5-2-3 Size Composition

5-2-3 Size Composition

The size compositions determined in the landing site survey (sample boat survey) of commercially important species are shown in Figs. 5-2-3-1 to 5-2-3-18.

The number of fish on which measurements were made, mean body length, body length range and mode are summarized in Table 5-2-3-1 to 5-2-3-17 for each species in order to compare those results with the size compositions obtained in the sea-borne survey.

(1) Brushtooth Lizardfish *Saurida undosquamis*

The size compositions of brushtooth lizardfish in the landing site survey were obtained in the West and East Mediterranean Sea (Fig. 5-2-3-1, Table 5-2-3-1).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey in the same seasons and same areas with respect to the mean fork length, fork length range and mode, the results of the landing site survey tended to be generally larger.

In addition, when the mean fork lengths in the landing site survey were compared by sub area, those values were found to be 22-24 cm in the West Mediterranean Sea and 19-23 cm in the East Mediterranean Sea, thus indicating that the fork length tends to be smaller in the East Mediterranean Sea than the West Mediterranean Sea.

Moreover, when the results of the landing site survey were compared by season with respect to the fork length, the fork lengths were larger in winter (24 cm in the West Mediterranean Sea and 23 cm in the East Mediterranean Sea), and smaller in summer (22 cm in the West Mediterranean Sea and 19 cm in the East Mediterranean Sea).

Table 5-2-3-1 Size Composition of Brushtooth Lizardfish

Body length:FL in cm

Sub area \ Seasons		Spring			Summer			Autumn			Winter		
		Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey
North Aegean Sea	N												
	MEAN												
	MIN~MAX												
	MODE												
South Aegean Sea	N												
	MEAN												
	MIN~MAX												
	MODE												
West Mediterranean Sea	N						308	280			1,298		311
	MEAN						22	22			19	<	24
	MIN~MAX						13~33	19~27			12~29	< >	14~33
	MODE						21~22, 27~28	19~20			19~20	<	26~27
East Mediterranean Sea	N	616		898	3,158		559	682		1,165	3,379		1,920
	MEAN	22	>	21	16	<	19	22	=	22	17	=	23
	MIN~MAX	10~32	< >	14~29	3~30	< >	14~25	10~31	< >	17~32	7~29	< >	13~35
	MODE	21~22	=	21~22	9~10, 17~18	<	19~20	22~23	<	23~24	10~11, 20~21	<	22~23

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey.

(2) Hake *Merluccius merluccius*

The size compositions of hake in the landing site survey were obtained in the North and South Aegean Sea as well as the West and East Mediterranean Sea (Fig. 5-2-3-2, Table 5-2-3-2).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey in the same seasons and sub areas with respect to the mean total length, total length range and mode, the results of the landing site survey generally tended to be larger than the results of the sea-borne survey with the exception of a portion of the results.

In addition, when the total lengths in the sea-borne survey were compared by area, they were found to be 22-31 cm in the North and South Aegean Sea, and 16-25 cm in the West and East Mediterranean Sea, with those in the Aegean Sea tending to be larger than those in the Mediterranean Sea. When these values are further looked at by sub area, the total lengths were 27-31 cm in the North Aegean Sea and 22-26 cm in the South Aegean Sea, with that in the North Aegean Sea tending to be larger than that in the South Aegean Sea. In the Mediterranean Sea, the total length in the West Mediterranean Sea was 16 (autumn) to 25 (summer) cm, while that in the East Mediterranean Sea was 19 cm (summer only), thus indicating a trend in which the total length tended to be larger in the West Mediterranean Sea than in the East Mediterranean Sea. In addition, in looking at the size compositions by season, large fish was caught in spring in the North and South Aegean Sea, while large fish was caught in summer in the West Mediterranean Sea.

(3) Comber *Serranus cabrilla*

The size compositions of comber in the landing site survey were obtained in the North and South Aegean Sea (Fig. 5-2-3-3, Table 5-2-3-3).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey in the same seasons and same areas with respect to the mean fork length, fork length range and mode, the results of the landing site survey tended to be larger.

In addition, in looking at the size compositions by season, the mean fork length, fork length range and mode all were larger in autumn than in spring.

Table 5-2-3-2 Size Compositions of Hake

Body length:TL in cm

Sub area \ Seasons		Spring			Summer			Autumn			Winter		
		Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey
North Aegean Sea	N	1,277		193	1,628		261	2,465			1,620		115
	MEAN	24	<	31	25	<	31	16			21	<	27
	MIN~MAX	2~68	< >	23~49	6~68	< >	18~51	6~76			8~46	< >	22~36
	MODE	23~24	<	30~31	25~26	>	24~25	41~42			20~21	<	28~29
South Aegean Sea	N	1,612		365	580		175	2,046		284	718		
	MEAN	25	<	26	24	>	22	18	<	24	35		
	MIN~MAX	12~68	= >	14~61	6~70	< >	13~32	6~48	<<	13~51	8~78		
	MODE	21~22	<	24~25	27~28	>	21~22	13~14	<	23~24	12~13, 61~62		
West Mediterranean Sea	N	858			416		104	487		81	1,110		88
	MEAN	25			35	>	25	27	>	16	18	<	22
	MIN~MAX	14~50			8~50	< >	17~40	8~48	>>	6~25	8~44	< >	16~32
	MODE	18~19			35~36, 41~42	>	23~25	15~16, 32~34	>	18~20	14~15	<	21~22
East Mediterranean Sea	N	1,065			2,217		202	2,171			922		
	MEAN	24			18	<	19	19			29		
	MIN~MAX	14~48			44	< >	15~23	8~50			12~46		
	MODE	21~22			14~15, 21~22	≒	19~20	16~17, 20~21			39~40		

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey.

Table 5-2-3-3 Size Compositions of Comber

Body length:FL in cm

Sub area \ Seasons		Spring		Summer		Autumn		Winter	
		Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey
North Aegean Sea	N	1,224		962		1,870		1,082	
	MEAN	15		15		14		14	
	MIN~MAX	12~21		6~32		9~21		11~18	
	MODE	13~14		16~17		13~14		14~15	
South Aegean Sea	N	7,637	442	1,613			379	2,033	
	MEAN	14	< 16	17			(<) 18	17	
	MIN~MAX	8~20	<< 12~21	10~23			(<<) 14~25	16~20	
	MODE	14~15	< 16~17	18~19			(<) 18~19	17~18	
West Mediterranean Sea	N								
	MEAN								
	MIN~MAX								
	MODE								
East Mediterranean Sea	N	1,694							
	MEAN	14							
	MIN~MAX	12~17							
	MODE	14~15							

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey.
Figures in parentheses indicate the results of comparison with sea-borne survey results of adjacent areas in the same season for reference purposes.

(4) **Painted Comber** *Serranus scriba*

The size compositions of painted comber in the landing site survey were obtained in the South Aegean Sea (Fig. 5-2-3-4, Table 5-2-3-4).

Since the sea-borne survey results in the same season and same area that could be compared with the results of the landing site survey were not able to be obtained for this species, a direct comparison was unable to be made. However, when the results of the landing site survey in the South Aegean Sea in summer were compared with the results of the sea-borne survey in the North Aegean Sea, both the mean total length and mode were roughly 4 cm larger in the landing site survey than in the sea-borne survey.

In addition, in looking at the size compositions by season, the mean total length, total length range and mode were all larger in autumn than in summer.

(5) **Red Mullet** *Mullus barbatus*

The size compositions of red mullet in the landing site survey were obtained in the North and South Aegean Sea and the West and East Mediterranean Sea (Fig. 5-2-3-6, Table 5-2-3-5).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey obtained in the same seasons and same areas with respect to the mean fork length, fork length range and mode, nearly all results of the landing site survey tended to be larger.

In addition, when the mean fork lengths in the landing site survey were compared by area, they were found to be 14-17 cm in the North and South Aegean Sea, and 12-17 cm in the West and East Mediterranean Sea, with the values in the Aegean Sea tending to be larger than those in the Mediterranean Sea. When these values were further looked at by sub area, the mean fork lengths were 14-16 cm in the North Aegean Sea and 15-17 cm in the South Aegean Sea, with the values in the South Aegean Sea tending to be larger than those in the North Aegean Sea. In the Mediterranean Sea, the mean fork lengths were 15-17 cm in the West Mediterranean Sea and 12-15 cm in the East Mediterranean Sea, with the values in the East Mediterranean Sea tending to be smaller than those in the West Mediterranean Sea.

Moreover, since the landing site survey results were obtained for nearly all seasons in the case of this species, when the seasonal changes in the size composition by sub area were looked at based on those results, large fish tended to be caught in winter in the North Aegean Sea and East Mediterranean Sea, and mainly in autumn in the South Aegean Sea and West Mediterranean Sea.

Table 5-2-3-4 Size Compositions of Painted Comber

Body length:TL in cm

Sub area \ Seasons		Spring		Summer		Autumn		Winter	
		Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey
North Aegean Sea	N MEAN MIN~MAX MODE			4,983 13 8~24 12~13, 15~16					
South Aegean Sea	N MEAN MIN~MAX MODE			(<) (<<) (<)	793 17 13~22 16~17		215 18 14~23 17~18		
West Mediterranean Sea	N MEAN MIN~MAX MODE								
East Mediterranean Sea	N MEAN MIN~MAX MODE								

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey.
Figures in parentheses indicate the results of comparison with sea-borne survey results of adjacent areas in the same season for reference purposes.

Table 5-2-3-5 Size composition of Red Mullet

Body length:FL in cm

Sub area	Seasons	Spring			Summer			Autumn			Winter		
		Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey
North Aegean Sea	N	5,647		227	3,208		592	2,324		380	2,782		350
	MEAN	12	<	14	13	<	14	13	<	15	13	<	16
	MIN~MAX	7~21	<<	12~21	8~22	<<	10~23	5~20	<<	11~21	8~20	<=	12~20
	MODE	11~12	<	14~15	13~14	>	12~13	13~14	<	15~16	13~14	<	15~16
South Aegean Sea	N	4,165		377	4,359		747	3,934		727	6,252		
	MEAN	13	<	15	13	<	17	13	<	17	11		
	MIN~MAX	7~21	<<	11~23	4~22	<<	12~25	7~23	<<	11~26	8~20		
	MODE	13~14	<	15~16	11~12, 13~14	<	17~18	13~14	<	17~18	10~11		
West Mediterranean Sea	N	4,920		80	3,645		276	4,728		264	8,334		288
	MEAN	13	<	16	12	<	15	14	<	17	11	<	15
	MIN~MAX	8~22	<<	10~24	5~23	<>	9~22	8~23	><	8~24	6~21	<=	9~22
	MODE	13~14	<	11~12, 17~18	12~13	<	17~18	15~16	<	17~18	11~12	<	15~16
East Mediterranean Sea	N	4,217		525	10,377		821	3,354		1,143	1,669		1,644
	MEAN	14	>	13	10	<	12	12	=	12	14	<	15
	MIN~MAX	9~23	<>	10~18	4~21	><	3~25	7~22	>>	7~20	9~21	<=	10~22
	MODE	13~14	=	13~14	6~ 7	<	12~13	12~13	=	12~13	13~14	<	14~16

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-born survey.

(6) Striped Red Mullet *Mullus surmuletus*

The size compositions of striped red mullet in the landing site survey were obtained in the North and South Aegean Sea as well as the West and East Mediterranean Sea (Fig. 5-2-3-7, Table 5-2-3-6).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey obtained in the same seasons and same areas with respect to the mean fork length, fork length range and mode, there were both cases in which the results of the landing site survey were larger, as well as cases in which the results of the landing site survey were smaller.

In addition, when the mean fork lengths in the landing site survey were compared by area, those values were found to be 13-22 cm in the North and South Aegean Sea, and 12-18 cm in the West and East Mediterranean Sea, with the mean fork lengths tending to be larger in the Aegean Sea than in the Mediterranean Sea. When these values were further looked at by sub area, the mean fork lengths were found to be 13-22 cm in the North Aegean Sea and 13-19 cm in the South Aegean Sea, with the values in the North Aegean Sea tending to be slightly larger than those in the South Aegean Sea. In the Mediterranean Sea, the mean fork lengths were 12-17 cm in the West Mediterranean Sea and 18 cm in the East Mediterranean Sea (summer only), suggesting that the values in the West Mediterranean Sea tend to be smaller than those in the East Mediterranean Sea.

The above results indicated a somewhat different trend from that of the previous species of the same genus mentioned above.

(7) Golden-Banded Goatfish *Upeneus moluccensis*

The size compositions of golden-banded goatfish in the landing site survey were obtained in the South Aegean Sea, West Mediterranean Sea and East Mediterranean Sea (Fig. 5-2-3-8, Table 5-2-3-7).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey in the same seasons and same areas with respect to the mean fork length, fork length range and mode, the mixed results were obtained in which there were cases in which the results of the landing site survey were larger, as well as cases in which those results were smaller.

In addition, in looking at the mean fork lengths in the landing site survey by area, they were found to be 14-18 cm in the South Aegean Sea and 12-14 cm in the West and East Mediterranean Sea, with the values in the Aegean Sea tending to be larger than those in the Mediterranean Sea. Furthermore, when looking at the mean fork lengths in the Mediterranean Sea by sub area, there was hardly any difference between the West Mediterranean Sea and East Mediterranean Sea.

Table 5-2-3-6 Size Compositions of Striped Red Mullet

Body length:FL in cm

Sub area	Seasons	Spring			Summer			Autumn			Winter		
		Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey
North Aegean Sea	N	1,310		260	1,599		533	166		402	312		291
	MEAN	14	<	19	15	<	22	17	>	13	19	<	22
	MIN~MAX	11~23	< >	14~22	12~21	<<	17~37	14~25	>>	9~19	17~22	<<	19~25
	MODE	13~14	<	19~20	14~15	<	23~24	14~18	>	13~14	21~22	<	22~23
South Aegean Sea	N	1,162		375	1,093		746	408		222	5,255		
	MEAN	15	>	14	16	>	13	18	>	19	13		
	MIN~MAX	11~33	>>	8~21	12~21	>>	10~16	14~21	> <	13~26	9~17		
	MODE	14~15	>	13~14	15~16	>	12~13	18~19	<	20~21	12~14		
West Mediterranean Sea	N	1,241			788		172	565		20	232		169
	MEAN	16			12	<	17	12	=	12	18	>	17
	MIN~MAX	13~21			7~15	<<	12~25	9~15	> <	7~17	14~26	>>	10~23
	MODE	16~17			12~13	<	16~18	12~14	>	11~12	—		17~19
East Mediterranean Sea	N	429					21	508					
	MEAN	14					18	14					
	MIN~MAX	12~25					17~21	8~24					
	MODE	13~14					17~18	10~11, 17~18					

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey.

Table 5-2-3-7 Size Composition of Golden-Banded Goatfish

Body length:FL in cm

Sub area	Seasons	Spring		Summer		Autumn		Winter	
		Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey
North Aegean Sea	N								
	MEAN								
	MIN~MAX								
	MODE								
South Aegean Sea	N		286	727	104	1,029	269		
	MEAN		17	14 =	14	14 <	18		
	MIN~MAX		11~25	13~16 > <	10~20	10~16 <<	13~25		
	MODE		17~18	14~15 ≒	13~15	14~16 <	19~20		
West Mediterranean Sea	N	1,355	42	5,303	372	1,261	20	11,219	391
	MEAN	13 >	12	12 <	13	13 =	13	13 >	12
	MIN~MAX	9~17 = >	9~16	6~17 <<	8~19	10~17 =	10~17	9~18 > <	6~19
	MODE	12~13, 14~15 ≒	11~12	10~11, 13~14 ≒	12~13	14~15 >	11~12	14~15 >	12~13
East Mediterranean Sea	N	3,057	1,261	8,573	1,072	2,235	1,143	5,401	1,872
	MEAN	10 <	13	10 <	12	13 >	12	13 <	14
	MIN~MAX	7~17 < =	9~17	5~18 < >	8~19	7~19 < >	9~17	8~17 <<	9~19
	MODE	9~10 <	12~14	6~7, 13~14 ≒	12~13	14~15 >	12~13	13~14 <	14~15

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey

(8) Gilt-Head Sea Bream *Sparus aurata*

The size compositions of gilt-head sea bream were obtained in the landing site survey in the North and South Aegean Sea, as well as the West and East Mediterranean Sea (Fig. 5-2-3-9, Table 5-2-3-8).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey obtained in the same seasons and same areas with respect to the mean fork length, fork length range and mode, the results of the landing site survey tended to somewhat smaller overall.

In addition, when the mean fork lengths in the landing site survey were compared by area, they were found to be 19-27 cm in the North and South Aegean Sea, and 12-20 cm in the West and East Mediterranean Sea, with the values in the Aegean Sea being larger than those in the Mediterranean Sea. When these values were further looked at by sub area, they were found to be 19-27 cm in the North Aegean Sea and 20-23 cm in the South Aegean Sea, with those in the North Aegean Sea being larger than those in the South Aegean Sea. In the Mediterranean Sea, the mean fork lengths were 20 cm in the West Mediterranean Sea (winter only) and 12-17 cm in the East Mediterranean Sea, with the values in the West Mediterranean Sea tending to be larger than those in the East Mediterranean Sea.

In addition, when the fork length ranges of the landing site survey results and sea-borne survey results were compared, since the results of the landing site survey demonstrated a broader fork length range, it was thought that this species tends to be caught in a broader range than the body length range obtained in the sea-borne survey in each of the areas.

(9) Large-Eye Dentex *Dentex macrophthalmus*

The size compositions of large-eye dentex were obtained in the North and South Aegean Sea, as well as the West and East Mediterranean Sea (Fig. 5-2-3-10, Table 5-2-3-9).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey in the same seasons and same areas with respect to the mean fork length, fork length range and mode, all the results of the landing site survey were larger.

In addition, when the mean fork lengths in the landing site survey were compared by area, they were found to be 17-28 cm in the North and South Aegean Sea, and 14-17 cm in the West and East Mediterranean Sea, with the mean fork lengths being larger in the Aegean Sea than in the Mediterranean Sea. When these values were further looked at by sub area, the values were 19-28 cm in the North Aegean Sea, and 17-18 cm in the South Aegean Sea, with the values in the North Aegean Sea being larger than those in the South Aegean Sea. In the Mediterranean Sea, the values were 15-17 cm in the West Mediterranean Sea and 14 cm in the East Mediterranean Sea, with the values in the West Mediterranean Sea tending to be larger than those in the East Mediterranean Sea.

Table 5-2-3-8 Size Compositions of Gilt-Head Sea Bream

Body length:FL in cm

Sub area \ Seasons		Spring			Summer			Autumn			Winter		
		Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey
North Aegean Sea	N			123			120			125			194
	MEAN			23			27			19			24
	MIN~MAX			19~29			21~36			16~25			17~33
	MODE			23~24			24~25			19~20			24~25
South Aegean Sea	N	513		185	204		158	81		395			
	MEAN	21	=	21	21	>	20	22	<	23			
	MIN~MAX	19~25	>>	14~39	21~23	><	15~51	22~23	><	15~37			
	MODE	21~22	=	21~22	21~22	>	19~20	22~23	<	23~24			
West Mediterranean Sea	N												58
	MEAN												20
	MIN~MAX												16~27
	MODE												18~19, 20~23
East Mediterranean Sea	N	433		566	384		459	581		1,262	916		930
	MEAN	17	>	16	16	<	17	15	>	12	17	>	16
	MIN~MAX	15~20	><	11~24	15~18	<>	13~23	11~19	><	8~23	15~20	><	12~23
	MODE	17~18	>	15~16	16~17	<	17~18	11~12, 15~16	>	11~12	17~18	>	16~17

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey.

Table 5-2-3-9 Size Compositions of Large-Eye Dentex

Body length:FL in cm

Sub area \ Seasons		Spring		Summer		Autumn		Winter	
		Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey
North Aegean Sea	N	2,041		1,337		1,166	260	170	13
	MEAN	14		14		14 <	19	16 <	28
	MIN~MAX	6~19		9~22		9~20 <<	13~33	13~20 <<	24~35
	MODE	17~18		12~13		16~17 <	19~20	18~19 <	24~25
South Aegean Sea	N	2,984	222	9,205		2,438	237	7,851	
	MEAN	12 <	17	12		13 <	18	13	
	MIN~MAX	7~18 <<	13~25	7~18		8~20 <<	13~25	8~18	
	MODE	12~13 <	17~18	12~13		13~14 <	17~18	12~13	
West Mediterranean Sea	N	581		2,463	333	2,019	141	3,054	401
	MEAN	14		14 <	15	13 <	17	12 <	15
	MIN~MAX	13~18		9~19 <<	10~25	9~21 <<	12~25	8~20 <<	8~23
	MODE	14~15		13~14 =	13~14	14~15 <	18~19	13~14 <	14~15
East Mediterranean Sea	N	576		792		594	11		362
	MEAN	13		12		12 <	14		14
	MIN~MAX	9~17		9~17		9~16 <<	13~15		11~18
	MODE	12~13, 16~17		13~14		12~13 <	14~15		14~15

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey.

(10) **Annular Sea Bream** *Diplodus annularis*

The size compositions of annular sea bream were obtained in the West and East Mediterranean Sea (Fig. 5-2-3-11, Table 5-2-3-10).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey obtained in the same seasons and same areas with respect to the mean fork length, fork length range and mode, the results of the landing site survey tended to be larger in the West Mediterranean Sea, while in the East Mediterranean Sea, the results of the landing site survey tended to be smaller.

In addition, when the mean fork lengths in the landing site survey were compared by sub area, they were found to be 11-12 cm in the West Mediterranean Sea and 8-13 cm in the East Mediterranean Sea, with the values in the East Mediterranean Sea tending to demonstrate a broader range of body sizes throughout the year. Moreover, when the results of the landing site survey were compared by season and sub area with respect to the mean fork length, those values were 12 cm in the West Mediterranean Sea and 8 cm in the East Mediterranean Sea in summer, and 11 cm in the West Mediterranean Sea and 13 cm in the East Mediterranean Sea in winter, demonstrating a trend in which larger fish was caught in the West Mediterranean Sea in summer and in the East Mediterranean Sea in winter.

(11) **Common Two-Banded Sea Bream** *Diplodus vulgaris*

The size compositions of common two-banded sea bream were obtained in the North and South Aegean Sea, and the West and East Mediterranean Sea (Fig. 5-2-3-12, Table 5-2-3-11).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey in the same seasons and areas with respect to the mean fork length, fork length range and mode, all the results of the landing site survey were larger.

In addition, when the mean fork lengths in the landing site survey were compared by area, those values were found to be 17-25 cm in the North and South Aegean Sea, and 15-20 cm in the West and East Mediterranean Sea, with the values in the Aegean Sea tending to be larger than those in the Mediterranean Sea. When these were further look at by sub area, the mean fork lengths were 22-25 cm in the North Aegean Sea and 17-19 cm in the South Aegean Sea, with the values in the North Aegean Sea being larger. In the Mediterranean Sea, the values were 20 cm in the West Mediterranean Sea (summer only) and 15-19 cm in the East Mediterranean Sea, with the values in the West Mediterranean Sea tending to be larger than in the East Mediterranean Sea.

