JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF FISHERIES, SOCIALIST REPUBLIC OF VIET NAM

THE MARINE RESOURCES STUDY IN VIET NAM

Appendix

FEBRUARY 1998

FUYO OCEAN DEVELOPMENT & ENGINEERING Co., Ltd.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF FISHERIES, SOCIALIST REPUBLIC OF VIET NAM

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Organization of the Study Team

Organization of the Study Team

1. Japanese Side

Kenji Takagi	: Leader of Study Team / Resource management Director, Fuyo Ocean Development & Engineering CO., LTD
Kazuo Arai	: Resource survey / Data analysis Fuyo Ocean Development & Engineering CO., LTD
Wataru Hiramatsu	: Marine biology Fuyo Ocean Development & Engineering CO., LTD
Masaru Watanabe	: Oceanographic observation Fuyo Ocean Development & Engineering CO., LTD
Masahiro Mastumoto	: Fishing operation, 1st & 2nd cruises KOYO KAIJI CO., LTD
Kastuo Suzuki	: Fishing operation, 3rd and 4th cruise Fuyo Ocean Development & Engineering CO., LTD
Kenneth Ruddle	: Socio-fishery I C Net Limited
Hiroaki Yonesaka	: Fishery economy I C Net Limited
Toshihisa Hagiwara	: Ship improvement NKK CORPORATION
Ken-ichi Ogawa	: Ship improvement (electrical) NKK CORPORATION
Wajirou Fujisawa	: Liaison Fuyo Ocean Development & Engineering CO., LTD

2. Vietnamese Side

Bui Dinh Chug	: Leader of Study Team / Resource management Director, Research Institute of Marine Products
Chu Tien Vinh	: Chief researcher Research Institute of Marine Products
Nguyen Duong Thao	: Marine biology, 1st, 3rd & 4th cruises Research Institute of Marine Products
Pham Ngoc Tuyen	: Marine biology, 1st & 2nd cruises Research Institute of Marine Products
Doan Van Du	: Marine biology, 2nd cruise Research Institute of Marine Products
Dao Trong Hong	: Marine biology, 3rd & 4th cruises Research Institute of Marine Products
Le Hong Cau	: Marine physics, 1st & 2nd cruises Research Institute of Marine Products
Tran Luu Khanh	: Marine physics, 3rd & 4th cruises Research Institute of Marine Products
Nguyen Dinh Nhan	: Fishing operation Research Institute of Marine Products
Nguyen Long	: Socio-fishery, Fishery economy Research Institute of Marine Products
Nguyen Quoc Lap	: Ship improvement Research Institute of Marine Products
Research Vessel "Bien Dong"	: Captain, Nguyen Trong Hiep, and crew of 26 Research Institute of Marine Products

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Scope of Work and Minutes of Meeting

SCOPE OF WORK
FOR
THE MARINE RESOURCES STUDY
IN VIET NAM

AGREED UPON BETWEEN
MINISTRY OF FISHERY
AND
THE JAPAN INTERNATIONAL COOPERATION AGENCY

HANOI, 21 SEPTEMBER, 1994

MR. HO VAN HOANH
DIRECTOR,
INTERNATIONAL COOPERATION
DEPARTMENT,
MINISTRY OF FISHERIES
SOCIALIST REPUBLIC OF VIET NAM

MR. AKIMITSU KOGANEZAWA
LEADER,
PREPARATORY STUDY TEAM
JAPAN INTERNATIONAL
COOPERATION AGENCY

MR. NGUYEN XUAN THAO
DIRECTOR
DEPARTMENT OF AGRICULTURE,
FORESTRY, FISHERY
STATE PLANNING COMMITTEE,
SOCIALIST REPUBLIC OF VIET NAM

MR. BUI DINH CHUNG
DIRECTOR,
RESEARCH INSTITUTE OF
MARINE PRODUCTS
MINISTRY OF FISHERIES
SOCIALIST REPUBLIC OF VIET NAM

1. INTRODUCTION

In response to the request of the Government of Socialist Republic of Viet Nam (hereinafter referred to as " the Government of Viet Nam"), the Government of Japan has decided to conduct the Marine Resources Study in Viet Nam (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

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

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

2 .OBJECTIVES OF THE STUDY

The objectives of the Study are :

(1) to investigate relative stock abundance of pelagic fishery resources in the Viet Nam Exclusive Economic Zone,

(2) to clarify coastal fishery conditions through landing site survey at selected major fish landing sites,

(3) to prepare guide-lines for a marine resources management plan which would include the proper fishing methods,

(4) to carry out technology transfer and training in the course of the Study to the counterpart personnel of the Government of Viet Nam, and thus contribute to sustainable utilization of marine resources in Viet Nam.

3. STUDY AREA

(1) The sea-borne survey

The sea-borne survey area is defined as the offshore area of Viet Nam shown in APPENDIX 1 within the Viet Nam Exclusive Economic Zone.

(2) The landing site survey

The landing site survey will be carried out at the following fish landing sites in Viet Nam.

a. Da Nang
b. Qui Nhon
c. Nha Trang
d. Phan Thiet
e. Vung Tau

4. OUTLINE OF THE STUDY

The Study will consist of the following two phases. Work plans in each phase are as follows.

4-1 Work in Phase 1

(1) Collection of data and information on,

a. Natural conditions

b. Socio-economic conditions

c. Fisheries conditions

(2) Sea-borne survey (Stage 1)

In order to conduct relative stock abundance, the sea-borne survey will be carried out twice a year considering the direction of the current. The sea-borne survey will include following items.

a. Drifting gillnet survey

b. Acoustic survey

c. Oceanographic observation

d. Biological survey

e. Analysis of collected data

f. others

(3) Land site survey

In order to grasp conditions of coastal fishery, the land site survey will be carried out on the following items.

a. Collection of data and information

b. Interview

d. Sampling

c. others

4-2 Work in phase 2

(1) Sea-borne survey (Stage 2)

In order to supplement Stage 1 survey and to recommend the proper fishing methods, the sea-borne survey will be continued to Stage 1 survey. The sea-borne survey will include the following items.

a. Test fishing survey

b. Acoustic survey

c. Oceanographic observation

d. Biological survey

e. Analysis of collected data

f. others

(2) Formulation of guide-lines for a marine resources management plan

5 Work schedule

The Study shall be carried out in accordance with the attached tentative work schedule. (APPENDIX -2)

6. Reports

JICA shall prepare the following reports in English for the Government of Viet Nam. (APPENDIX -2)

(1) Inception Report :

Twenty (20) copies at the beginning of phase 1 field work.

