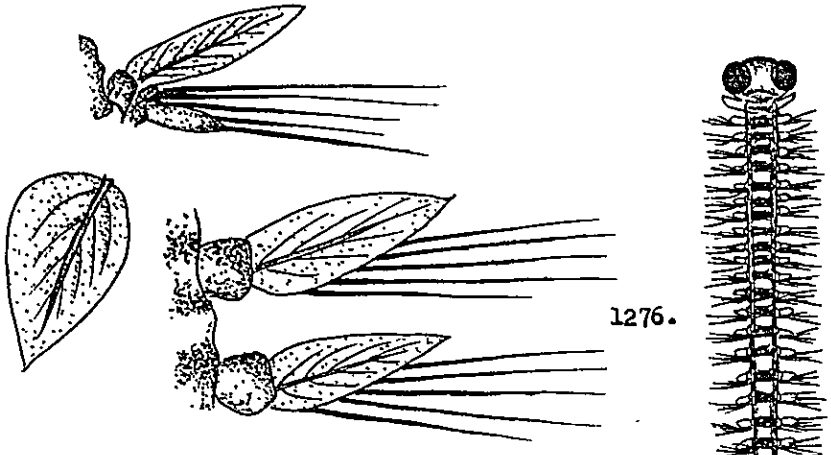
1272. Callizona Moebii

1273. Vanadis crystallina

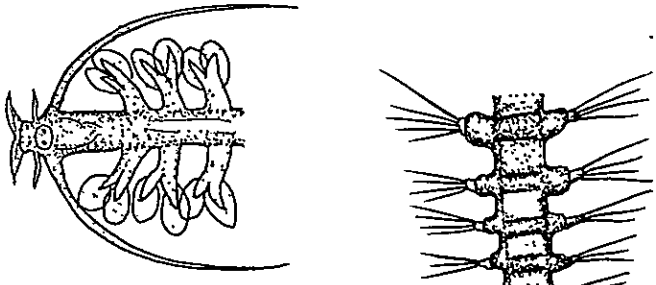
1274. Vanadis formosa



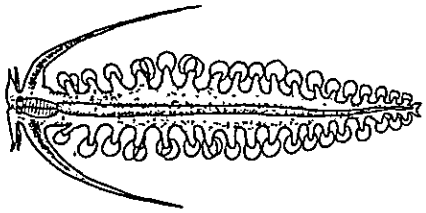
1275. Vanadis grandis



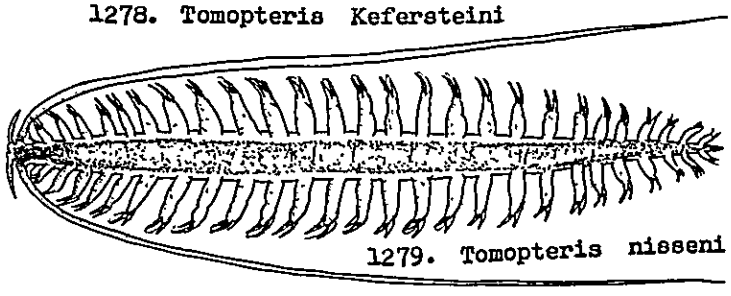
1276. Rhynchonerella fulgens



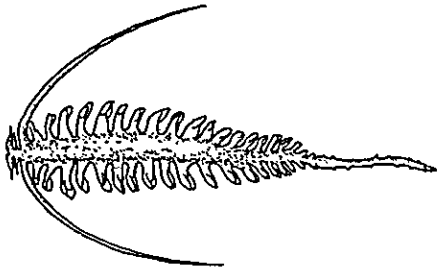
1277. Tomopteris levipes



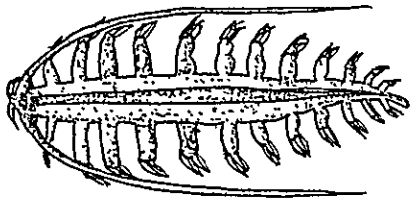
1278. Tomopteris Keferateini



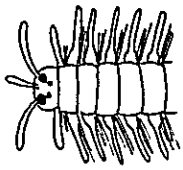
1279. Tomopteris nisseni



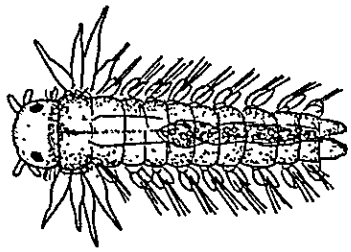
1280. Tomopteris pacifica



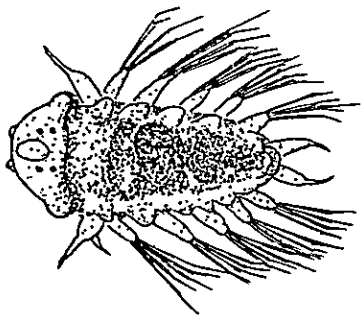
1281. Tomopteris elegans



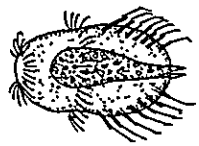
1282. Autolytus prolifer



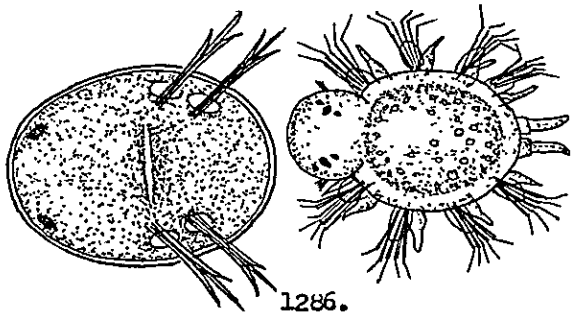
1283. Eulalia viridis



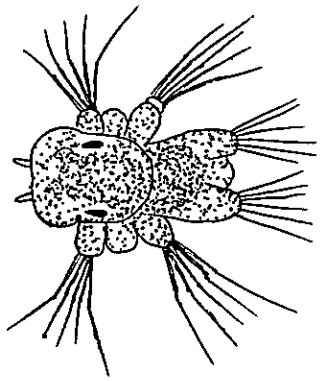
1285. Harmothoe imbricata



1284. Glycera alba

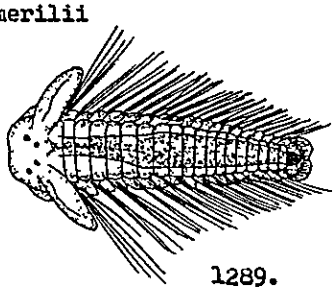


1286.
Nereis diversicolor

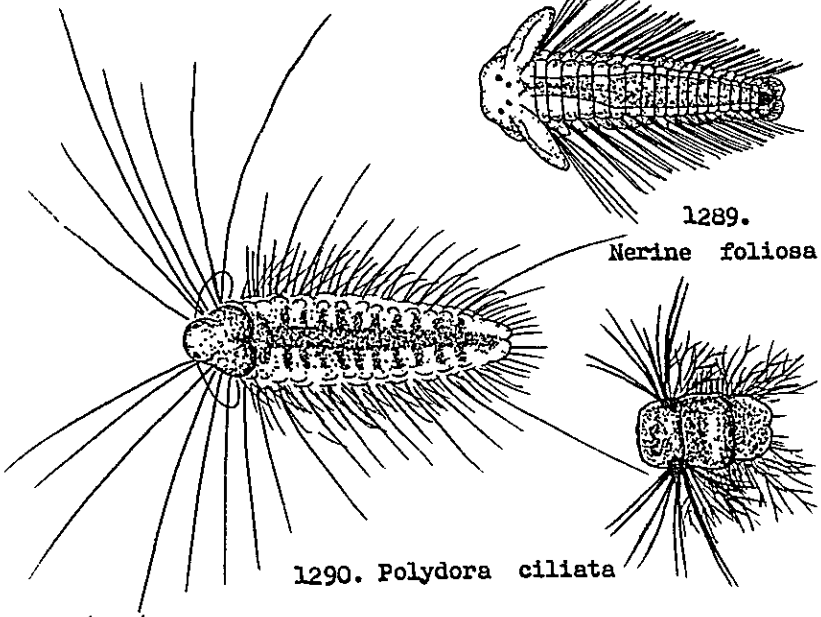


1287. Nereis pelagica

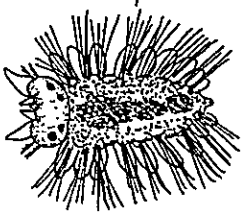
1288. Platynereis Dumerilii



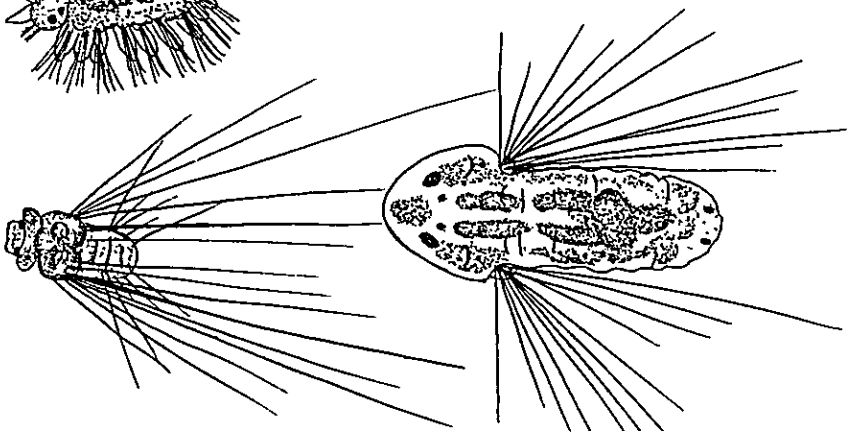
1289. Nerine foliosa



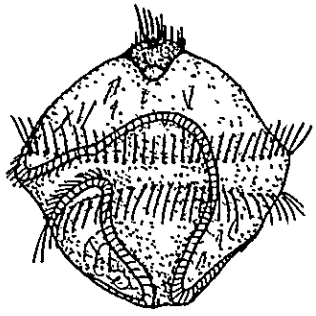
1290. Polydora ciliata



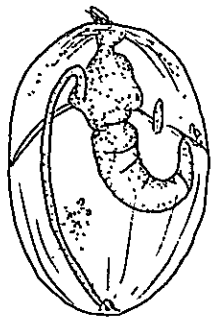
1291. Polynoinien larva



1292. Sabellaria alveolata



1293. Unice aphroditoia



1294. Sipunculus nudus

1295. Sagitta bedoti

1296. Sagitta bipunctata

1297. Sagitta crassa

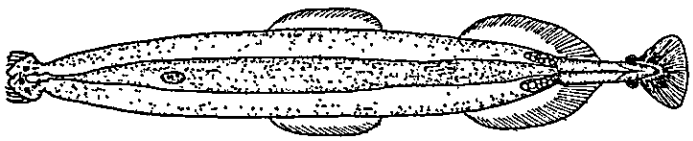
1298. Sagitta crassa fo. naikaiensis

1298.

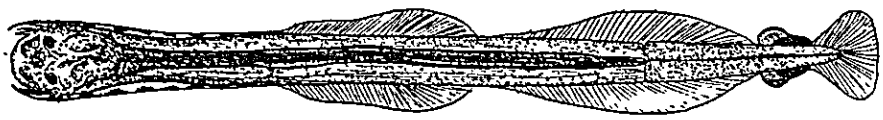
1299. Sagitta decipiens

1300. Sagitta delicata

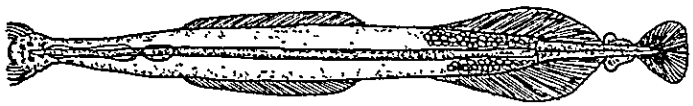
1301. Sagitta elegans



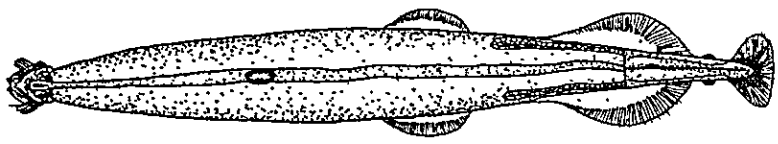
1302. Sagitta enflata



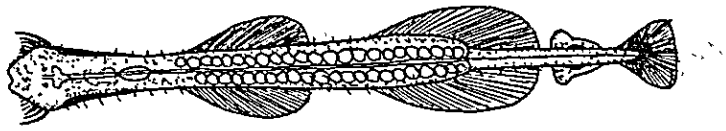
1303. Sagitta ferox



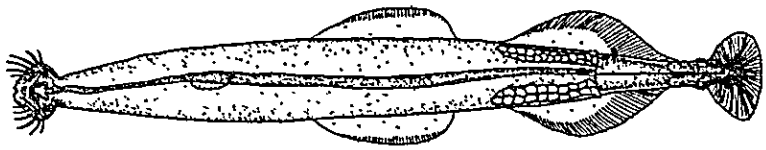
1304. Sagitta friderici



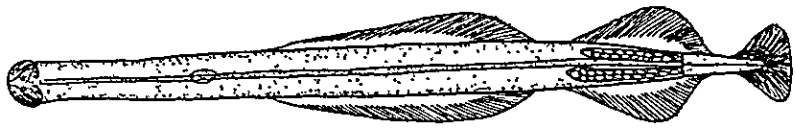
1305. Sagitta hexaptera



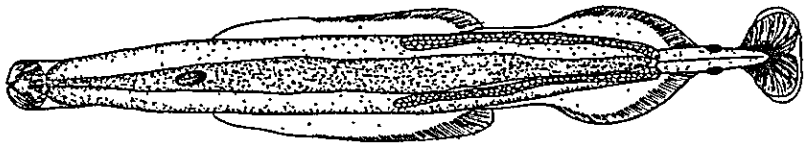
1306. Sagitta hispida



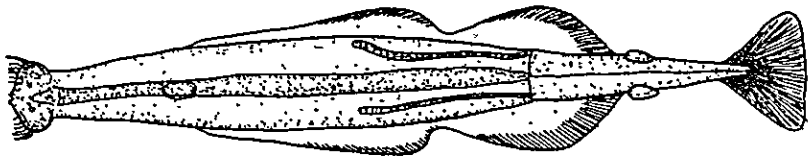
1307. Sagitta inflata



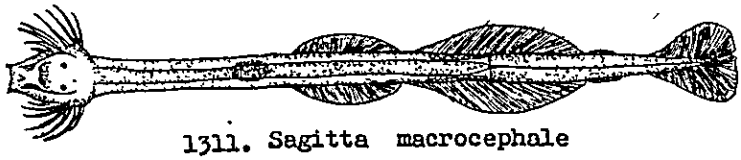
1308. Sagitta lyra gazellae



1309. Sagitta lyra typica



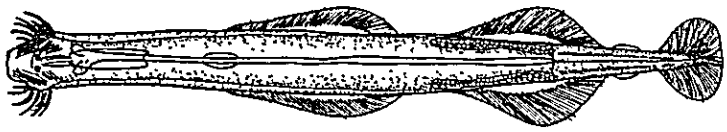
1310. Sagitta maxima



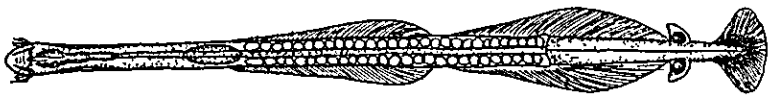
1311. Sagitta macrocephale

1312. Sagitta minima

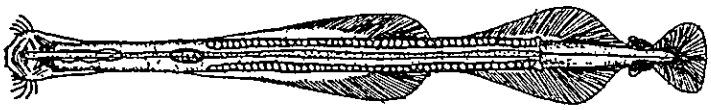
1313. Sagitta neglecta



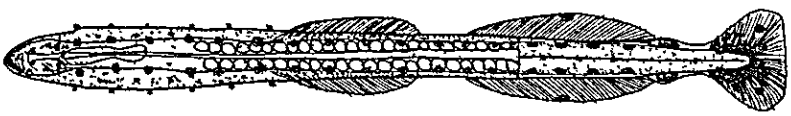
1314. Sagitta planktonis



1315. Sagitta pseudoserratodentata



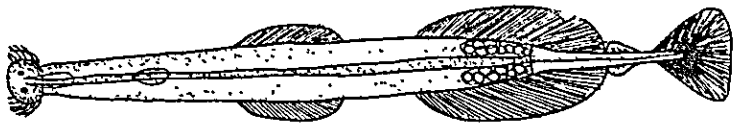
1316. Sagitta pulchra



1317. Sagitta regularis

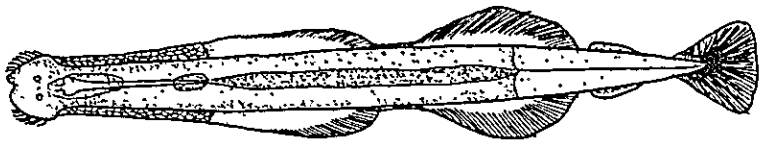
1318. Sagitta robusta

1319. Sagitta serratodentata

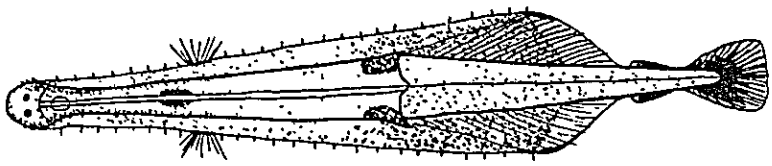


1320. Sagitta setosa

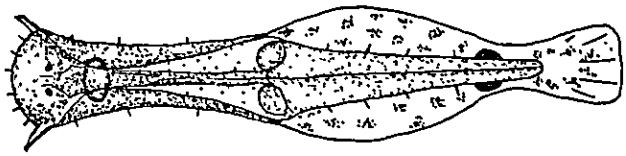
1321. Sagitta tumida



1322. Sagitta zetesios

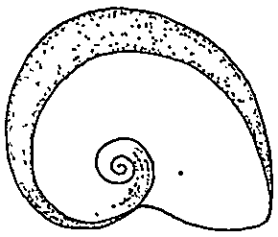


1323. Pterosagitta draco

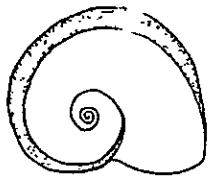


1324. Spadella cephaloptera

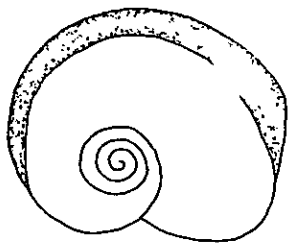
1325. Krohnitta pacifica



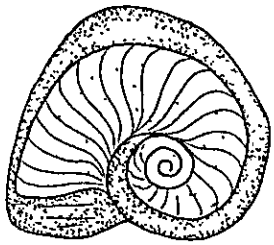
1326. Atlanta fusca



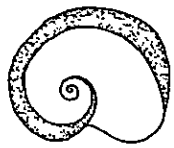
1327. Atlanta gaudichaudi



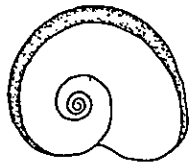
1328. Atlanta helicinoides



1329. Atlanta inclinata

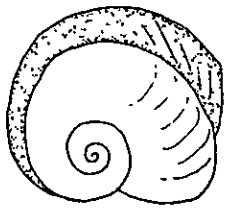


1330. Atlanta lesueuri

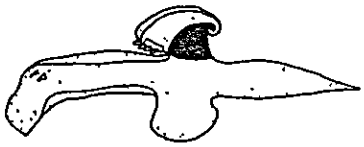


1331. Atlanta peroni

1334. Cardiopoda placenta



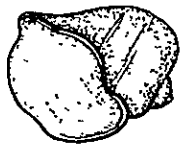
1332. Atlanta Quoyana



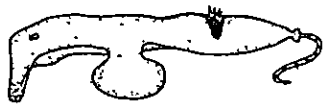
1335. Carinaria lamarcki

1333. Oxygyrus rangi

1336. Firoloida desmaresti



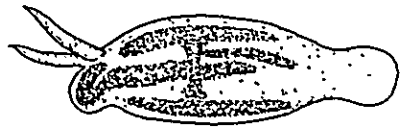
1338. Janthina globosa



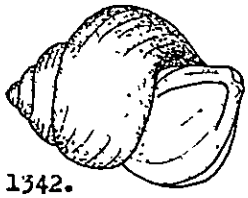
1337. Pterotrachea mutica

1339.