Moreover, when the changes in size composition with respect to the East Mediterranean Sea, for which landing site survey results were obtained throughout all seasons by sub area, were looked at in terms of mean fork length (fork length range), the

mean fork length was found to demonstrate a maximum in winter at 19 cm (12-25 cm), and a minimum in summer at 15 cm (10-20 cm). In addition, since two modes were observed in autumn and winter, this species is believed to add recruit members to its population from autumn to winter in the Mediterranean Sea.

(12) **Common Pandora** *Pagellus erythrinus*

The size compositions of common pandora in the landing site survey were obtained in the North and South Aegean Sea, and West and East Mediterranean Sea (Fig. 5-2-3-13, Table 5-2-3-12).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey in the same seasons and areas with respect to the mean fork length, fork length range and mode, the results of the landing site survey were larger in the North and South Aegean Sea, while in the Mediterranean Sea, the results of the landing site survey tended be larger the West Mediterranean Sea (spring only) and East Mediterranean Sea in summer. However, the results of the landing site survey tended to be smaller in the East Mediterranean Sea in all other seasons.

In addition, when the mean fork lengths in the landing site survey were compared by area, those values were found to be 17-23 cm in the North and South Aegean Sea, and 12-15 cm in the West and East Mediterranean Sea, with the values being larger in the Aegean Sea than in the Mediterranean Sea. When these values were further looked at by sub area, the mean fork lengths were found to be 18-23 cm in the North Aegean Sea and 17-19 cm in the South Aegean Sea, with the values in the North Aegean Sea being larger than those in the South Aegean Sea. In the Mediterranean Sea, the values were 14 cm in the West Mediterranean Sea (spring only) and 12-15 cm in the East Mediterranean Sea (throughout all seasons). As such, size differences between sub areas were unclear.

Moreover, in looking at the changes in size compositions with respect to the East Mediterranean Sea, for which the landing site survey results were obtained throughout all seasons by sub area, in terms of mean fork length (fork length range), those values were found to demonstrate a maximum in winter at 15 cm (10-22 cm), indicating a trend that was similar to the two species of this family mentioned above.

Table 5-2-3-10 Size Compositions of Annular Sea Bream

Body length:FL in cm

Sub area \ Seasons		Spring		Summer		Autumn		Winter	
		Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey
North Aegean Sea	N	9,559		6,599		1,503		549	
	MEAN	10		10		10		11	
	MIN~MAX	7~18		7~16		8~13		9~14	
	MODE	10~11		10~11		10~11		10~11	
South Aegean Sea	N	3,204		3,601		2,769		1,877	
	MEAN	11		11		11		10	
	MIN~MAX	8~18		8~17		8~16		8~13	
	MODE	10~11		11~12		10~11		10~11	
West Mediterranean Sea	N			7,534	62	9,714		14,312	21
	MEAN			11	< 12	12		10	< 11
	MIN~MAX			8~15	<= 9~15	9~16		7~13	<= 9~13
	MODE			11~12	= 11~12	12~13		10~11	< 11~12
East Mediterranean Sea	N		410	1,200	238	700	273		497
	MEAN		11	11	> 8	10	= 10		13
	MIN~MAX		9~16	8~15	>> 5~12	9~13	>= 7~13		10~16
	MODE		11~12	11~12	> 8~ 9	11~12	= 11~12		13~14

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey.

Table 5-2-3-11 Size Compositions of Common Two-Banded Sea Bream

Body length:FL in cm

Sub area \ Seasons		Spring			Summer			Autumn			Winter		
		Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey
North Aegean Sea	N	1,576		71	783		591				5,297		161
	MEAN	14	<	22	12	<	25				16	<	24
	MIN~MAX	9~19	<<	18~27	8~17	<<	15~52				12~20	<<	20~35
	MODE	13~14	<	21~22	8~9, 11~12	<	24~25				15~17	<	23~24
South Aegean Sea	N			193			670			310			
	MEAN			18			17			19			
	MIN~MAX			12~25			12~24			14~26			
	MODE			16~17			18~19			19~20			
West Mediterranean Sea	N			20									
	MEAN			20									
	MIN~MAX			16~24									
	MODE			22~23									
East Mediterranean Sea	N			809			864	816		659			1,728
	MEAN			17			15	15	<	16			19
	MIN~MAX			12~24			10~20	13~18	> <	9~22			12~25
	MODE			18~19			15~16	15~16	<	14~15, 19~20			18~19, 22~23

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey.

Table 5-2-3-12 Size Compositions of Common Pandora

Body length:FL in cm

Sub area \ Seasons		Spring			Summer			Autumn			Winter		
		Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey
North Aegean Sea	N	3,402			1,438		339	778		235	386		
	MEAN	16			15	<	23	16	<	18	16		
	MIN~MAX	11~24			9~24	<<	17~42	9~21	<<	13~24	11~21		
	MODE	14~15			13~14	<	22~23	14~15	<	18~19	16~17		
South Aegean Sea	N	1,821		401	3,727		979	2,654		557	1,653		
	MEAN	16	<	18	15	<	17	15	<	19	15		
	MIN~MAX	8~25	<=	12~25	10~23	<=	13~24	11~25	<<	12~26	13~19		
	MODE	14~15	<	16~17	15~16	<	16~17	12~13	<	19~20	15~16, 19~20		
West Mediterranean Sea	N	8,786		63	2,467			1,740			1,334		
	MEAN	13	<	14	13			14			16		
	MIN~MAX	10~19	<=	11~19	7~20			7~23			12~24		
	MODE	11~12	<	14~15	13~14			14~15			15~16, 19~20		
East Mediterranean Sea	N	1,573		985	7,318		428	1,873		882	572		1,535
	MEAN	14	>	13	10	<	13	15	>	12	15	=	15
	MIN~MAX	8~23	< >	9~19	5~19	< >	10~17	8~24	< >	10~18	13~20	> =	10~22
	MODE	11~12, 15~16	>	12~13	7~8, 13~14	≦	13~14	15~16	>	11~12	15~16	=	15~16

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey.

(13) **Axillary Sea Bream** *Pagellus acarne*

The size compositions of axillary sea bream in the landing site survey were obtained in the North and South Aegean Sea, and West and East Mediterranean Sea (Fig. 5-2-3-14, Table 5-2-3-13).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey obtained in the same seasons and same areas with respect to the mean fork length, fork length range and mode, the results of the landing site survey were larger in the North and South Aegean Sea, while in the Mediterranean Sea, a mixture of results were obtained in which there were cases in which the results of the landing site survey were larger, as well as cases in which they were smaller.

In addition, when the mean fork lengths in the landing site survey were compared by area, those values were 15-20 cm in the North and South Aegean Sea, and 12-15 cm in the West and East Mediterranean Sea, with the values in the Aegean Sea being larger than those in the Mediterranean Sea. When these values were further looked at by sub area, they were found to be 16-20 cm in the North Aegean Sea and 15-16 cm in the South Aegean Sea, with the mean fork lengths being larger in the North Aegean Sea than in the South Aegean Sea. In the Mediterranean Sea, the values were 15 cm in the West Mediterranean Sea (winter only) and 12-15 cm in the East Mediterranean Sea, with the values in the West Mediterranean Sea tending to be larger than those in the East Mediterranean Sea.

(14) **Red Sea Bream** *Pagellus bogaraveo*

The size compositions of red sea bream in the landing site survey were obtained in the North and South Aegean Sea, and West Mediterranean Sea (Fig. 5-2-3-15, Table 5-2-3-14).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey obtained in the same seasons and same areas with respect to the mean fork length, fork length range and mode, the results of the landing site survey tended to be larger in the North and South Aegean Sea as well as the West Mediterranean Sea.

In addition, when the mean fork lengths in the results of the landing site survey were compared by area, they were found to be 15-16 cm in the North and South Aegean Sea, and 16 cm in the West Mediterranean Sea. Thus there were no size differences observed according to area.

Table 5-2-3-13 Size Compositions of Axillary Sea Bream

Body length:FL in cm

Sub area \ Seasons		Spring			Summer		Autumn			Winter		
		Sea-borne Survey		Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey		Landing Site Survey	Sea-borne Survey		Landing Site Survey
North Aegean Sea	N	10,292		79	1,325		1,760		7			111
	MEAN	13	<	16	12		14	<	18			20
	MIN~MAX	11~18	<<	12~21	10~18		11~21	< =	17~21			18~24
	MODE	13~14	<	15~16	11~12		14~15	<	17~18			21~22
South Aegean Sea	N	4,070		298	5,517		10,943		433			
	MEAN	14	<	15	12		14	<	16			
	MIN~MAX	5~18	<<	11~23	8~17		7~19	<<	12~23			
	MODE	13~14	<	14~15, 16~17	13~14		14~16	<	16~17			
West Mediterranean Sea	N				656		955			10,855		313
	MEAN				12		11			11	<	15
	MIN~MAX				11~15		10~13			8~15	<<	12~19
	MODE				12~13		12~13			11~12	<	16~17
East Mediterranean Sea	N	7,213		170	3,044		1,128		206			
	MEAN	14	<	15	12		13	>	12			
	MIN~MAX	11~19	< =	12~19	8~20		11~17	= >	11~15			
	MODE	14~15	<	15~16	11~12		13~14	>	12~13			

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey.

Table 5-2-3-14 Size Compositions of Red Sea Bream

Body length:FL in cm

Sub area \ Seasons		Spring		Summer		Autumn		Winter	
		Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey
North Aegean Sea	N	1,300	108			937		1,126	
	MEAN	12 <	16			12		12	
	MIN~MAX	9~20 < =	13~20			11~14		9~19	
	MODE	11~12 <	15~16			12~13		13~14	
South Aegean Sea	N			123	834				
	MEAN			14 <	15				
	MIN~MAX			14~15 > <	11~20				
	MODE			14~15 =	14~15				
West Mediterranean Sea	N	4,491			21				
	MEAN	11		(<)	16				
	MIN~MAX	10~14		(<<)	14~20				
	MODE	11~12		(<)	16~17				
East Mediterranean Sea	N			80					
	MEAN			12					
	MIN~MAX			11~13					
	MODE			11~13					

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey. Figures in parentheses indicate the results of comparison with sea-borne survey results of adjacent areas in the same season for reference purposes.

(15) **Barracuda** *Sphyraena sphyraena*

The size compositions of barracuda in the landing site survey were obtained in the South Aegean Sea only (Fig. 5-2-3-16, Table 5-2-3-15).

Although the results of the landing site survey for this species were unable to be directly compared since the results of the sea-borne survey were unable to be obtained for the same seasons and areas, when the mean fork length of 41-56 cm and fork length range of 27-83 cm in the landing site survey for the South Aegean Sea were compared with the mean fork length of 25-28 cm and fork length range of 22-35 cm in the sea-borne survey for the Mediterranean Sea, it was thought that the results of the landing site survey tended to be larger than the results of the sea-borne survey.

(16) **Obtuse Barracuda** *Sphyraena chrysotaenia*

The size compositions of obtuse barracuda were obtained in the West Mediterranean Sea (Fig. 5-2-3-17, Table 5-2-3-16).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey obtained in the same seasons and areas with respect to the mean fork length, fork length range and mode, the results of the landing site survey tended to be larger in summer, while the results of the landing site survey tended to be smaller in winter.

In addition, when the mean fork lengths in the landing site survey were compared by season, those values were the smallest in autumn (13 cm), and within a range of 21-22 cm in other seasons.

(17) **Common Sole** *Solea vulgaris*

The size compositions of common sole in the landing site survey were obtained in the North Aegean Sea, West Mediterranean Sea and East Mediterranean Sea (Fig. 5-2-3-18, Table 5-2-3-17).

When the size compositions of this species in the landing site survey were compared with the results of the sea-borne survey in the same seasons and areas with respect to the mean total length, total length range and mode, the results of the landing site survey demonstrated smaller values in the North Aegean Sea, West Mediterranean Sea and East Mediterranean Sea.

In addition, when the mean total lengths in the landing site survey were compared by area, those values were 20-39 cm in the North Aegean Sea and 18-27 cm in the West and East Mediterranean Sea, with the values in the Aegean Sea tending to be larger than those in the Mediterranean Sea. When these values were further looked at by sub area with respect to the Mediterranean Sea, the mean total lengths were 25-27 cm in the West Mediterranean Sea and 18-24 cm in the East Mediterranean Sea, with the values tending to be larger in the West Mediterranean Sea than in the East Mediterranean Sea.

Moreover, when the changes in size compositions were looked at in terms of mean total length (total length range) with respect to the North Aegean Sea and East Mediterranean Sea, for which the landing site survey results were obtained throughout all seasons by sub area, those values demonstrated a maximum in summer at 39 cm (21-56 cm) and a minimum in autumn at 20 cm (15-25 cm) in the North Aegean Sea. In the East Mediterranean Sea, those values demonstrated a maximum in spring at 24 cm (15-35 cm) and a minimum in summer at 18 cm (10-25 cm).

Table 5-2-3-15 Size Compositions of Barracuda

Body length:FL in cm

Sub area \ Seasons		Spring		Summer		Autumn		Winter	
		Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey
North Aegean Sea	N								
	MEAN								
	MIN~MAX								
	MODE								
South Aegean Sea	N		81				72		
	MEAN		56				41		
	MIN~MAX		27~83				27~66		
	MODE		50~51, 54~55 56~57, 62~63				27~28, 52~53		
West Mediterranean Sea	N			140					
	MEAN			25					
	MIN~MAX			24~26					
	MODE			24~26					
East Mediterranean Sea	N			482		524			
	MEAN			27		28			
	MIN~MAX			22~35		25~30			
	MODE			26~27		29~30			

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey.

Table 5-2-3-16 Size Compositions of Obtuse Barracuda

Body length:FL in cm

Sub area \ Seasons		Spring		Summer		Autumn		Winter	
		Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey
North Aegean Sea	N MEAN MIN~MAX MODE								
South Aegean Sea	N MEAN MIN~MAX MODE					246 23 21~26 21~22			
West Mediterranean Sea	N MEAN MIN~MAX MODE		67 22 18~26 24~25	880 19 15~26 20~21	127 < 21 << 16~31 < 21~22		20 13 12~16 12~13		180 (>) 22 (>>) 18~27 (≒) 22 ~23
East Mediterranean Sea	N MEAN MIN~MAX MODE			624 19 13~26 20~22				851 25 22~31 22~23	

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey. Figures in parentheses indicate the results of comparison with sea-borne survey results of adjacent areas in the same season for reference purposes.

Table 5-2-3-17 Size Compositions of Common Sole

Body length:FL in cm

Sub area \ Seasons		Spring		Summer		Autumn		Winter	
		Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey	Sea-borne Survey	Landing Site Survey
North Aegean Sea	N	138	108		107	57	130		58
	MEAN	31 >	29		39	31 >	20		29
	MIN~MAX	30~32 ><	24~41		21~56	31~32 >>	15~25		24~41
	MODE	30~32 ≒	30~31		40~41	31~32 >	20~21		26~27
South Aegean Sea	N						135		
	MEAN						27		
	MIN~MAX						21~41		
	MODE						27~28		
West Mediterranean Sea	N		20		43				164
	MEAN		25		25				27
	MIN~MAX		21~29		20~36				15~36
	MODE		27~28		22~24				27~28
East Mediterranean Sea	N	213	1,116	1,399	687	41	1,011	71	1,821
	MEAN	27 >	24	20 >	18	29 >	20	27 >	23
	MIN~MAX	23~31 >>	15~35	13~28 >>	10~25	29~30 >>	13~25	27~28 ><	12~41
	MODE	23~24, 29~31 >	22~23	20~21 >	18~19	29~30	> 15~16, 21~22	27~28 <	21~22

Note:
Equality and inequality signs indicate the quantitative relationship between the results of the landing site survey and the results of the sea-borne survey.

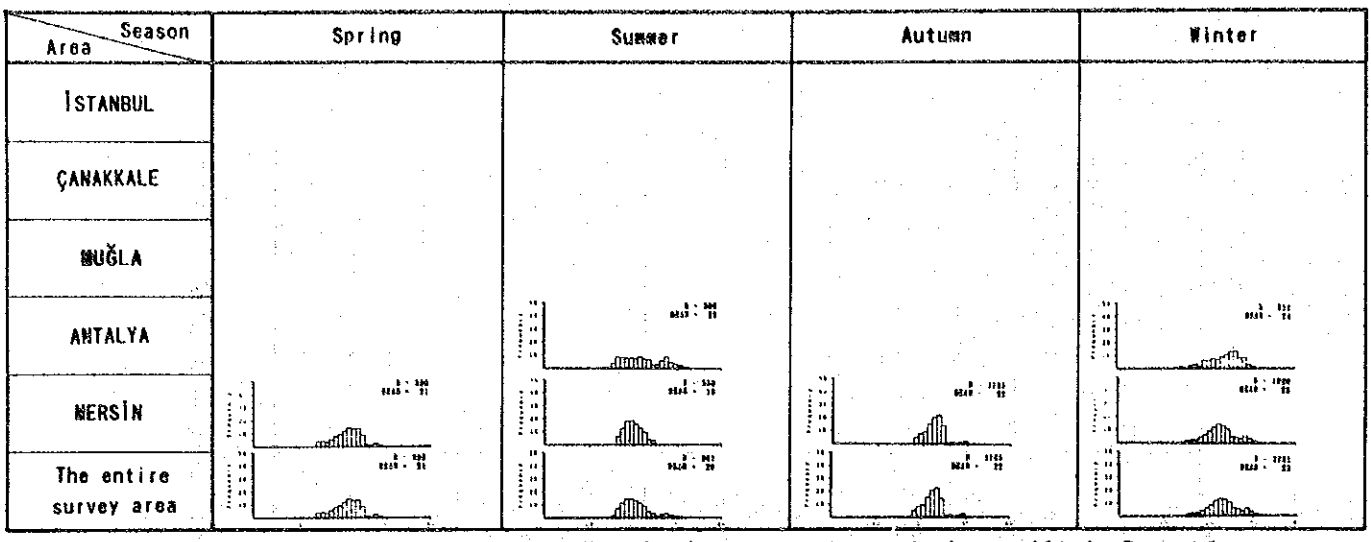


Fig. 5-2-3-1 Size composition (FL) of brushtooth lizardfish *Saurida undosquamis* by the representative prefectures for each sub areas and seasons

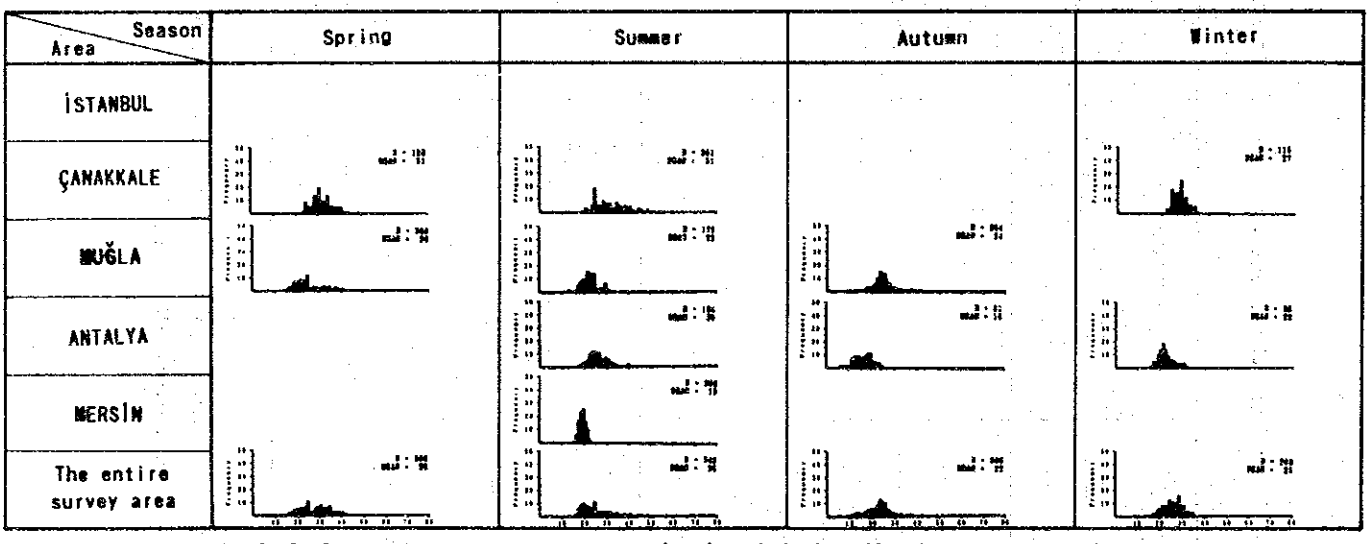


Fig. 5-2-3-2 Size composition (TL) of hake *Merluccius merluccius* by the representative prefectures for each sub areas and seasons

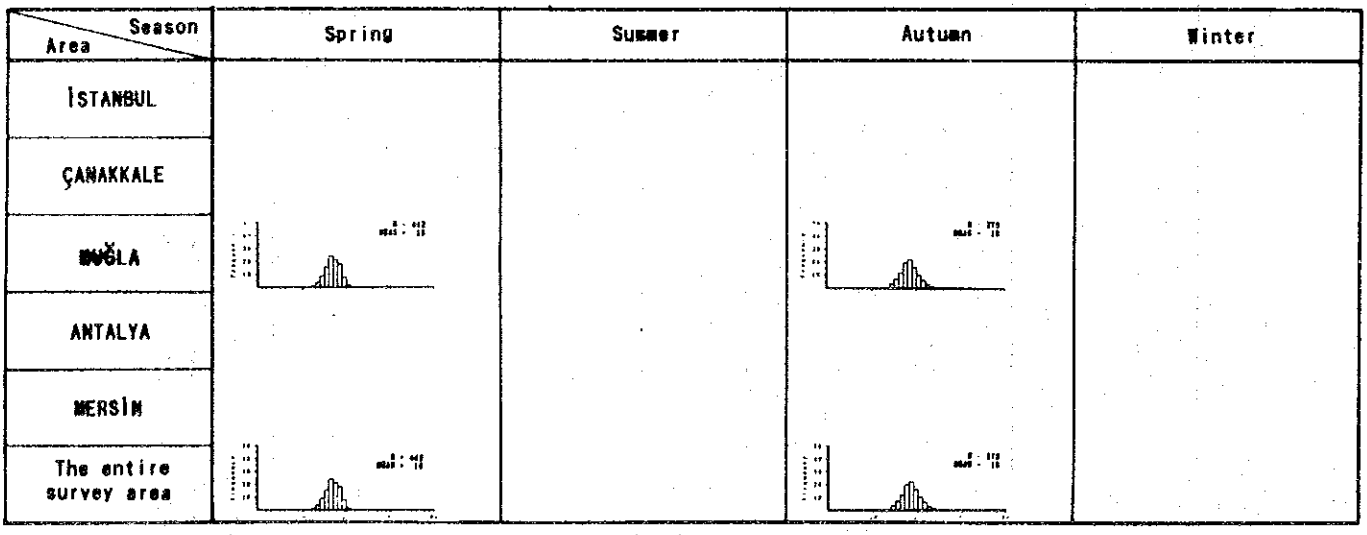


Fig. 5-2-3-3 Size composition (FL) of comber *Serranus cabrilla* by the representative prefectures for each sub areas and seasons