(2) Interim Report :

Twenty (20) copies at the end of phase 1 study.

(3) Draft Final Report :

Twenty (20) copies at the end of phase 2 study. The Government of Viet Nam will provide JICA with its comments on the Draft Final Report within one (1) month after receipt of the Draft Final Report.

(4) Final Report :

Fifty (50) copies within two (2) months after receipt of the comments from the Government of Viet Nam on the Draft Final Report.

7. UNDERTAKING OF THE GOVERNMENT OF VIET NAM

(according to Japanese relevant laws and regulations)

(1) To facilitate the smooth conduct of the Study, the Government of Viet Nam shall take necessary measures ;

a. to secure the safety of the Japanese study team,

b. to permit the members of the Japanese study team to enter, leave and sojourn in Viet Nam for the duration of the their assignment therein, and exempt them from foreign registration requirements and fees,

c. to exempt the members of the Japanese study team from taxes, duties and other charges on equipment, machinery and other materials brought into Viet Nam for the conduct of the Study,

d. to exempt the members of the Japanese study team from income tax and charges of any kind imposed on or in connection with any emoluments or allowance paid to the members of the Japanese study team for their services in connection with the implementation of the Study.

e. to provide necessary facilities to the Japanese study team for the remittance as well as utilization of the funds introduced into Viet Nam from Japan in connection with the implementation of the Study,

f. to secure permission for entry into all areas concerned for the implementation of the Study.

g. to secure permission for the Japanese study team to take all data and documents (including maps, photographs) related to the Study out of Viet Nam to Japan,

h. to provide medical services as needed. whose expenses will be charged on members of the Japanese study team.

i. to secure clearance for the use of communication facilities including transceivers,

(2) The Government of Viet Nam shall bear claims, if any arise against the members of the Japanese study team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the

implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Japanese study team.

(3) The Ministry of Fishery shall act as a counterpart agency to the Japanese study team and also as the coordinating body in relations with other governmental and non-governmental organizations concerned with the smooth implementation of the Study.

(4) The Ministry of Fishery shall, at its own expense, provide the Japanese study team with the following, in cooperation with other organizations concerned:

a. available data, maps and information related to the Study,
b. counterpart personnel,
c. research vessel for the sea-borne survey
d. suitable office space with necessary equipment,
e. credentials or identification cards,

8. UNDERTAKING OF JICA

For the implementation of the Study, JICA shall take the following measures:

(1) To dispatch, at its own expense, the study team to the Viet Nam,

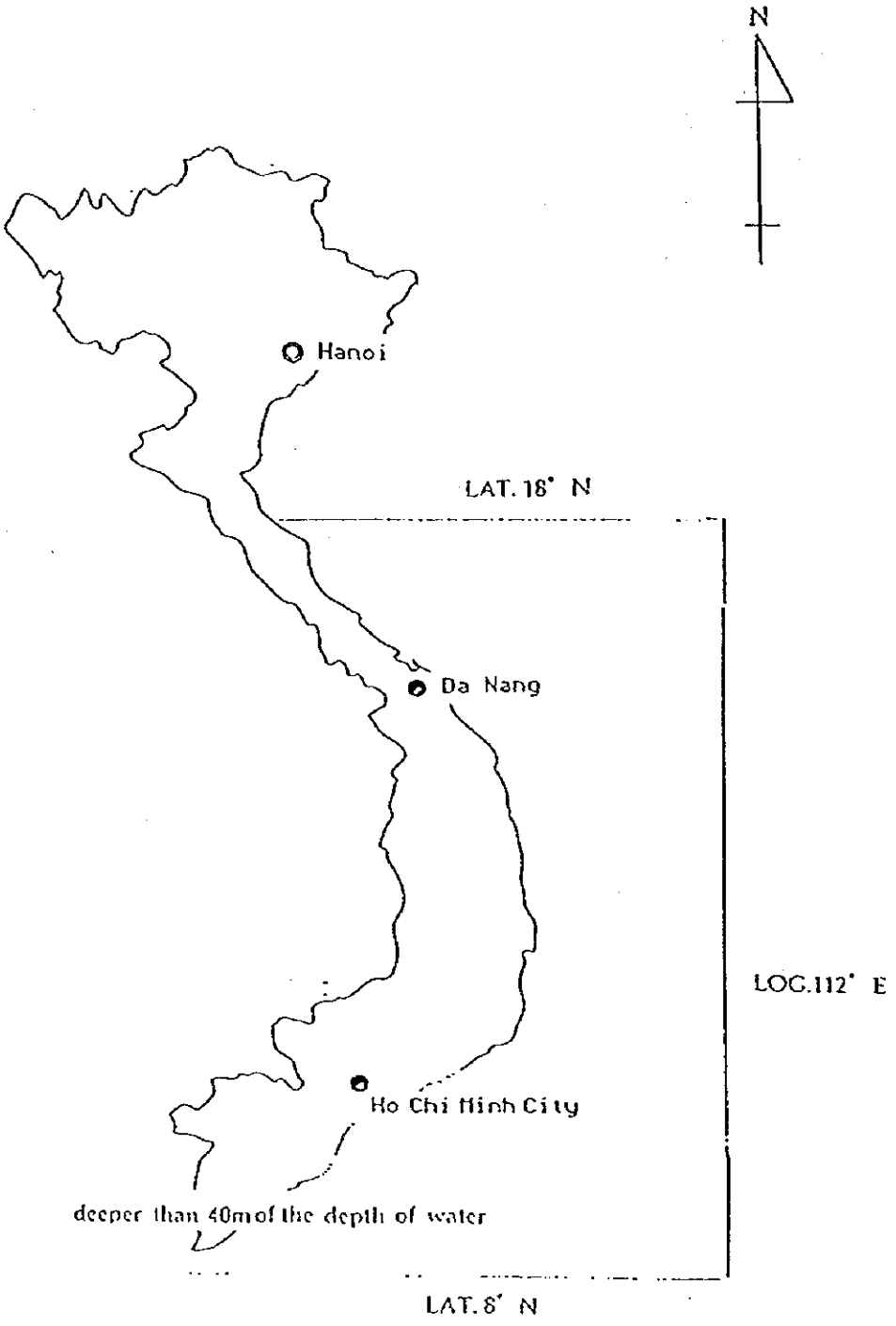
(2) To pursue technology transfer and training to the Viet Nam counterpart personnel in the course of the Study.