1340. Glaucus lineatus

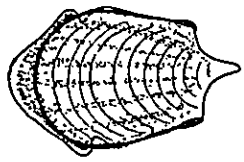


1341. Phyllirrhoe bucephalum



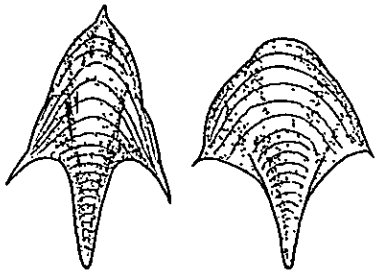
1342. Limacina trochiformis

1343. Limacina inflata

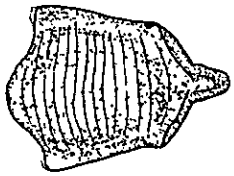


1344. Cavolinia gibbosa

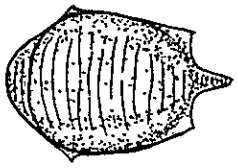
1345. Cavolinia globulosa



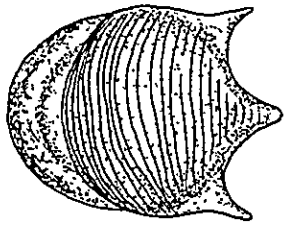
1347. Cavolinia inflexa



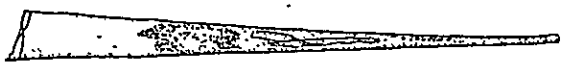
1346. Cavolinia longirostris



1348. Cavolinia tridentata



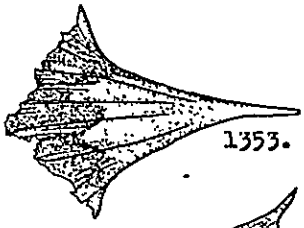
1349. Cavolinia uncinata



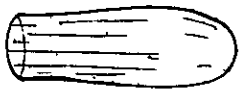
1350. Creseis acicula

1352. Creseis virgula conica

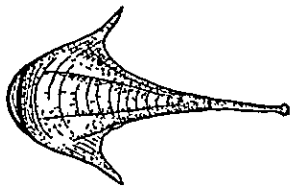
1351. Creseis virgula virgula



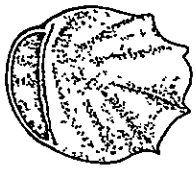
1353.



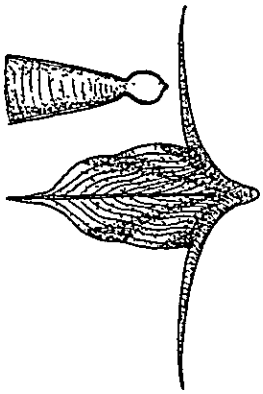
1354. Cuvierina columnella



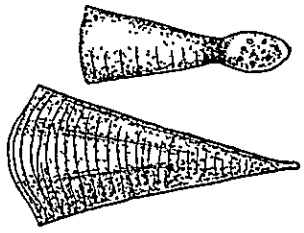
1355. Diacria trispinosa



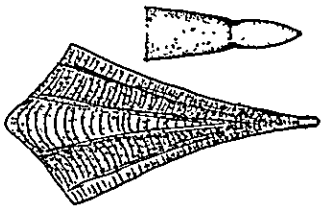
1356. Diacria quadridentata



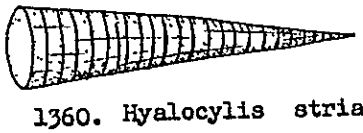
1359. Euclio cuspidata



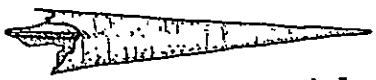
1357. Euclio polita



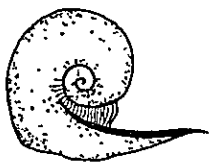
1358. Euclio pyramidata



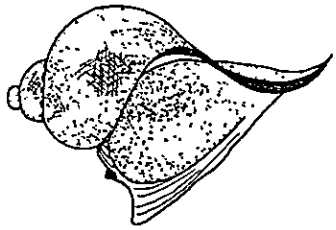
1360. Hyalocylis striata



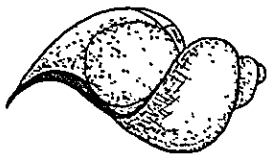
1361. Styliola subula



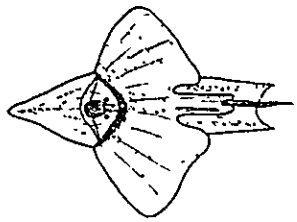
1362. Peraclis moluccensis



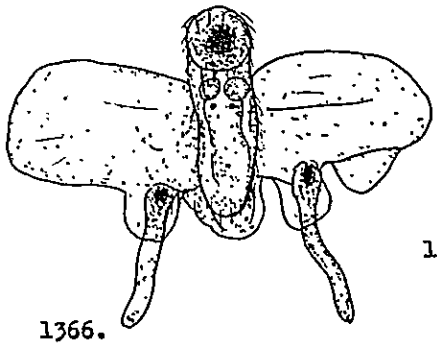
1363. Peraclis bispinosa



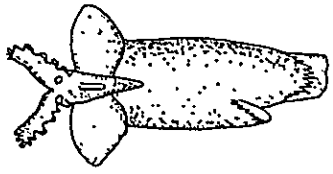
1364. Peraclis reticulata



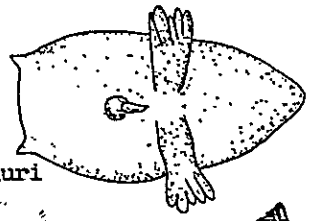
1365. Cymbulia peroni



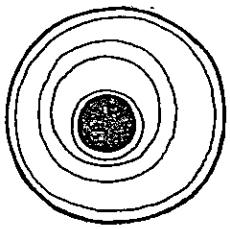
1366. Desmopterus papilis



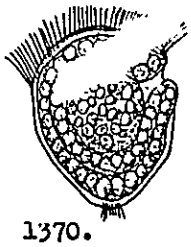
1367. Pneumoderma mediterranea



1368. Thliptodon Gegenbauri



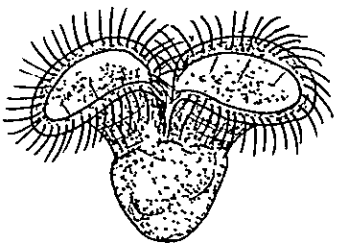
1369. Nodilittorina granularis



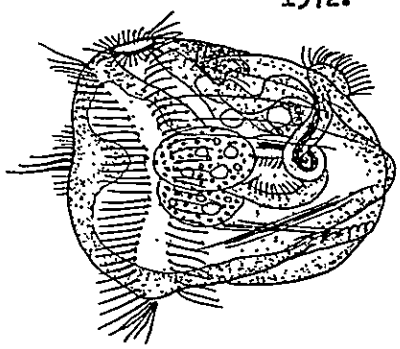
1370. (Veliger larva)

1371.

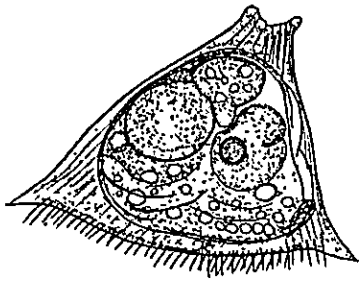
1372.



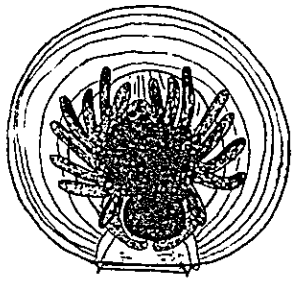
1373. Nerita albicilla



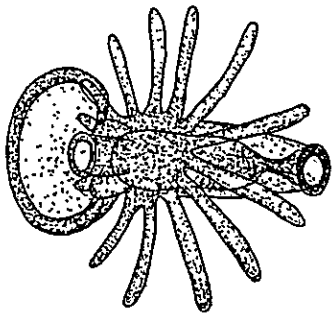
1374. (Veliger larva)



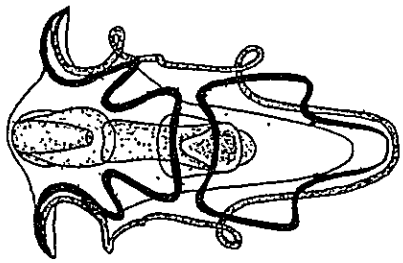
1375. Bugula neritina



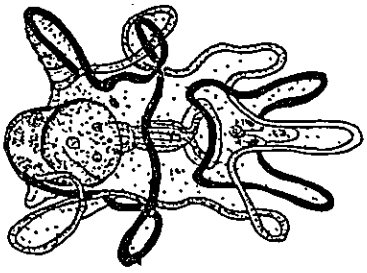
1376. Lingula lingula



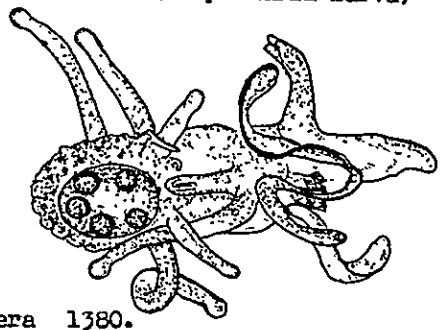
1377. Phoronis australia



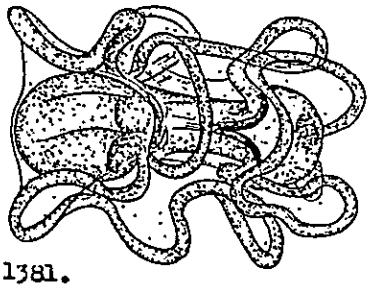
1378. Asterias glacialis
(Bipinnaria larva)



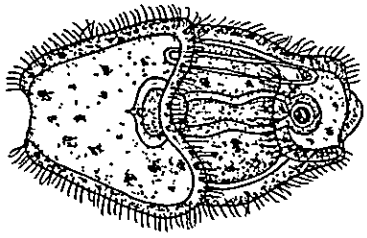
1379. Asterina pectinifera
(Bipinnaria larva)



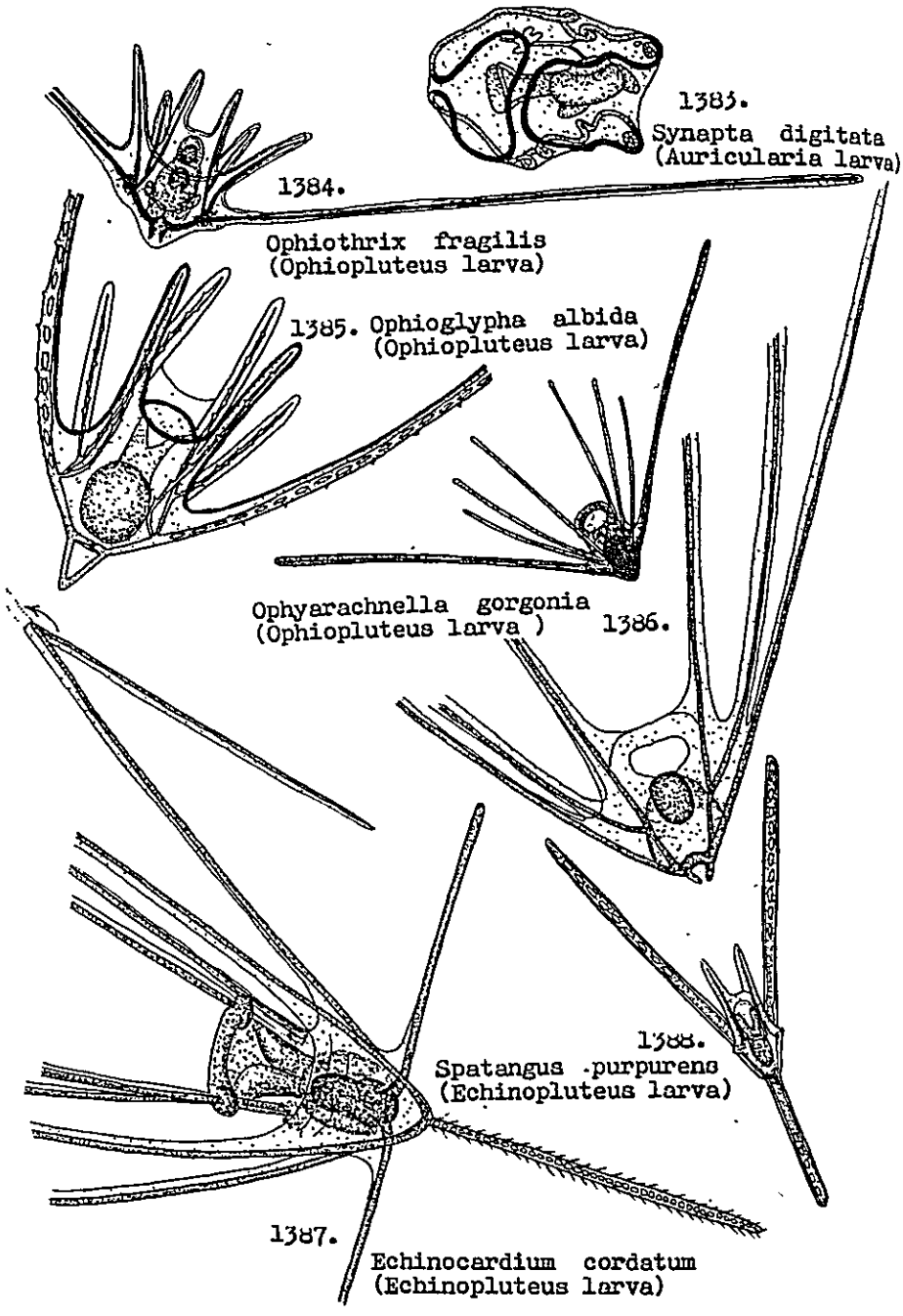
1380.
Asterina pectinifera
(Brachiolaria larva)

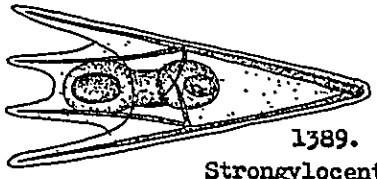


1381.
Holothuria leucospilota
(Auricularia larva)

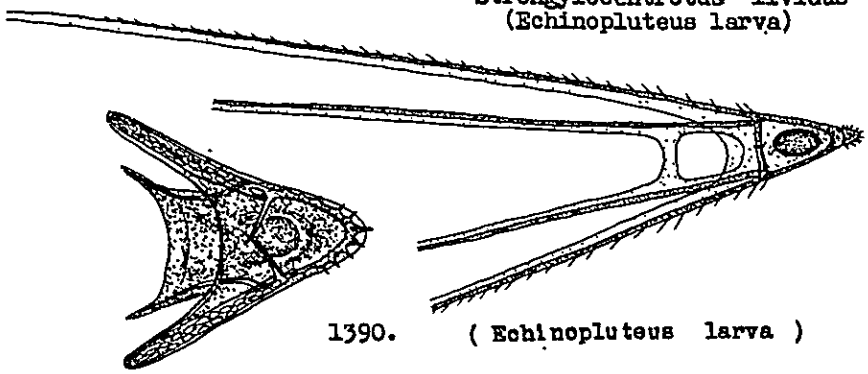


1382. Holothuria tubulosa
(Auricularia larva)

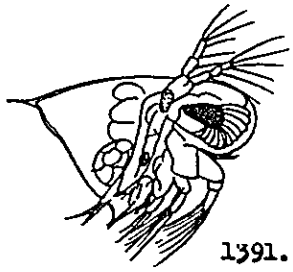

1383.
Synapta digitata
(Auricularia larva)
1384.
Ophiothrix fragilis
(Ophiopluteus larva)
1385. Ophioglypha albida
(Ophiopluteus larva)
Ophyarachnella gorgonia
(Ophiopluteus larva)
1386.
1388.
Spatangus purpureus
(Echinopluteus larva)
1387.
Echinocardium cordatum
(Echinopluteus larva)



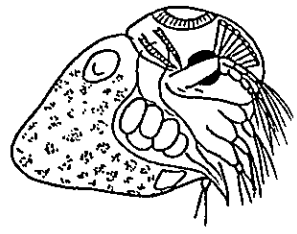
1389.
Strongylocentrotus lividus
(Echinopluteus larva)



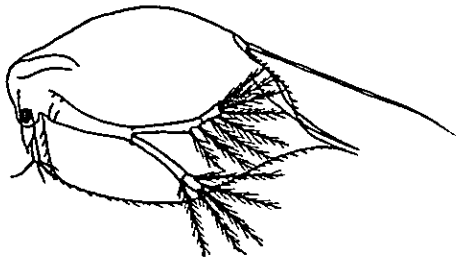
1390. (Echinopluteus larva)