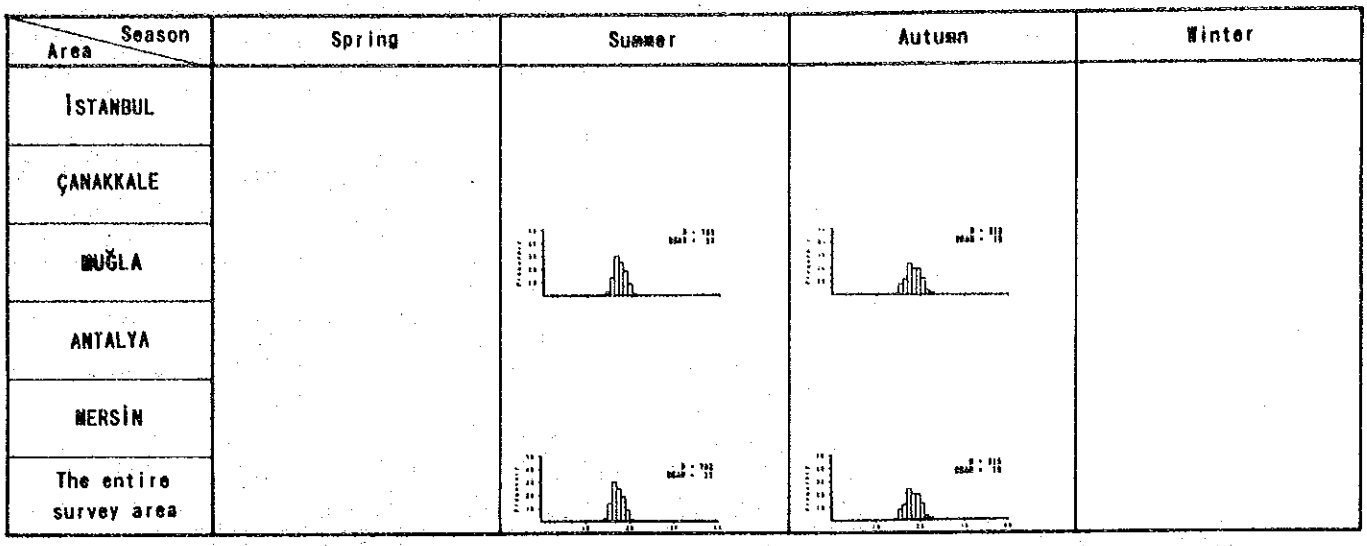


Fig. 5-2-3-4 Size composition (TL) of painted comber *Serranus scriba* by the representative prefectures for each sub areas and seasons

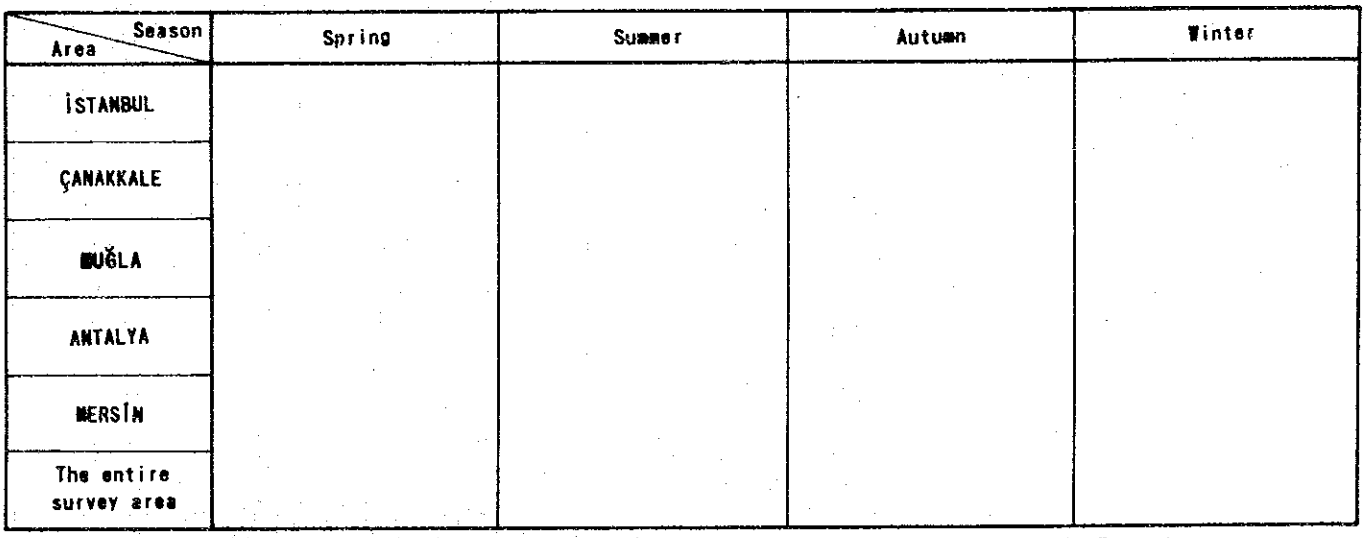


Fig. 5-2-3-5 Size composition (FL) of Atlantic horse-mackerel *Trachurus trachurus* by the representative prefectures for each sub areas and seasons

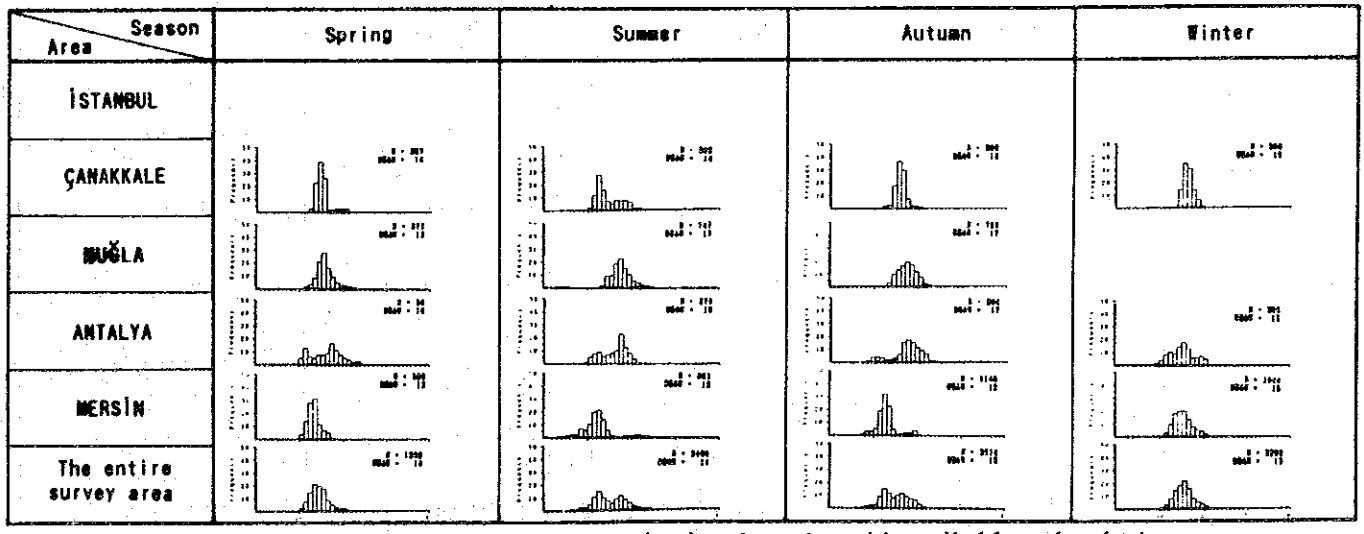


Fig. 5-2-3-6 Size composition (FL) of red mullet *Mullus barbatus* by the representative prefectures for each sub areas and seasons

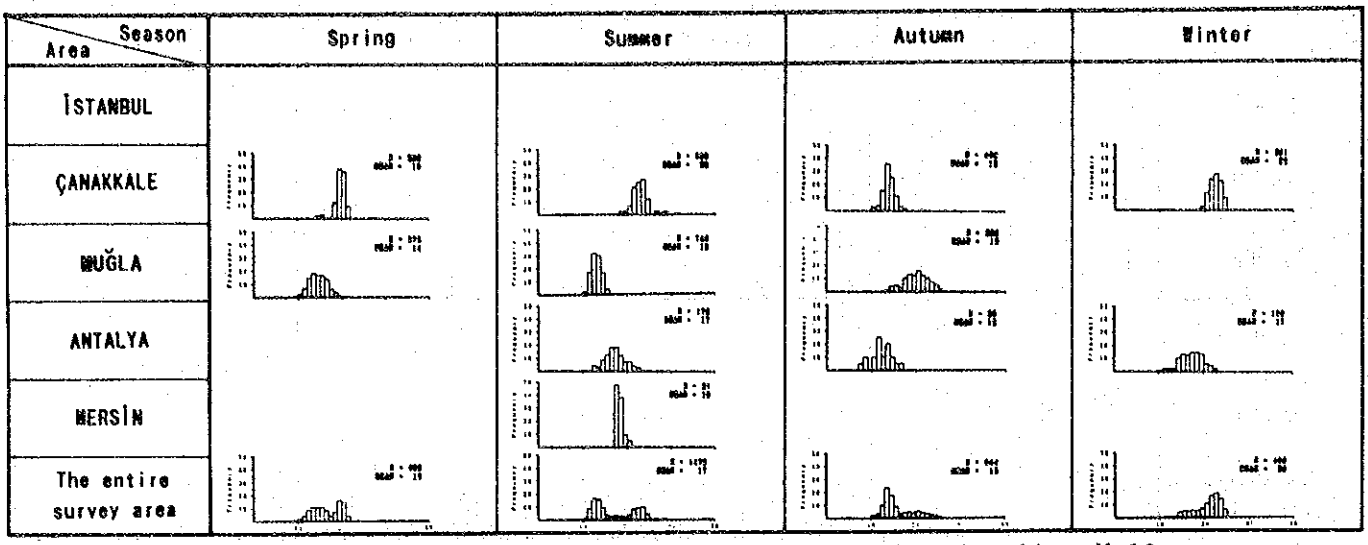


Fig. 5-2-3-7 Size composition (FL) of striped red mullet *Mullus surmuletus* by the representative prefectures for each sub areas and seasons

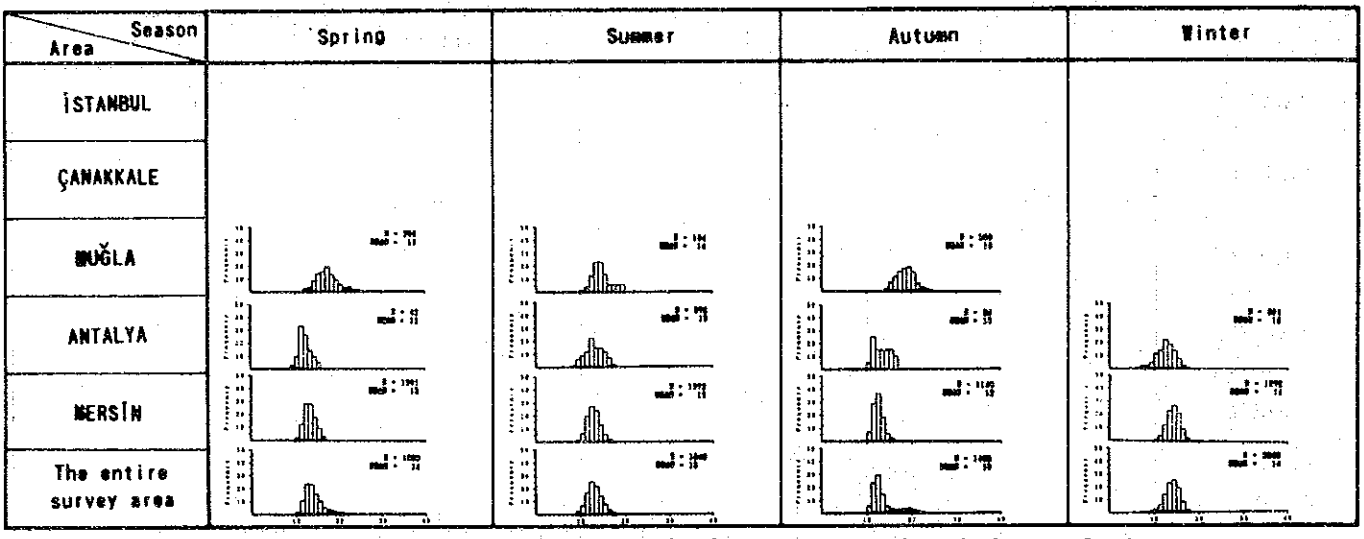


Fig. 5-2-3-8 Size composition (FL) of golden-banded goatfish *Upeneus moluccensis* by the representative prefectures for each sub areas and seasons

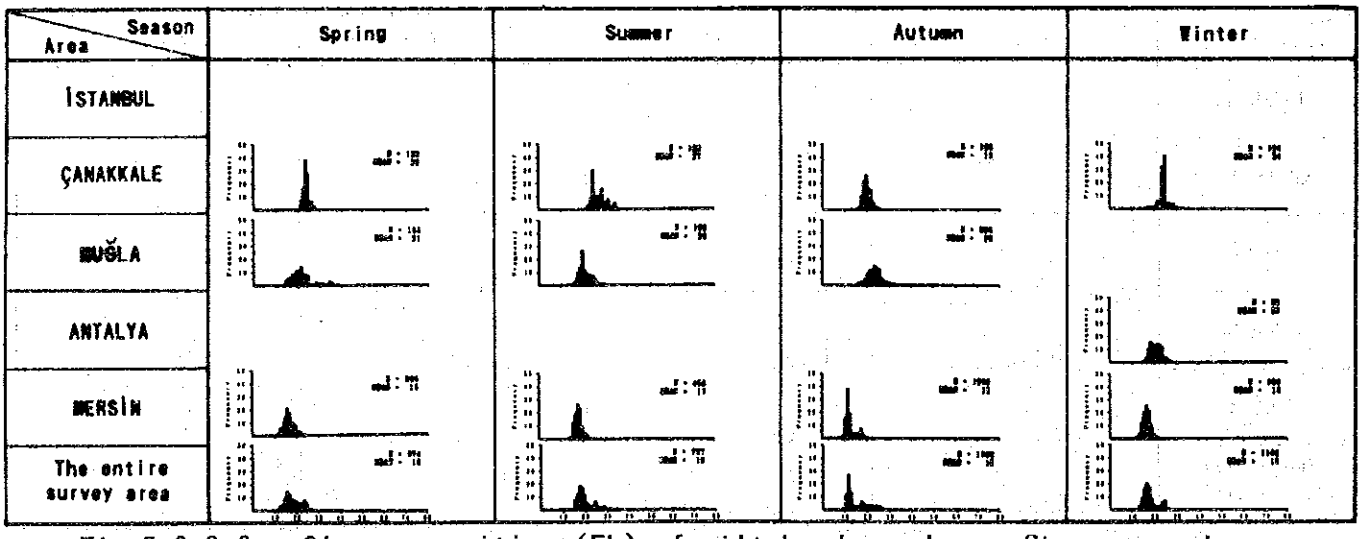


Fig. 5-2-3-9 Size composition (FL) of gilt-head sea bream *Sparus aurata* by the representative prefectures for each sub areas and seasons

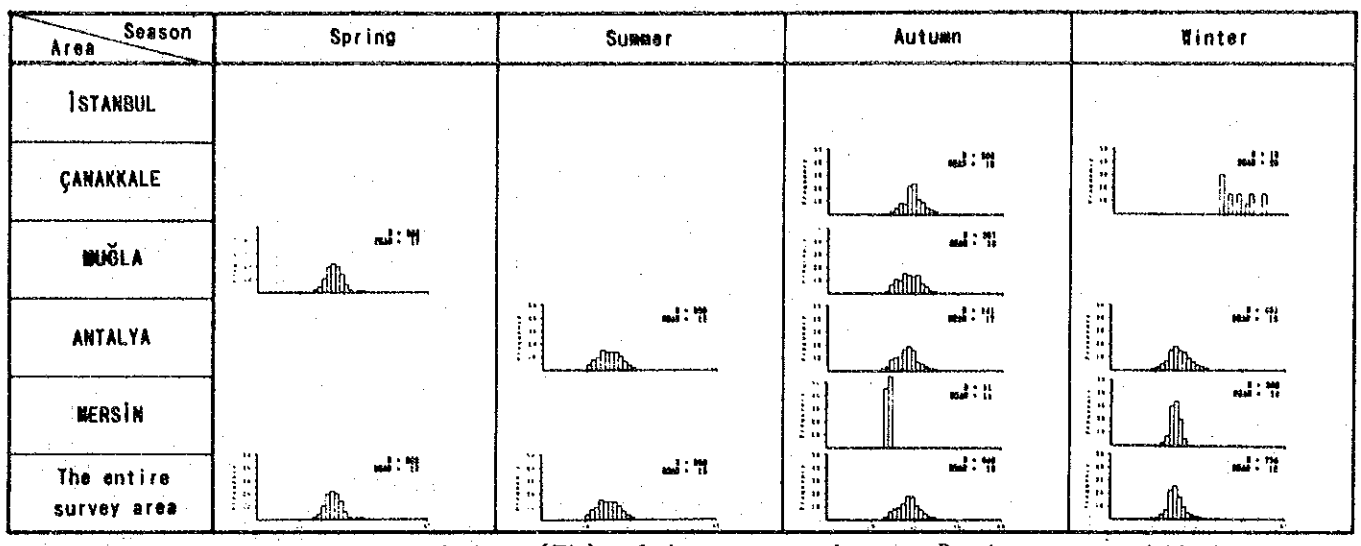


Fig. 5-2-3-10 Size composition (FL) of large-eye dentex *Dentex macrophthalmus* by the representative prefectures for each sub areas and seasons

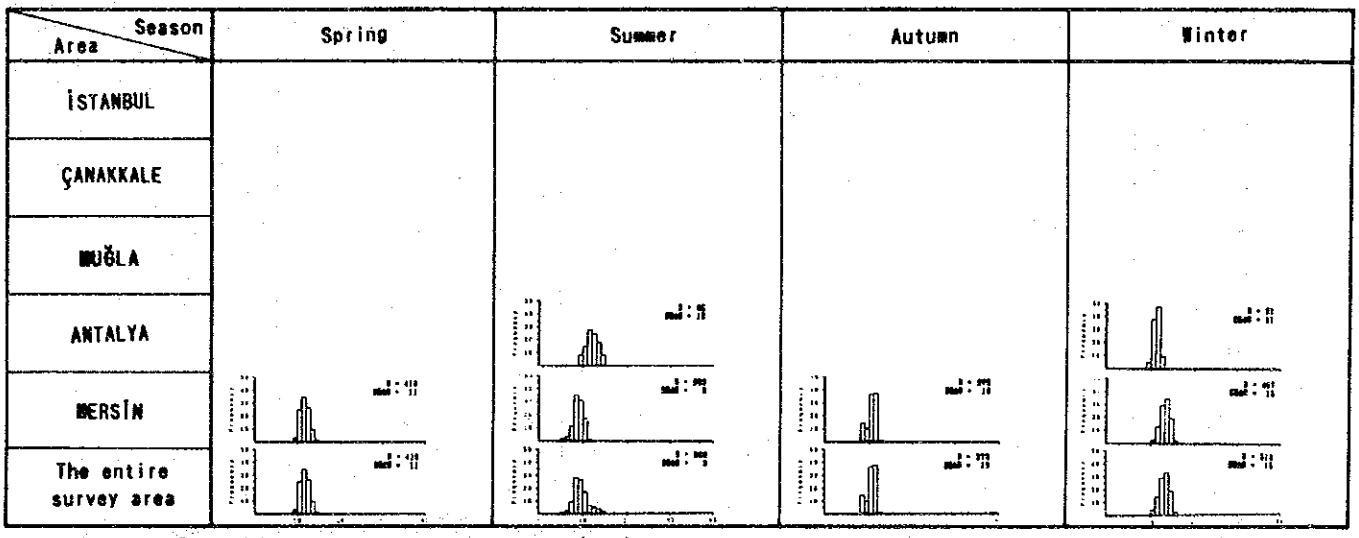


Fig. 5-2-3-11 Size composition (FL) of annular sea bream *Diplodus annularis* by the representative prefectures for each sub areas and seasons

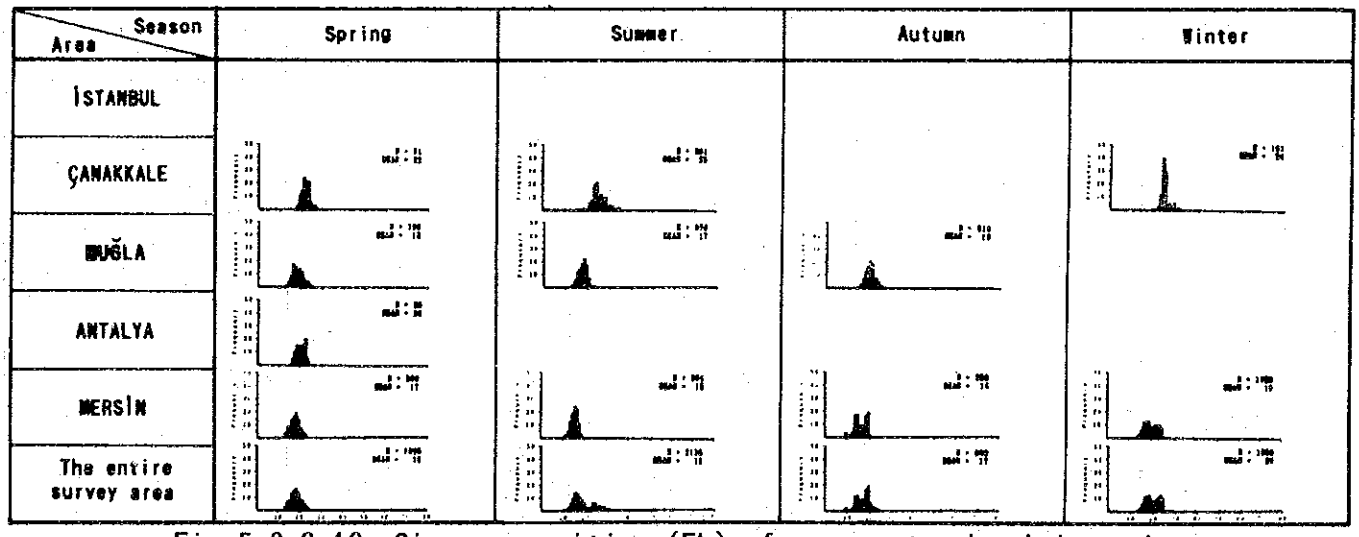


Fig. 5-2-3-12 Size composition (FL) of common two-banded sea bream *Diplodus vulgaris* by the representative prefectures for each sub areas and seasons