(3) To offer all data collected in the course of the Study to the Vietnamese side.

9. OTHERS

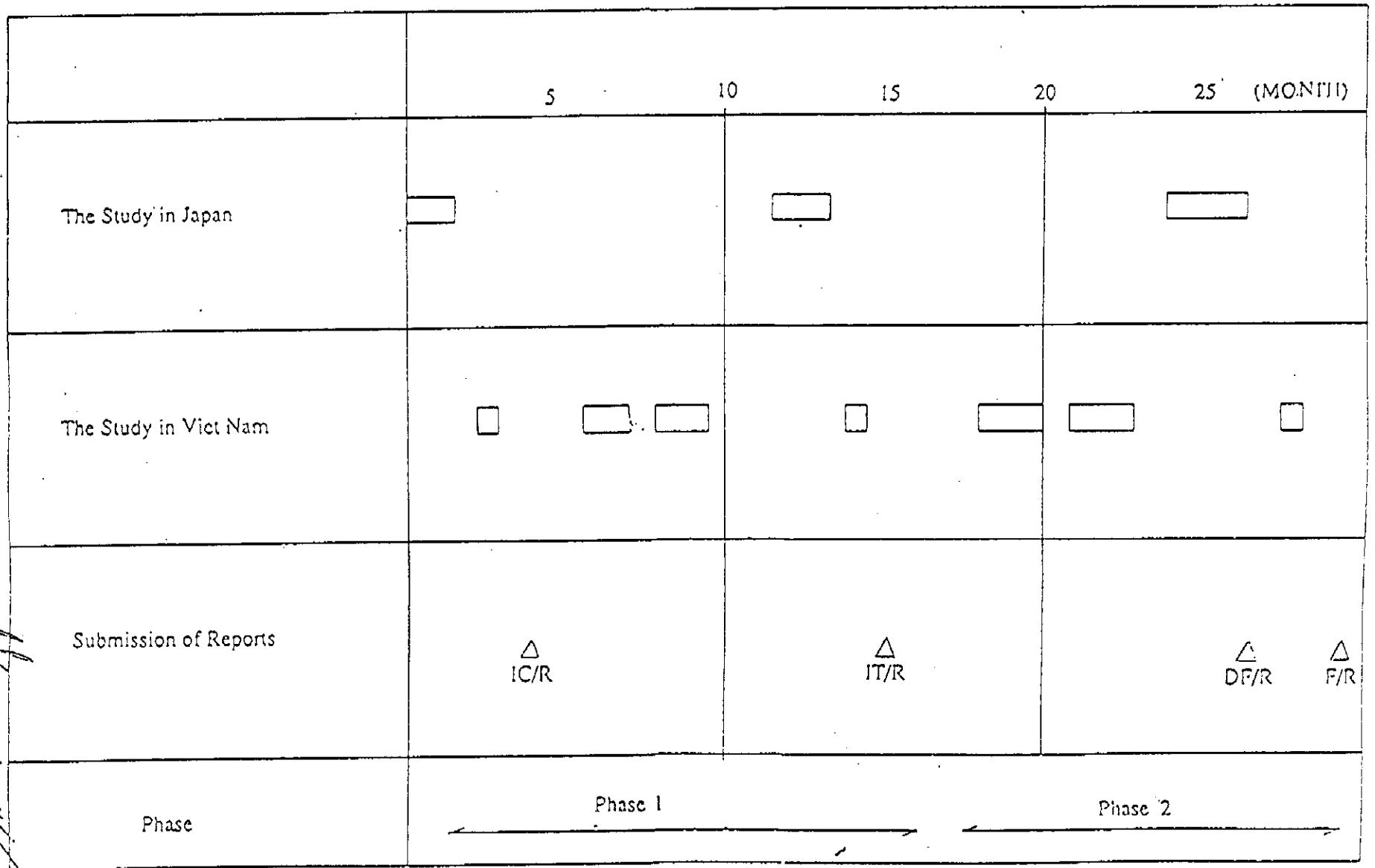
(1) JICA and the Ministry of Fishery shall consult with each other on any matter that may arise from or in connection with the Study.

APPENDIX 1


N
Hanoi
LAT. 16° N
Da Nang
LOG. 112° E
Ho Chi Minh City
deeper than 40m of the depth of water
LAT. 8° N

APPENDIX 2

TENTATIVE WORK SCHEDULE OF THE STUDY



Note : IC/R:Inception Report IT/R:Interim Report DF/R:Draft Final Report F/R:Final Report

MINUTES OF MEETING
OF
SCOPE OF WORK
FOR
THE MARINE RESOURCES STUDY
IN VIET NAM

The preparatory study team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA"), and headed by Mr. AKIMITSU KOGANEZAWA, visited Viet Nam from September 13, 1994 to September 23 for the purpose of discussing and confirming the Scope of Work for The Marine Resources Study in Viet Nam (hereinafter referred to as "the Study").

The Team had a series of discussions with the officials concerned of the Ministry of Fishery (hereinafter referred to as "MOF") on the Scope of Work for the Study. The list of participants in a series of meetings is attached in the ANNEX-2.

As the result of discussions, MOF and the Team agreed on the Scope of Work for the Study.

The main issues discussed and agreed upon by both sides in relation to Scope of Work for the Study are shown in the ANNEX-1 as attached hereto.

Hanoi, September 21, 1994

MR. HO VAN HOANH
DIRECTOR,
INTERNATIONAL COOPERATION
DEPARTMENT,
MINISTRY OF FISHERIES
SOCIALIST REPUBLIC OF VIET NAM

MR. AKIMITSU KOGANEZAWA
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MR. NGUYEN XUAN THAO
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SOCIALIST REPUBLIC OF VIET NAM

MR. BUI DINH CHUNG
DIRECTOR,
RESEARCH INSTITUTE OF
MARINE PRODUCTS
MINISTRY OF FISHERIES
SOCIALIST REPUBLIC OF VIET NAM

ANNEX-1

The following are the main issues discussed and agreed upon by both sides in relation to the Scope of Work for the Study.

1. MOF will be responsible for the implementation of the Study. The Research Institute of Marine Products (hereinafter referred to as "RIMP") will be directory responsible for the implementation of the Study, and will act as the counterpart organization to the Japanese study team and as the coordinating body in relation to other relevant authorities concerned to the smooth implementation of the Study.