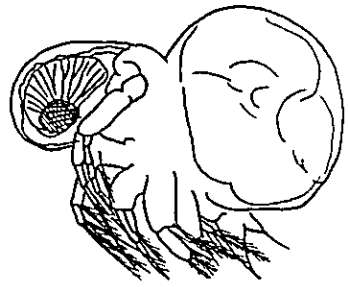
1391. Evadne spinifera



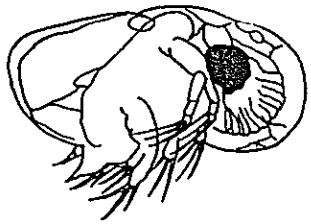
1392. Evadne tergestina



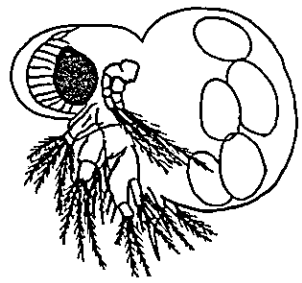
1393. Penilia schmackeri



1394. Podon leuckarti

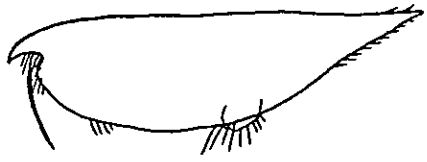


1395. Podon polyphemoides

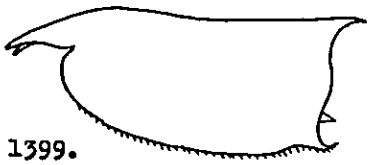


1396. Podon schmackeri

1397. Asterope marine

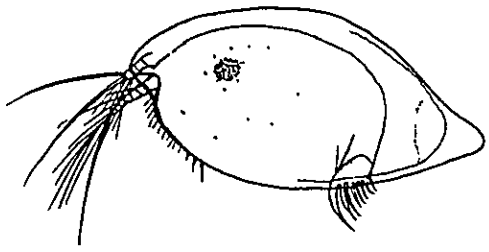


1398. Conchoecia daphnoides

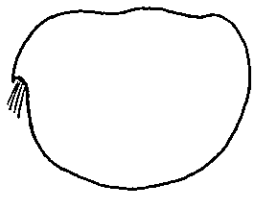


1399. Conchoecia imbricata

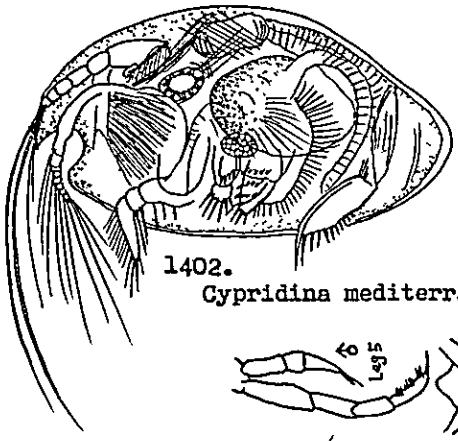
1400. Conchoecia obtusata



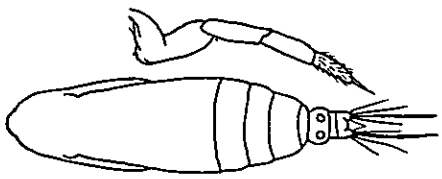
1401. Cypridina noctiluca



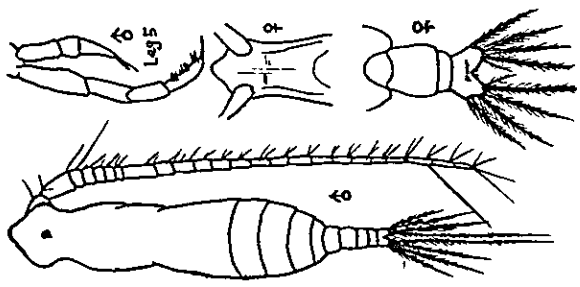
1403. Halocypris globosa



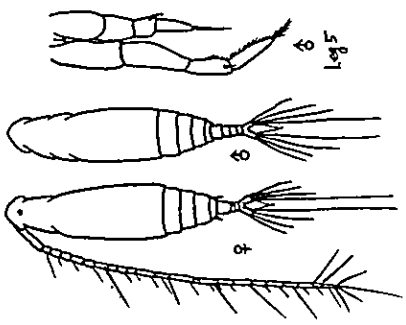
1402. Cypridina mediterranea



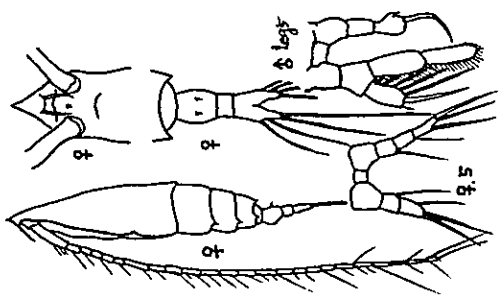
1404. Eucalanus crassus



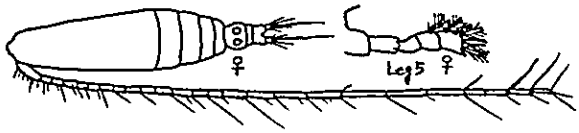
1405. Eucalanus attenuatus



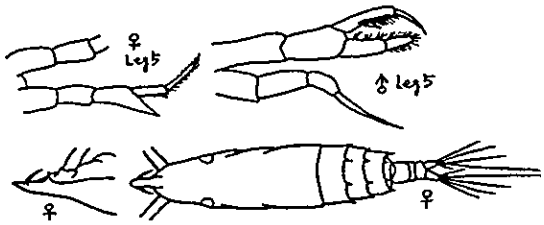
1406. Eucalanus elongatus



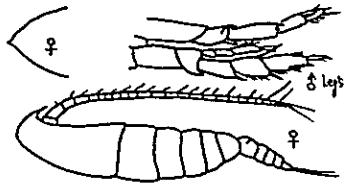
1407. Rhincalanus nasutus



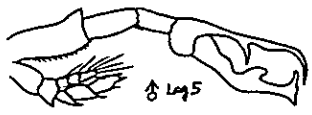
1408. Mecynocera clausii



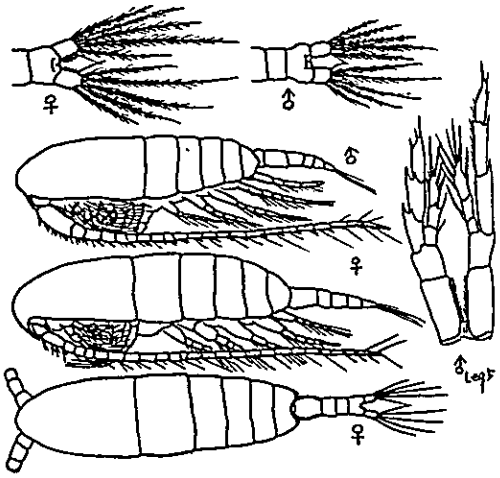
1409. Rhincalanus cornutus



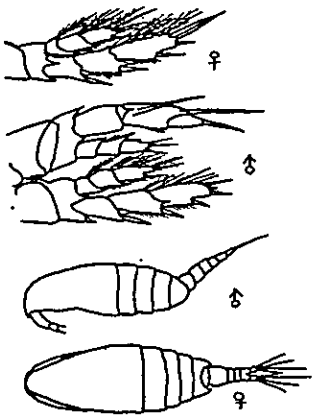
1410. Calanus brevicornis



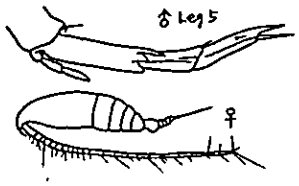
1411. Calanus darwinii



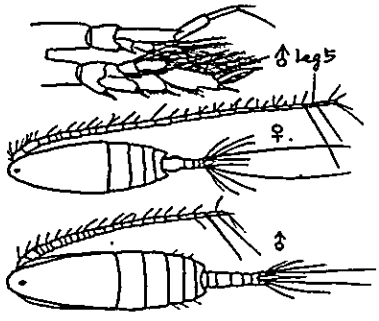
1412. Calanus helgolandicus



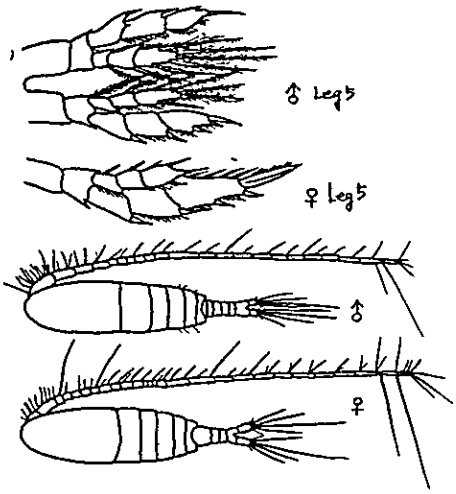
1413. Calanus minor



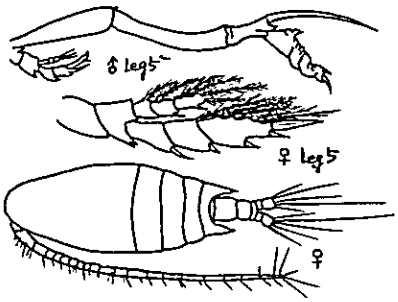
1414. Neocalanus robustior



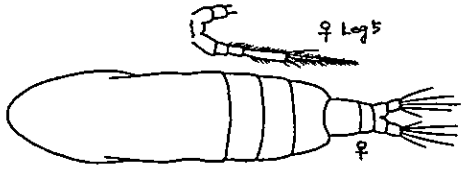
1415. Neocalanus gracilis



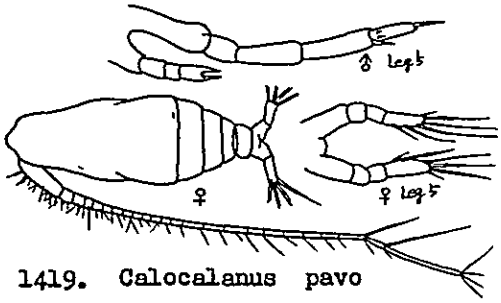
1417. Calanus tenuicornis



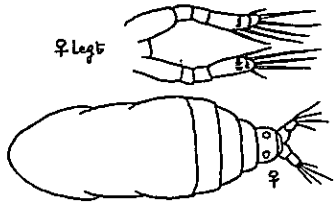
1416. Calanus vulgars



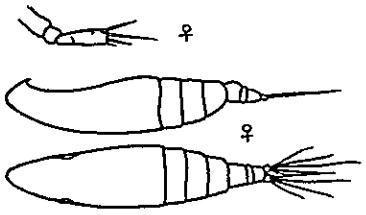
1418. Calocalanus plumulosus



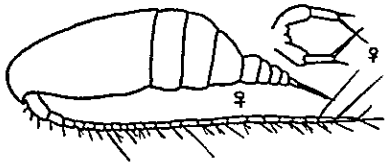
1419. Calocalanus pavo



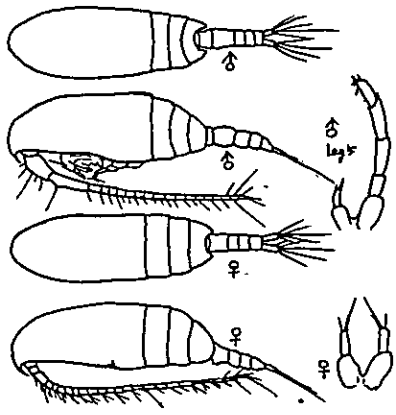
1420. Calocalanus styliremis



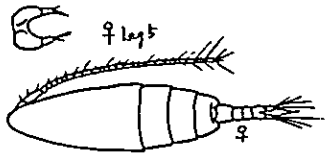
1421. Calocalanus tenuis



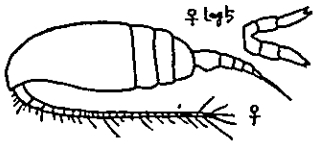
1422. Paracalanus aculeatus



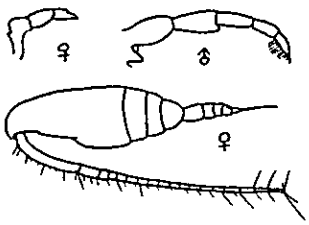
1423. Paracalanus parvus



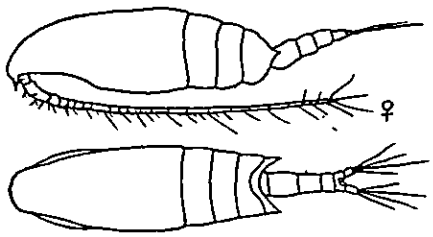
1424. Paracalanus nanus



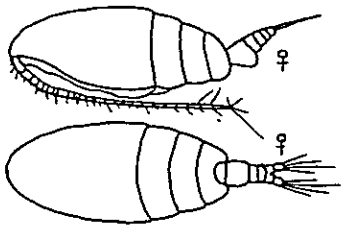
1426. Clausocalanus pergens



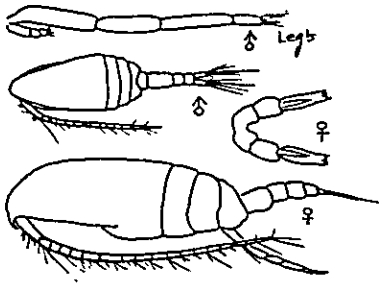
1428. Ctenocalanus vanus



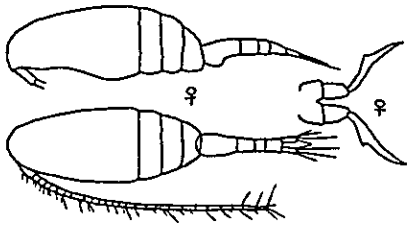
1429. Aetideopsis multiserrata



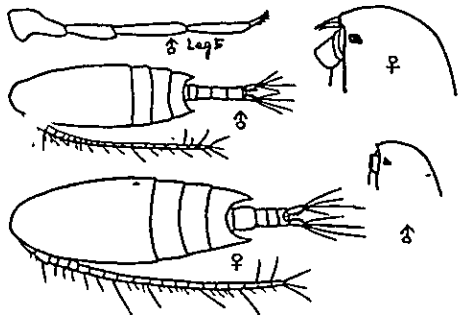
1431. Chiridiella macrodactyla



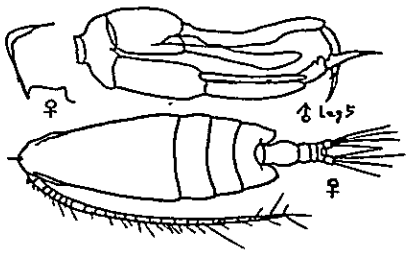
1425. Clausocalanus arcuicornis



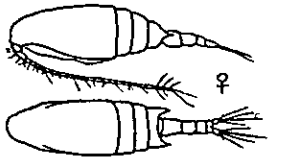
1427. Drepanopus bungei



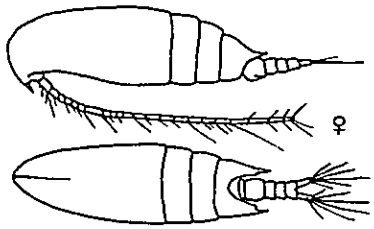
1430. Aetieus armatus



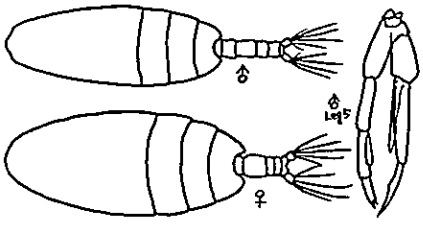
1432. Chirundina streetsii



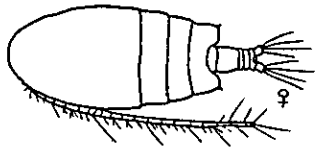
1433. Chiridius gracilis



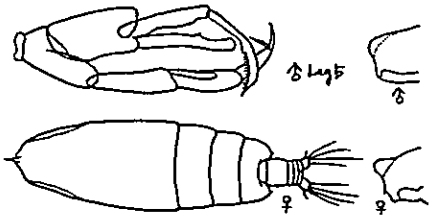
1434. Euaetideus giesbrecht



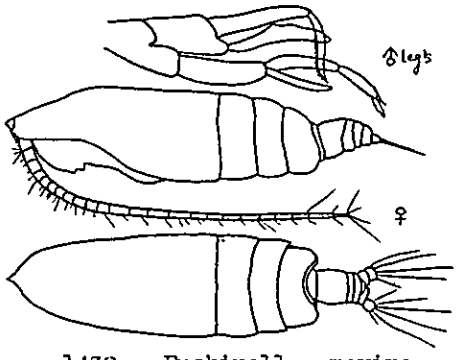
1435. Euchirella rostrata



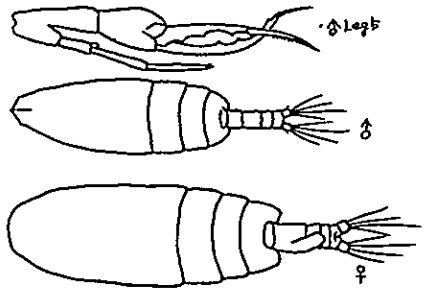
1436. Euchirella brevis



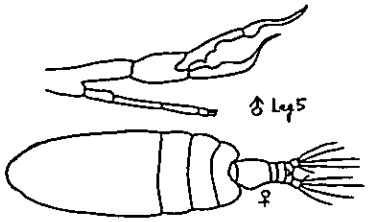
1437. Euchirella curticauda



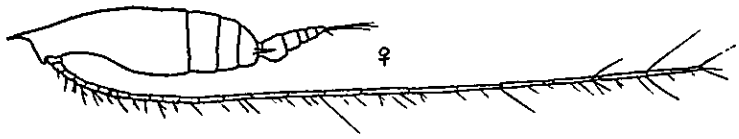
1438. Euchirella maxima



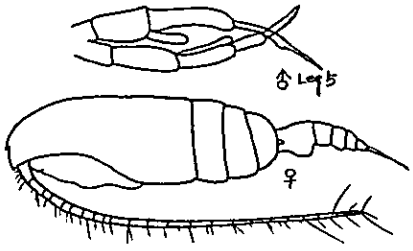
1439. Euchirella messinensis



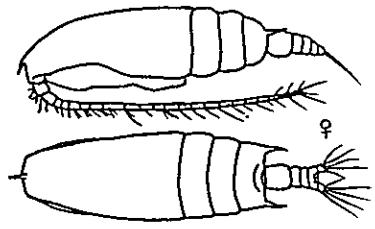
1440. Euchirella pulchra



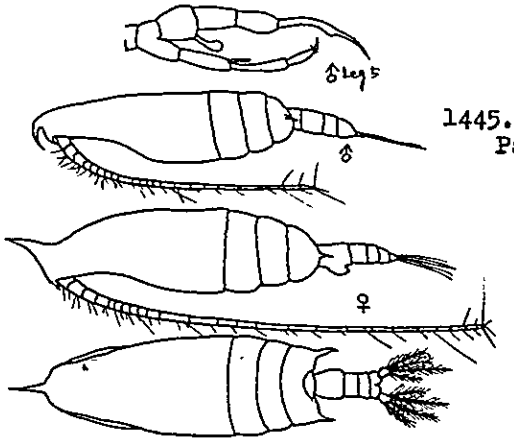
1441. Gaetanus miles



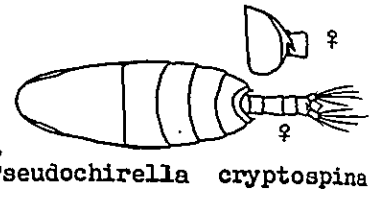
1442. Gaetanus kruppii



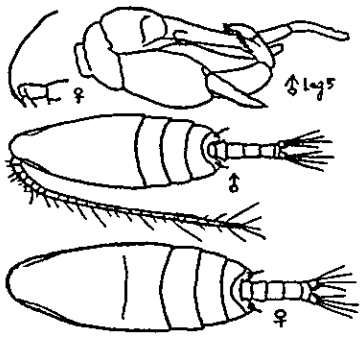
1443. Gaetanus minor



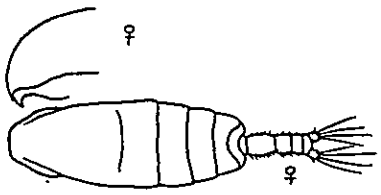