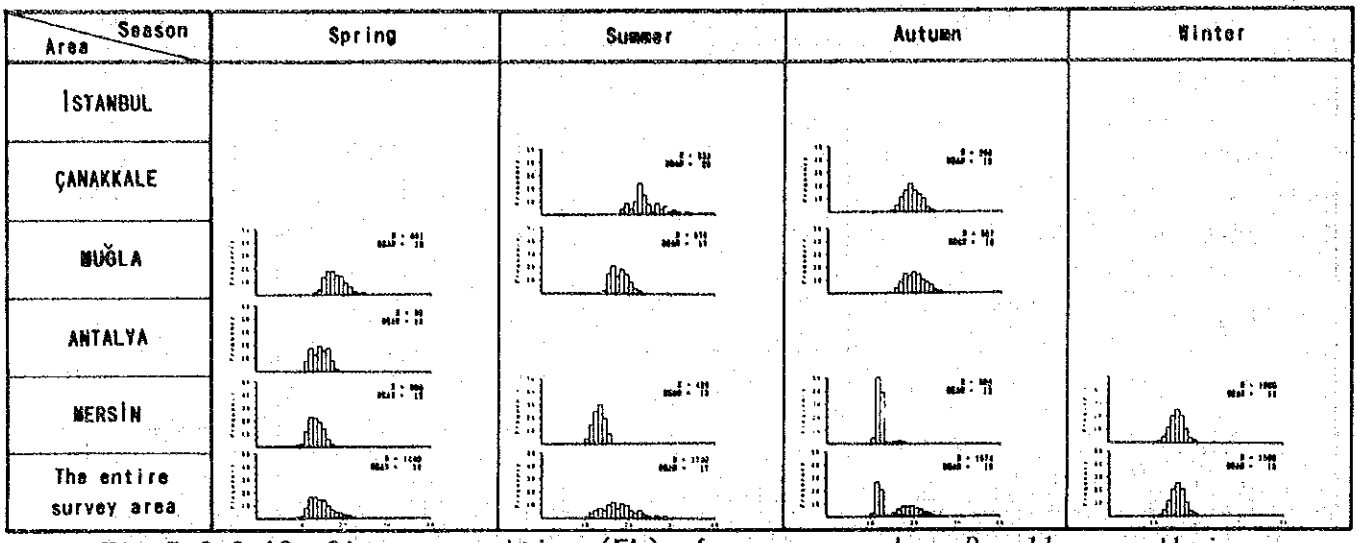


Fig. 5-2-3-13 Size composition (FL) of common pandora *Pagellus erythrinus* by the representative prefectures for each sub areas and seasons

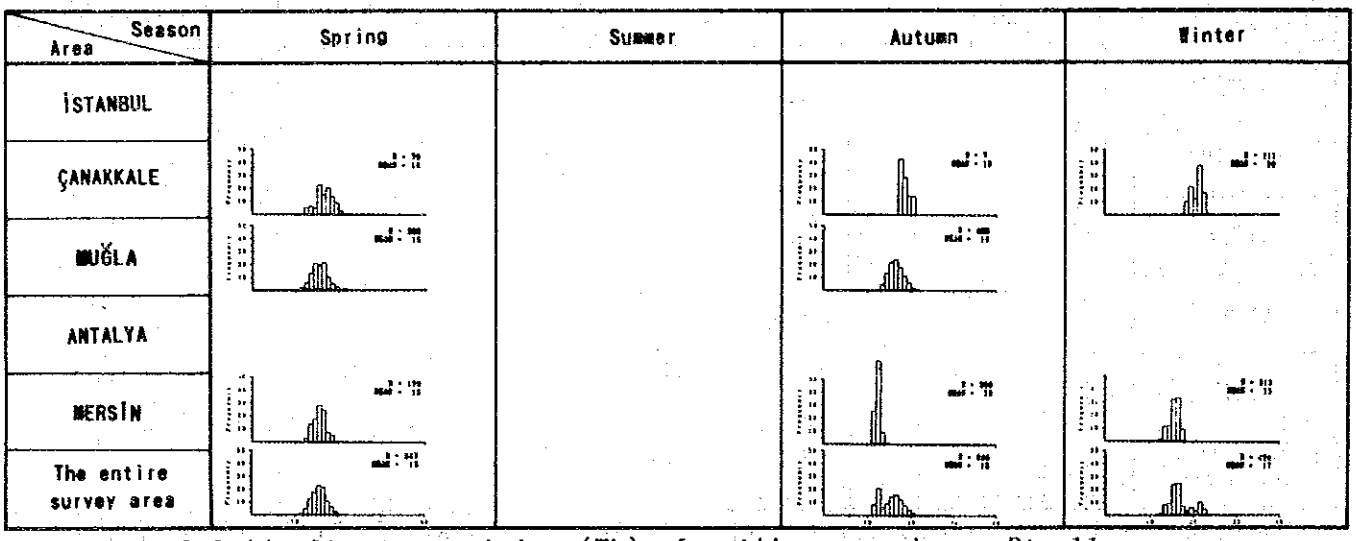


Fig. 5-2-3-14 Size composition (FL) of axillary sea bream *Pagellus acarne* by the representative prefectures for each sub areas and seasons

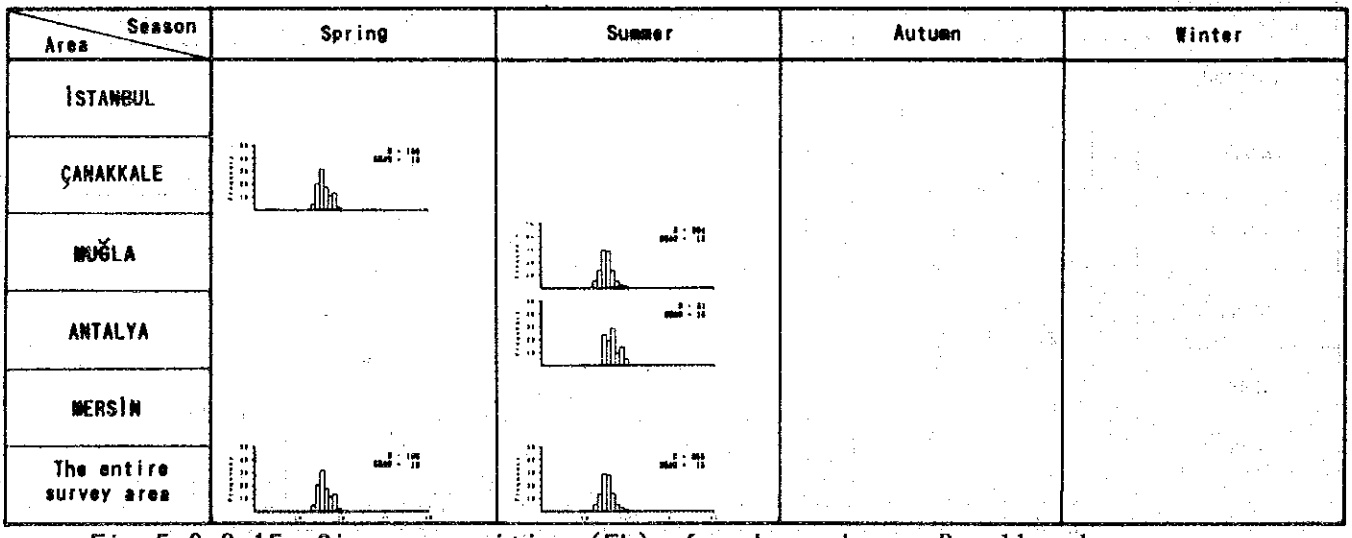


Fig. 5-2-3-15 Size composition (FL) of red sea bream *Pagellus bogaraveo* by the representative prefectures for each sub areas and seasons

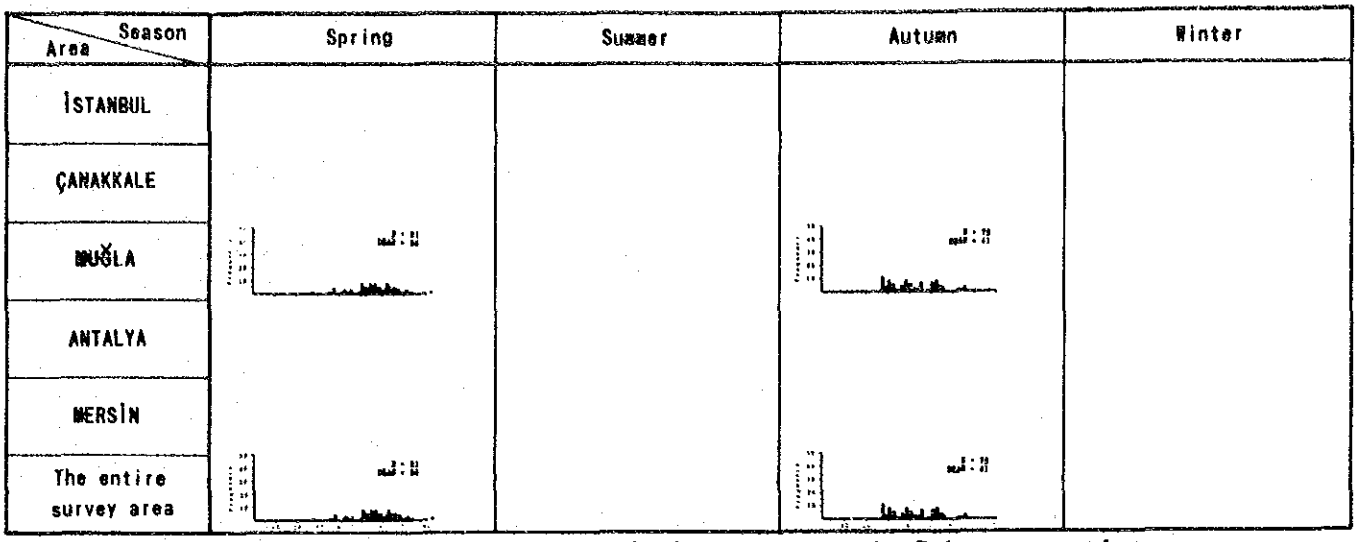


Fig. 5-2-3-16 Size composition (FL) of barracuda *Sphyraena sphyraena* by the representative prefectures for each sub areas and seasons

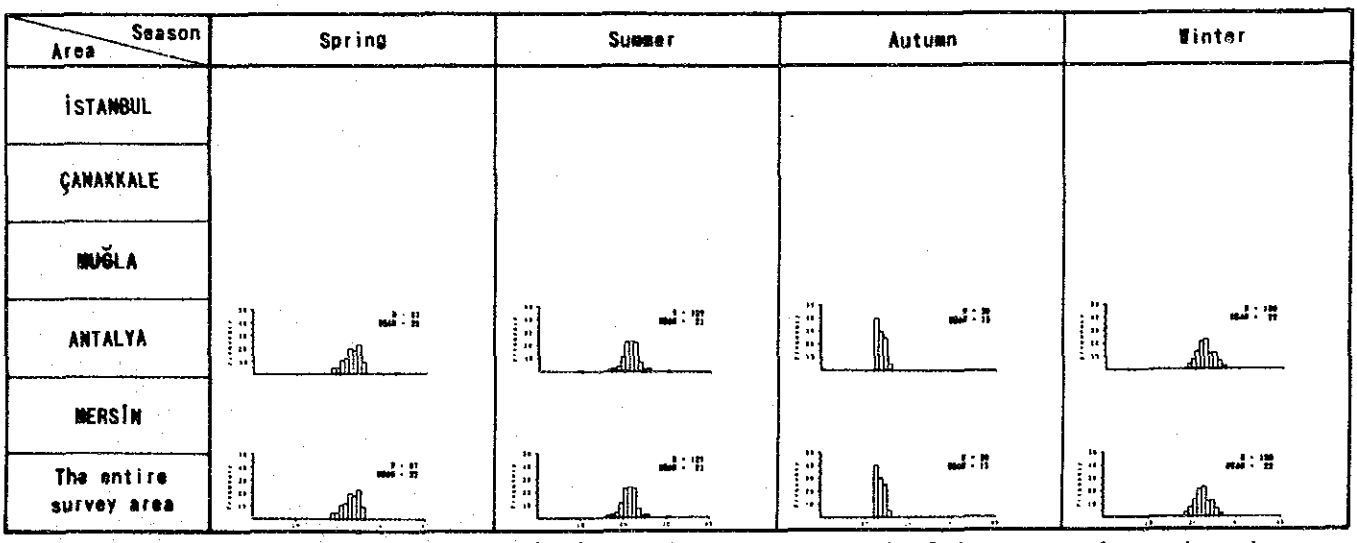


Fig. 5-2-3-17 Size composition (FL) of obtuse barracuda *Sphyraena chrysotaenia* by the representative prefectures for each sub areas and seasons

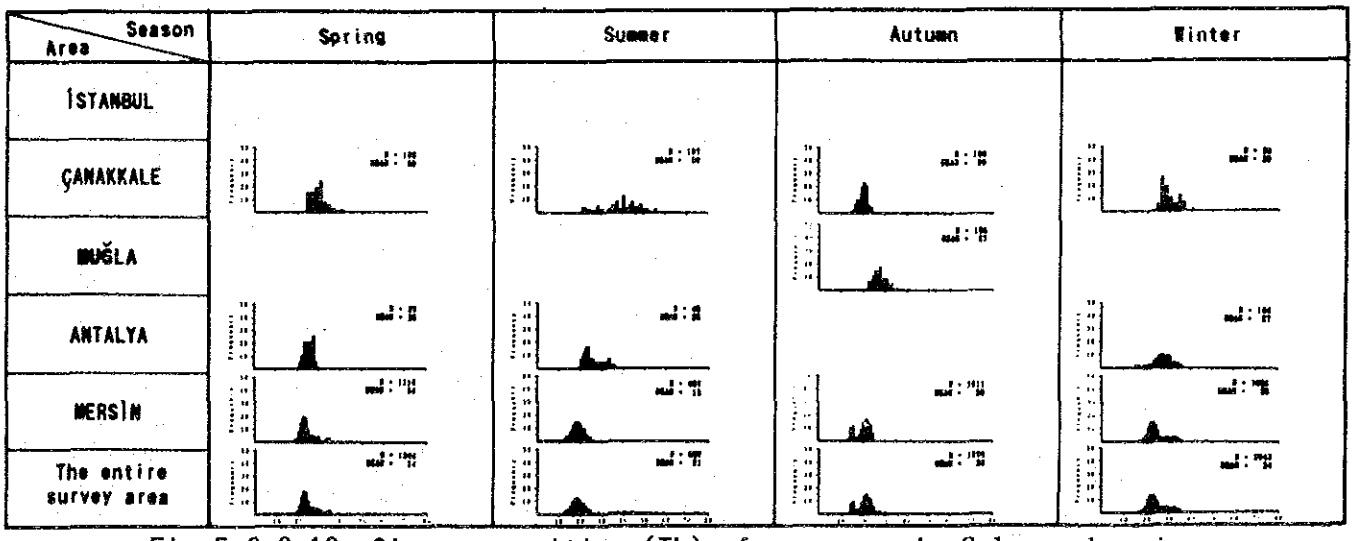


Fig. 5-2-3-18 Size composition (TL) of common sole *Solea vulgaris* by the representative prefectures for each sub areas and seasons

Chapter 6 Evaluation of Exploited Marine Resources

Chapter 6 Evaluation of Exploited Marine Resources

The actual status of utilization of marine resources in coastal and international waters around the Republic of Turkey was studied based on the total mortality coefficient, survival rate, biological findings and other parameters determined from the fisheries statistical data, demersal fisheries resource survey and age composition.

6-1 Present Status of Exploited Marine Resources

6-1-1 Catch Statistics

Fisheries statistical data for 1990 published by the government of Turkey was used for catch by area and species in correspondence with the results of the demersal fisheries resource survey carried out from 1991 to 1993. This fisheries statistical data contains a record, in terms of calendar year, of the species and catch by species (tons) caught by all types of fisheries industries in the Black Sea, The Sea of Marmara, the Aegean Sea and the Mediterranean Sea, and includes data for fishes, crustaceans and mollusks. The total catch of sea fishes in The Sea of Marmara, the Aegean Sea and Mediterranean Sea in 1990 was 97,293 tons.

Although the government fisheries statistics for 1990 are roughly 1-2 years behind the time period of the demersal fisheries resource survey, it was assumed that the catch of each fish species as well as those stock levels continued both in 1991 and 1992 because total catch of The Sea of Marumara, the Aegean Sea and the Mediterranean Sea since 1980 have been generally stabilized as pointed out in section 5-2-1. Those species that were covered in this demersal fisheries resource survey consisted of 11 of the 21 species analyzed in section 5-1-2 that are listed in fisheries statistics and for which the catch size by species is clearly indicated. Other species are tabulated using a mixture of species, thus preventing them from being correlated with the results of the demersal fisheries resource survey (Tables 6-1-1 and 6-1-2).

6-1-2 Demersal Fisheries Resource Survey

In order to correlate the stock size estimations by area and species of the demersal fisheries resource survey with the area classifications of fisheries statistics, the stock size estimations of the North and South Aegean Sea as well as the East and West Mediterranean Sea were grouped together into the Aegean Sea and Mediterranean Sea. All strata were used for the stock size estimations by species for each area. Tables 6-1-1 and 6-1-2 show the upper limits, lower limits and mean values of the stock size estimations by species, area and season according to the species classification of fisheries statistics.

In looking at the relationship between catch and stock size estimations by area for the 11 species covered, those species are divided into the five categories, A) those species for which catch is not recorded although distribution was confirmed from the sea-borne survey, B) those species for which distribution was not confirmed from the survey, and thus there is no record of catch, C) those species for which there is a record of catch despite distribution not having been confirmed from the survey, D) those species for which the mean of estimated stock size is smaller than the recorded catch, and E) those species for which the mean of estimated stock size is larger than the recorded catch (Tables 6-1-1 and 6-1-2).

Although category B) can be said to be an obvious result, categories A) and C) indicate a contradiction in the relationship between catch and estimated stock size. In addition, with respect to category D), since the demersal fisheries resource survey was conducted assuming a 1.0 for the efficiency of fishing of the fishing gear, even if the actual stock size is underestimated, in reality, this could not occur.

6-1-3 Estimation of Total Mortality Coefficient (Z) and Survival Rate (S)

Dynamics of populations are reflected in the age composition of individual age groups.

In the case of resources having a high mortality rate and low survival rate, numerous members of the population die while still young and there are few older fish. In the opposite case, numerous older fish are contained in the population. Thus, the age composition of catches is an important clue for clarifying the survival process of fish. The total mortality coefficient (or survival rate) provides one way depicting these relationships numerically. There are several methods to calculate the total mortality coefficient using age composition, examples of which include the age composition method, logarithmic regression method and the mean age method. In this analysis, the logarithmic regression method was employed.

A plot of the number of fish caught by age versus age for a specific species is referred to as a catch curve. In the case there are no large changes in survival and the number of fish entering the population each year, the total mortality coefficient can be estimated from the catch curve.

The total mortality coefficient determined from the catch curve is calculated for age on the right side, including the maximum value of the number of fish caught by age. In other words, this is premised on each age being the exclusive target of fish catching. The total mortality coefficient according to the logarithmic regression is calculated from the coefficient of a logarithmic regression formula between age and the number of fish caught by age.

The total mortality coefficients calculated for 8 species for

which data was available were within a range of 0.27-1.83. Although the total mortality coefficient of brushtooth lizardfish *Saurida undosquamis* was low at 0.27, the values of red mullet *Mullus barbatus* and hake *Merluccius merluccius* were considerable high at 1.52 and 1.83, respectively (Table 6-2). The total mortality coefficients tentatively calculated according to the age composition method and mean age method using the number of fish caught by age were 0.34-1.30 and 0.37-1.45, respectively.

6-2 Evaluation of Exploited Marine Resources

6-2-1 Catch and Estimated Stock Size

There are several problems with this method. With respect to the fisheries statistics, due to time differences in tabulation of statistical values and catch by fishing grounds, fisheries type and species being unable to be determined, compatibility with the stock size estimations is inadequate.

On the other hand, in the case of stock size estimations, even if fluctuations in estimated values due to moves in fish populations are covered in the survey throughout all seasons, since marine resources thriving in coastal areas at depths of 20 m or less outside the surveyed areas are not included, and the height of the net opening of the trawl gear is 1.1-3.1 m, bias occurs in the estimated values of those marine resources at higher strata or those moving between different depths. In addition, since marine resources in areas in which surveying by trawling is not possible (such as on rocks) are also not included, this also results in the occurrence of bias in estimated values thereby leading to underestimation of stock size. Moreover, the most fundamental problem is the estimating of stock size while assuming fishing efficiency of 1.0. Although methods such as Alternate Tail Attack and Tagging are used to attempt to solve these problems, these methods do not offer a complete solution due to the extreme difficulty associated with such problems. However, it is at least certain that the fishing efficiency is less than 1.0. Thus, it can be definitely stated that stock size estimations are underestimated although there may exist some herding effects by the otter boards and hand ropes.

With respect to the six examples of species and areas of category E) in which the values for catch by species and estimated stock size contradict the results of this survey, the exploitation rate as tentatively calculated by using the mean values of estimated stock size ranged from 0.26 to 0.82 (mean: 0.64) (Tables 6-1-1 and 6-1-2). This indicates that 60% or more of the total amount of each marine resource is being caught. This is believed to be high in terms of being the exploitation rate of demersal fish considered to have a relatively long life span and small fluctuations in stock..

6-2-2 Total Mortality Coefficients and Survival Rates

As can be seen from Table 6-2, with respect to the 8 species examined, age at full recruitment consisted of 0-3 year old fish. In addition, results of section 5-1-4 the range of ages of the majority of fishes caught was from 0 year to 6 or 7 years. In particular, the range of ages of *Sparidae* species, considered to have a long life span, was short at 4-7 years. The total mortality coefficients as calculated from these findings were within a range of 0.27-1.83 (mean: 1.07), or in when converted into survival rates, 0.16-0.76 (mean: 0.37). This means that roughly only 37% of those fishes resources survive. This finding reflects the fact the high proportion of juvenile fish among fish caught as well as the low proportion of older fish.

6-2-3 *Biological Findings*

Those species that appeared during the course of the survey consisted of roughly 60 families within a range of 130-170 species. Those species that demonstrated a mean estimated stock size of 500 tons or more throughout all seasons consisted of hake *Merluccius merluccius*, 3,641 tons, red mullet *Mullus barbatus*, 1,802 tons, Atlantic horse-mackerel *Trachurus trachurus*, 1,077 tons and common pandora *Pagellus erythrinus*, 694 tons, while those species of crustaceans and mollusk consisted of deep-water pink shrimp *Parapenaeus longirostris*, 1,056 tons, Norway lobster *Nephrops norvegicus*, 954 tons and horned octopus *Eledone cirrhosa*, 922 tons.

The sampling errors (in the coefficient of variance, CV) of estimation of stock size for each commercially important speceis throughout four seasons are generally over 20% except 12-14% for hake and 14-19% for red mullet. Therefore, these estimations may only have a lower practical meanings. The stock sizes of other species were small. The large number of species that appeared during the survey and the small stock sizes of individual species reflects the diversity of the fauna in temperate zones.

The mean body lengths of fish species were relatively small, with 1-3 years old 18 fishes accounting for the majority of catch. Consequently, the proportion of older fish was extremely low, and the age range of catches was narrow. In addition, nearly all 18 species of fishes participated in spawning at the age of 1-2 years, indicating a trend towards early maturity.

When the above findings are considered collectively, demersal fish resources in waters around the Republic of Turkey may be over fished.

6-3 Estimation of Optimum Yield

Based on a comparison of catch and estimated stock sizes, and the results of total mortality coefficients, survival rates

and biological findings, each of the resources on the continental shelf at depths of 200 m or less may be over fished, and a specific optimum yield was unable to be recommended.

However, at the present time, the biological findings and stock parameters, although fragmentary, have been obtained for the 18 species. In addition, the selectivity curves have also been obtained for the mesh size of the cod end for 4 species, although by no means sufficient. The values for $F_{0.1}$, F_{max} and so on were tentatively calculated by analyzing the catch per recruitment of individual fish according to the method of Thompson and Bell using these values. Omitted values occurred frequently during the course of these calculations, and as a result, there were many values that were not considered to be reasonable. A portion of the results obtained for the two species of hake *Merluccius merluccius* and Atlantic horse-mackerel *Trachurus trachurus* with respect to a cod end mesh size of 50 mm are shown in Table 6-3.