2. MOF promised to cooperate with the Japanese study team for the implementation of the Study, and provide with the staff of MOF for the implementation of the land site survey, and also provide with the following staff of RIMP for the implementation of the sea-borne survey.
   a) Captain
   b) Crew
   c) Researchers

3. MOF requested that the following necessary equipments for the Study be procured by JICA and be donated to RIMP after the termination of the Study.
   The Team promised to convey its request to the Government of Japan.
   a) Drift net
   b) Net hauler
   c) Scanning sonar
   d) Echo sounder
   e) Doppler current meter
   f) Electric thermometer
   g) Plankton net (Zooplankton net, Phytoplankton net)
   h) G.P.S
   i) Radar
   j) Personal computer(s)
   k) Four-wheel drive vehicle
   l) Other necessary equipments

4. The research vessel which will be used for the sea-borne survey will be offered by RIMP without compensation. If the improvement of the research vessel would be needed for the implementation of the sea-borne survey, its expenses would be paid by the Japanese study team. The operation cost for the sea-borne survey will be also paid by the Japanese study team.

5. MOF requested JICA to open a seminar on the result of the Study at the end of the Study period.

6. MOF requested the training of counterpart personnel in Japan for effective transfer of technology in connection with the Study. The Team promised to convey its request to the Government of Japan.

7. MOF promised to offer suitable office space with necessary equipment for the Japanese study team at RIMP in Haiphong.

8. If fisheries regulations demand that the license would be required for the implementation of the Study, MOF will take necessary measures for granting or obtaining the license before the commencement of the Study.

9. Both sides confirmed that the sea-borne survey will not be carried out in the areas of the international dispute.

10. MOF will be responsible to the disposal of all fish caught in the course of the sea-borne survey, except those needed for studies .

ANNEX-2

LIST OF PARTICIPANTS

Subject : Discussion of Scope of Work
Date : From September 13 to September 21, 1994
Place : Ministry of Fisheries, Research Institute of Marine Products

Vietnamese Side

Name	Position
Mr. Vo Van Trac	Vice Minister, MOF
Mr. Ho Van Hoanh	Director, International Cooperation Department, MOF
Mr. Dinh Trong Thai	Deputy Director, Science and Technology Management Department, MOF
Mr. Tran Duc Try	Representative, International Cooperation Department, MOF
Mr. Pham Van Thanh	Planning and Investment, MOF
Mr. Bui Dinh Chung	Director, RIMP
Mr. Pham Thuoc	Deputy Director, RIMP
Mr. Nguyen Van Ngoan	Deputy Director, RIMP
Mr. Chu Tien Vinh	Assistant Director, RIMP
Mr. Dao Manh Muon	Head of Fishery Oceanography Research Dep., RIMP
Mr. Nguyen Cong Ruong	Deputy Head of Fishery Oceanography Research Dep., RIMP
Mr. Nguyen Long	Head of Fishing Technology Research Dep., RIMP
Mr. Tran Khen	Agriculture, Forestry, Fisheries Dep., SPC

Japanese Side

Name	Position
Mr. Akimitsu Koganezawa	Leader of Mission, JICA Preparatory Study Team
Mr. Noritaka Asakawa	Member, JICA Preparatory Study Team
Mr. Masanori Takahashi	Member, JICA Preparatory Study Team
Mr. Shirou Yuge	Member, JICA Preparatory Study Team
Mr. Terutada Okamoto	Member, JICA Preparatory Study Team
Mr.Tatuya Yamada	Member, JICA Preparatory Study Team
Mr. Takahiro Sasaki	Second Secretary, Embassy of Japan

3

Description of Species which occurrence were newly observed in Vietnamese waters

1) ***Pseudocarchrias kamoharai*** (Matsubara, 1936)

Body slender, spindle-like; eye very large without nictating membrane, vertical diameter of orbit at least half as long as first gill slit; caudad peduncle with both sides of precaudal pits and low lateral keels on each side; gill opening onto dorsal surface of head; dorsal fins small, without spines; anal fin narrow-based. Body uniformly dark grey.

Reference : 2, 6

2) ***Prionance glauca*** (Linnaeus, 1758)

Body slender, typically shark-shape with a caudad keel; no spiracles; teeth with serations; first dorsal fin origin nearer to pectoral fin; pectoral fin long. Body uniformly blue in dorsal side, white in ventral side.

Reference : 3, 6

3) ***Carcharhinus brevipinna*** (Muller & Henle, 1839)

Body just a normal shark-shape without caudal keels; interdorsal ridge absent; snout long and pointed; teeth on jaws same, with narrow cusps, the upper finely serrated, the lower smooth edged; second dorsal fin especially smaller than first dorsal one; origin of first dorsal fin located in inner corner of pectoral fin; origin of second dorsal fin located in middle point of anal base or anteriorly. Distal portions of pectoral, second dorsal, anal fins and lower caudal lobe black.

Reference : 3 , 4

4) ***Isistius brasiliensis*** (Quoy & Gaimard, 1824)

Body small size, cigar-shape; snout moderately short, suctorial lips; lower teeth with a single cusp without serrate edges; first dorsal fin behind middle of body, rear end of base at pelvic insertion. Body brown, dark brown to black transverse bands on throat.

Reference : 2, 6

5) ***Manta birosiris*** (Donndorff, 1798)

Head projecting with pair of paddle-like extensions; large triangular

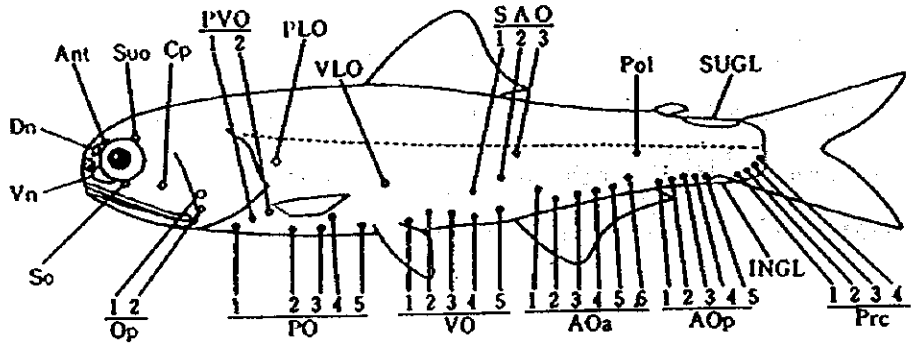
"wings"(pectoral fin flaps); tail long and whip-like; small dorsal fin present; disc above and below covered with small denticles; mouth opend on anterior margin of head; no teeth in upper jaw.