1444. Gaetanus pileatus



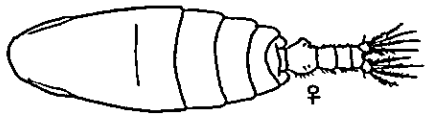
1445. Pseudochirella cryptospina



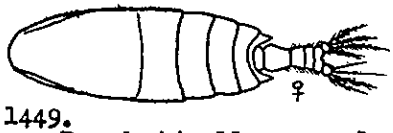
1446. Pseudochirella notacantha



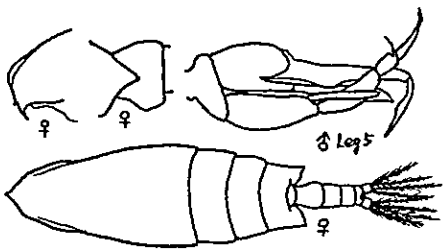
1447. Pseudochirella obtusa



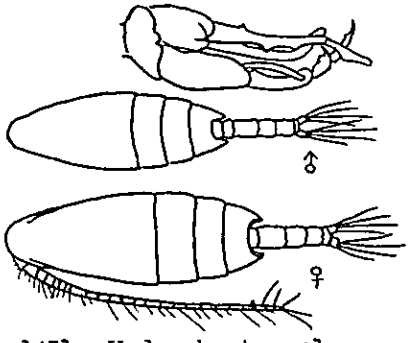
1448. Pseudochirella pustulifera



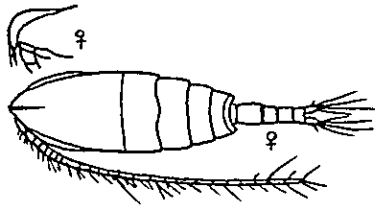
1449. Pseudochirella scopularis



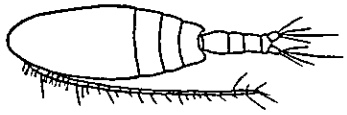
1450. Undeuchaeta major



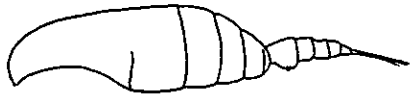
1451. Undeuchaeta plumosa



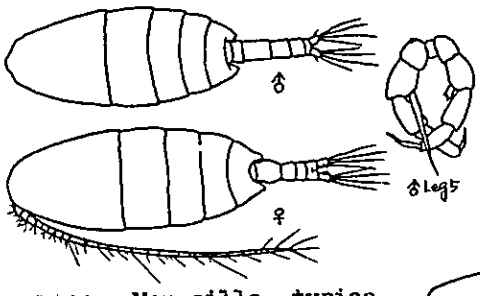
1452. Monacilla tenera



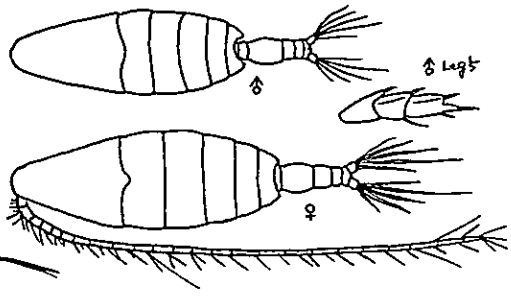
1454. Spinocalanus caudatus



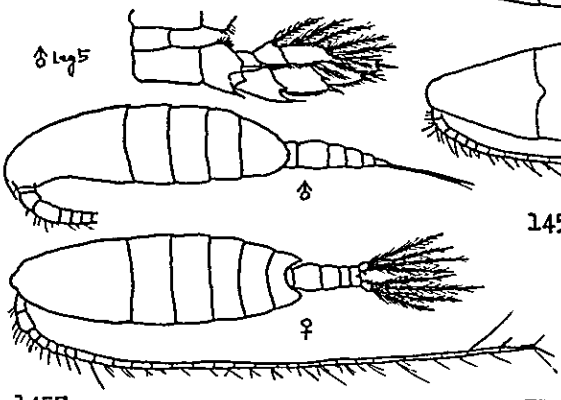
1455. Spinocalanus spinosus



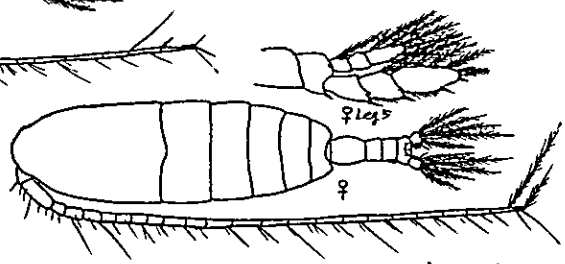
1453. Monacilla typica



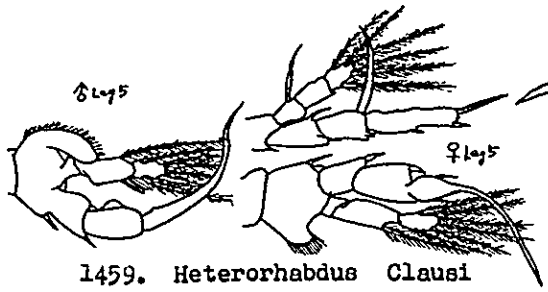
1456. Bathycalanus richardi



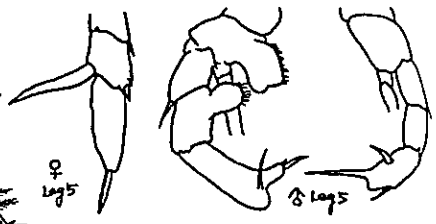
1457.
Bathycalanus princeps



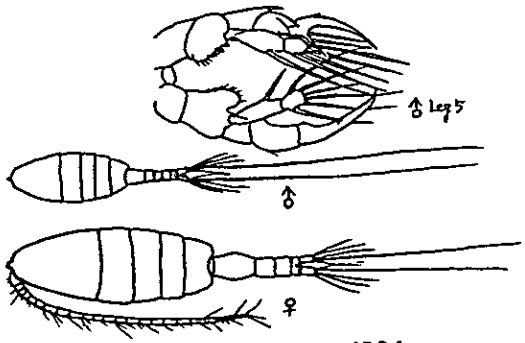
1458. Megacalanus princeps



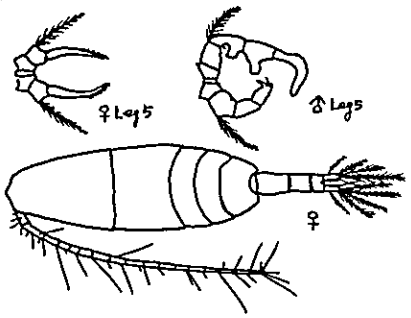
1459. Heterorhabdus Clausi



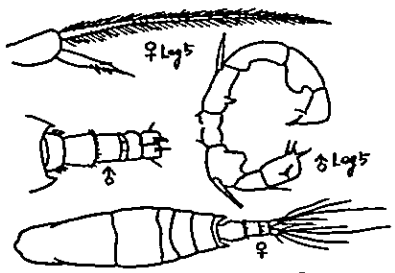
1460. Heterorhabdus vipera



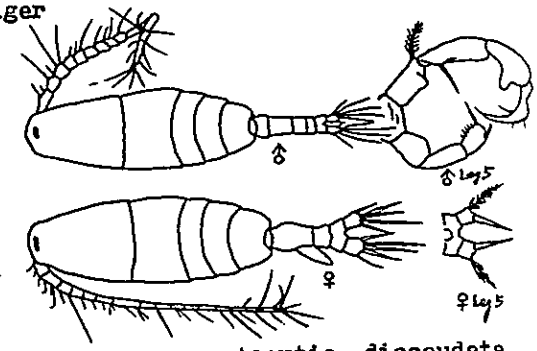
1461. Heterorhabdus papilliger



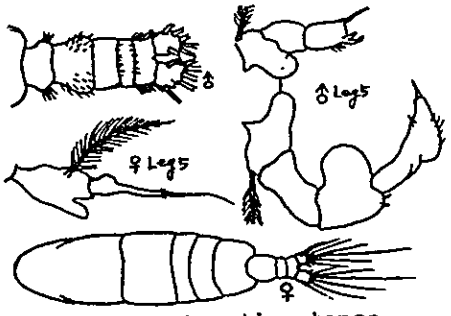
1462. Acartia Clausi



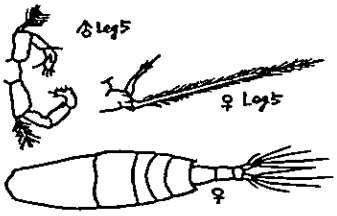
1463. Acartia danae



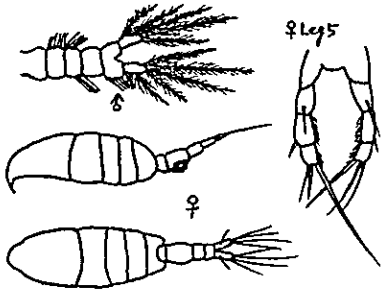
1464. Acartia discaudata



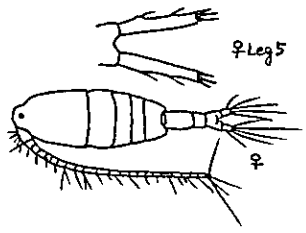
1465. Acartia tonsa



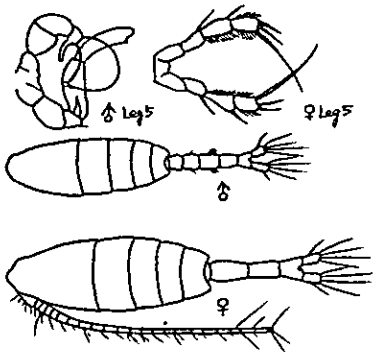
1466. Acartia negligens



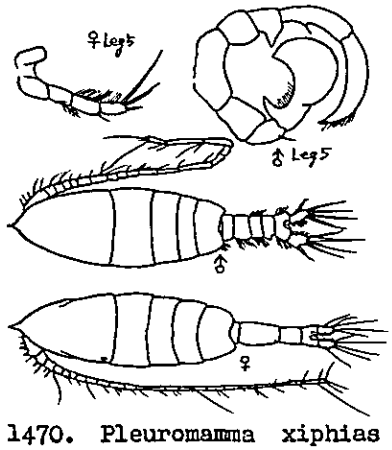
1467. Pleuromamma abdominalis



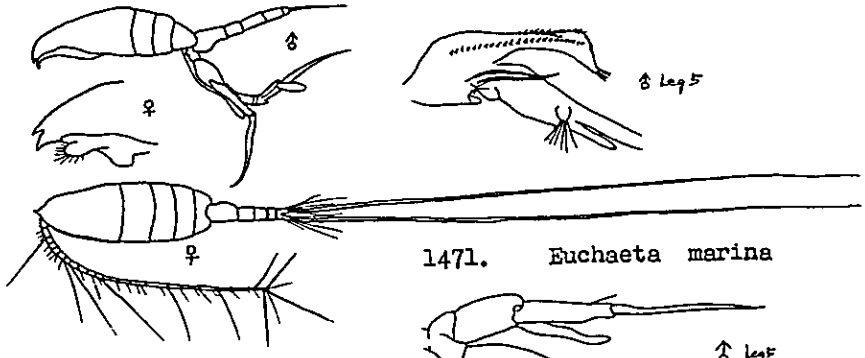
1468. Pleuromamma gracilis



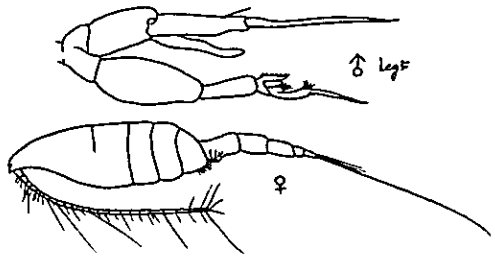
1469. Pleuromamma robusta



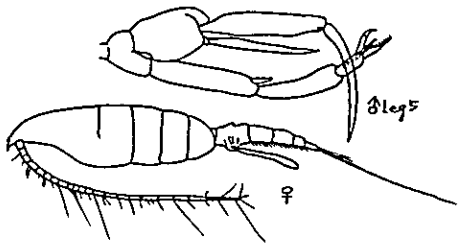
1470. Pleuromamma xiphias



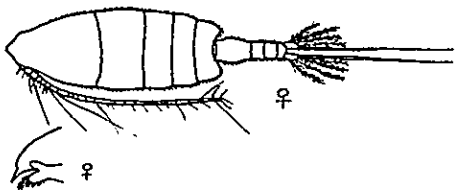
1471. Euchaeta marina



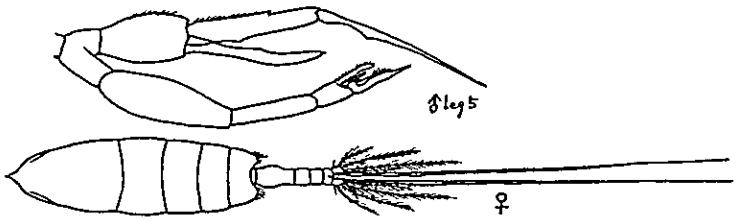
1472. Euchaeta acuta



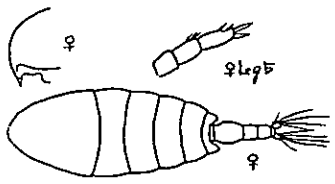
1473. Euchaeta hebes



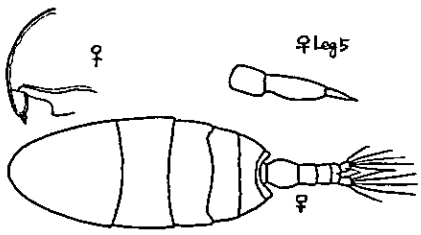
1474. Euchaeta pubera



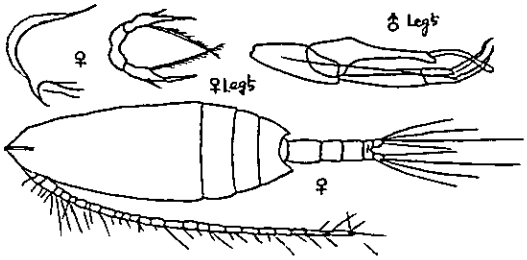
1475. Euchaeta spinosa



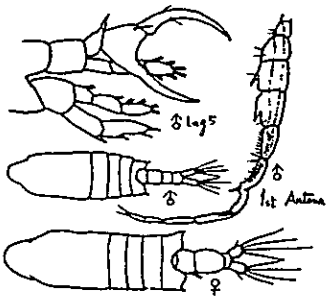
1476. Cornucalanus simplex



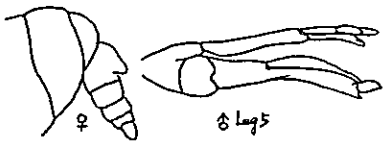
1477. Heteremalla dubia



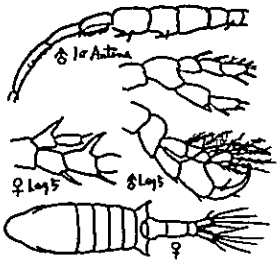
1478. Scaphocalanus magnus



1480. Centropages aucklandicus

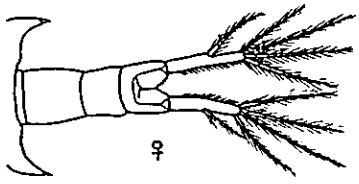


1479. Scolecithrix dane

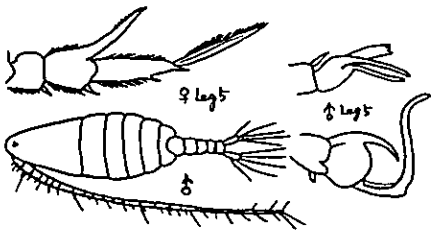


1481. Centropages Kroyeri

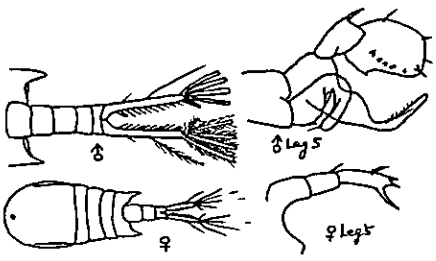
1482. Centropages orsinii



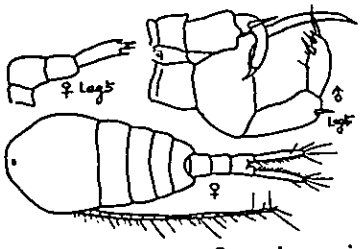
1484. Temora discaudata



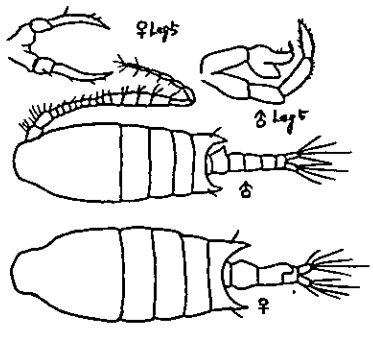
1483. Centropages violaceus



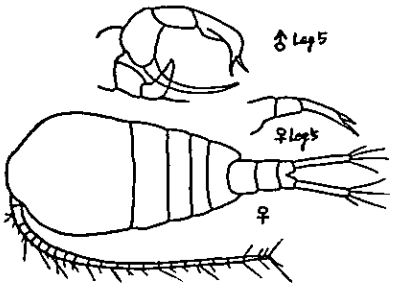
1485. Temora stylifera



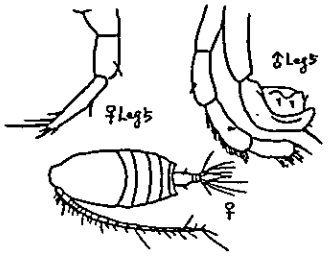
1486. Temora longicornis



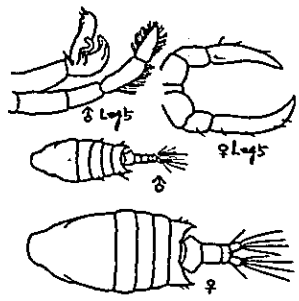
1488. Candacia armata



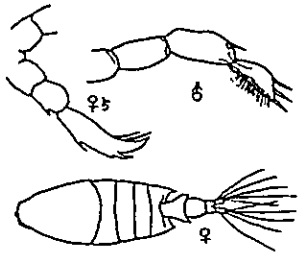
1487. Temora turbinata



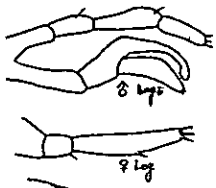
1489. Candacia aethiopica

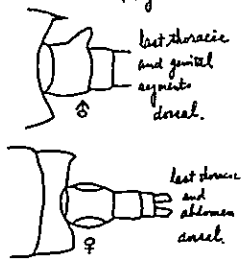


1490. Candacia bipinnata

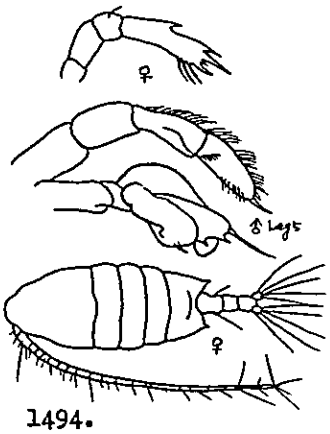


1491.
Candacia bispinosa

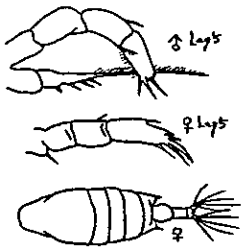




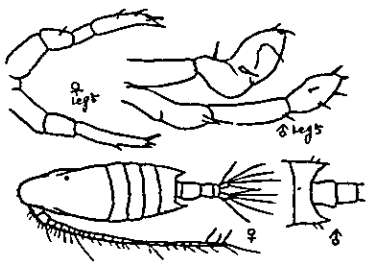
1493.
Candacia longimana



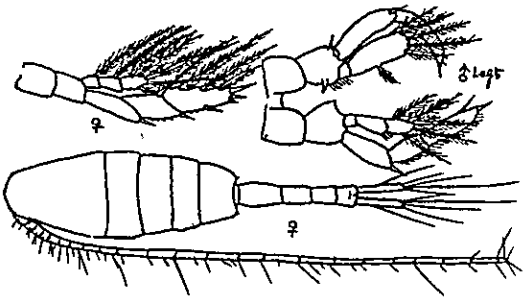
1494.
Candacia pachydactyla



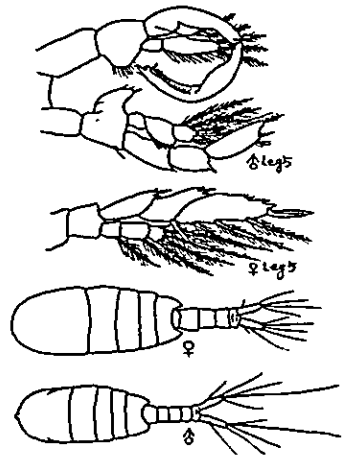
1492.
Candacia simplex



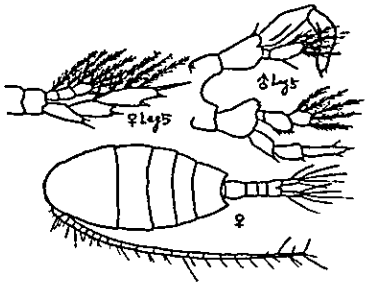
1495. Candacia varicans



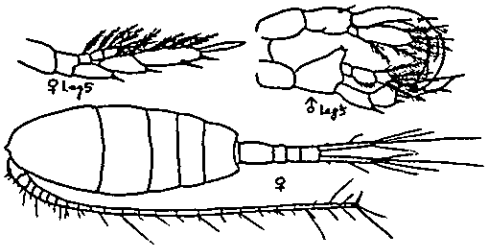
1496. Lucicutia atlantica