The values for optimum yield (OY) and maximum sustainable yield (MSY) obtained for these two species are both considerably lower than actual catch. Since the conditions for application of the method of Thompson and Bell are premised on the catch with respect to the stock size of a given species being extremely small in the state of a so-called "virgin stock", this can be said to be an obvious outcome when considered with that previously described in section 6-2.

Table 6-1-1 Comparison Between Catch (ton) by Species and by Sub Area in 1990 Catch Statistics and Estimated Stock Size (ton)

Scientific name	Sub area	Catch in 1990	Stock size Mean / Range	Remarks *
Saurida undosquamis	The Sea of Marmara	—	0 / 0 ~ 0	B
	Aegean Sea	—	0 / 0 ~ 1	A
	Mediterranean Sea	1,145	385 / 132 ~ 699	D
Merluccius merluccius	The Sea of Marmara	937	1,685 / 777 ~3,644	E
	Aegean Sea	402	1,567 / 1,070 ~2,900	E
	Mediterranean Sea	—	389 / 328 ~ 419	A
Serranus scriba	The Sea of Marmara	—	0 / 0 ~ 0	B
	Aegean Sea	—	16 / 0 ~ 50	A
	Mediterranean Sea	70	0 / 0 ~ 0	C
Trachurus trachurus	The Sea of Marmara	6,042	267 / 24 ~ 497	D
	Aegean Sea	503	651 / 225 ~ 1,287	E
	Mediterranean Sea	216	159 / 69 ~ 272	D
Mullus barbatus	The Sea of Marmara	91	72 / 23 ~ 111	D
	Aegean Sea	745	976 / 666 ~1,340	E
	Mediterranean Sea	1,363	754 / 437 ~1,162	D
M. surmuletus	The Sea of Marmara	676	0 / 0 ~ 0	C
	Aegean Sea	158	148 / 28 ~ 235	D
	Mediterranean Sea	727	33 / 3 ~ 91	D
Sparus aurata	The Sea of Marmara	18	0 / 0 ~ 0	C
	Aegean Sea	286	8 / 4 ~ 14	D
	Mediterranean Sea	686	40 / 24 ~ 79	D

A) Those species for which catch is not recorded although distribution was confirmed from the sea-borne survey
B) Those species for which distribution was not confirmed from the survey, and thus there is no record of catch
C) Those species for which there is a record of catch despite distribution not having been confirmed from the survey
D) Those species for which the mean of estimated stock size is smaller than the recorded catch
E) Those species for which the mean of estimated stock size is larger than the recorded catch

Table 6-1-2 Comparison Between Catch (ton) by Species and by Sub Area in 1990 Catch Statistics and Estimated Stock Size (ton)

Scientific name	Sub area	Catch in 1990	Stock size Mean / Range	Remarks *
Diplodus annularis	The Sea of Marmara	110	9 / 0 ~ 37	D
	Aegean Sea	388	278 / 35 ~ 566	D
	Mediterranean Sea	68	83 / 7 ~ 196	E
D. vulgaris	The Sea of Marmara	221	0 / 0 ~ 0	C
	Aegean Sea	227	45 / 0 ~ 144	D
	Mediterranean Sea	359	4 / 0 ~ 10	D
Pagellus erythrinus	The Sea of Marmara	33	6 / 6 ~ 7	D
	Aegean Sea	246	361 / 87 ~ 815	E
	Mediterranean Sea	647	326 / 131 ~ 505	D
S. chrysotaenia	The Sea of Marmara	9	0 / 0 ~ 0	C
	Aegean Sea	36	2 / 0 ~ 6	D
	Mediterranean Sea	178	46 / 0 ~ 92	D

A) Those species for which catch is not recorded although distribution was confirmed from the sea-borne survey
B) Those species for which distribution was not confirmed from the survey, and thus there is no record of catch
C) Those species for which there is a record of catch despite distribution not having been confirmed from the survey
D) Those species for which the mean of estimated stock size is smaller than the recorded catch
E) Those species for which the mean of estimated stock size is larger than the recorded catch

Table 6-2 Total Mortality Coefficients (Z) and Survival Rates (S) as Calculated by Logarithmic Regression Method

Scientific name	Range of age	Age at full recruitment	Total mortality coefficient (Z)	Survival rate (S)
Saurida undosquamis	0 ~ 6	0	0.27	0.76
Merluccius merluccius	0 ~ 10	2	1.83	0.16
Trachurus trachurus	0 ~ 8	1	1.07	0.34
Mullus barbatus	0 ~ 7	2	1.52	0.22
M. surmuletus	0 ~ 10	3	1.13	0.32
Dentex macrophthalmus	0 ~ 6	2	0.84	0.43
Diplodus annularis	0 ~ 6	2	0.87	0.42
Pagellus erythrinus	0 ~ 7	3	1.03	0.36

Table 6-3 Optimum Yield (OY: tons), Maximum Sustainable Yield (MSY: ton) and Catch (ton)

Scientific name	Von Bertalanffy equation			Total mortality coefficient (Z)	Natural mortality coefficient (M)	Codend mesh size (50mm)	
	k	to	L∞ (mm)			$F_{0.1}$	F_{max}
Merluccius merluccius	0.09	-1.58	962	1.83	0.25	0.27	0.43
Trachurus trachurus	0.03	-3.21	871	1.07	0.31	0.34	0.58

Scientific name	OY Mean / Range	MSY Mean / Range	Catch in 1990
Merluccius merluccius	492 / 293~940	783 / 467~1,497	1,339
Trachurus trachurus	183 / 134~296	312 / 229~505	6,761

Chapter 7 Utilization of Unutilized Marine Resources and the Potential for Development of Unexpolited Marine Resources

Chapter 7 Utilization of Unutilized Marine Resources and the Potential for Development of Unexploited Marine Resources

7-1 Utilization of Unutilized Marine Resources

There are no reports or surveys relating to unutilized species among fishes and other marine resources in the waters around the Republic of Turkey. A study was therefore conducted of the actual status of unutilized marine resources using the fisheries statistics issued by the Turkish government. Although roughly 50 species of marine resources are contained in those fisheries statistics, those species not contained in those statistics were assumed to be unutilized species. At present, trawling grounds in the Republic of Turkey are located on the so-called continental shelf at depths of 200 m or less. Species having an estimated stock size of 300 tons or more, excluding those species of fishes, crustaceans and mollusks caught on the continental shelf at depths of 200 m or less in this demersal fisheries resource survey (utilized species counted as single species or compound species), are shown in Table 7-1 by sub area and season.

Table 7-1 Stock Size Estimations by Sub Area and Season of Unutilized Marine Resources on the Continental Shelf (300 tons or more)

Sub area	Season	Scientific name	Stock size
The Sea of Marmara	Spring	*Squalus blainvillei*	914
	Summer	*S. blainvillei*	456
	Autumn	*S. blainvillei*	790
	Winter	*Dasyatis pastinaca*	1,501
		Myliobatis aquila	871
North Aegean Sea	Spring	*Scyliorhinus stellaris*	527
		S. canicula	459
	Summer	*S. canicula*	3,263
	Autumn	*S. canicula*	1,174
		Dasyatis pastinaca	329
	Winter	*D. pastinaca*	826
		Scyliorhinus canicula	725
		Squalus blainvillei	321
South Aegean Sea	Summer	*Macroramphosus scolopax*	1,197
		Dasyatis violacea	749
East Mediterranean Sea	Summer	*Dasyatis pastinaca*	375
	Autumn	*D. pastinaca*	1,032

There were 7 species of unutilized marine resources having stock size estimations of 300 tons or more, namely nursehound *Scyliorhinus stellaris*, smallspotted catshark *Scyliorhinus*

canicula, longnose spurdog *Squalus blainvillei*, common stingray *Dasyatis pastinaca*, violet stingray *Dasyatis violacea*, common eagle ray *Miliobatis aquila* and snipe fish *Macroramphosus scolopax*.

Since the area of the continental shelf of the North Aegean Sea accounts for 39% of its total area (12,591 km^2), the stock size estimations of unutilized marine resources in this area by season were the largest, with the exception of winter, in reflection of this large area of the continental shelf. The stock size estimations of unutilized resources in winter were largest in The Sea of Marmara. Furthermore, there were no species having an estimated stock size of 300 tons or more observed in the West Mediterranean Sea.

The major species and stock sizes of unutilized species in the North Aegean Sea consisted of nursehound *Scyliorhinus stellaris*, 527 tons in spring, smallspotted catshark *Scyliorhinus canicula*, 3,263 tons and 1,174 tons, respectively in summer and autumn, and common stingray *Dasyatis pastinaca*, 826 tons and smallspotted catshark *Scyliorhinus canicula*, 725 tons in winter. The major species and stock sizes of unutilized species in The Sea of Marmara consisted of longnose spurdog *Squalus blainvillei*, 914 tons, 456 tons and 790 tons, respectively in spring, summer and autumn, and common stingray *Dasyatis pastinaca*, 1,051 tons and common eagle ray *Miliobatis aquila*, 871 tons in winter. The major species and stock sizes of unutilized species in the South Aegean Sea consisted of snipe fish *Macroramphosus scolopax*, 1,197 tons and violet stingray *Dasyatis violacea*, 749 tons in summer, while that in the East Mediterranean Sea consisted of common stingray *Dasyatis pastinaca*, 1,032 tons in autumn.

The estimated stock sizes of nursehound *Scyliorhinus stellaris*, smallspotted catshark *Scyliorhinus canicula*, longnose spurdog *Squalus blainvillei*, common stingray *Dasyatis pastinaca* and violet stingray *Dasyatis violacea* were considerably large in terms of being single species even when compared with the top ranked species in terms of the estimated stock size of teleost (bony fishes) and crustaceans.

The report of Fischer (1973) provides a detailed description of the distribution, fishing grounds and actual status of catch utilization of fishes, crustaceans and mollusks in the Mediterranean Sea and Black Sea. A study of the utilization of unutilized resources while referring to this paper allows nursehound *Scyliorhinus stellaris*, smallspotted catshark *Scyliorhinus canicula*, longnose spurdog *Squalus blainvillei*, common stingray *Dasyatis pastinaca* and violet stingray *Dasyatis violacea* to be used as fresh fish. In particular, since longnose spurdog *Squalus blainvillei* contains abundant amounts of vitamin A and squalene in its liver, it is valued in the form of fresh fish in Spain and France. Moreover, if a stable supply can be ensured, this species can also be exported to Japan for use as raw materials of fish paste products.

7-2 Possibility of Exploitation of Unexploited Marine Resources

7-2-1 Present Status of Unexploited Marine Resources

Unexploited marine resources was defined as the amount of latent unexploited marine resources is somewhat large in water areas in which trawling operations are not being conducted in Turkey. When this idea is applied to the results of this survey, unexploited marine resources are primarily concerned with those species thriving on the continental slope at depths of 201 m or more. Those species having an estimated stock size of 200 tons or more that were caught at depths of 201 m or more in this demersal fisheries resource survey are shown in Table 7-2 by sub area and season.

Table 7-2 Estimated Stock Sizes of Unexploited Marine Resources by Sub Area and Season on the Continental Slope (200 tons or more)

Sub area	Season	Scientific name	Stock size
The Sea of Marmara	Spring	*Galeus melastomus*	336
	Summer	* *Merluccius merluccius*	442
		Galeus melastomus	218
	Winter	* *Merluccius merluccius*	252
North Aegean Sea	Spring	* *Nephrops norvegicus*	636
		Lepidorhombus boscii	408
		Raja clavata	294
		* *Merluccius merluccius*	266
		Coelorhynchus coelorhynchus	201
	Summer	* *Nephrops norvegicus*	991
		* *Merluccius merluccius*	860
		* *Eledone cirrhosa*	689
		Raja clavata	678
		Argentina sphyraena	608
		Scyliorhinus canicula	545
		Lophius piscatorius	502
		Micromesistius poutassou	498
		Squalus blainvillei	448
		Lepidorhombus boscii	410
		Helicolenus dactylopterus dactylopterus	387
		* *Trachurus trachurus*	366
		Trigla lyra	288
		Capros aper	279
		* *Parapenaeus longirostris*	233
	Autumn	* *Nephrops norvegicus*	684
		Raja clavata	533
		* *Merluccius merluccius*	311
		Scropaena scrofa	290
		Lepidorhombus boscii	288
		Raja oxyrinchus	287
		Lophius piscatoris	249
		Micromesistrius poutassou	222
		* *Parapenaeus longirostris*	221
	Winter	* *Nephrops norvegicus*	1,178
		Raja oxyrinchus	322
		Micromesistius poutassou	277
		* *Parapenaeus longirostris*	273
		* *Merluccius merluccius*	208
South Aegean Sea	Spring	*Scyliorhinus canicula*	282
		Capros aper	228
	Summer	*C. aper*	1,027
		Scyliorhinus canicula	370
		Lepidotrigla cavillone	355
		Trigla lyra	335
		* *Trachurus trachurus*	259
	Autumn	*Squalus blainvillei*	283
	Winter	*S. blainvillei*	330
		Raja oxyrinchus	215
		* *Merluccius merluccius*	203
West Mediterranean Sea	Spring	*Squalus blainvillei*	252
	Summer	* *Merluccius merluccius*	221
		Raja oxyrinchus	214
	Autumn	*Capros aper*	341
	Winter	*Chlorophthalmus agassizii*	290
East Mediterranean Sea	Spring	*Raja oxyrinchus*	482
		Capros aper	318

* : Important species

There are a total of 22 species of unexploited marine resources, of which 19 species are fishes (including 14 species of teleost (bony fishes) and 5 species of sharks and rays), 2 species are crustaceans and 1 species is a mollusk. The stock sizes of unexploited marine resources in all areas for each season were within a range of roughly 4,000-11,000 tons (seasonal mean: roughly 6,000 tons).

When looking at the number of species and estimated stock sizes of unexploited marine resources for each season by sub area, the number of species and estimated stock sizes were found to be the highest in the North Aegean Sea throughout all seasons. There were 5-15 species of unexploited marine resources in the North Aegean Sea, and the stock sizes of those unexploited marine resources were within a range of roughly 2,000-8,000 tons (seasonal mean: roughly 4,000 tons).

The total area of the continental slope in the North and South Aegean Sea (14,434 km^2) accounted for 74% of the total area of the continental slope in all surveyed areas (19,386 km^2). Consequently, the number of species of unexploited marine resources that appeared in both areas was extremely high at 20 species throughout all seasons. In addition, the proportions of unexploited marine resources in these two areas in each season with respect to the total amount of unexploited marine resources were roughly 60% in spring and roughly 90% in the other three seasons.

The major species that demonstrated large estimated stock sizes in the North Aegean Sea consisted of Norway lobster *Nephrops norvegicus*, 636 tons in spring, Norway lobster *Nephrops norvegicus*, 991 tons, hake *Merluccius merluccius*, 860 tons, horned octopus *Eledone cirrhosa*, 689 tons, thornback ray *Raja clavata*, 678 tons and argentine *Argentina sphyraena*, 608 tons in summer, Norway lobster *Nephrops norvegicus*, 684 tons in autumn, and Norway lobster *Nephrops norvegicus*, 1,178 tons in winter. Boarfish *Capros aper*, 1,027 tons demonstrated the largest estimated stock size in the South Aegean Sea in summer.

7-2-2 Possibility of Exploitation of Unexploited Marine Resorces

Those useful species that were treated as important species (indicated with an asterisk * in the Table) in this demersal fisheries resource survey consisted of 2 species of fish, namely hake *Merluccius merluccius* and Atlantic horse-mackerel *Trachurus trachurus*, 2 species of crustaceans, namely deep-water pink shrimp *Parapenaeus longirostris* and Norway lobster *Nephrops norvegicus*.

CPUA of the 4 species mentioned above is shown in Fig. 7-1 by depth and seasons.

CPUA of hake *Merluccius merluccius* was high in the continental shelf where depth of 200 m or less but in the continental slope where the depth of 201 m or more, it was higher in summer at depth of 220-440 m. The CPUA of Atlantic horse-

mackerel *Trachurus trachurus* by depth indicated that it was higher in spring and summer where depth of 200 m or less and depth of 201 m or more, it was higher in summer at depth of 290-320 m.

On the other hand, CPUA of deep-water pink shrimp *Parapenaeus longirostris* was high in The Sea of Marmara at depth of 50-150 m. In the area where depth of 201 m or more, CPUA was high in summer at depth of 250-350 m. Norway lobster *Nephrops norvegicus* was distributed primarily in the Aegean Sea, north of 28° north latitude and on the continental slope where the depth of 201 m or more. Especially, CPUA was high in spring and summer at depth of 280-440 m. There is no need to further mention the usefulness of shrimps and prawns as foods. As such, development of both of these species can be expected through the use of deep-sea fishing gear.

In addition, horned octopus *Eledone cirrhosa* has been confirmed to thrive in the Aegean Sea, and its development is expected in the summer when its stock size is the largest.

The use of trawl gear equipped with heavy ground ropes is effective for developing and catching these deep sea resources. In the case of development of new resources, a method is believed to be favorable in which fishing is continued at a fixed amount of fishing effort and the degree of development is carefully monitored while confirming annual CPUE values and fluctuations in body length composition.

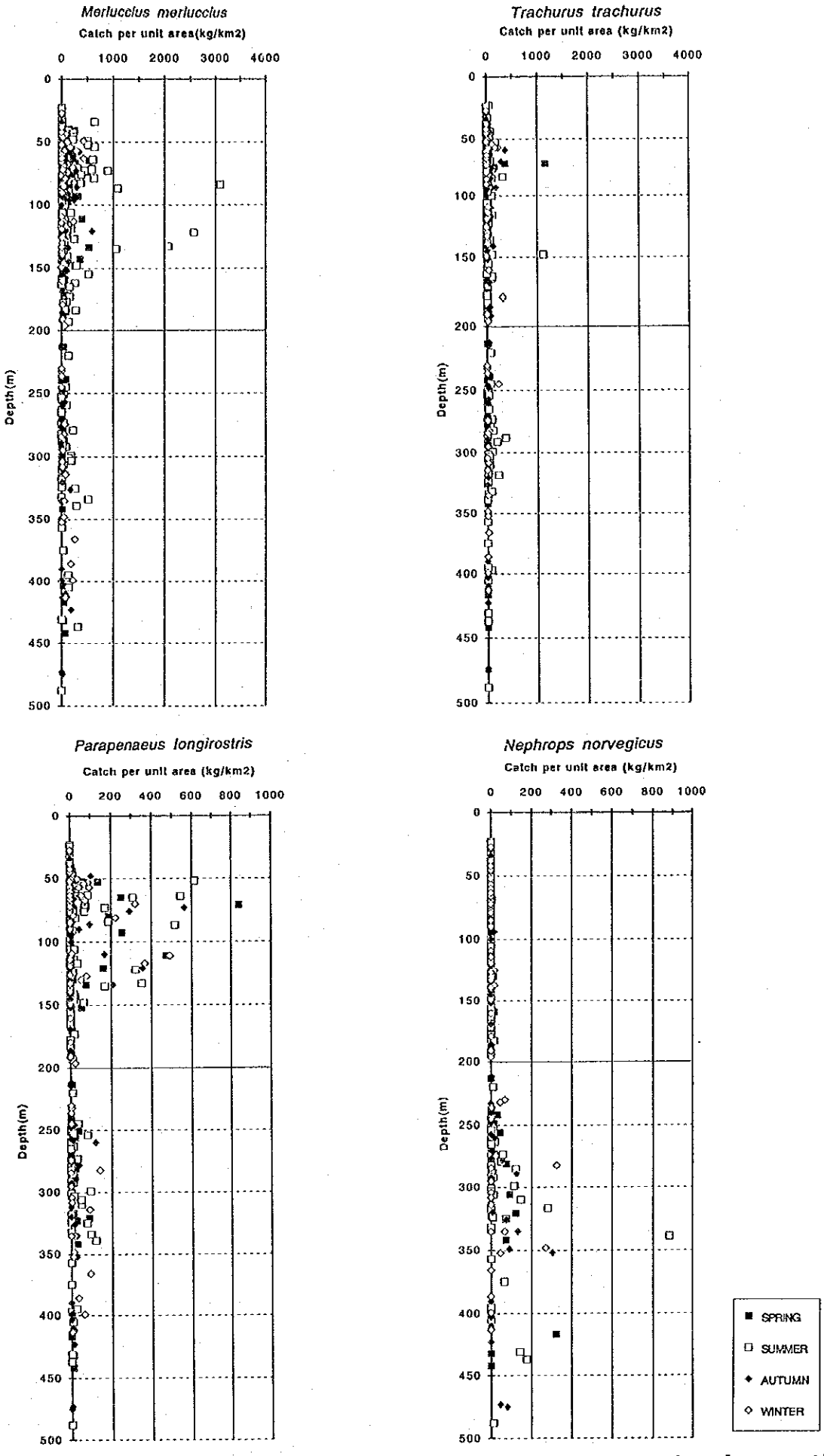


Fig 7-1 Distribution of CPUA of Unexploited 4 Species by Depth and Seasons

Chapter 8 Recommendation for Fisheries and Resource Managements and Future Managements of Fisheries Resources

Chapter 8 Recommendation for Fisheries and Resource Managements and Future Managements of Fisheries Resources

The following provides a discussion of recommendations relating to the management of fisheries and its resources as well as future resource management based on a comprehensive evaluation of the results obtained from these fisheries resource surveys conducted in Turkey.

8-1 Fisheries and Resource Managements

8-1-1 Basic Concept of Resource Managements

Different from the mineral resources such as coal and petroleum, the marine resources are renewable natural resources. If adequate precautions are taken with respect to the conservation of marine resources, we can expect to obtain ample and continuous benefits from these marine resources. In order to do this, together with regulating our own actions and maintaining and managing the ecosystem that surrounds those resources to maximize the benefits, we are also presently obligated to pass on these abundant natural resources to our descendants.

Fisheries management refers to maintaining the fisheries in a desirable status, or bringing it as close as possible to that desirable status. Since the marine resources must also be healthy in order for the fisheries to be healthy, the manner of thinking with respect to fisheries management must include the concept of resource management.

Resource management is performed based on the resource evaluation. In other words, the resource evaluation refers to examining the status of marine resources in various ways and evaluating whether resources are in a healthy status or not. If there are problems with the status of marine resources, the marine resource evaluation involves determining the location and manner of the problem as well as determining steps to be taken to make improvements. More specifically, this refers to an estimation of whether or not the marine resources are being abused. If it is found that the marine resources are indeed being abused, some form of fishery regulations are imposed by taking advantage of the effects of measures such as protection of small fish and curtailment of the amount of fishing effort. When attempting to implement resource management, the biological information of the marine resources to be managed should be adequately taken into consideration.

8-1-2 Trends of Fisheries Managements

(1) Fisheries Managements by Open Access and Top Down Management

In Europe and United States, the fundamental fisheries managements has been under the government controlled policy of

"open access" and "top down management", in which fisheries are managed for the purpose of conservation and sustainable use of fisheries resources and anybody should be allowed to engage in fisheries because the marine resources are the common property of mankind. this system is the policy to manage fisheries according to the quota of the catch which the government set every year for certain species of fish because the particular fish species resource need to be managed. Managing system through the catch quota is logical from the biological point of view but in practice it is technical difficulty and requires a great amount of efforts and moneys. An example is the management and control system for demersal fish resources in the Bering Sea and Aleutian Islands by United States.