Reference : 6, 8

6) ***Mobula japonica*** (Muller & Henle, 1841)

Head projecting with pair of paddle-like extensions; large triangular "wings"(pectoral fin flaps); tail long and whip-like, without caudal and dorsal fins; venomous spine present; mouth opened on ventral side of head; teeth present in both jaws.

Reference : 6, 8



Shematic arrangement of photopores in Mcytophids fish.

7) ***Diaphus watasei*** Jordan & Starks, 1904

More than two Prc, Po1, PVO1 and PVO2 on straight ascending line; VO1,VO2 and VO3 on straight ascending line; Dn round, directed forward, its size about equale to body photophore; Vn extending dorsally between front margin of orbit and nasal apparatus, to make contact with or become confluent with Dn; Suo and So absent;Ant present; PLO nearer upper base of pectoral than lateral line; SAO3 and Po1 three photophore-diameter or more below lateral line.

Reference : 6, 8

8) ***Diaphus gigas*** Gilbert, 1913

More than two Prc, Po1, PVO1 and PVO2 on a straight ascending line; VO1, VO2 and VO3 on a straight ascending line; Dn and Vn very large, both extending anteriorly to ethmoid crest, dorsal margin of Dn barely extending higher than level of eye; Suo and So absent; Ant present; PLO middle point between lateral line and upper base of pectoral fin; SAO3 and Po1 one photophore-diameter or less below lateral line.

Reference : 6, 8

9) ***Cypselurus cyanopterus*** (Valenciennes, 1846)

Dorsal rays 12-15; anal rays 9-10; predorsal scales 35-40. Lateral line unbranched at pectoral base; pectoral fin very long, reaching to anal base posteriorly; only first pectoral ray unbranched; pelvic fin origin close to posterior margin of operclum than to origin of caudad lobe; anal origin located below third dorsal ray. Dorsal fin with a large black blotch; pectoral fin mostly bright dark-blue.

Reference : 6

10) ***Cypselurus spilonotopterus*** (Bleeker, 1866)

Dorsal rays 13-14; anal rays 10-11; predorsal scales 29-34. Laterad line unbranched at pectoral base; pectoral fin very long, reaching to anal base posteriorly; only first pectoral ray unbranched; pelvic fin origin about mid-point between posterior margin of operclum and lower origin of caudal lobe; anal origin located below third dorsal ray. Dorsal fin with a large black blotch; pectoral fin violet brown.

Reference : 6

11) ***Cypselurus unicolor*** (Valenciermes, 1846)

Dorsal rays 12-14; anal rays 10-11; laeral line scales 49-57; predorsal scales 28-38. Lateral line unbranched at pectoral base; pectoral fin very long, it's tip reaching to extreme posterior of anal fin; first pectoral ray unbranched; pelvic fin origin nearer to posterior edge of operculum than to

origin of lower caudal lobe; anal origin located below or third dorsal ray posterior. Pectoral fin uniformly transparent without any blotches; dorsal without a dark area.

Reference : 6

12) *Cypselurus naressi* (Gunther, 1889)

Dorsal rays 10-12; anal rays 7-9; laeral line scales 45-48; predorsal scales 28-32. Body elongate, broad and cylindrical in shape; lower jaw not prusible; head longer than base of dorsal fin; lateral line unbranched at pectoral base; pectoral fin enlarged, it's tip extending beyond anal fin origin; only first pectoral ray branched, the other rays unbranched; pelvic fin origin almost midway between posterior edge of operculum and origin of lower caudal lobe; anal origin below posterior to 3rd dorsal rays. Membrane of dorsal fin transparent without black blotch; pectoral fin dark without a diagonal transparent area.

Reference : 6

13) *Ablennes hians* (Valenciennes, 1846)

Dorsal rays 21-34; anal rays 25-27; pectoral rays 13-15. Body slender and well compressed, its depth greater than 2 times of width; no keels on caudal peduncle; postorbital scaleless. Bluish green above, silvery white on side; about 15 dark transverse bands on side of body.

Reference : 6

14) *Tylosurus acus melanotus* (Bleeker, 1850)

Dorsal rays 24-27; anal rays 22-24; pectoral rays 11-13. Body and head slender, strongly compressed; upper and lower jaws become prolongated; posterior of upper canine teeth erect; gill-raker absent on first gill arch; origin of dorsal fin about opposite to anad fin; caudal peduncle compressed; prominent, raised keel on side of caudal peduncle . No dark bluish transverse bands on anterior part of opercle margin.

Reference : 6

15) ***Parastromateus niger*** (Bloch, 1795)

Body deep and strongly compressed; a keel on caudal peduncle; dorsal spine embedded, not apparent in adults; no separate spines before anal fin; minute pelvic fin present in young, but absent in adults; small cycloid scales on body; dorsal and anal fins scaly. Body uniformly black.

Reference : 5, 6

16) ***Seliola rivoliana*** Valenciennes, 1833

Body moderately compressed; snout blunt; no scutes; soft rayed sections of both dorsal and anal fins steeply elevated anteriorly with long tips these rays longer than pectoral fin; no finlet. An oblique dark stripe from eye to upper nape; caudal fin uniformly darkish without tip of lower caudal white.

Reference : 5, 6

17) ***Scomberoides commersonianus*** Lacepede, 1801

Lower gill rakers less then 15; no scutes. Body well compressed; maxilla extending to far beyond posterior margin of eye; lateral line weakly bent above pectoral fin. Body silvery gray with bluish tinge on back, silvery white below; several dusky blotches above or touching lateral line, first 2 may intersect lateral line.

Reference : 5, 6

18) ***Trachinotus baillonii*** (Lacepede, 1801)

Dorsal rays VI+I, 21-25, anad rays II+I,20-24. Body moderately compressed, deep and ventral profile lightly convex; body height greater than head length; snout pointed; eye weak adipose eyelid; no scutes; dorsal spines not connected with each other by membrane; soft dorsal and soft anal rays prolong, strongly falcate in shape; pectoral fin short and not falcate. Body silvery blue to grayish green above, solvery white below; sides with 3-5 small black spots in longitudinal row on ot near lateral line.