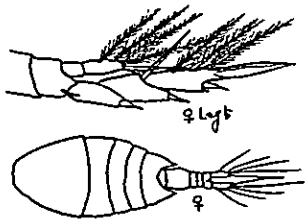
1497. Lucicutia flavicornis



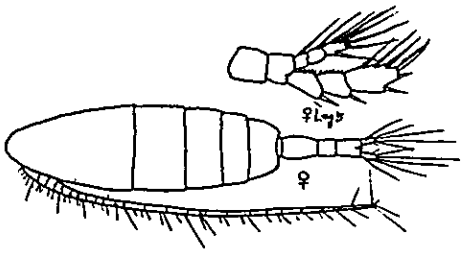
1498. Lucicutia longiserrata



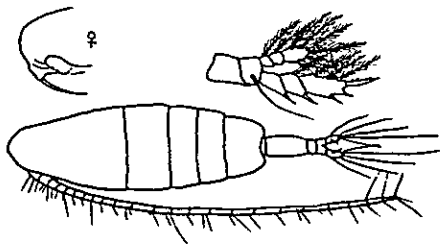
1499. Lucicutia tenuicauda



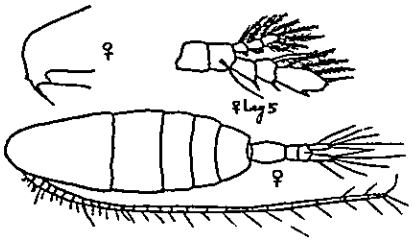
1500. Lucicutia ovalis



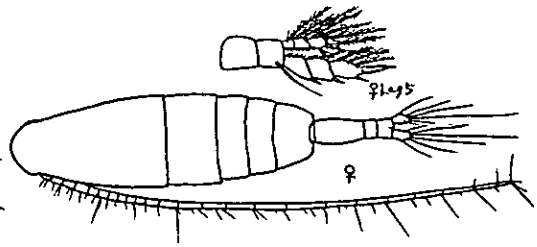
1501. Euaugaptilus affinis



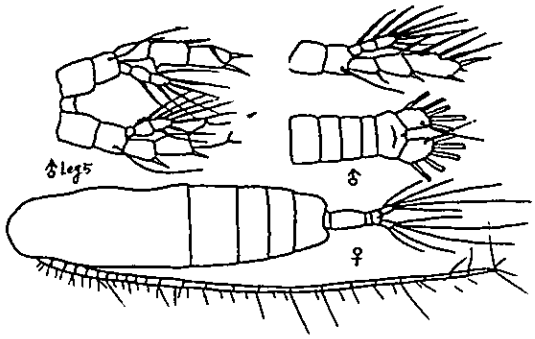
1502. Euaugaptilus bullifer



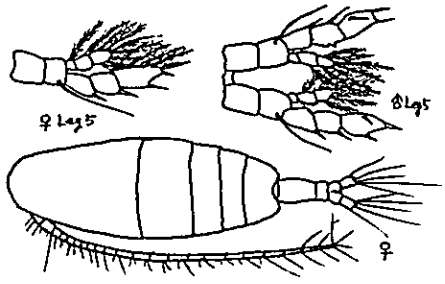
1503. Augaptilus anceps



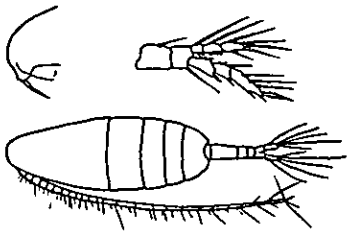
1504. Euaugaptilus facilis



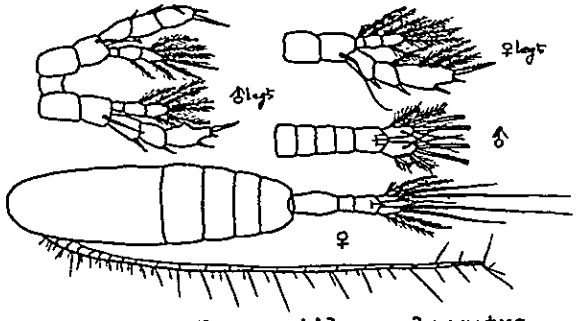
1505. Euaugaptilus filiger



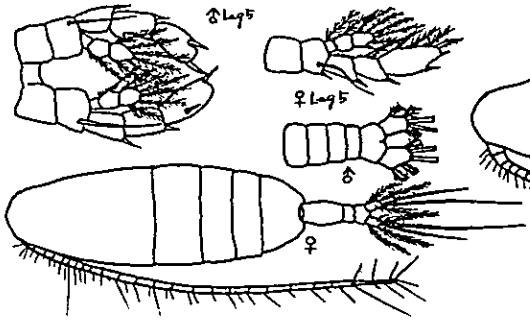
1506. Euaugaptilus gibbus



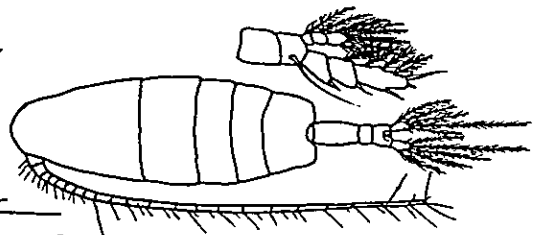
1507. Euaugaptilus palumboi



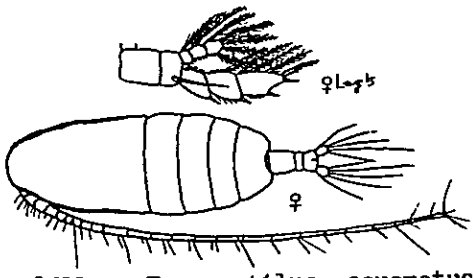
1508. Euaugaptilus elongatus



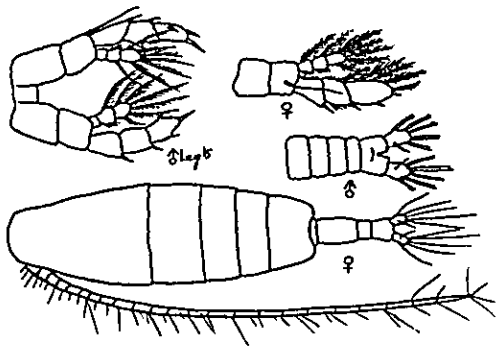
1510. Euaugaptilus nodifrons



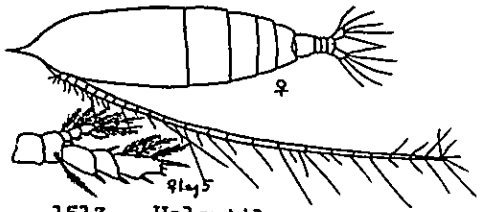
1509. Euaugaptilus truncatus



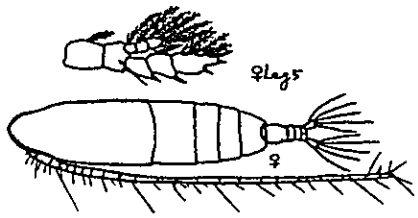
1511. Euaugaptilus squamatus



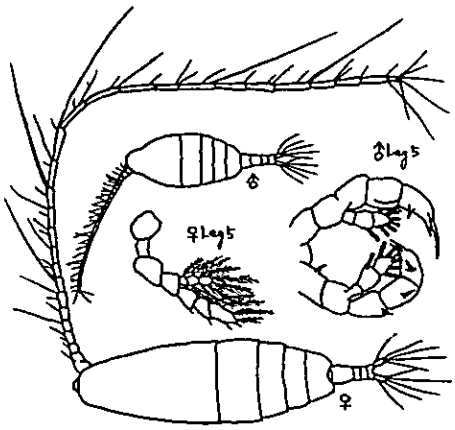
1512. Euaugaptilus oblongus



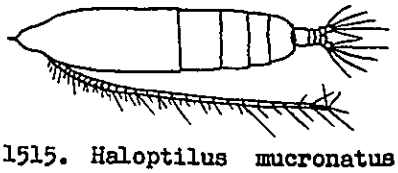
1513. Haloptilus acutifrons



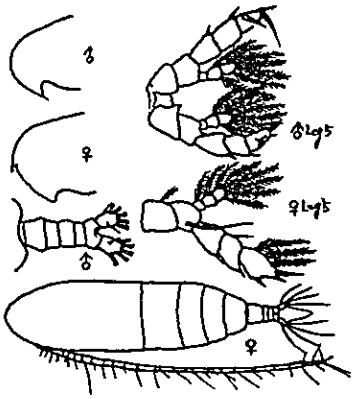
1514. Haloptilus angusticeps



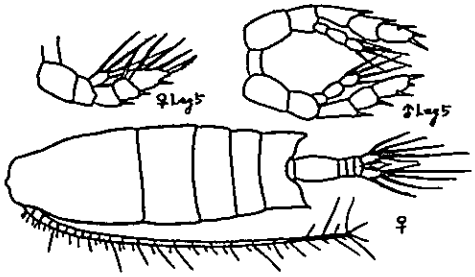
1516. Haloptilus longicornis



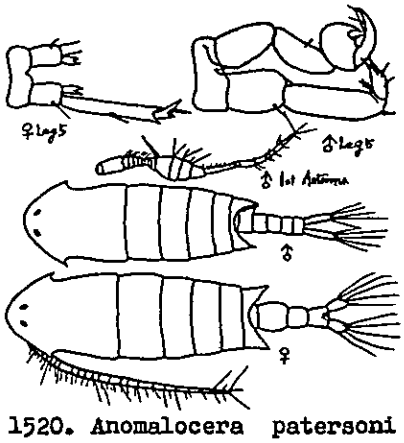
1515. Haloptilus mucronatus

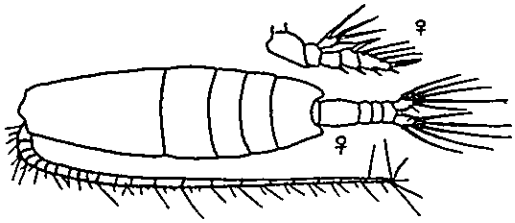


1517. Haloptilus tenuis



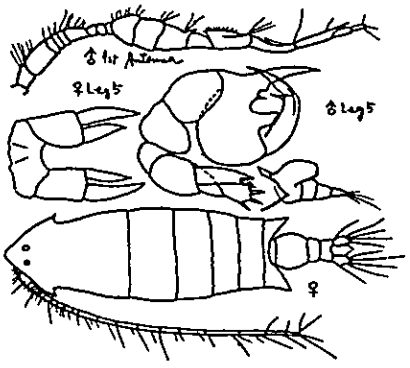
1518. Heteroptilus acutilobus



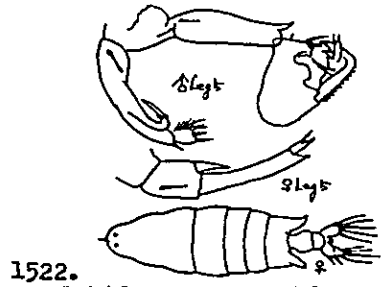


1519. Heteroptilus attenuatus

1520. Anomalocera patersoni

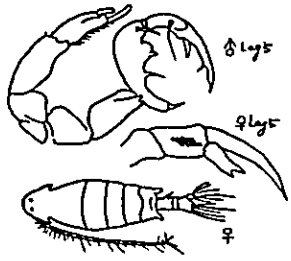


1521. Labidocera wollastoni

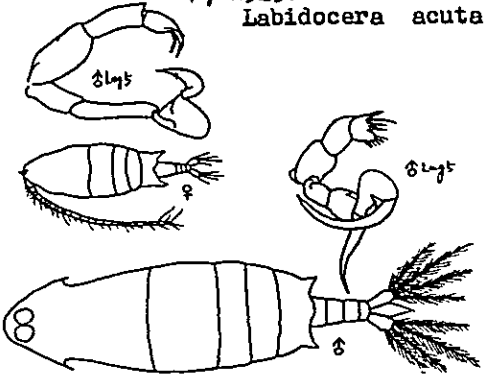


1522. Labidocera acutiforons

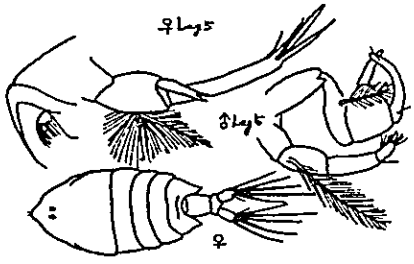
1523. Labidocera acuta



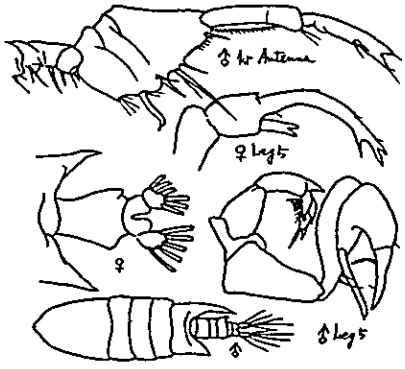
1524. Labidocera Kroyeri



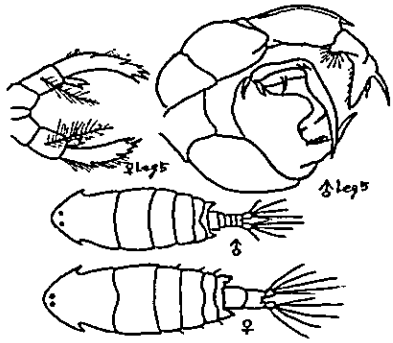
1525. Labidocera detruncata



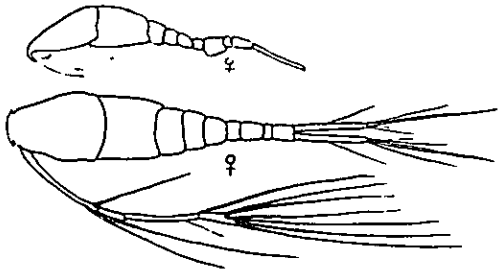
1526. Pontellina plumata



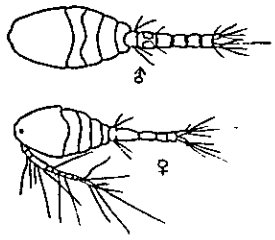
1527. Pontellopsis regalis



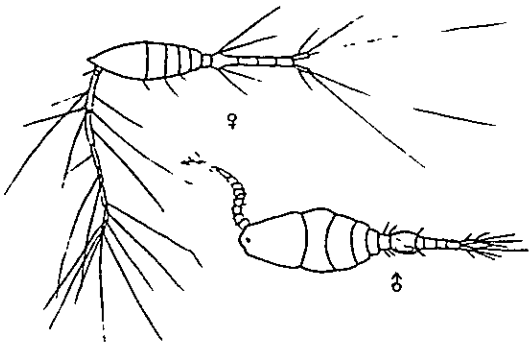
1528. Pontella Lo Biancoi



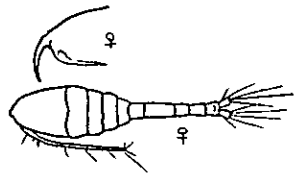
1529. Mormonilla phasma



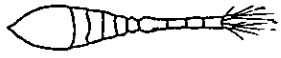
1530. Oithona nana



1533. Oithona plumifera

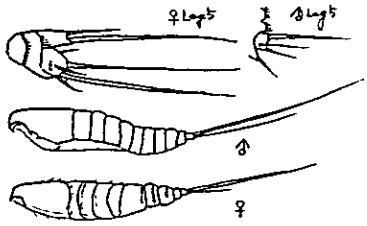


1531. Oithona robusta

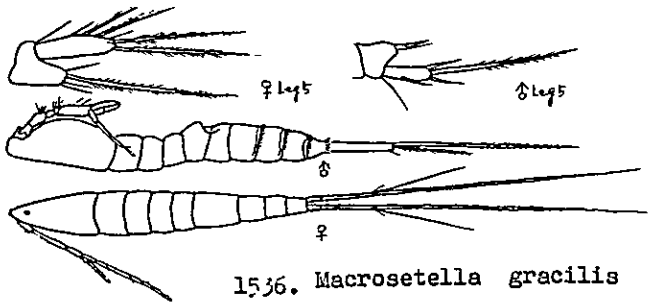


1532. Oithona setigera

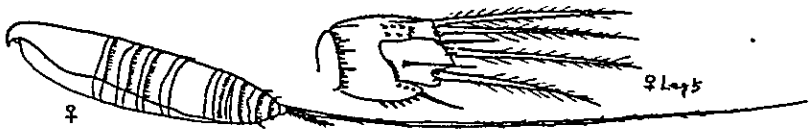
1534. Miracia efferata



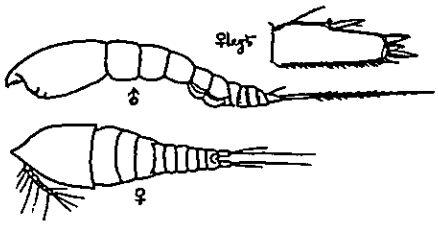
1535. Microsetella norvegica



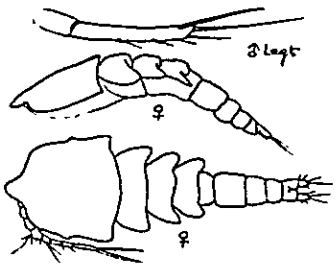
1536. Macrosetella gracilis



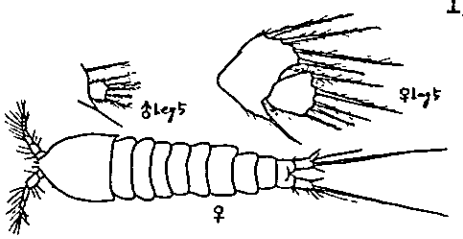
1537. Microsetella rosea



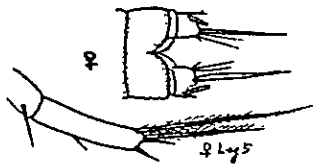
1538. Enterpe acutifrons



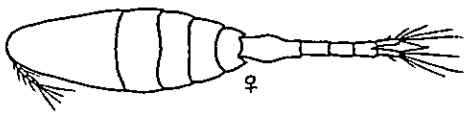
1539. Clytemnestra scutellata



1541. Laophonte brevirostris

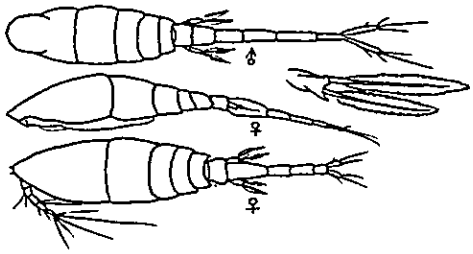


1540. Clytemnestra rostrata

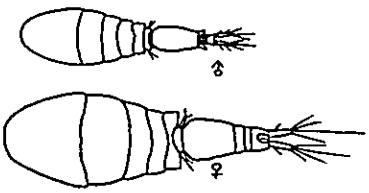


1542. Lubbockia minuta

1544. Oncaea media

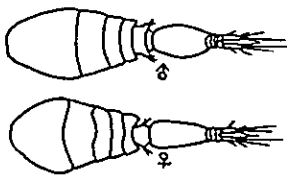


1543. Lubbockia squillimana

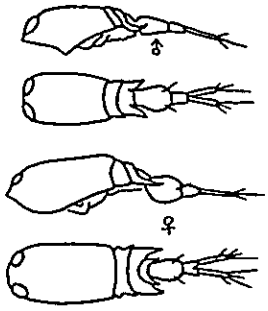


1545. Oncaea mediterranea

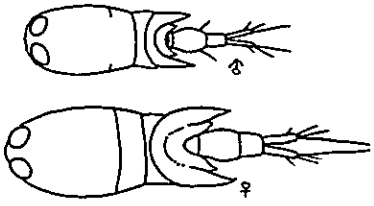
1546. Oncaea minuta



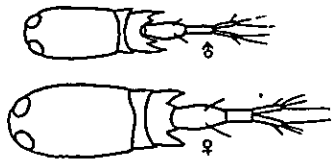
1547. Oncaea venusta



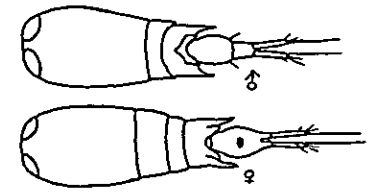
1548. Corycaeus brehmi



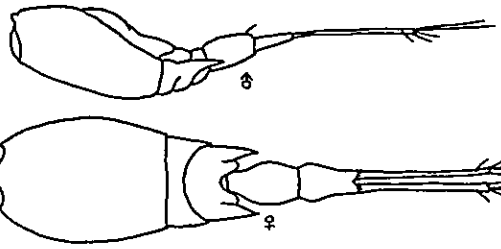
1549. Corycaeus Clausi



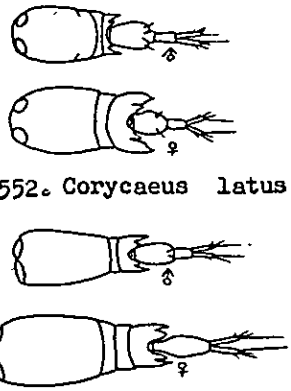
1550. Corycaeus giesbrechti



1551. Corycaeus flaccus