(2) Fisheries Managements by Limited Entry and Bottom Up Management

Japanese fisheries consist of many coastal fisheries and capitalized large scale fisheries and fisheries resources are used only by the member of the regional fisheries cooperative associations or by the fishermen who possess the fishing license. Therefore the Japanese fisheries system are managed by limited entry and bottom up management. In this system, fishermen are responsible for the fisheries management because the marine resources and fishing grounds are used in accordance with the license/application by the fisheries cooperative associations or fishermen. It is the characteristics of this management system, especially in coastal fisheries, that the fishermen voluntarily control the number and size of the boat and fishing equipments and fishing season and this control contributes to the conservation of marine resources. Since this system is a voluntary bases, the government does not need a large amount of budget for fisheries managements.

The trends in the fisheries managements appear to be shifting from "open access" to "limited entry" and from "top down management" to "bottom up management".

8-2 Strategies for the Fisheries Resources Management for the Future

8-2-1 Collecting of Fisheries Data and Establishment of a Management Organization

An accurate understanding of current fisheries data (including catch and effort statistics and biological information) is essential to serve as the basis for management of fisheries and its resources. With respect to the government fisheries statistics, it is necessary to compile statistics on catch by fisheries for each fishing ground and the amount of fishing effort (number of fishing boats, number of operating days and so on). In addition, it was found from the fish landing site

surveys that the same species of fish is being referred to by different names at different fishing ports, and the body lengths of surveyed species are not being measured accurately. It is thus necessary to provide proper guidance so that these procedures be carried out properly. Thus, it is necessary to promptly establish an organization and system for collection and management of fisheries data.

8-2-2 Expansion and Strengthening of Fisheries Administration and Research Institutions

A system working in cooperation with research institutions is required for proper promotion of fisheries administration. Those results are largely dependent on the accumulation of testing and research results. In addition, development of applied technology is possible through testing and research relating to the ecology of marine resources, fishing techniques, the marine environment, utilization and processing, and the society and economy surrounding the fisheries. In order to accomplish this, in addition to strengthening of fisheries education system, which serves as the foundation of this administration and research, it is also desirable to expand and strengthen the number of researchers and technicians, as well as research facilities, measuring instruments and so forth.

8-2-3 Continuation of Fisheries Resource Surveys

(1) Analysis of Acquired Data

This survey was conducted with the cooperation of numerous concerned parties and following huge investments both in terms of funding and manpower. The fundamental data that has been obtained has already been computerized. Further in-depth analysis of data is required to extract problem areas and effectively utilize that data in the future. As a result of those efforts, it is expected that new facts along with means of solving any problems will be discovered.

(2) Continuation of Surveys

Fisheries and its resource management also requires an accurate understanding of the manner in which target fisheries resource are changing under current fisheries operations. This fisheries resource survey is unlike any other in the world in that it was conducted continuously throughout all seasons in identical surveyed areas and by the same research vessel. Valuable data was obtained with respect to biological findings relating various species of marine life as was described in detail in Chapter 5. However, those portions of the survey relating to quantitative analysis cannot be said to be adequate due in part to this being the first large-scale survey.

Thus, it will be necessary to carry out fisheries resource surveys to determine resource conditions every 2-3 years while using this current survey as a starting point. If the fisheries resource survey can not be continued, at least some of the surveys which monitors the size composition and CPUA of the commercially important species, should be continued.

In the future both the quality and quantity of data would be better by improving the following items beforehand and more accurate analytical results are expected. As a result the managements of fisheries and its resources would be more implement at present.

a. Organization of Surveyed Species

Considerably detailed biological findings and other data were obtained for 21 important species. Based on these results, it is necessary to narrow down the scope of species surveyed to those species that are commercially important, having large stock sizes and have a high potential for development, while referring to section 5-1-3.

b. Organization of Survey Items

The survey items covered a broad range because this was the first large-scale survey. Starting with the next survey, the current survey items should be reorganized into those items that are necessary to ensure adequate accomplishment of objectives by clarifying the survey objectives and referring to the results of detailed analysis of the data. For example, if greater emphasis is to be placed on evaluation of stock size of important species, one way of proceeding with this is to carry out the survey while focusing on items for improvement of the accuracy of stock parameters.

c. Acquisition of Research Vessel

In order to maintain consistency of data, it is necessary that future surveys be carried out using a research vessel and fishing gear having specifications identical to those used in the current survey. In cases when use of a research vessel becomes difficult, it most likely would be satisfactory to charter a fishing boat. In this case, fundamental data should be corrected by making use of the results of the comparative test of fishing efficiency described in section 5-1-6, and those results should then be compared with the results of the current survey.

8-2-4 Fisheries Regulations

Fisheries regulations consisting of qualitative regulations,

including the closed time-area and closed season for fishing, restrictions on the fishing gear and fishing methods used, restrictions on mesh size and restrictions on the body lengths of fish caught, as well as quantitative regulations, including regulations on the amount of fishing effort (such as restrictions on the number of fishing boats and the number of fishing gear used) and regulation of catch limit itself by setting catch quotas. Fisheries regulations are typically implemented by combining several different methods corresponding to the actual status of the fisheries. The following fisheries regulations are believed to be effective policies based on the results of the current survey.

(1) Enlargement of Cod End Mesh Size

The cod·end mesh size of commercial fishing boats is 44 mm. The age of the majority of species caught using a mesh size of 44 mm (age at full recruitment) was 2 years for the majority of species as described in section 6-2. Since the mature age of most species is 1 year or more as is clear from section 5-1-4, the use of this mesh size results in fish being caught that have just reached a mature age.

Although fisheries regulations in place in Turkey include the establishment of prohibition of trawling zones (for example, such as in The Sea of Marmara and in coastal waters three miles from shore), and restrictions on the minimum cod·end mesh size of trawl nets (44 mm) and body length (for example, catch of red mullet *Mullus barbatus* having a body length of 13 cm or less is prohibited), these will cause reductions in resources under the present circumstances of the fisheries regulation. Thus, in order to maintain the reproductivity of the marine resources, it is necessary enlargement the mesh size of the cod· end being used to suppress the number of smaller fish caught and secure an adequate sized population of spawning fish. Although it is believed that this regulation of mesh size will not reduce the number of fishing boats and only place a small economic burden on fishermen, it will be necessary to take into consideration the temporary reduction in income accompanying this decrease in the number of fish caught.

(2) Allocation of the Amount of Fishing Effort

Moreover, as already mentioned, when considering that the majority of fishes caught are juvenile fish age 3 years or younger, considerations must also be given to quantitative regulations in addition to regulation of mesh size. Specific proposals are unable to be made since the number of fishing boats using trawl net for catching demersal fishes as well as their tonnage is unknown. At least, however, the number, size and engine horsepower fishing boat could be freezed and also operations at those times and at those locations should be

prohibited taking into consideration those times and locations where small fish are main distributed. The economic burden on fishermen will be alleviated if those fishing boats for which operation has been prohibited are assured operations in other water areas.

When attempting to introduce fishery regulations relating to mesh size and the amount of fishing effort, the purpose and effects of those regulations should be adequately explained to those fishermen affected in advance to obtain their understanding. It is also necessary to simultaneously deploy check functions that can be performed by operators themselves as well as establish a system for administrative management. Fisheries regulations that are ignored by fishermen cannot be expected to be effective.

8-2-5 Rational Utilization of Marine Resources

As pointed out in section 6-2-1, the problem related to the estimated stock sizes of this fisheries resource survey is that the estimations that were obtained are underestimated. In actuality, the stock sizes several times larger than these estimations are believed to exist. However, in reflection of the depleted amount of marine nutrients, the latent stock sizes of demersal fishes within the territorial waters of Turkey and international waters cannot be said to be abundant, being equal to roughly only 1/10th that found in other areas (Table 8-1). Under the present circumstances in which young (small) fish account for the majority of fishes caught and older fish are few in number, based on judgments made from the results of this survey, the potential for further development of any resources that could be the targets of trawling is considered to be low.

Therefore, it is proposed that currently existing resources and the environment surrounding those resources be used precisely and effectively.

(1) Utilization and Development of Unutilized and Unexploited Marine Resources

Based on the number of classifications of species in catch statistics examined in section 6-1-1, the marine resources on the continental shelf are considered to be utilized with considerable thoroughness. Since the effective utilization of unutilized resources can be accomplished without altering the present allocation and distribution of fishing effort, the economic burden placed on fishermen would be mild. Among those resources thriving on the continental shelf, the stock sizes of nursehound *Scyliorhinus stellaris*, smallspotted catshark *Scyliorhinus canicula*, longnose spurdog *Squalus blainvillei*, common stingray *Dasyatis pastinaca* and violet stingray *Dasyatis violacea* are considerably large as stock size of single species as was mentioned in section 7-1. It is therefore necessary to attempt

to make even more effective use of these species.

Together with further increasing the added value of resources already being used at present through the development of fisheries processing technology and the establishment of distribution mechanisms for processed products in the future, it is also believed to be possible to stimulate domestic consumption and exports by promoting the use of unutilized marine resources.

With respect to the development of unexploited marine resources thriving in the regions of the continental slope, the development can be initially expected for those species that are currently already being utilized in consideration of investment effects as well as having a high economic value.

These species are presently limited to two species of shrimps and prawns. Deep-water pink shrimp *Parapenaeus longirostris* is distributed in the North Aegean Sea, while Norway lobster *Nephrops norvegicus* is distributed in the North and South Aegean Sea. The development of both of these species can be expected using deep-sea trawling gear, prawn cage and etc.

Next, although hake *Merluccius merluccius* and Atlantic horse-mackerel *Trachurus trachurus* have thus far been caught by trawling on the continental shelf in waters around Turkey, it was confirmed in this recent survey that these species could be applicable to trawling on the continental shelf and slope as well. Since the stock sizes of both these species are widely distributed in pelagic and intermediate strata, the development and utilization of these resources can be expected in the future.

Moreover, the distribution and presence of horned octopus *Eledone cirrhosa* have been confirmed on the continental slope in the Aegean Sea. Although there are large fluctuations in stock size there within a range of roughly 4-700 tons, since the life span of this species is relatively short at 2 years and generation replacement is rapid, contrary to the case of resources of demersal fishes, this species is considered to be relatively resistant to the pressure of the fisheries. Development of these resources is expected in summer during which the stock size of this species is large.

(2) Development of Resources by Fishing Gear and Fishing Methods other than Trawling Gear

Obtaining the stock size of unexploited marine resources and collection of biological information an area-swept method using trawling gear was employed in this fisheries resource survey due to quantification procedures being established for this method. This survey was conducted targeted at those demersal resources thriving in water areas in which trawling operations are possible. For example, the marine resources thriving on rocks, off the bottom or those that migrate between various depths are excluded from the targets of this survey. By focusing on the development of marine resources thriving near the bottom, the development of these resources can be considered using bottom

longlines, bottom setnets, bottom gillnets, or prawn cage and etc.

8-2-6 Promotion of Propagation and Aquaculture

The further promotion of propagation and aquaculture targeted at freshwater fish using the numerous natural and artificial lakes distributed throughout Turkey is proposed as a means of responding to the preference for fishes of the Turkish people for which demand has increased in recent years, and to satisfy the demand for fish protein accompanying the proliferation of fish in the diet.

In addition, the propagation and aquaculture of sea fish is presently being carried out in coves and inlets spreading along the coasts of The Sea of Marmara and the Mediterranean Sea. Since development is considered to be possible for many more species and locations through the introduction of advanced technology, it will also be important to aggressively proceed with the introduction of such technology.

At that time, however, it will be necessary to make arrangement feeding problems necessary for the propagation and aquaculture, changes in the environmental conditions accompanying construction and expansion of propagation and aquaculture facilities, as well as changes in the ecosystems of waters accompanying introduction of new species and etc.

The recommendations described above are the results of studies of the potential for effective utilization of marine resources already existing in international waters and territorial waters around the Republic of Turkey from the standpoint of their effective utilization. In the case these recommendations are implemented, it is desirable that methods be employed that allow these recommendations to be implemented in a form that matches the actual status of the fisheries conditions in Turkey.

Table 8-1-1 Results of Stock Size Surveys on Demersal Fishes

Area	Period	Survey area (km²)	Stations	Estimated stock size (ton)	Mean density (ton/km²)	Depth zone (m)	Main species
Bering Sea	May～Sept., 1979	658,740	950	9,003,400	13.7	14～1,080	Pollock Yellowfin sole Pacific cod Flounders
Aleutian Islands	June ～Nov., 1980	119,426	319	1,799,200	15.1	1 ～900	Cods Rattails Flat fishes
South Africa Agulhas Bank	Nov. ～Dec., 1980	66,813	146	276,186	4.1		Cape hake Panga Cape horse mackerel
South Africa Agulhas Bank	June, 1982	70,241	136	316,668	4.5		Cape hake Panga Cape horse mackerel
South Africa Agulhas Bank	Nov. ～Dec., 1981	70,241	186	347,149	4.9		Cape hake Panga Cape horse mackerel
New Zealand E, F	March～May, 1982	343,532	220	2,792,200	8.1	201～800	Hoki Barracudas Blue whiting
New Zealand E, F	March～April 1983	61,071	114	636,500	10.4	201～600	Barracudas Hoki
Greenland East, West	June ～Nov., 1988	277,860	180	920,500	3.3	201～1,400	Greenland halibut Atlantic cod Red fishes
Greenland East, West	April～Nov., 1989	277,860	142	298,000	1.1	201～1,500	Greenland halibut Red fishes Grenadiers

Table 8-1-2 Results of Stock Size Surveys on Demersal Fishes

Area	Period	Survey area (km²)	Stations	Estimated stock size (ton)	Mean density (ton/km²)	Depth zone (m)	Main species
Turkey							
Sea of Marmara	June ～Aug., 1991	51,835	172	49,669	1.0	20～500	Hake Red mullet Atlantic horse-mackerel
Aegean Sea	Dec., 1991～Jun., 1992						
Mediterranean Sea	Jan. ～Feb., 1993	51,835	86	26,674	0.5	20～500	
	Apr. ～June, 1992	51,835	140	28,406	0.5	20～500	
	Sep. ～Nov., 1992	51,835	155	21,229	0.4	20～500	
South China Sea				3,771,000	4.0	～ 50	
South China Sea					2.0	51～500	

Chapter 9 References

Chapter 9 References

Chapter 1:

1) JETRO 1991: Turkey. JETRO trade market series 311. 128pp. Japan External Trade Organization. Tokyo, Japan.(In Japanese).
2) Republic of Turkiye 1990: Fishery Statistics. State Institute of Statistics Prime Ministry Republic of Turkiye. Ankara, Turkiye.
3) Republic of Turkiye 1990: Turkey ;an official handbook. 286pp. The General Directorate of Press and Information. Ankara, Turkiye.

Chapter 3:

1) Alverson, D. L. and Pereyra, W. T. 1969: Demersal fish explorations in the northeastern Pacific Ocean -- an evaluation of exploratory fishing methods and analytical approaches to stock size and yield forecasts. J. Fish. Res. Board Can., 26: 1985-2001.
2) Beverton, R. J. H. and Holt, S. J. 1959: A review of the lifespans and mortality rates of fish in nature and their relation to growth and other physiological characteristics. In "The Life span of Animals" CIBA Foundation Colloquia on ageing., 5: 142-180.
3) Doubleday, W. G. and Rivard, D. 1981: Bottom trawl surveys. Canadian Special Publication of Fisheries and Aquatic Sciences 58. 273pp. Department of Fisheries and Oceans, Ottawa, Canada.
4) Doubleday, W. G. (ed.) 1981: Manual of groundfish surveys in the Northwest Atlantic. NAFO Scientific Council Studies No. 2. Ottawa, Canada.
5) JICA 1991: Manual of demersal fisheries resource survey in the Republic of Turkey. 48pp. Japan International Cooperation Agency. Tokyo, Japan.
6) JICA 1991: Plan of operation for demersal fisheries resource survey in the Republic of Turkey. 38pp. Japan International Cooperation Agency. Tokyo, Japan.
7) Mackett, D. J. 1973: Manual of methods for fisheries resources survey and appraisal, Part 3- Standard methods and techniques for demersal fisheries resources surveys. FAO. FIRD/T 124.
8) MARA and JICA 1992: Minutes of meeting on demersal fishery resources survey in the Republic of Turkey. 2pp. Ministry of Agriculture and Rural Affairs and Japan International Cooperation Agency.
9) Nagai, T. 1990: Yield per recruit analysis by Thompson and Bell's method. Stock assessments programs for personal computers(II). 212-218. National Research Institute of Fisheries Science.
10) Pauly, D. 1980: On the interrelationships between natural

mortality, growth parameters, and mean environmental temperature in 175 fish stocks. J. Cons. Int. Explor. Mer., 39(2): 175-180.
11) Ricker, W. E. 1975: Computation and interpretation of biological statistics of fish populations. Bull. Fish. Res. Board Can., Bull. 191: 382pp.
12) Tanaka, S. 1960: Studies on the dynamics and management of fish populations. Bull. Tokai Reg. Fish. Res. Lab., 28: 1-200. (In Japanese with synopsis).
13) Widrig, T. M. 1954: Method of estimating fish populations, with application to Pacific sardine. U. S. Fish and Wildl. Serv., Fish. Bull., 56(94):141-166.

Chapter 5:

1) Aoyama, T. 1961: The selectivity action of trawl nets and its application to management of the Japanese trawl fisheries in the East China and the Yellow Seas. Bull. Seikai Reg. Fish. Res. Lab., 23:1-63. (In Japanese with English synopsis).
2) Campbell, R. C. 1979: Statistics for biologist(2nd Ed.). 346pp. Cambridge University Press. London, England.
3) Charbonnier, D. and Caddy, J. F.(ed.) 1986: Report of the technical consultation on the stock assessment in the eastern Mediterranean. FAO Fisheries Report 361: 131pp.
4) Farmer, A. S. D. 1975: Synopsis of biological data on the lobster Nephrops norvegicus (Linnaeus, 1758). FAO Fisheries Synopsis 112: 97pp.
5) Hamano, T. 1987: Biology of stomatopoda-3 Stomatopods from Japan-1, History of taxonomy and species list. Aquabiology., 9(3): 281-211. (In Japanese with English title).
6) Kimoto, S. 1967: Some quantitative analysis on the Chrysomelid fauna of the Ryukyu Archipelago. Esakia, 6: 27-54.
7) Miyake, S. 1982: Japanese crustacean decapods and stomatopods in color. Vol. I. Macrura, Anomura and Stomatopoda. 261pp. Hoikusha Publishing Co., Ltd. Osaka, Japan. (In Japanese).
8) Nose, Y., Ishii, T. and Shimizu, M. 1988: Fish population dynamics. 217pp. University of Tokyo Press. Tokyo, Japan. (In Japanese).
9) Okada, K., et al. 1965: New illustrated encyclopedia of the fauna of Japan. 2245pp. Hokuryu-kan Publishing Co., Ltd. Tokyo, Japan. (In Japanese).
10) Okutani, T. 1979-1985: Biology of cephalopoda, 1-37. Aquabiology, 1(1), 19-7(2), 146. (In Japanese with English title).
11) Republic of Turkiye 1970-1980, 1983-1990: Fishery Statistics. State Institute of Statistics Prime Ministry Republic of Turkiye. Ankara, Turkiye.
12) Republic of Turkiye 1990: Deniz urunleri bilgi toplama

formu; Istanbul il mudurlugu, Canakkale il mudurlugu, Anatlya il mudurlugu, Icelil mudurlugu. Ankara, Turkiye.
13) Sakai, T. 1976: Crabs of Japan and the adjacent seas. 773pp. (In English), 461pp. (In Japanese), 251Pls. Kodansha Ltd. Tokyo, Japan.
14) Uchida, T., et al. 1972: The encyclopedia of the animal taxonomic names. 1411pp. Nakayama-Shoten Co., Ltd. Tokyo, Japan. (In Japanese with English title).
15) Uchida, T., et al. 1974: Animal systematics. Vol. 8(ii) Echinodermata. 403pp. Nakayama-Shoten Co., Ltd. Tokyo, Japan. (In Japanese).
16) Whitehead, P. J. P., Bauchot, M.-L., Hureau, J.-C., Nielsen, J. and Tortonese, E. 1989: Fishes of the North-eastern Atlantic and the Mediterranean, Volume I. 510pp. UNESCO.
17) Whitehead, P. J. P., Bauchot, M.-L., Hureau, J.-C., Nielsen, J. and Tortonese, E. 1989: Fishes of the North-eastern Atlantic and the Mediterranean, Volume II. 517-1007pp. UNESCO.
18) Whitehead, P. J. P., Bauchot, M.-L., Hureau, J.-C., Nielsen, J. and Tortonese, E. 1989: Fishes of the North-eastern Atlantic and the Mediterranean, Volume III. 1015-1473pp. UNESCO.

Chapter 6:

1) Beverton, R. J. H. 1954: Notes on the use of theoretical models in the study of the dynamics of exploited fish populations. U. S. Fish. Lab., Beaufort, North Carolina, Misc. Contrib., 2: 159pp.
2) Doi, T. 1974: Outline of mathematical analysis on fish populations for practical use in front (Part II). Textbook for marine fisheries research course, Fisheries biology and population dynamics of marine resources. 105-210. Japan International Cooperation Agency.
3) Ikeda, I. 1979: Estimation of vulnerability of trawl net by alternate tail attack method. Far Seas Fish. Res. Lab., Enyo 34: 1-4.(In Japanese).
4) Takeshita, K. 1983: Abundance of tanner crab in the Bering Sea. Population dynamics of fishery resources. 69-78. Koseisha-Kouseikaku Co., Ltd. Tokyo, Japan. (In Japanese with English title).
5) Tauti, M. 1936: An estimation of the diminishing rate of stock. Japan. Soc. Sci. Fish., 5(4) 239-241 (In Japanese with English synopsis).