Reference:6

19) *Megalaspis cordyla* (Linnaeus, 1758)

Dorsal rays VIII+I,10-11+8-10; anal rays II+I,8-9+6-8; scutes 53-58. Body fusiform, less compressed; tail tapering; adipose eyelid well developed; teeth on upper jaw biserial, outer one larger and conical; extremely deep and stout scutes present on entire stright lateral line which commences below 4th to 5th spine of spinous dorsal fin; first dorsal fin lower than second dorsal fin; anterior rays of second and anal fins falcate; several finlets behind dorsal and anal fins.

Reference : 5, 6

20) *Decapterus akaadsi* Abe, 1958

Gill rakers 11-12+29-32. Adipose eyelid well developed; maxilla not reaching to below anterior margin of eye; posterior margin of opercle membrane smooth; predorsal scales extending beyond anterior margin of eyes; scutes present on entire straight lateral line; pectoral fin long, reaching to below 5th dorsal ray; a single finlet behind dorsal and anal fins. Caudal fin orange red in life.

Reference : 5, 6

21) *Carangoides orthogrammus* (Jordan & Gilbert, 1881)

Dorsal rays VIII+I,29-33; anal rays II+I,26-27; gill rakers 8-9+22-23. Snout a little pointed, length than eye diameter; breast naked ventrally to pelvic origin; curved part of lateral line slightly longer to about equal to stright, posterior part. Sides with several elliptical yellow spots above or below lateral line.

Reference : 5, 6

22) *Coryphaena equiselis* Linnaeus, 1758

Dorsal rays 52-59; anal rays 24-28. Greatest body depth in adults more than 25 percent of standard length; a broad, square tooth patch on the tongue; pectoral fin equal to about half of head lenght.

Reference : 6, 8

23) ***Brama orcini*** Cuvier, 1831

Dorsal rays 32-36; anal rays 28-30; laterad line scales 48 to 55. Body strongly compressed, deep; lateral line complete; scales of adults without spines; caudal fin forked.

Reference : 6, 7, 8

24) ***Lobotes surinamensis*** (Bloch, 1790)

Dorsal rays XI-XII,15-16. Body oval to oblong, somewhat compressed; supramaxillary absent; a single dorsal fin with stout spines and elevated possterior section; scales moderately ctenoid, covering head and body except preorbital region and jaws. Body uniformly dark brown or greenish yellow.

Reference : 6, 8

25) ***Lepidocybium flavobrunneum*** (Smith, 1849)

Dorsal rays VIII-X,16-19+4-6. Caudal peduncle with a prominent lateral keel and 2 small supplementary keels above and below; lateral line single, but greatly undulated, reaching nearly to both dorsal and ventral contours of body; scales rather small, each surrounded by a network of tubules bearing pores; abdomen not keeled; dorsal and anal fins each with 5-7 finlets.

Reference : 6, 8

26) ***Ruvettus pretiosus*** Cocco, 1829

Dorsal rays XIII-XV,16-20+2. Caudal peduncle without prominent keel; lateral line single straight, but obscure; skin very rough; scales interspaced with rows of spinous bony tubercles; a distinct keel present along midventral line between pelvic fin and anus; dorsal and anal fins each with 2 finlets.

Reference : 6, 8

27) ***Gempylus serpens*** Cuvier, 1829

Dorsal rays XXXVI-XXXII,I,11-14+5-7. Body fairly elongate and compressed; caudal peduncle without prominent keel; skin smooth; two lateral lines, both originating below first dorsal fin spine; the upper line running along base of dorsal spines, ended below the last spine; the lower line

along midlateral line, extending to caudal base; no keels on belly; dorsal and anal fins each with 5-7 finlets.

Reference : 6, 7, 8

28) ***Scomber australasicus*** Cuvier, 1831

Dorsal rays XI-XII+I,11-12+5. First dorsal and second dorsal fins widely separated; five finlets behind dorsal and anal fin; adipose eyelid cover front and rear of eye; gill rakers shorter than gill filaments, barely visible through open mouth. Markings on back oblique, zigzag or wavy blue-black lines, many small black spots on belly.

Reference : 1, 6, 8

29) ***Tetrapturus audax*** (Philippi, 1887)

Anterior dorsal rays elevated into triangular peak, remainder of fin very low; height of anterior lobe of first dorsal fin about equal to or a little higher than greatest body depth; pelvic fins long and sslender, about equal to or slightly shorter than pectoral fin in large specimens.

Reference : 6

30) ***Psenes arafurensis*** Gunther, 1889

Dorsal rays X-XI+I-II,18-22; anal rays III,20-23. Body firm and compressed; snout short; lower jaw teeth long, compressed, contiguous, very different from those in upper jaw; vomer and palatine with teeth; dorsal origin before or directly over pectoral origin; anterior part of head naked; scaled region on head extending to posterior border of eye. Body uniformly black or dark brown in adults; young with mottled or banded color pattern.

Reference : 6, 8

31) ***Psenes maculatus*** Lutken, 1880

Dorsal rays IX-XI+I,22-24; anal rays III,21-23. Body somewhat elongate and thick; musculate firm; snout moderately long; lower jaw teeth long, compressed, contiguous, very different from those in upper jaw; vomer and palatine with teeth; dorsal origin before or directly over pectoral origin.

Reference : 6, 8

32) ***Psenes cyanophrys*** Valenciennes, 1833

Dorsal rays IX-XI,23-28; anal rays III,23-28; gill rakers 8-9+20. Body oval and compressed; snout blunt; lower jaw teeth pointed or only slightly flattened, similar to those in upper jaw; second dorsal and anal fins highter than spinous dorsal; caudal fin forked with somewhat rounded lobes; sacles very tiny. Adults yellowish with dark longitudinal lines on side; young translucent whitish, with silvery head and abdomen.

Reference : 6, 8

33) ***Nomeus gronovii*** (Gmelin, 1789)

Dorsal rays IX-XII+I,23-27; anal rays I-II,21-23; gill rakers 8+15-19. Body compressed and not soft; pelvic fin long and connected by membrane to abdomen. Juveniles silvery with black bars and spots, pelvic fins block with white blotches; adults uniformly dark brown.