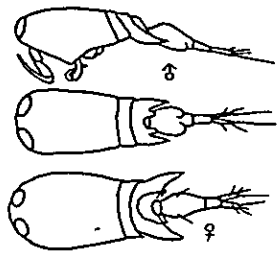


1553. Corycaeus lautus

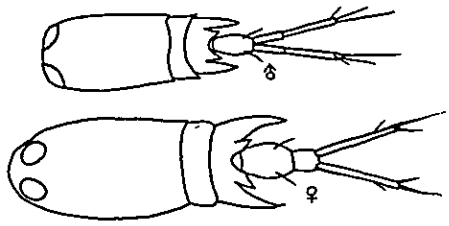


1554. Corycaeus limbatus

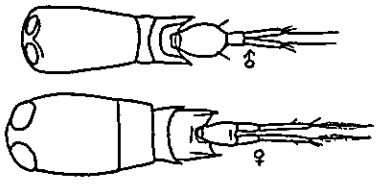
1552. Corycaeus latus



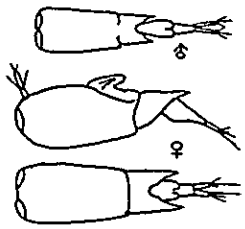
1555. Corycaeus ovalis



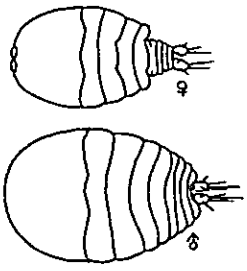
1556. Corycaeus speciosus



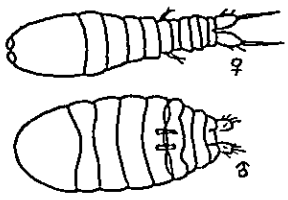
1557. Corycaeus' typicus



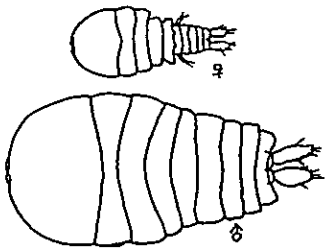
1558. Corycella carinata



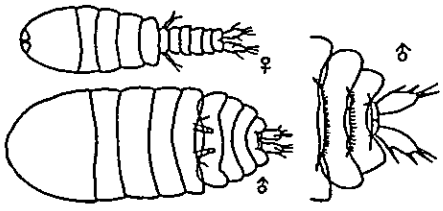
1559. Sapphirina bicuspidata



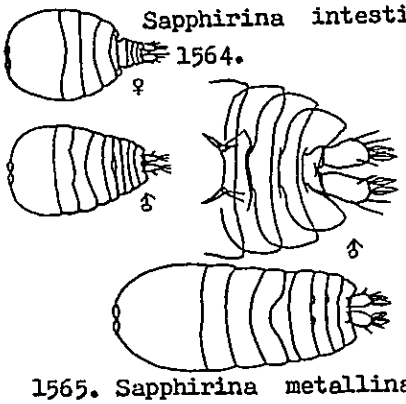
1560. Sapphirina angusta



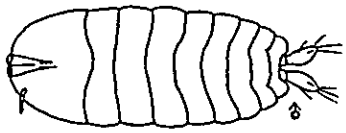
1561. Sapphirina gastrica



1562. Sapphirina gemma



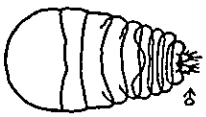
1564. Sapphirina intestinata



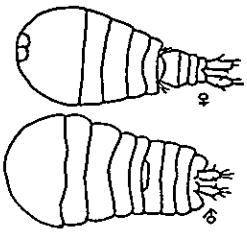
1563. Sapphirina iris

1566. Sapphirina lactens

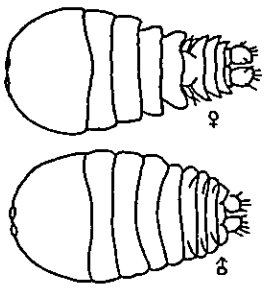
1565. Sapphirina metallina



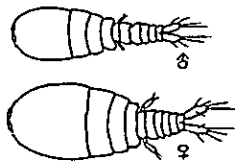
1567. Sapphirina maculosa



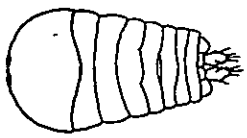
1568. Sapphirina nigromaculata



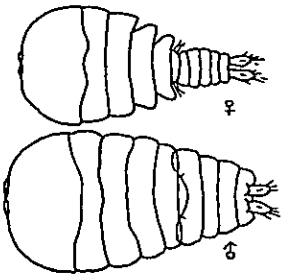
1569. Sapphirina opalina



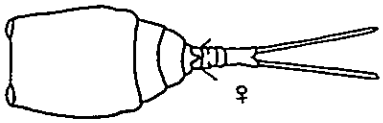
1570. Sapphirina sali



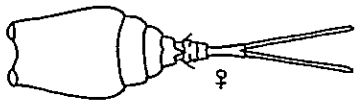
1571. Sapphirina opalina var. Darwini



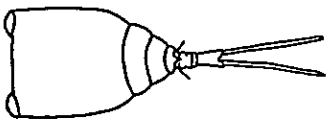
1572. Sapphirina scarlata



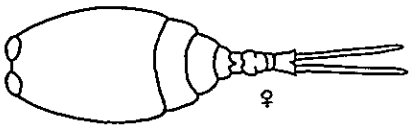
1573. Copilia mediterranea



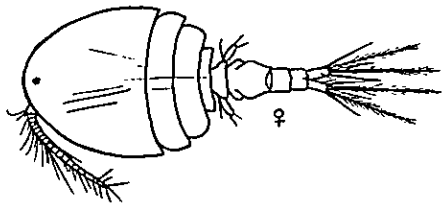
1575. Copilia mirabilis



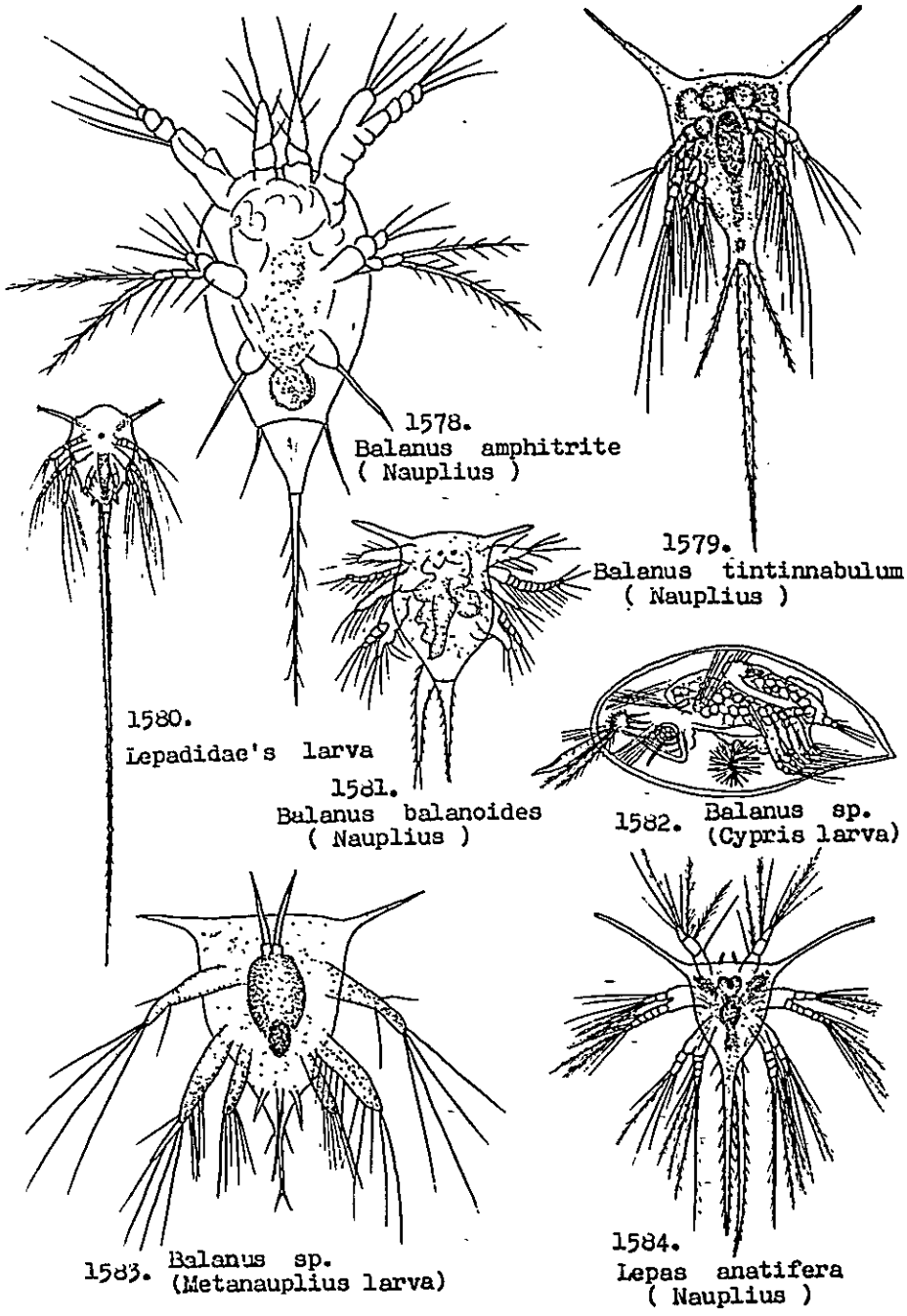
1574. Copilia quadrata



1576. Copilia vitrea



1577. Ascomyzon parvum



1578.
Balanus amphitrite
(Nauplius)

1579.
Balanus tintinnabulum
(Nauplius)

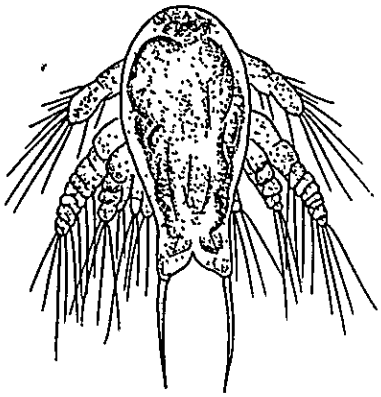
1580.
Lepadidae's larva

1581.
Balanus balanoides
(Nauplius)

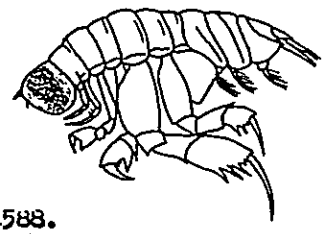
1582. Balanus sp.
(Cypris larva)

1583. Balanus sp.
(Metanauplius larva)

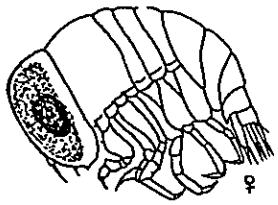
1584.
Lepas anatifera
(Nauplius)



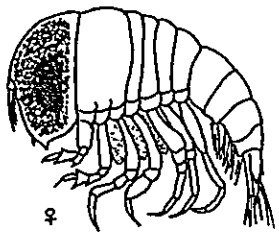
1585. Sacculina sp.
(Nauplius)



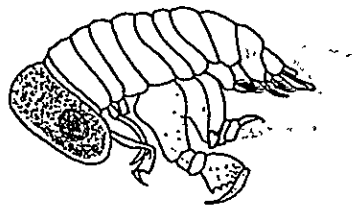
1588.
Phrosina semilunata



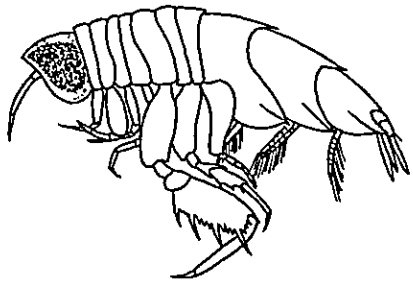
1590. Hyperia latissima



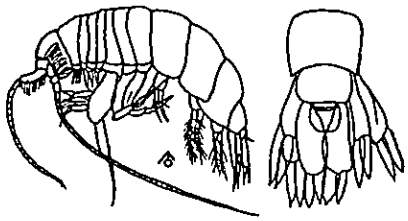
1591.



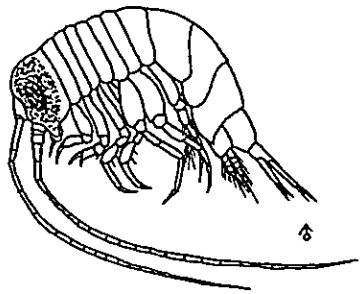
1586. Anchylomera Blossevillei



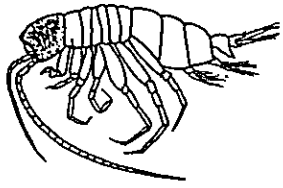
1587. Euprimno macropus



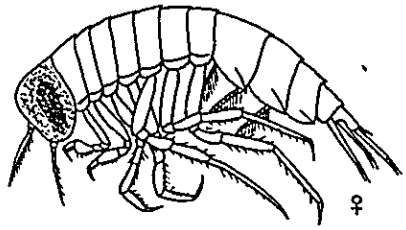
1589. Hyperia sibaginis



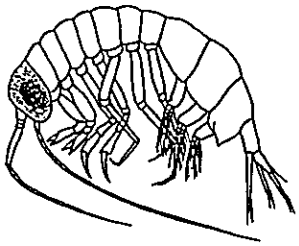
1591. Hyperia schizogeneios



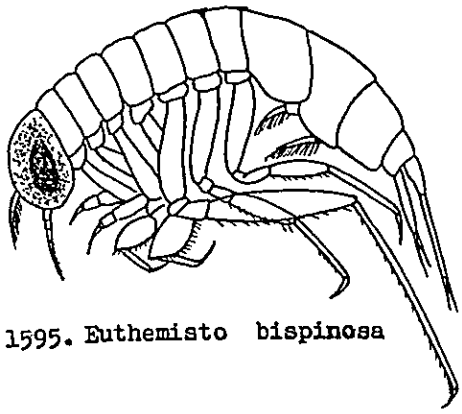
1592. Hyperioides longipes



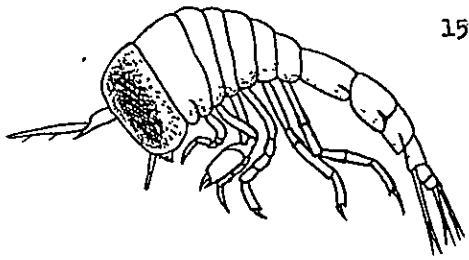
1593. Parathemisto oblivia ♀



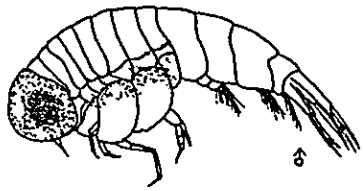
1594. Hyperoche Kroyeri



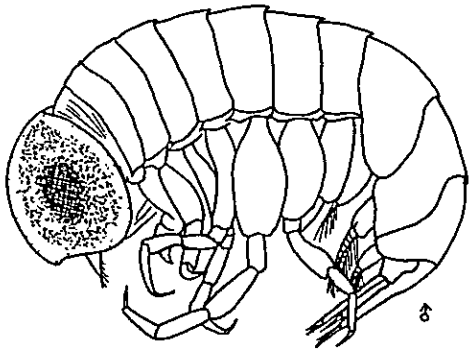
1595. Euthemisto bispinosa



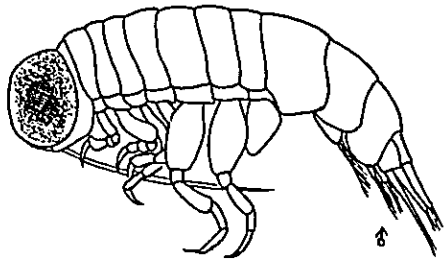
1596. Phronimopsis spinifera



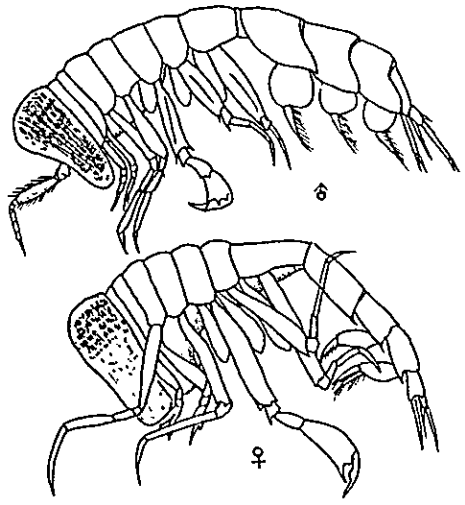
1597. Brachyscelus crusculum ♂



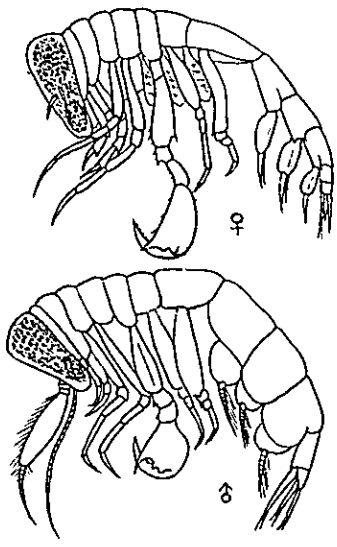
1598. Lycaea pulex ♂



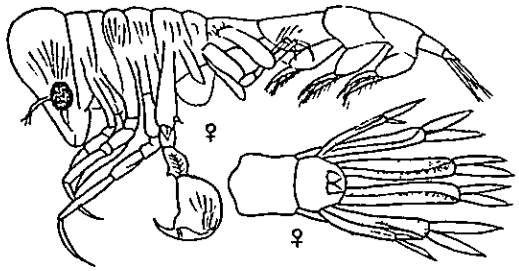
1599. Pseudolycaea pachypoda ♂



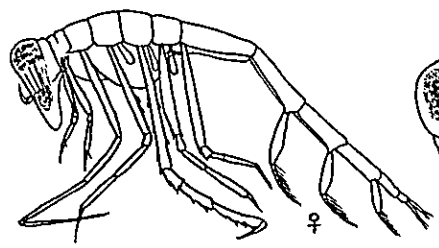
1600. Phronima sedentaria



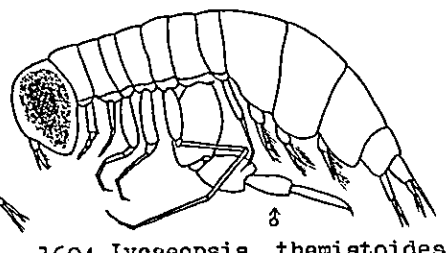
1601.



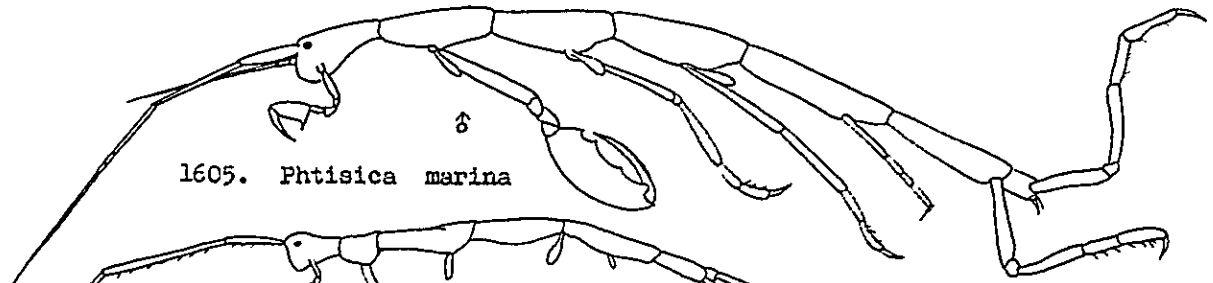
1602. Phronima pacifica



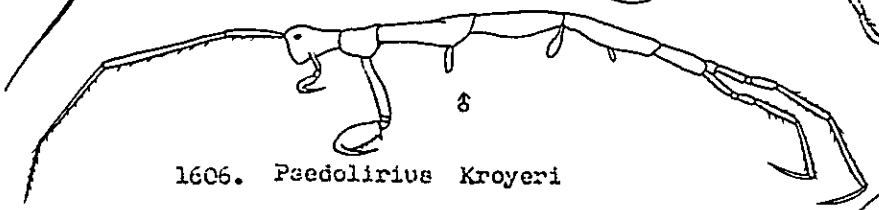
1603. Phronimella elongata



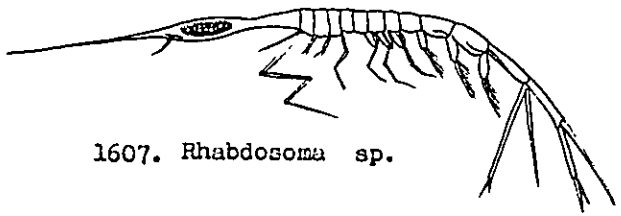
1604. Lycaeopsis themistoides



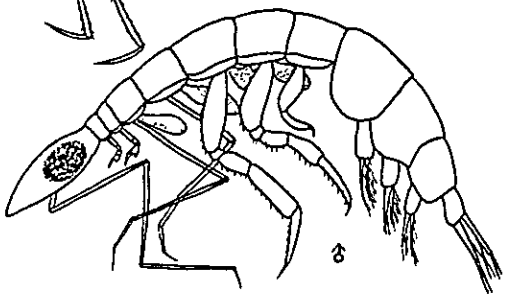
1605. Phtisica marina



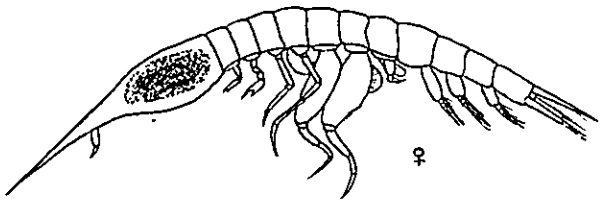
1606. Paedolirius Kroyeri



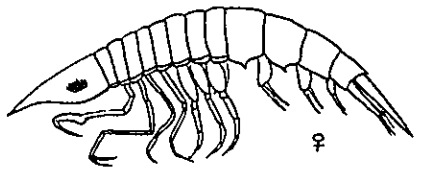
1607. Rhabdosoma sp.