Chapter 7:

1) Fischer, W. (ed.) 1973: FAO species identification sheets for fishery purposes. Mediterranean and Black Sea. Fishing Area 37. Volume I. FAO. Rome, Italy.
2) Fischer, W. (ed.) 1973: FAO species identification sheets

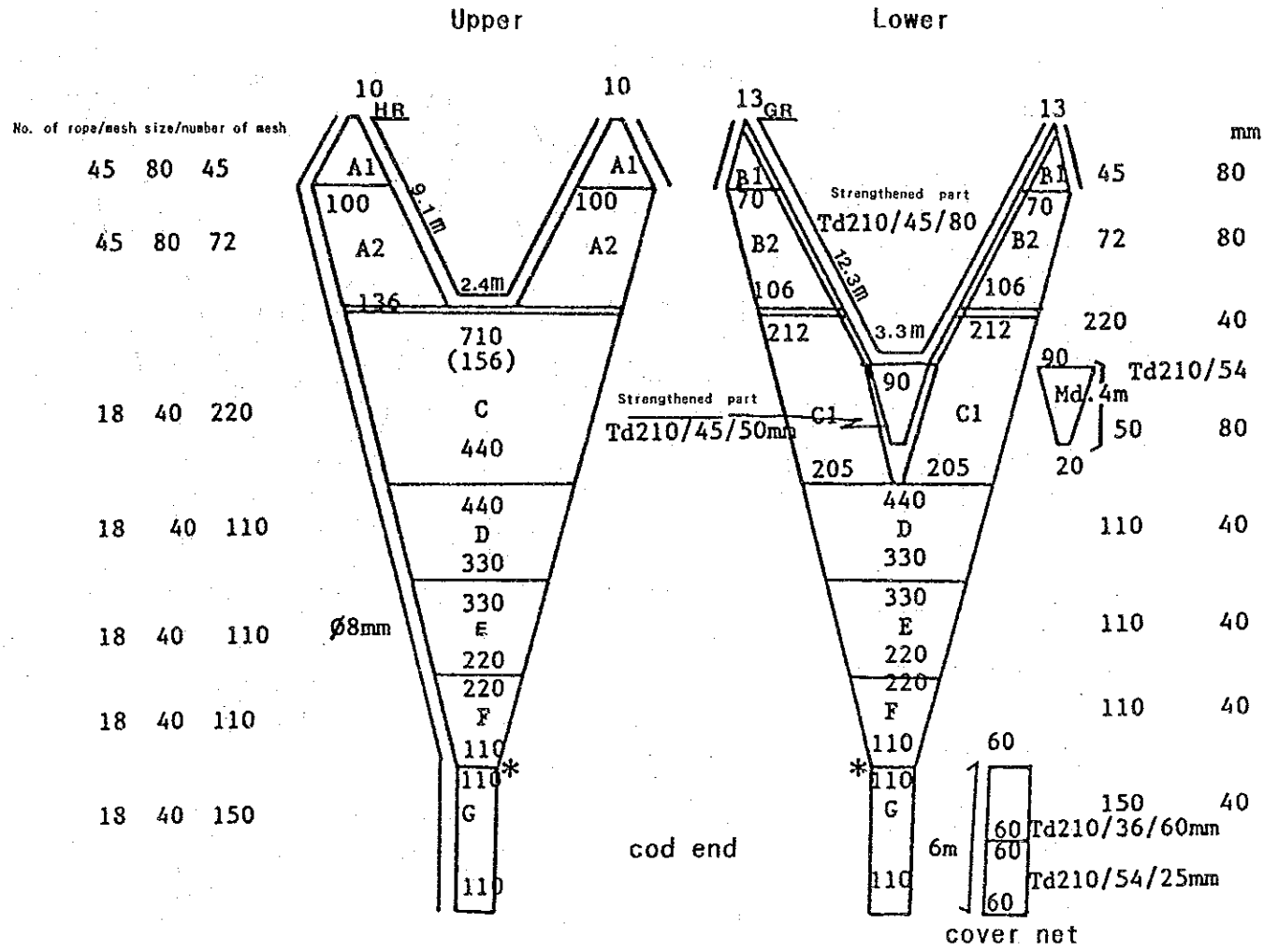
for fishery purposes. Mediterranean and Black Sea. Fishing Area 37. Volume II. FAO. Rome, Italy.

Chapter 8:

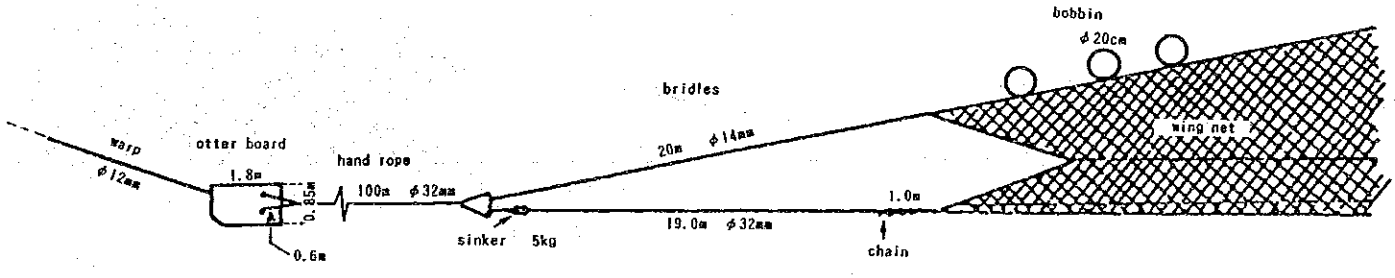
1) Bakkala, R. G. and Wakabayashi, K. (ed.) 1985: Results of cooperative U.S. - Japan groundfish investigations in the Bering Sea during May - August 1979: Int. North Pac. Fish. Comm. Bull., 44: 252pp.
2) Caddy, J. F. and Griffith, R. C. 1990: Recent trends in the fisheries and environment in the General Fisheries Council for the Mediterranean (GFCM) area. Studies and Reviews. General Fisheries Council for the Mediterranean. 63:71pp.
3) Charbonnier, D. and Garcia, S. (ed.) 1986: Report of the fourth technical consultation on the stock assessment in the Adriatic. FAO Fisheries Report 345: 204pp.
4) Charbonnier, D.(ed.) 1986: Report of the fourth technical consultation on the stock assessment in the Balearic and Gulf of Lions statistical divisions. FAO Fisheries Report 347: 231pp.
5) Garcia, S. and Charbonnier, D. (ed.) 1985: Report of the second technical consultation on the stock assessment in the central Mediterranean. FAO Fisheries Report 336: 140pp.
6) Gulland, J. A.(compiled and ed.) 1970: The fish resources of the ocean, FAO Fisheries Technical Paper 97: 425pp.
7) Gulland, J. A. 1982: Fish stock assessment: A manual of basic methods. xii+223pp. FAO/Wiley series on food and agriculture, John Wiley & Sons. New York, U.S.
8) Hatanaka, H. and Sato, T. 1983: Report on the Japan/South Africa joint trawling survey on the Agulhas Bank in November/December 1980. 73pp. Japan Marine Fishery Resource Research Center.
9) Levi, D. and Troadec, J. P. 1974: The fish resources of the Mediterranean and the Black Sea. Studies and Reviews. General Fisheries Council for the Mediterranean. 54:29-52.
10) Republic of Turkiye 1991: Su urunleri avciligini duzenleyen 25 numarali sikuler, Yayin No:349/46. 50pp. Tarim orman ve koyisleri, Ankara, Turkiye.
11) Ronholt, L. L., Wakabayashi, K., Wilderbuer, T. K., Yamaguchi, H. and Okada, K. 1986: Groundfish resource of the Aleutian Island waters based on the U.S.-Japan trawl survey, July-November 1980. Int. North Pac. Fish. Comm. Bull., 48: 251pp.
12) Savini, M. and Caddy, J. F. (ed.) 1989: Report of the second technical consultation on the stock assessment in the eastern Mediterranean. FAO Fisheries Report 412: 206pp.
13) Shindo, S. 1976: Fishery and its resources in South China Sea. 94pp. Japan Fisheries Resource Conservation Association. Tokyo, Japan. (In Japanese with English

title).
14) Uozumi, Y., Hatanaka, H., Sato, T., Augustyn, J., Payne, A. and Leslie, R. 1984: Report on the Japan/South Africa joint trawling survey on the Agulhas Bank in November/ December 1981. 91pp. Japan Marine Fishery Resource Research Center.

Appendix Figures

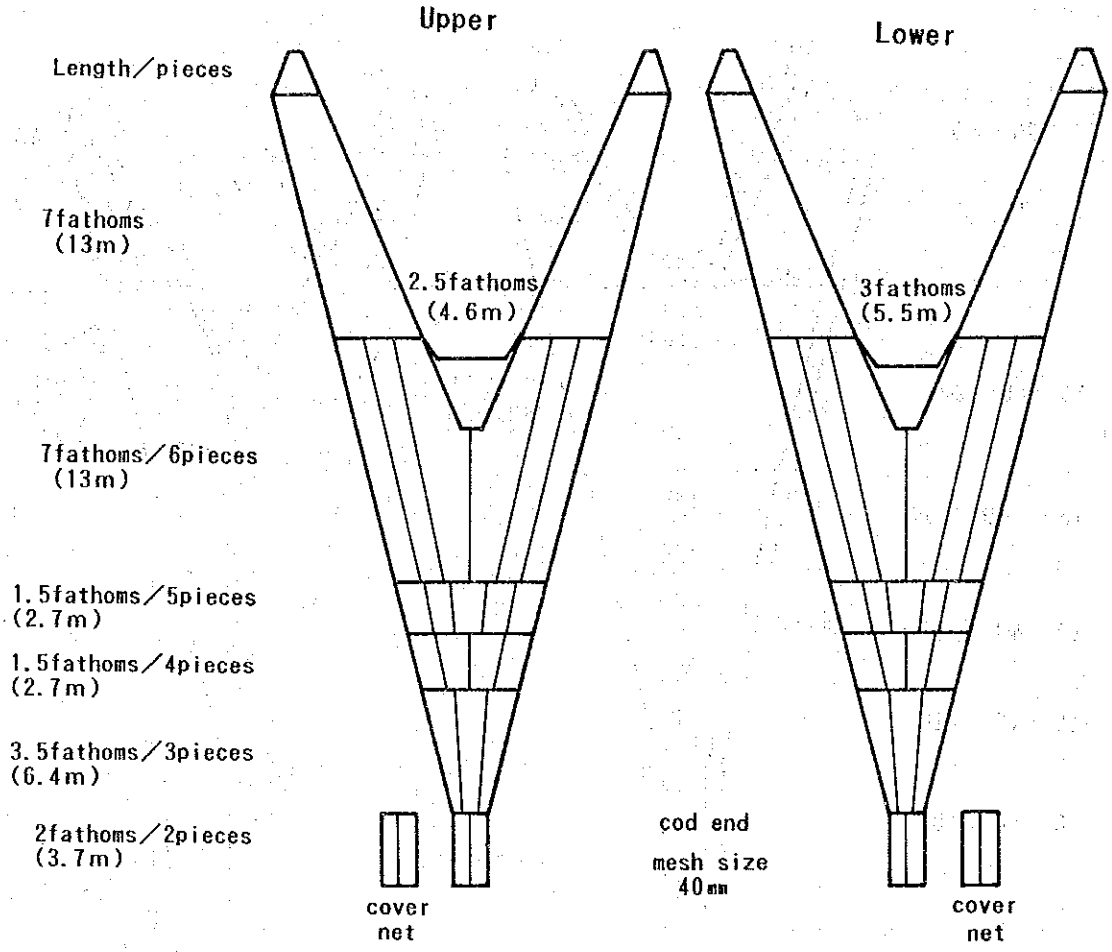


<Design of the bottom trawl net used in the survey>

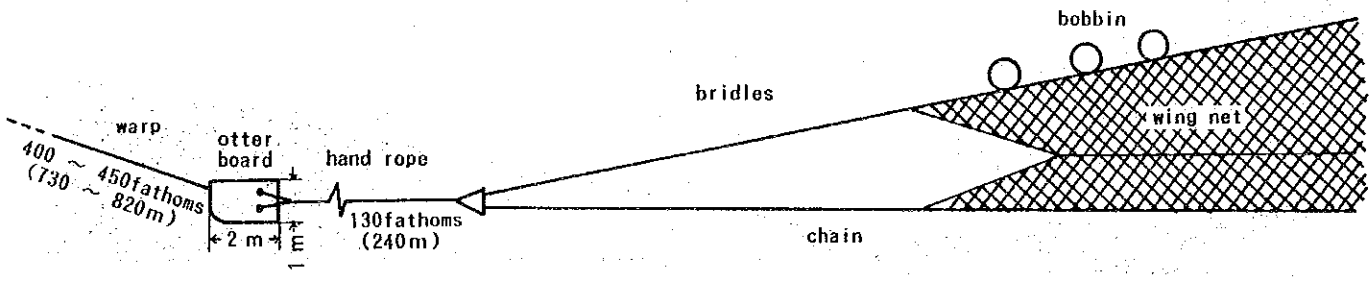


<Diagram of the hand rope and bridles>

Appendix Fig.1 Design of the bottom trawl net used in the survey

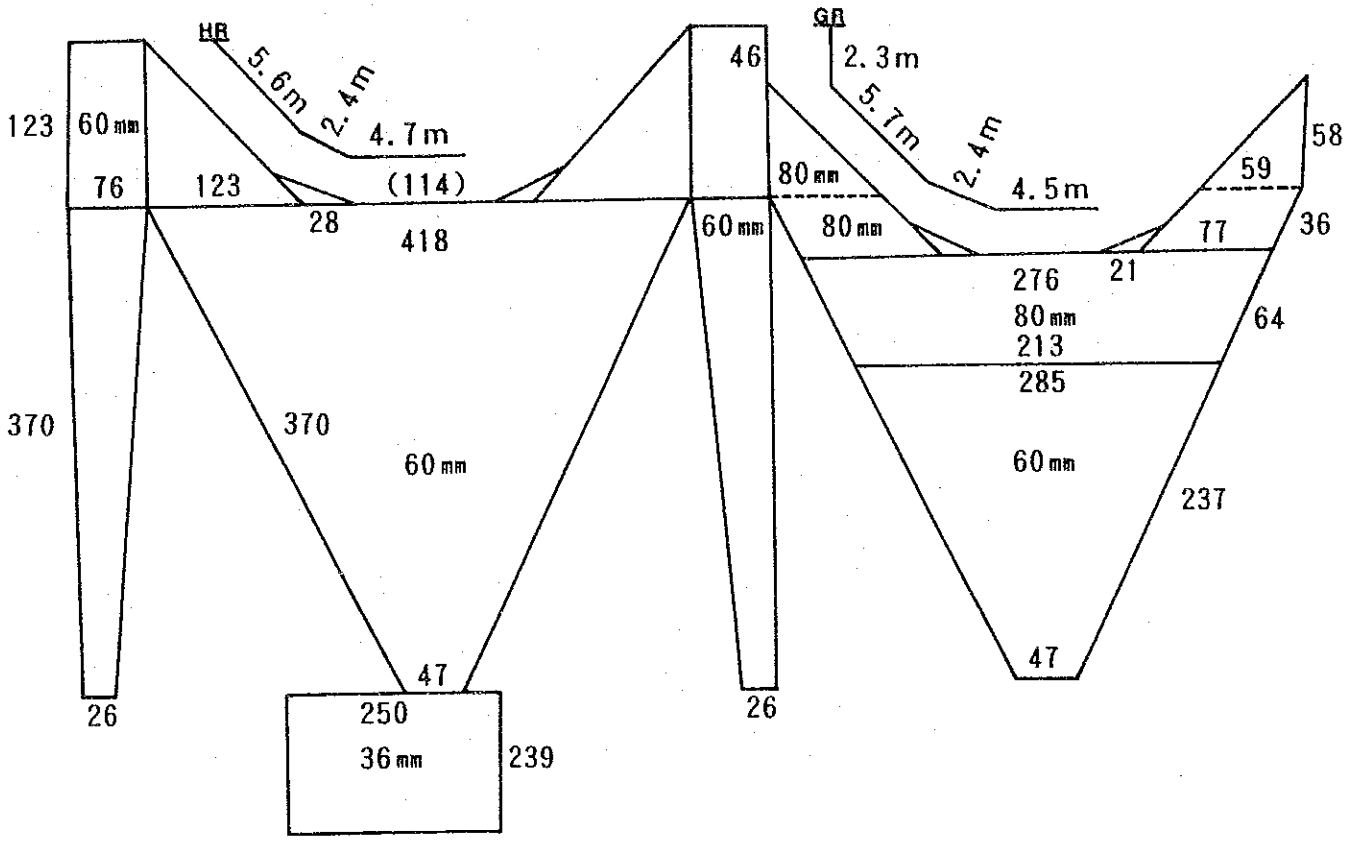


<Design of the bottom trawl net used by commercial fishing boat>

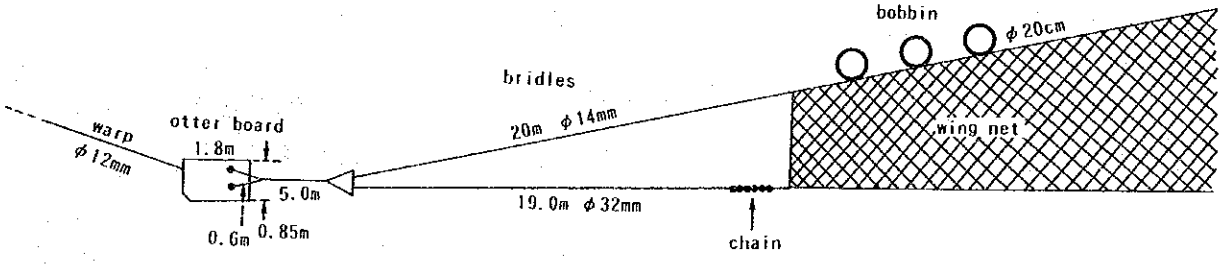


<Diagram of the hand rope and bridles>

Appendix Fig. 2. Design of the bottom trawl net used by commercial fishing boat for comparative fishing experiment



< Design of the shrimp trawl net used in the survey >

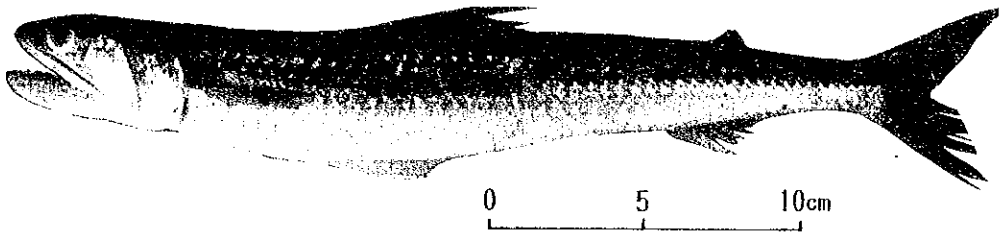


< Diagram of the otter board and bridles >

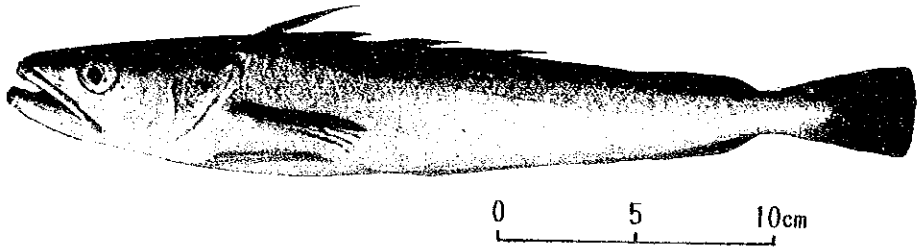
Appendix Fig. 3 Design of the shrimp trawl net (single rig type) used in the shrimp resources survey

Photographs of Important 21 Species

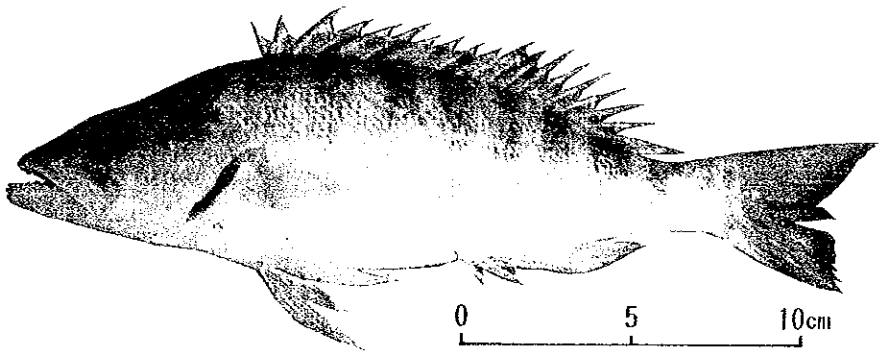
Photographs of 21 Important Species (Part 1)



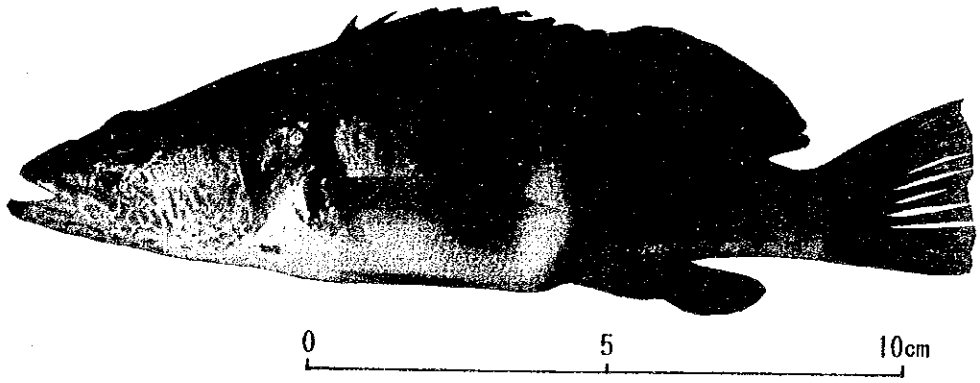
Brushtooth lizardfish *Saurida undosquamis*



Hake *Merluccius merluccius*

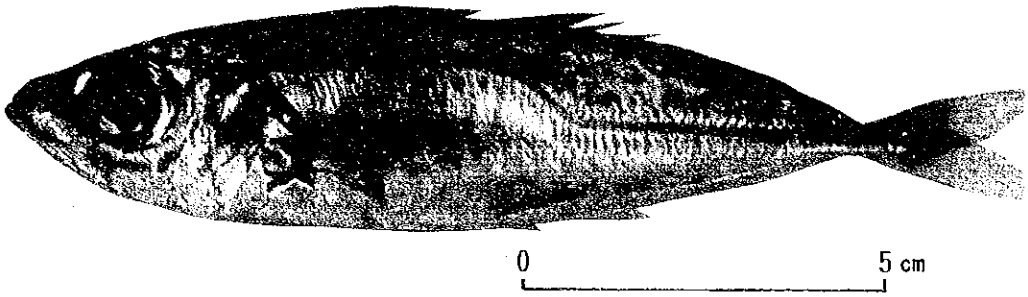


Comber *Serranus cabrilla*

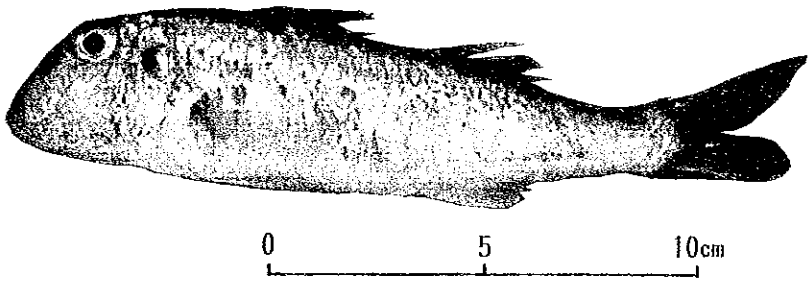


Painted Comber *Serranus scriba*

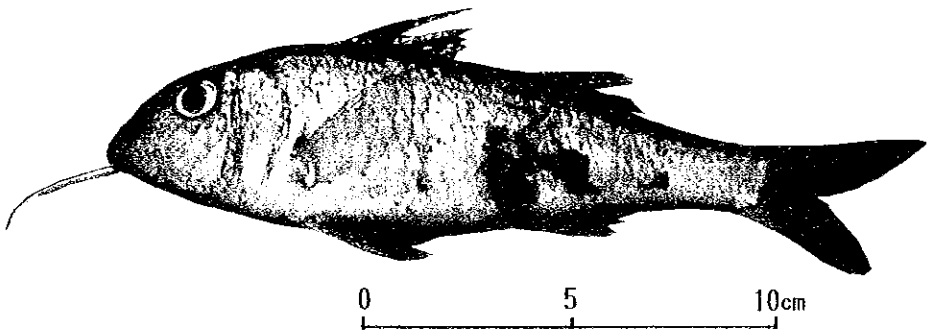
Photographs of 21 Important Species (Part 2)