Reference: 6

34) ***Ariomma indica*** (Day, 1870)

Dorsal rays XI+I,15-16; anal rays III,15; gill rakers 6-9+15-17. Body deep, compressed and ovoid; caudal peduncle remarkable low; teeth fine, in band on jaws, absent from vomer, palatine and tongue; scales cycloid and deciduous; spinous and soft dorsal fins deeply notched, scarcely separated. Body uniformly silvery with purplish tinge on back; pelvic fin whitish, others with black spots.

Reference : 6

35) ***Cubiceps baxteri*** McCulloch, 1923

Dorsal rays IX+I-II,20-24; anal rays II-III,19-22. Body elongate; eye large; vomer and palatine with small teeth; teeth on roof of mouth and tongue in single series; scales adherent; scales on top of head extend forward of the eyes; pectoral fin very long, extending beyond anal origin. Body uniformly dark brown.

Reference : 6, 8

36) *Cubiceps paucirladiatus* Gunther, 1872

Dorsal rays X-XI+I,15-17; anal rays II,14-16; gill rakers 7-9+16-19. Body rather elongate; vomer, palatine with small teeth; teeth on roof of mouth and tongue in broad knobby patches; scales on top of head extending forward of eyes; a conspicuous thin bony keel on ventral midline from pelvic fin to isthmus; lateral line placed very high on body.

Reference : 6, 8

37) *Cubiceps squamiceps* (Lloyd, 1909)

Dorsal rays X-XI+1,18-21; anal rays II-III,17-21; gill rakers 8-11+17-21. Body elongate; vomer and palatine with small teeth; snout region naked; scales on cheek extend to anterior margin of eyes; pectoral fin not extending to anal origin. Body dark gray, grayish white below.

Referencen : 6, 8

38) *Remorina albescens* (Temminck & Schlegel, 1845)

Dorsal rays 15-22. Body more robust, depth 5 to 8 times in standard length; sucking disc broad, as wide as 3/4 the length of disc, with 12 to 14 pairs of laminae; caudal fin truncated. Body pale grey to white.

Reference : 6, 8

39) *Remora remora* (Linnaeus, 1758)

Dorsal rays 22-27; gill rakers on lower limb of first arch (including rudiments) 12-14. Body short and rather robust; sucking disc comparatively large, with 14 to 20 pairs of laminae; caudal fin emarginate. Body dark brownish grey.

Reference : 6, 8

40) *Melichthys vidua* (Solander, 1884)

A deep longitudinal groove in front fo eye; enlarged osseous scales behind gill openig; third dorsal spine minute, slightly extending above dorsal edge of body; second dorsal and anal fins strongly elevated anteriorly; caudal fin

truncate. Second dorsal and anal fins whitish, with a black border.

Reference : 6, 8

41) ***Lagocepharus lagocephayus oceanicus*** Jordan & Fowler

Body elongate and streamlined; two nostrils on each side; well separated spines on vental surface, but dorsal one smooth; dorsal and anal fins falcaate; caudal fin emarginate, the lower lobe prominent longer than the upper. A longitudinal series of about 10 small black spots below pectoral fin; gill opening black; all fins dark, lower 1/3 of pectoral fin white.

Reference : 6, 8

42) ***Diodon eydouxii*** Brissout & Barneville, 1846

Body rounded, covered with many erectile lonf spines except snout and ventoral saface of caudal peduncle; many spines longer then eye-diameter; dorsolateral part of caudal peduncle with one or more short spines; dorsal and anal fins pointed. Body and fins covered with many small black spots and with no large dark markings.

Reference : 6

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4

Landing Site Survey

Data Collection Methodology

Manual for Field Enumerators

PROJECT FOR FISHERY RESOURCE SURVEY IN VIETNAM
(Fisheries Production and Economics)

CONTENTS

IC Net Limited
June 1995

1. The Objective of Survey

It is well known that, like agriculture, fisheries are one of the most important industries in Vietnam. The output of fisheries has increased rapidly. Especially, its export shows a remarkable increase. The fishery sector not merely contributes to provide people with food but also to a large part of the Vietnamese export.

For the sustainable development of fisheries, we ought to consider several things. For instance, constructing and keeping fishing ports and other infrastructure in good conditions are necessary. It is also necessary to understand what sort of fish are sold well, and where and when. Moreover, the nationwide road network and trucks with refrigerator may be needed to transport fresh fish to many cities. Fishing boats to catch more fish are, of course, vital to further expansion of fisheries.

Upon taking these things into considerations, we have to realize the most basic point that catching too much fish now would lead no fish in the future. Once fish resources are scarce, it is very difficult to recover them. This is not an unusual case; it actually happened in many parts of the world. Fortunately, Vietnamese marine resources have not deteriorated that far. Fish as our future's precious food and export merchandise have to be preserved.

Then, how can marine resources be preserved? First of all, one should know what kind of resources and how much exist in the Vietnamese sea and how Vietnamese fishermen are exploiting them. This survey is organized for this purpose. The survey is roughly divided into two parts. One is to research fishery resources in the sea. The other is to conduct a series of socio-economic surveys on fish production, fishing gear and boats, fishermen and their communities at five major fishing ports. To obtain an accurate picture about fishery resources and the present situation of fisheries, a lot of information have to be collected. Although we might sometimes disturb business of fishermen and other people when we ask questions, let us make our best efforts to secure their cooperation.

Information gathered through this survey will be widely utilized. Precise and sufficient knowledge on the present status of fisheries will help us identify what are needed for future fisheries development, and where and to what extent. Information and knowledge will be very useful for the national and local governments when formulating fisheries development plans. At the same time, the information and knowledge will facilitate international donors and private investors to make correct judgments on how to involve themselves in fisheries development in Vietnam. As the Vietnamese fishery resources now attract a great deal of international attention, it is quite important for the governments, both central and local, to be able to provide up-to-date and reliable information to potential investors.

As fisheries grow, various other businesses such as fish processing, export business, refrigerator manufacturing and shipbuilding will also be stimulated. Above all, it is most important and useful for fishermen themselves to know their own industry and resources they depend on. The survey will require our sincere efforts and even patience to collect as precise data as possible, with the method the following section explains.

2. Survey Items

In order to grasp the accurate situation of the Vietnamese fisheries sector, in the most strict sense, all Vietnamese fishing ports and villages have to be surveyed. However, that is unrealistic since such a nation-wide project demands too much money and time. Under this project, therefore, survey will be conducted only at five major fishing ports, and if necessary make estimations on the national fisheries sector as a whole. These five fishing ports are as follows;

- Dong Hoi Port
- Da Nang Port
- Nha Trang Port
- Phan Thiet Port
- Bung Tau Port

The eight important aspects which we envisage to investigate through this project are listed below. They are critical elements to better understand the fishing sector.