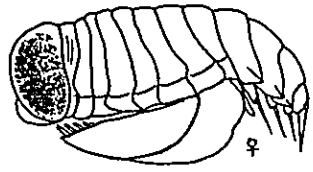
1609. Glossocephalus Milne-Edwardsi



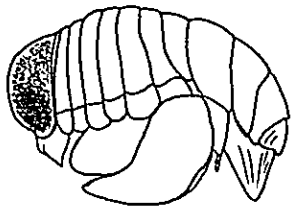
1608. Streetsia Challengeri



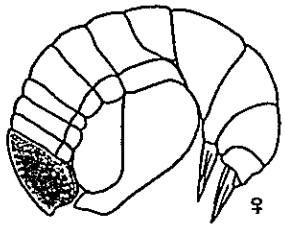
1610. Oxycephalus porcellus



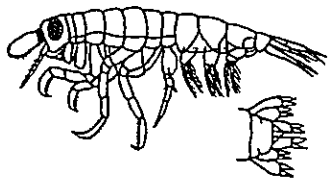
1611. Platyscelus ovoides



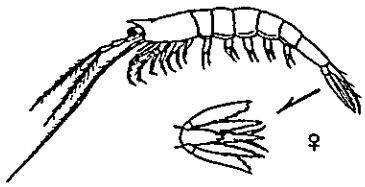
1612. Platyscelus serratulus



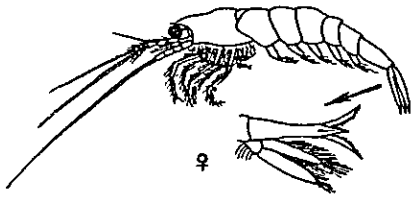
1613. Parascelus typhoides



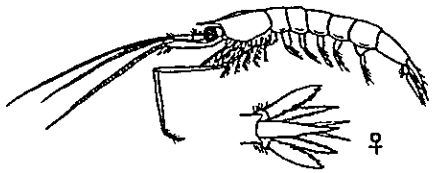
1614. Vibilia viatrix



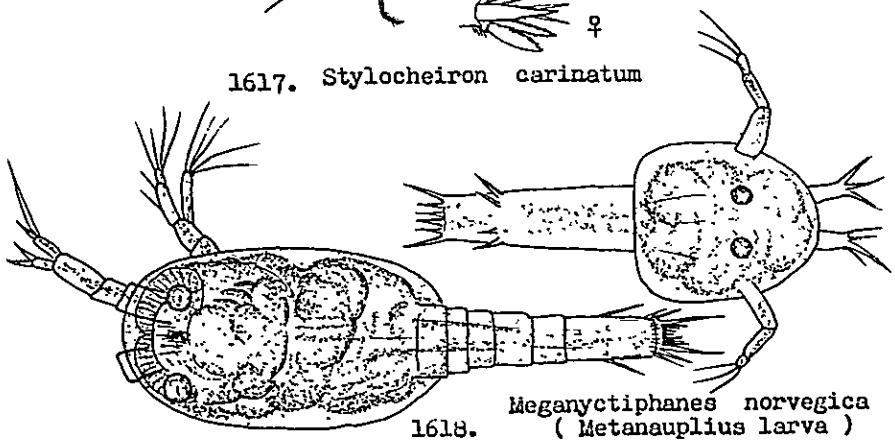
1615. Euphausia gracilis



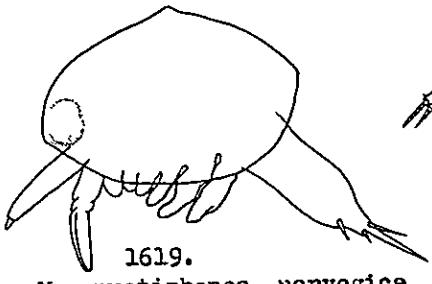
1616. Euphausia pellucida



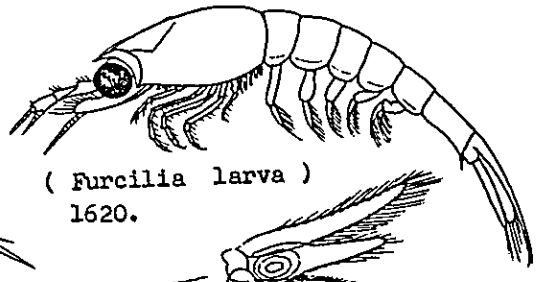
1617. Stylocheiron carinatum



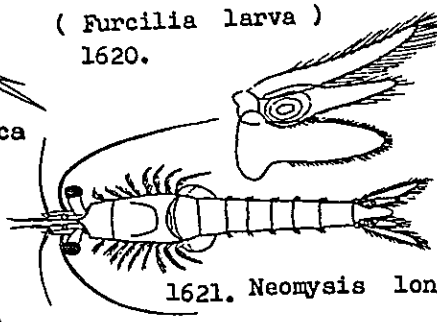
1618. Meganyctiphanes norvegica (Metanauplius larva)



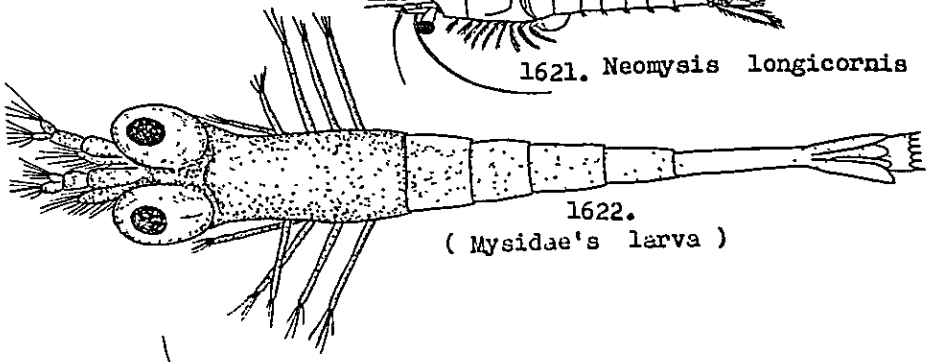
1619.
Meganyctiphanes norvegica
(Calyptopis larva)



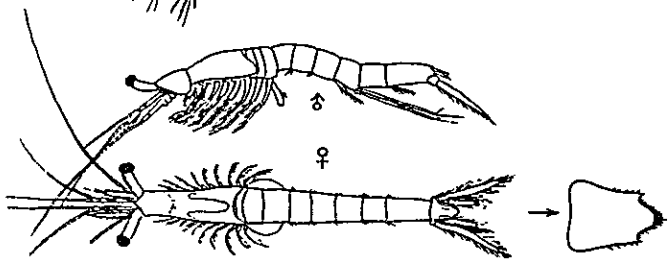
(Furcilia larva)
1620.



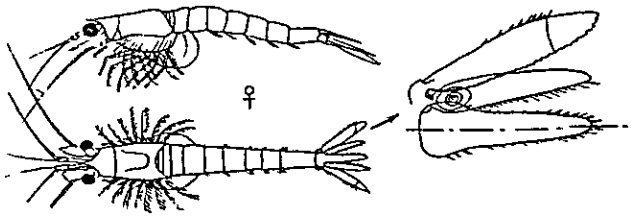
1621. Neomysis longicornis



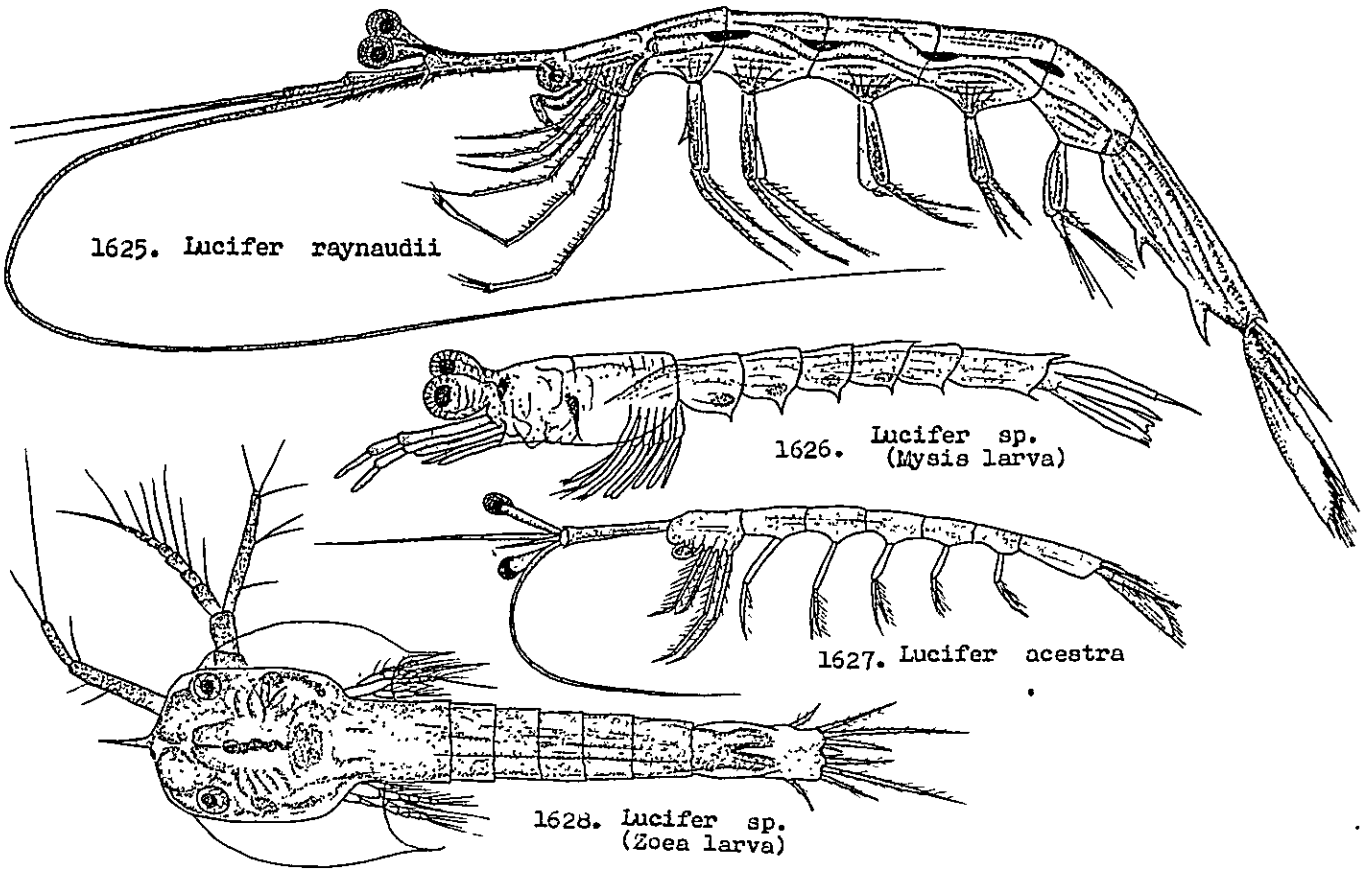
1622.
(Mysidae's larva)



1623. Mesopodopsis slabberi



1624. Siriella clausi

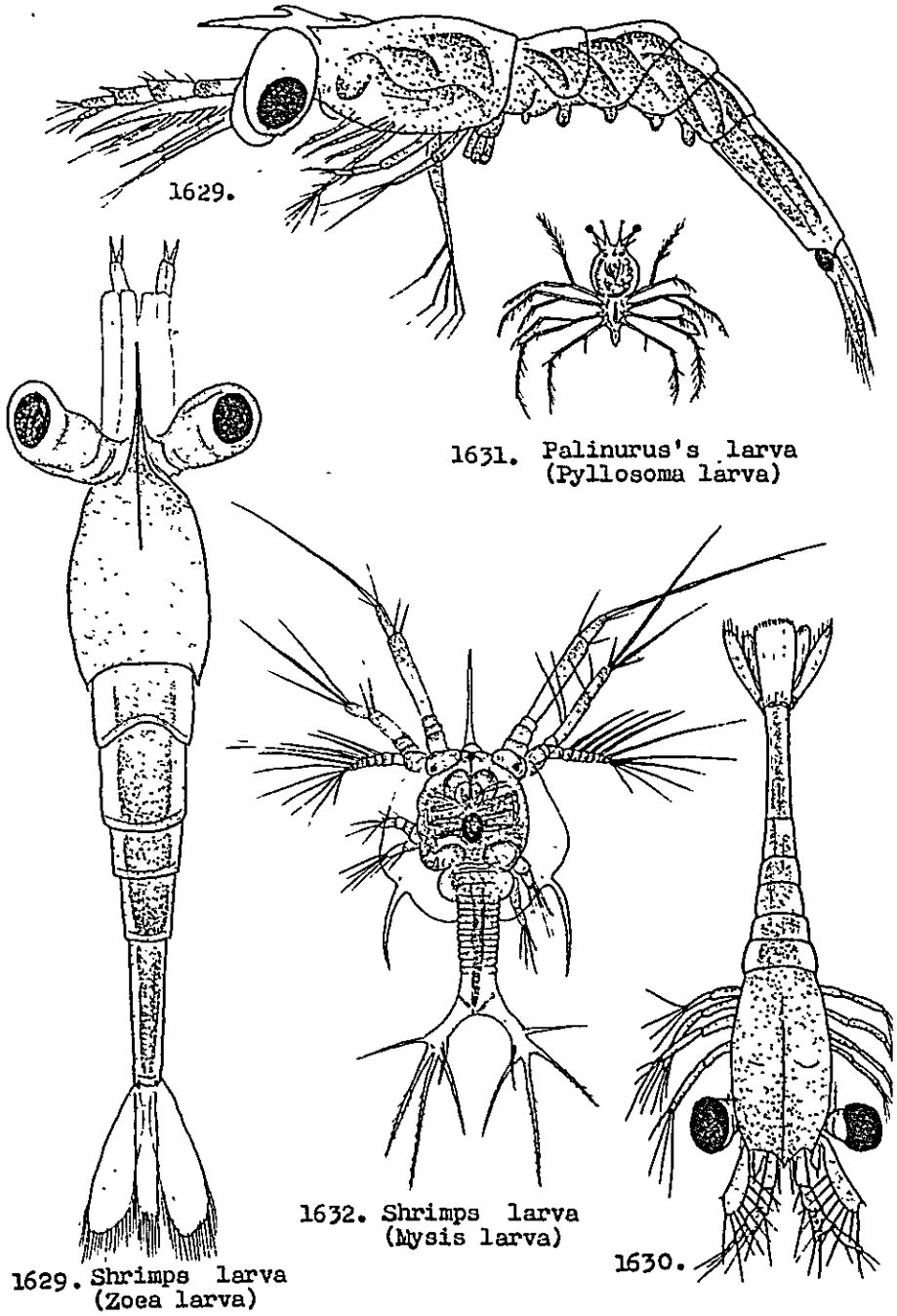


1625. Lucifer raynaudii

1626. Lucifer sp. (Mysis larva)

1627. Lucifer acestra

1628. Lucifer sp. (Zoea larva)

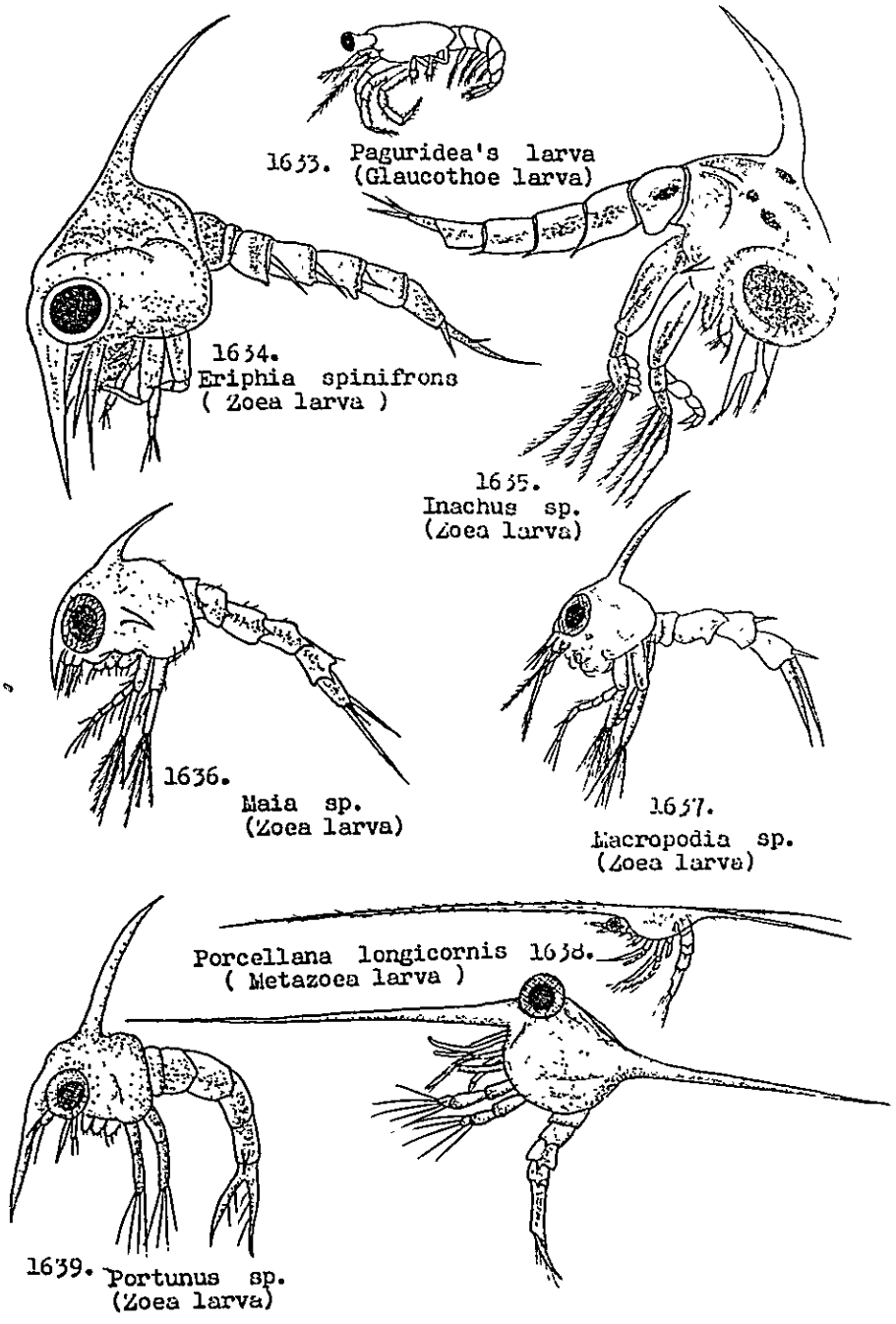


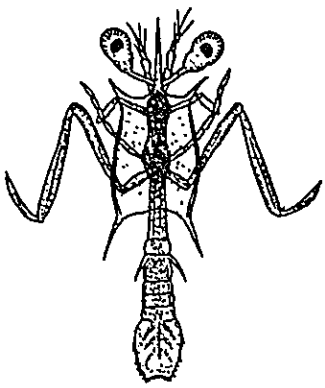
1629. Shrimps larva
(Zoea larva)

1631. Palinurus's larva
(Pyllosoma larva)

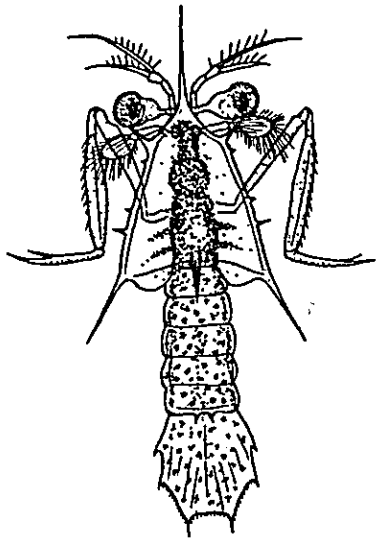
1632. Shrimps larva
(Mysis larva)

1630.