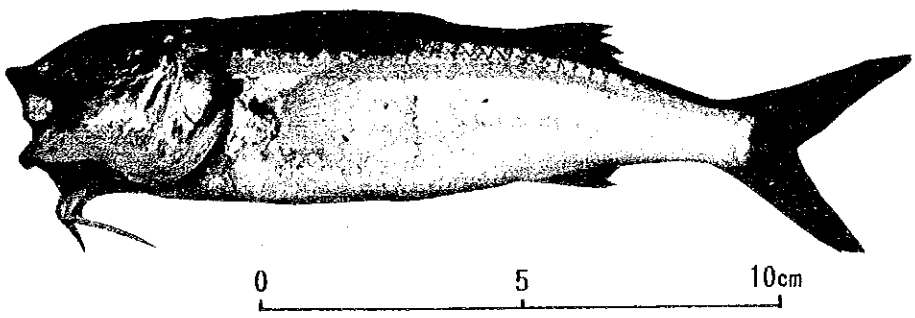
Atlantic horse-mackerel *Trachurus trachurus*



Red mullet *Mullus barbatus*

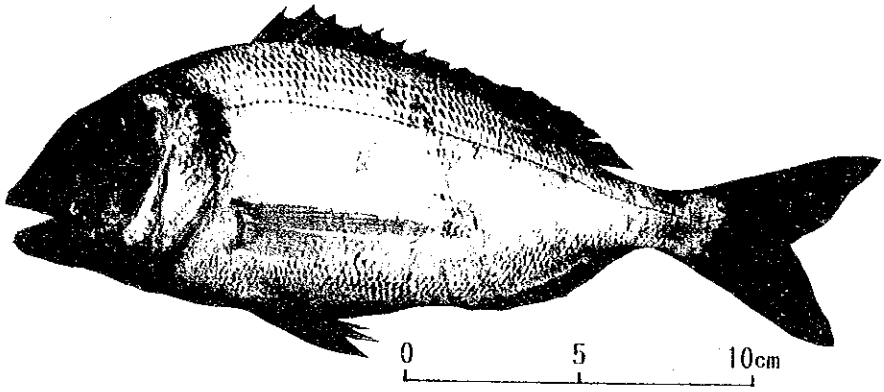


Striped red mullet *Mullus surmuletus*

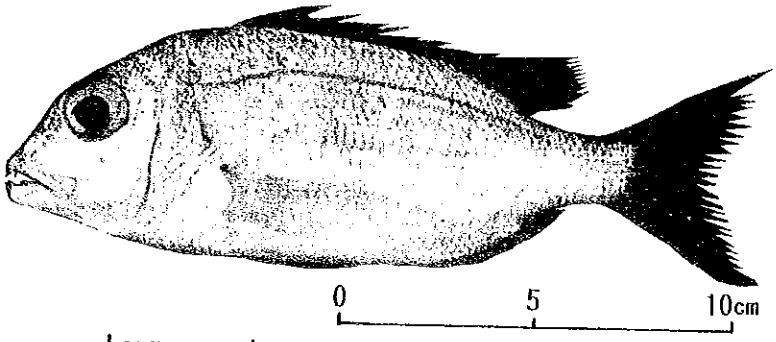


Golden-banded goatfish *Upeneus moluccensis*

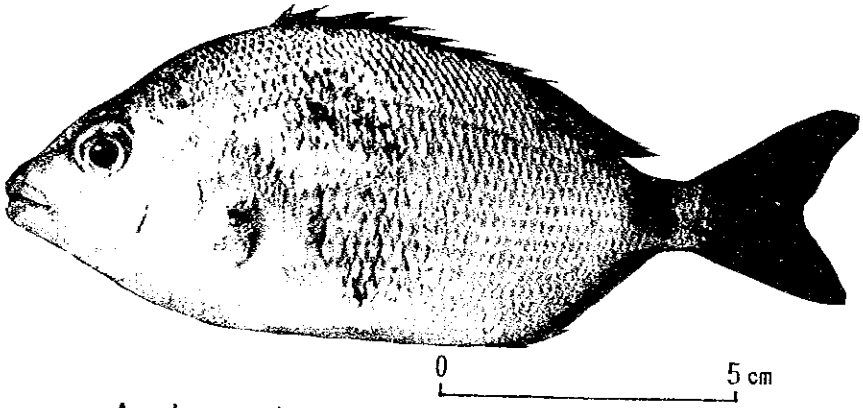
Photographs of 21 Important Species (Part 3)



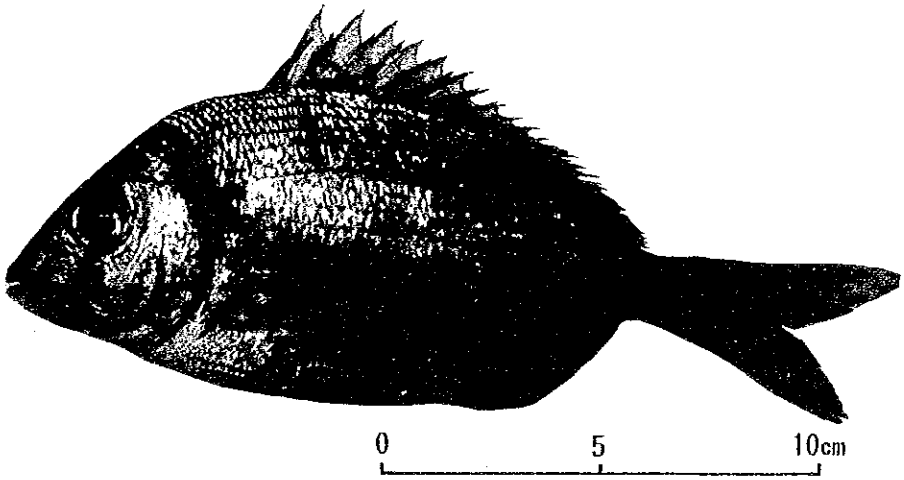
Gilt- head sea bream *Sparus aurata*



Large-eye dentex *Dentex macrophthalmus*

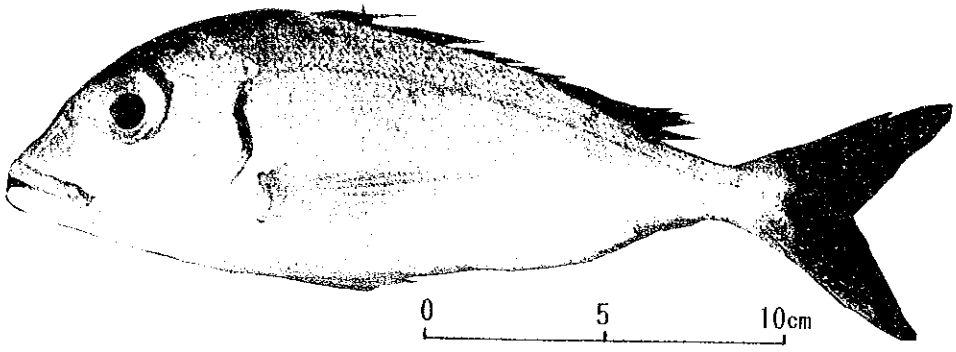


Annular sea bream *Diplodus annularis*

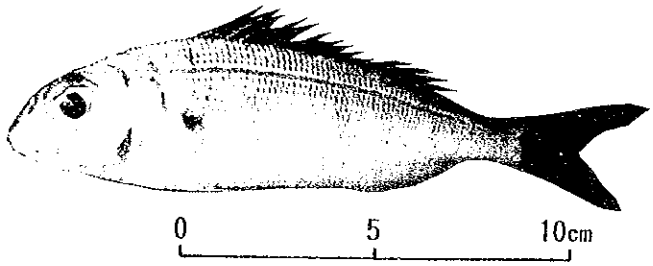


Common two-banded sea bream *Diplodus vulgaris*

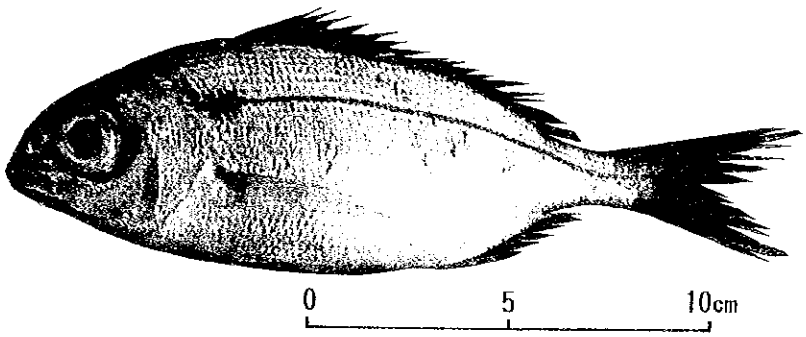
Photographs of 21 Important Species (Part 4)



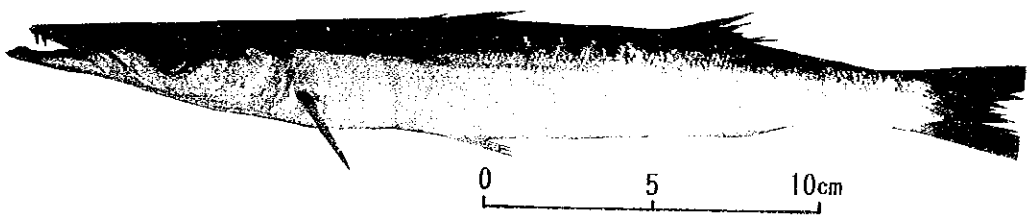
Common pandora *Pagellus erythrinus*



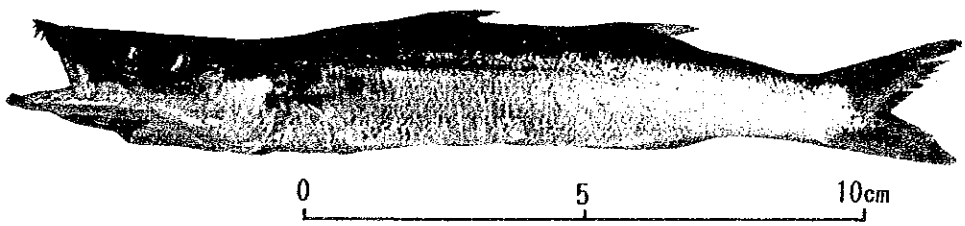
Axillary sea bream *Pagellus acarne*



Red sea bream *Pagellus bogaraveo*

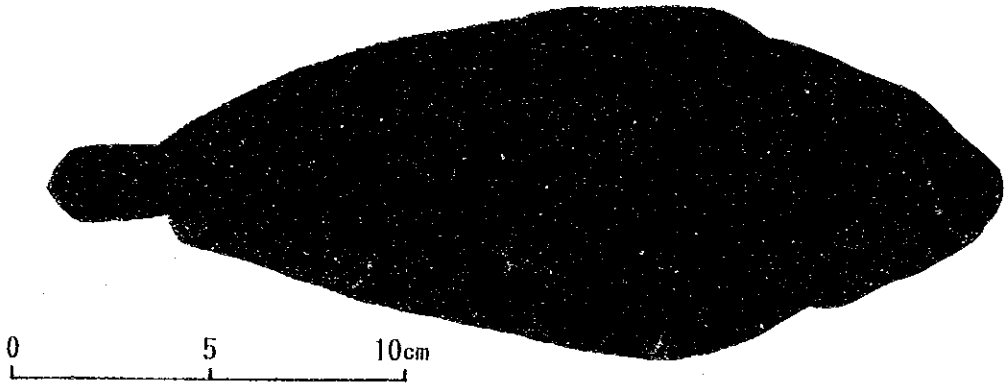


Barracuda *Sphyraena sphyraena*

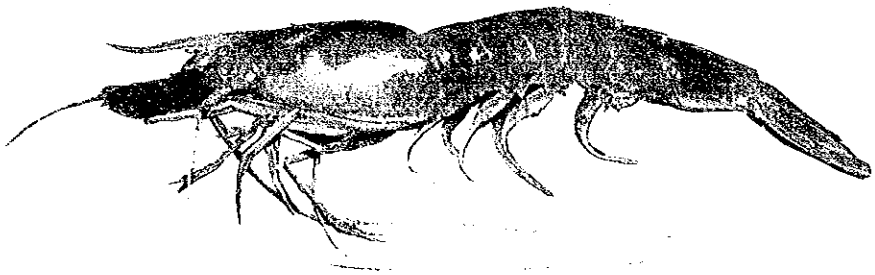


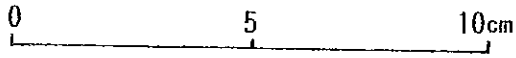
Obtuse barracuda *Sphyraena chrysotaenia*

Photographs of 21 Important Species (Part 5)

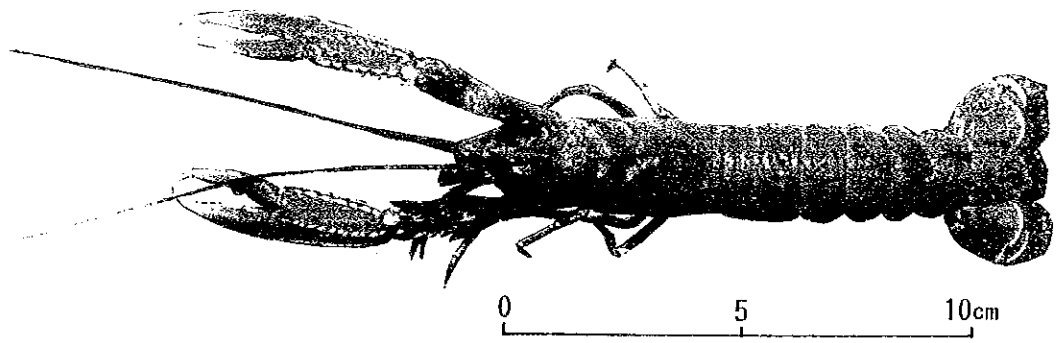


Common sole *Solea vulgaris*

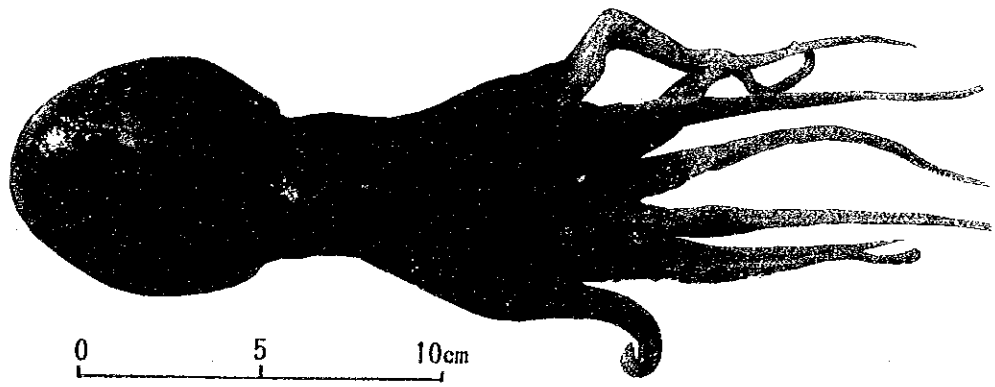




Deep-water pink shrimp *Parapenaeus longirostris*



Norway lobster *Nephrops norvegicus*



Horned octopus *Eledone cirrhosa*

Supplementary Reference

(Scope of Work)

SCOPE OF WORK

FOR

DEMERSAL FISHERIES RESOURCE SURVEY

IN

THE REPUBLIC OF TURKEY

AGREED UPON

BETWEEN

UNDERSECRETARIAT OF TREASURY AND FOREIGN TRADE,

PRIME MINISTRY

OF

THE REPUBLIC OF TURKEY

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

ANKARA, November 13, 1990

Mr. İbrahim BERBEROĞLU
Deputy General Director
of External Economic
Relations
Undersecretariat of
Treasury and Foreign
Trade

Mr. Atsushi Takei
Leader
Preliminary Survey Team
Japan International
Cooperation Agency

Ⅰ. INTRODUCTION

In response to the request of the Government of the Republic of Turkey(hereinafter referred to as "the Government of Turkey"), the Government of Japan has decided to conduct the Demersal Fisheries Resource Survey in Turkey(hereinafter referred to as "the Survey"), in acoordance with the relevant laws and regulations in force in Japan.

Accordingly, Japan International Cooperation Agency(hereinafter referred to as "JICA"), the official agency responsible for the implementation of technical cooperation programmes of the Government of Japan, will undertake the Survey in close cooperation with the authorities concerned of the Government of Turkey.

The present document sets forth the scope of work with regard to the Survey.

Ⅱ. OBJECTIVE OF THE STUDY

The objectives of the Survey are to assess distribution and abundance of demersal fish stocks, commercially important and under-exploited species respectively, in Turkish Exclusive Economic Zones (EEZs) of the Sea of Marmara, the Aegean Sea and the Mediterranean Sea.

Ⅲ. OUTLINE OF THE SURVEY

1. Survey Area

The Survey covers Turkish EEZs of the Sea of Marmara, the Aegean Sea, the Mediterranean Sea and selected fish landings along the coasts.

2. Scope of the Survey

The Survey consists of preparatory survey, sea-borne survey and fish landing site survey.

2-1 Preparatory survey

Preparatory survey will include:

(1)Data collection

Existing fisheries statistics, fish landing data and other relevant information will be collected.

(2)Preparation of Operation Plan

Q.T

A operation plan of sea-borne survey will be prepared and presented for discussion.

(3)Preparatory Sea-borne Survey

Preparatory sea-borne survey will be conducted to examine efficiency of survey vessel and survey equipment.

2-2 Sea-borne survey

Sea-borne survey will be carried out in Spring, in Autumn and in Winter in the first year, and in Summer in the second year, by a suitable stern trawler equipped with a high opening bottom trawl net, electric navigation equipment and oceanographic survey instrument.

In selecting sampling/observation stations for the survey, a stratified random mothod will be adopted.

Sea-borne survey will include:

(1)Trawl survey

a. Measurement of weight and number of demersal fishes by haul
b. Measurement of swept-area by haul
c. Others

(2)Biological survey

a. Length, and age if possible, composition of catches by species
b. Measurement of weight and maturity of gonad by species
c. Species indentification of fishes and other important invertebrates

(3)Oceanographic observation

a. Temperature and salinity observation
b. Others

2-3 Landing site survey

To complement the sea-borne survey, landing site survey will be carried out at selected major fish landings regularly.

The landing site survey will include:

a. Catch and effort data collection by species
b. Length composition data sampling by species
c. Others

2-4 Analysis of collected data

The data collected in the sea-borne survey and the landing site survey will be analyzed, and distribution and abundance of the

fish stocks, along with the oceanoraphic conditions, will be assessed.

Ⅳ. SURVEY SCHEDULE

The Survey will be executed in accordance with the attached tentative work schedule.

Ⅴ. REPORT

JICA shall prepare and submit the following reports in English to the Government of Turkey.

(1)Inception Report

Twenty(20) copies at the commencement of the Survey.

(2)Plan of Operation

Twenty(20) copies at the commencement of the spring's sea-borne survey.

(3)Interim Report

Twenty(20) copies at the end of winter survey.

(4)Draft Final Report

Twenty(20) copies at the end of analysis of data in Japan. The Government of Turkey provides JICA with its comments on the Draft Final Report through the Embassy of Japan within one(1) month after the receipt of the Draft Final Report.

(5)Final Report

Fifty(50) copies within two(2) months after receipt the comments on the Draft Final Report.

Ⅵ. UNDERTAKING OF THE GOVERNMENET OF TURKEY

1. To facilitate smooth conduct of the Survey, the Government of Turkey shall take necessary measures, if applicable:

(1) to secure the safety of the Japanese survey team.

(2) to permit the members of the Japanese survey team to enter, leave and sojourn in Turkey for the duration their assignment therein, and exempt them from alian registration requirements and consular fees.

(3) to exempt the members of the Japanese survey team from taxes, duties, and any other charges on equipment, machinery and other materials brought into Turkey for the conduct of the Survey.

(4) to exempt the members of the Japanese survey team from income

tax and charges of any kind imposed on or in connection with any emolumant or allowances paid to the members of the Japanese survey team for their services in connection with the implementation of the Survey.

(5) to provide necessary facilities to the Japanese survey team for remittance as well as utilization of funds introduced into Turkey from Japan in connection with the implementation of the Survey.

(6) to secure permission for entry into private properties for the conduct of the Survey.

(7) to secure permission for the Japanese survey team to take all documents including photographs related to the Survey out of Turkey to Japan.

(8) to provide medical services as needed. Its expenses will be chargeable on the members of the Japanse survey team.

(9) to facilitate prompt custom clearance and inland transportation of equipment, materials, supplies required for the Survey and the personal effects of members of the Japanese survey team.

(10) to provide necessary facilities to the members of the Japanese survey team for boarding a survey vessel.

2. The Government of Turkey shall bear claims, if any arises against the members of the Japanese survey team resulting from, occuring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Survey, except when such claims arise from gross negligence or wilful misconduct on the part of the members of Japanese survey team.

3. Undersecretariat of Treasury and Foreign Trade shall act as a coordinating body in relation with other governmental and non-governmental organization concerned, and Ministry of Agriculture, Forestry and Rural Affairs(hereinafter referred to as "MAFRA") shall act as counterpart agency to the Japanese survey team for the smooth implementation of the Survey.

4. MAFRA shall, at its own expense, provide the Japanese survey team with the following in cooperation with other agencies concerned.

If MAFRA cannot provide the below, MAFRA and JICA will discuss

9.T

an appropriate solution.

(1)available data and information related to the Survey,

(2)additional survey related to the Survey, if necessary,

(3)counterpart personnel,

(4)suitable office with necessary equipment,

(5)appropriate number of vehicles with drivers, and

(6)credentials or identification cards to the members of the survey team.

Ⅶ. UNDERTAKING OF JICA

For the implementation of the Survey, JICA shall take the following measures;

1. to dispatch, at its own expenses, survey team to Turkey,
2. to pursue technology transfer to the Turkish counterpart personnel in the course of the Survey.
3. to provide, at its own expenses, a survey vessel, materials and equipment necessary for the execution of the Survey.

Ⅷ. CONSULATION

JICA and MAFRA will consult with each other in respect of any matters that may arise from or in connection with the Survey.

ANNEX

Tentative Work Schedule

Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Preparatory Survey															
2. Sea-borne Survey															
3. Landing site Survey															
4. Data Analysis															
5. Explanation of DF/R															
Report		▲ Inc/R		▲ P/O											▲ Int/R

Description	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1. Preparatory Survey														
2. Sea-borne Survey														
3. Landing site Survey														
4. Data Analysis														
5. Explanation of DF/R														
Report											▲ DF/R			▲ F/R

Note: Works in Japan
Works in Turkey

Inc/R: Inception Report
P/O : Plan of Operation

Int/R: Interim Report
DF/R : Draft Final Report
F/R : Final Report