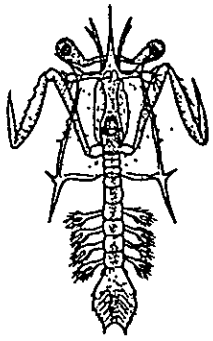

1633. Paguridea's larva
(Glaucothoe larva)
1634.
Eriphia spinifrons
(Zoea larva)
1635.
Inachus sp.
(Zoea larva)
1636.
Maia sp.
(Zoea larva)
1637.
Macropodia sp.
(Zoea larva)
Porcellana longicornis 1638.
(Metazoea larva)
1639. Portunus sp.
(Zoea larva)



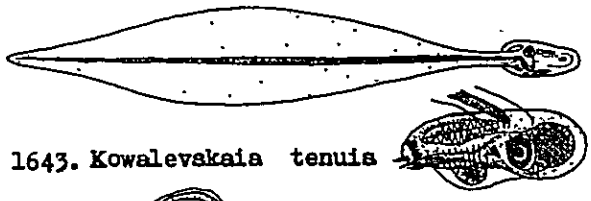
1640. Squilla's larva
(Alima larva)



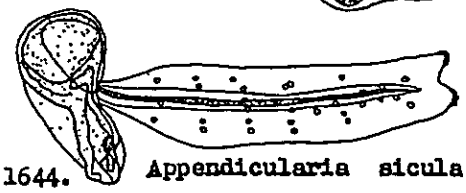
1641. Squilla's larva
(Alima larva)



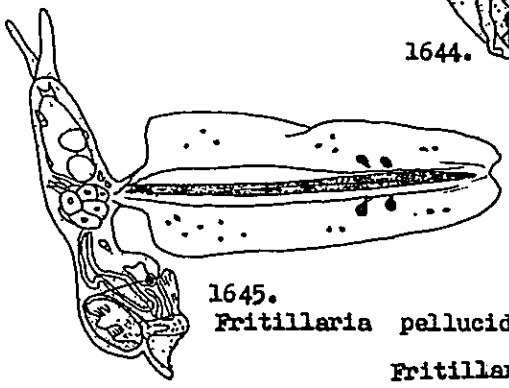
1642.
Stomatopoda's larva
(Erichthus larva)



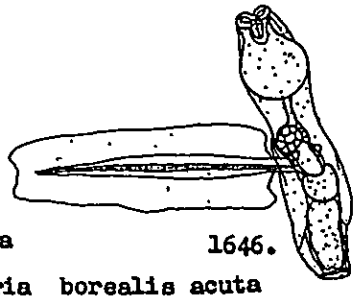
1643. Kowalevskaia tenuis



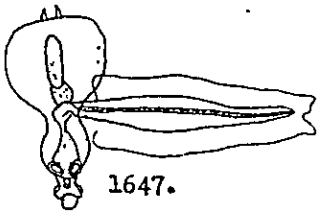
1644. Appendicularia sicula



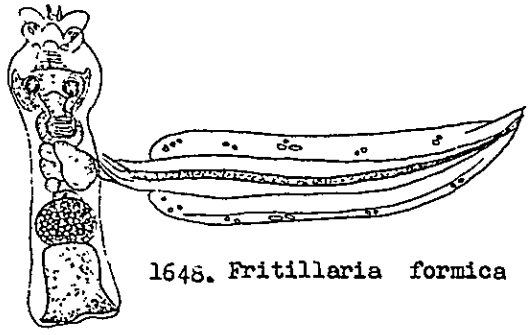
1645.
Fritillaria pellucida



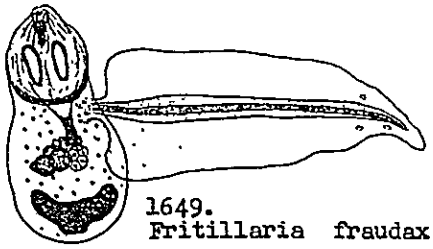
1646.
Fritillaria borealis acuta



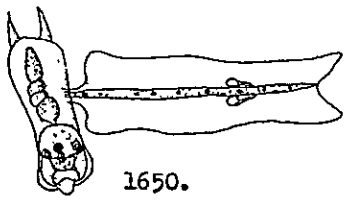
1647.
Fritillaria borealis truncata



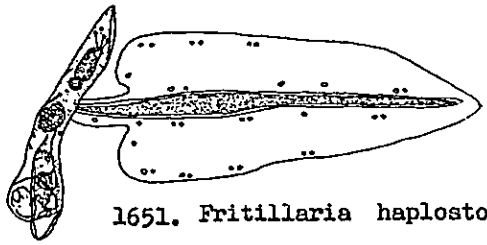
1648. Fritillaria formica



1649.
Fritillaria fraudax

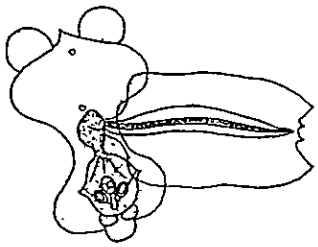


1650.
Fritillaria tenella

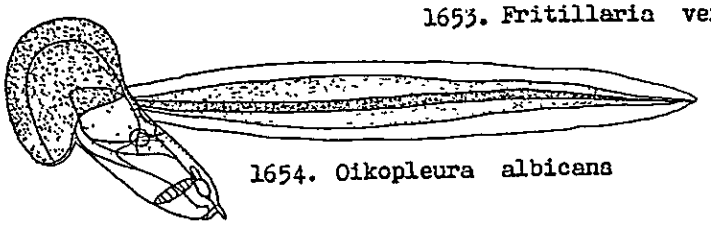


1651. Fritillaria haplostoma

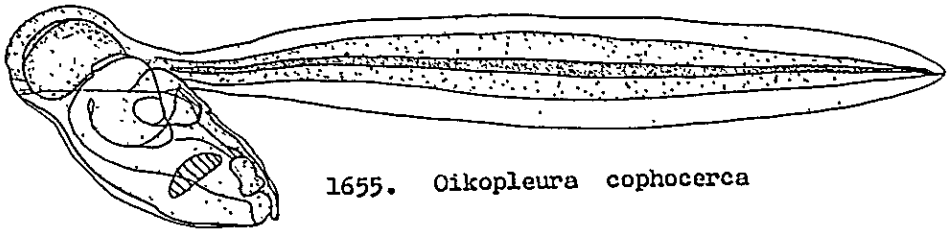
1652. Fritillaria megachile



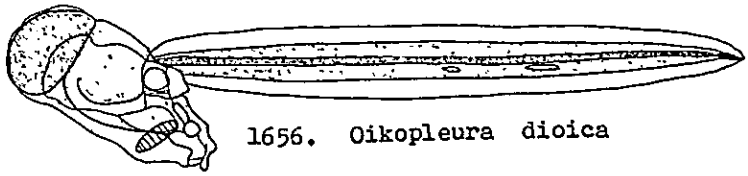
1653. Fritillaria venusta



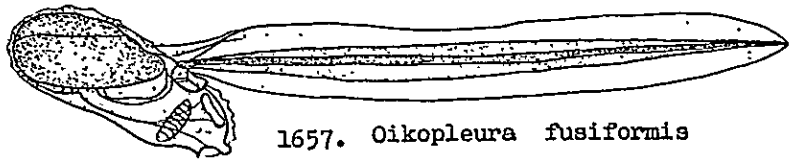
1654. Oikopleura albicans



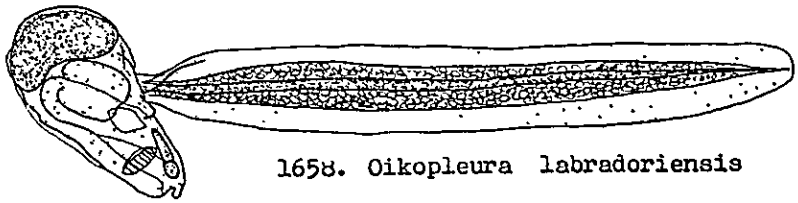
1655. Oikopleura cophocerca



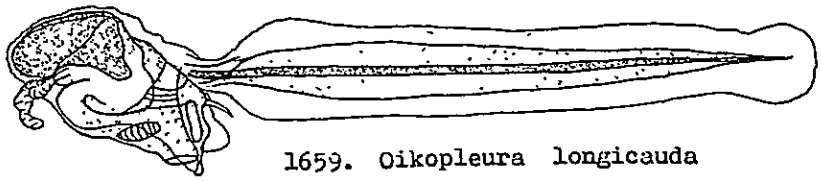
1656. Oikopleura dioica



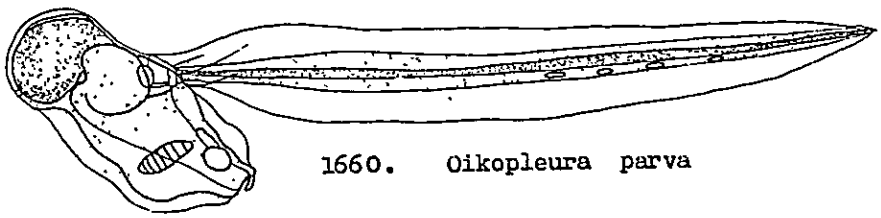
1657. Oikopleura fusiformis



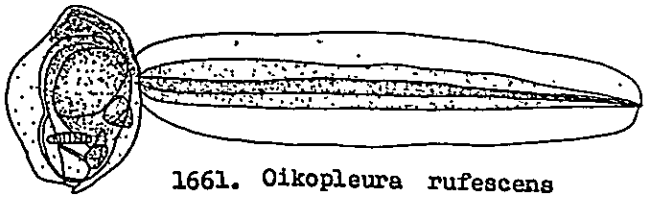
1658. Oikopleura labradoriensis



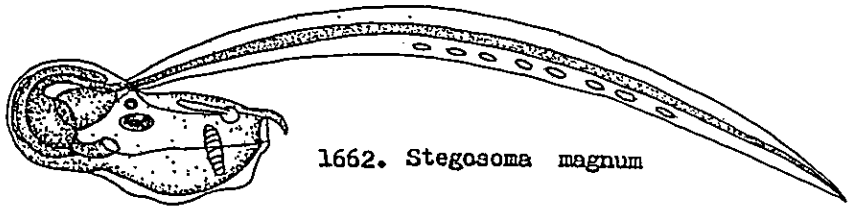
1659. Oikopleura longicauda



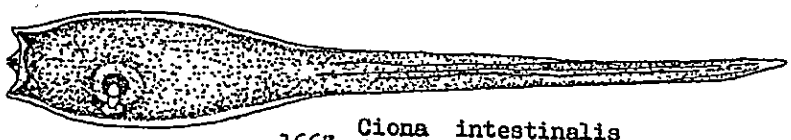
1660. Oikopleura parva



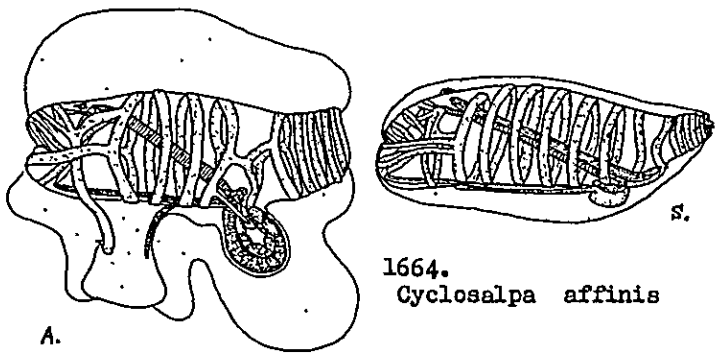
1661. Oikopleura rufescens



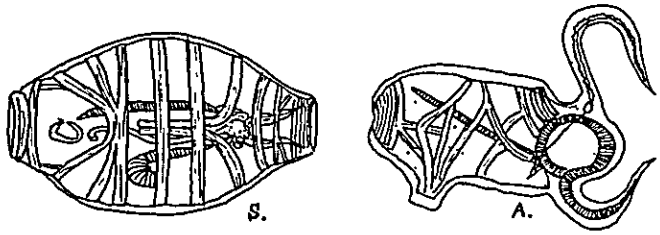
1662. Stegosoma magnum



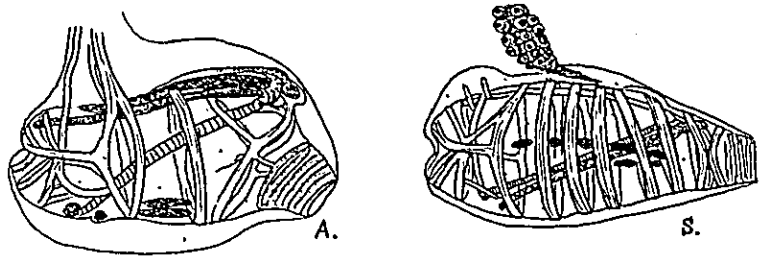
1663. Ciona intestinalis (Appendicularia larva)



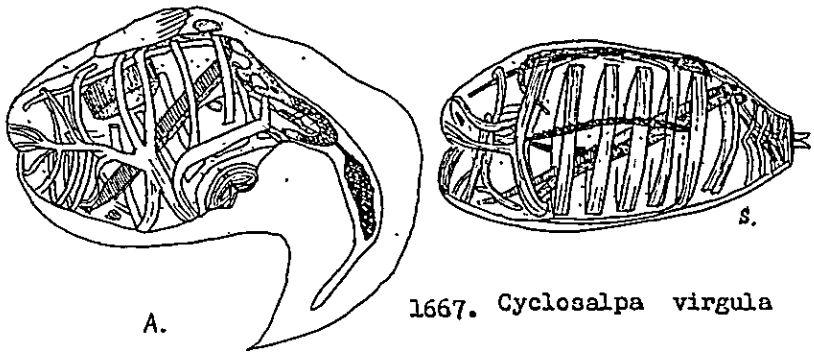
1664. Cyclosalpa affinis



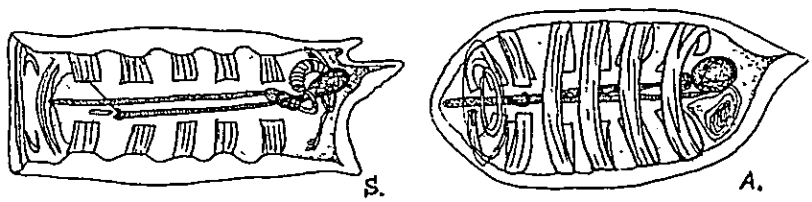
1665. Cyclosalpa bakeri



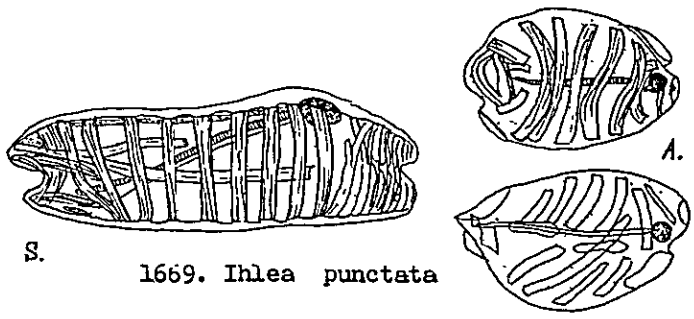
1666. Cyclosalpa pinnata



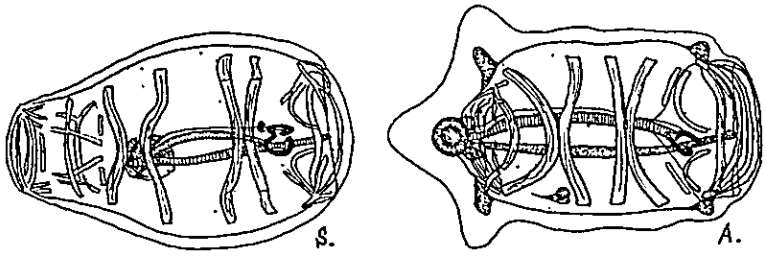
1667. Cyclosalpa virgula



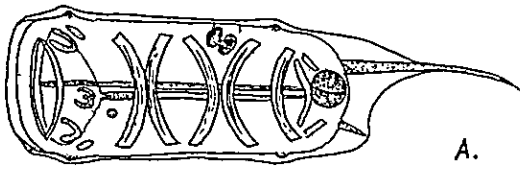
1668. Iasis zonaria



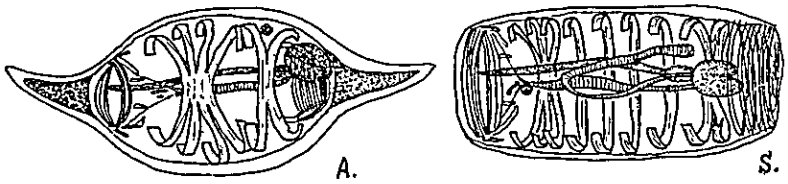
1669. Ihlea punctata



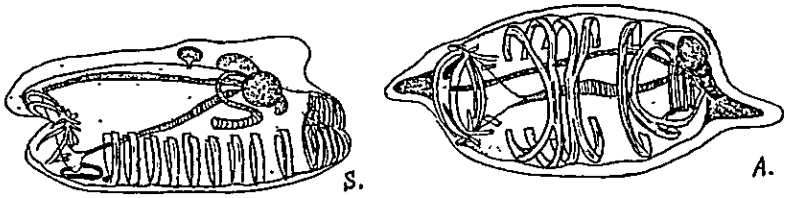
1670. Pegea confoederata



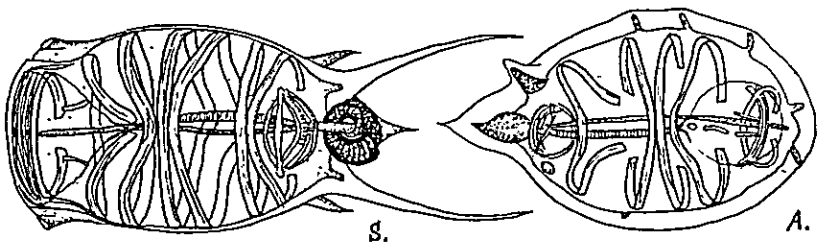
1671. Pegea confoederata var. bicaudata



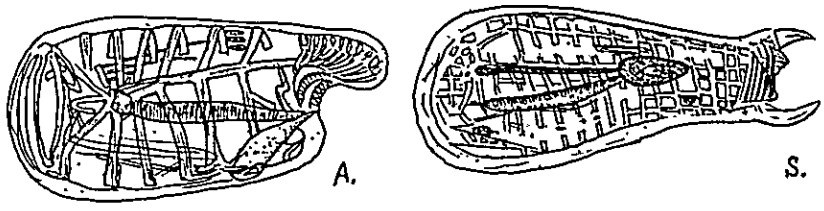
1672. Salpa fusiformis



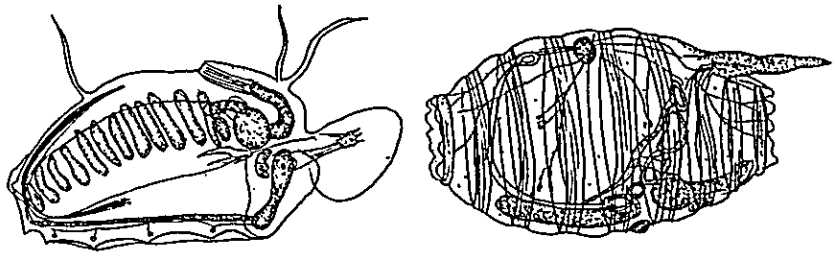
1673. Salpa maxima



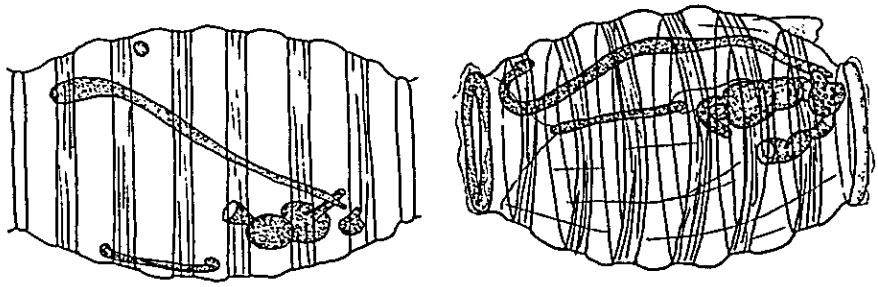
1674. Thalia democratica



1675. Thetys vagina

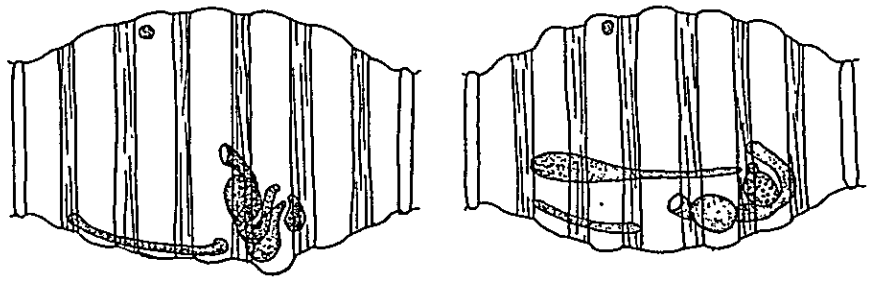


1676. Doliolum denticulatum



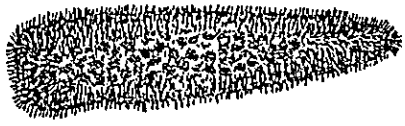
1677. Doliolum gegenbauri

1678. Doliolum gegenbauri var. tritonis

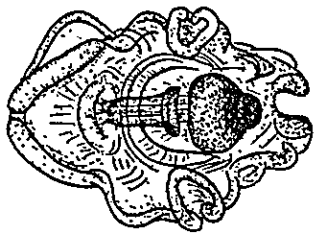


1679. Doliolum mulleri var. krohni

1680. Doliolum nationalis



1681. Pyrosoma atlanticum



1682. Balanoglossus misakiensis
(Tornaria larva)