(1) Catches in Quantity and Value and Their Seasonal Changes
(2) Fish Species Composition and Fish Prices
(3) Ratio of Trash Fish to Total Catch
(4) Freshness and Post-Harvest Loss
(5) Fishing Grounds
(6) Fishing Boats and Gear
(7) Fishing Productivity
(catch in quantity per boat by type of fishery, catch in quantity per fisherman)
(8) Fishery Infrastructure

Now, for understanding these aspects, we will carry out a series of investigation, with various survey items. These items can be divided into two categories. One is concerned largely with "quantity", the other is concerned more with "feature" than "quantity" or numbers.

Let us elaborate on "quantity-type" items, first.

1. The Number of Fishing Boats: to survey of how many boats are engaging in fisheries.
2. The Number of Fishing Units: to survey groups of fishing boats catching fish together.
3. Catch in Quantity: to survey how much is caught and landed by species at each fishing port.
4. Catch in Value: to survey of how much income is generated by fishermen selling fish.

Next, as to the "feature-type" items, it is to investigate of how and what kind of fishing boats catch fish, with what kind of fishing gear.

5. Fishing Boats: to survey the type, size and capacity of fishing boats and their engines.
6. Fishing Operations: to survey of how many fishermen are on boats, how many boats are working together, what type of fishing gear is used, and where fishermen go to fish.
7. Fisheries Infrastructure: to survey of how many and on what scale fisheries-related facilities are located in the five fishing ports, including pier, market, water supply, electricity, cold storage and ice plant.

3 The Method of Survey

3.1. Preparation Before Survey
(Selection and Determination of a Sampling Ledger)

In this section, we discuss how to conduct this survey. After procedures required for preparing the survey is explained, the items described above are examined one by one.

The first thing to do is to determine the sampling ledger. It is very difficult to investigate all fishing boats in the five fishing ports. If we could survey all boats there, of course, the most accurate and detailed information would be available. However, in reality, it takes many years and needs much more manpower. Like many other social surveys, this project will therefore conduct the survey by extracting samples, and for this purpose a sampling ledger is needed. When we do not select samples in a right way, even if the method of survey itself is correct afterward, survey results will not be reliable. Therefore, first of all, one has to be careful in determining the sampling ledger, and there are four important points for this.

1. The sampling ledger should be appropriate to the objective of the survey. It is naturally essential that the selected sampling ledger must contain sufficient information

of the targeted population.

2. There should not be large bias and skewness in data of the sampling ledger.

3. If a part of the targeted population is missing in the sampling ledger, an appropriate measure(s) should be taken to compensate it.

4. The sampling ledger should contain recent information. As things change very rapidly today, one has to be careful about how old the sampling ledger is.

As this project will investigate fisheries, these ledgers such as registration records of fishing licenses, fishing boats and fishermen, a taxation ledger, and documents of fishery cooperatives could be possibly used as a sample ledger. However, based on the ex-ante field trip JICA already had in these fishing ports, the taxation ledger of fishing boats seems to be most suited as a sampling ledger since it meets four requirements mentioned above.

First of all, the taxation ledger prepared at each port includes information about every fishing method and gear, the size of fishing boats, their engine horsepower. Secondly, since the taxation ledger is renewed every year, its information is relatively up-to-date. Thirdly, according to the ex-ante fieldwork, leakage from the taxation ledger appears to be within a manageable range. In other words, the concern about tax-evading fishermen exists but is not very serious in Vietnam. On the basis of these considerations, it seems reasonable to adopt the taxation ledger as the sample ledger of our survey. In case, however, any crucial problem arises during fieldwork in using taxation ledgers, we must be flexible to change to turn to other documents to be used as a sampling ledger.

3.2. Sampling

This section describes in what ways and how many samples should be selected. When it comes to choose samples, specifically in this case, an appropriate number of fishing boats must be representing each type of fishery. The taxation ledgers prepared by prefectural fishery departments contain information of the number of fishing boats in each district, their gross tonnage, horsepower, the number of new boats, the number of boat classified by fishery, etc.. It is also an advantage of the taxation ledger that formats used at different fishing ports are somehow uniform.

This survey is aimed at clarifying how much and what kind of fish are caught by what kind of boat in what ways. Therefore, let us pay attention to two sections of the taxation ledger; they are "the number of boats classified by the type of fishery" and "the number of boats classified by length." The selection of samples should not be skewed in

terms of length of boats within each type of fishery.

The first issue is the determination of the number of fishing boats as samples. We may select boats using a table like Table 1 below. In Table 1, L means the length of fishing boats, which are classified into four categories.

Table. 1

	L<8m	8m<L<15m	15m<L<20m	20m<L	TOTAL
Trawl	3	3	3	3	12
Purse Seine	3	3	3	3	12
Gill Net	3	3	3	3	12
Lift Net	3	3	3	3	12
Set Net	regardless of length of hull				12
Shrimp Trawl	3	3	3	3	12
Others	3	3	3	3	12

Table 1 indicates that three samples have to be collected for every cell. There must be at least two samples in each cell so as not to make data skewed. Practically, however, three is the minimum number for samples, if one out of three samples is considered an unreliable data for whatever reasons. Even if every three samples collected in each cell are "usable", the total number of samples will amount to 84. If only two samples are all right, the total will be 56. We must ,therefore, secure at least 56 good samples.

The next issue is how to select samples. "simple random sampling" is one of the most basic statistical method. However, although the principle of "simple random sampling" is indeed simple, it has some complications in practice. For example, the larger the number of samples is, the more cumbersome its procedures will be. In simple random sampling, a random number table always has to be used to select samples. In order to avoid such a disadvantage, this survey will adopt "systematic sampling" which is another kind of random sampling method. Although the systematic sampling at first similarly uses a random number table, samples are later selected at an interval, without depending on the table. The interval of sampling can be simply calculated by dividing the number of the targeted group (statisticians call it "population") by the the number of required samples. As samples selected through this procedure are supposed to have the same character with the "population", we can avoid the problem of simple random sampling. As discussed earlier, this survey will select samples in each type of fishery classified in taxation ledgers prefectural fisheries departments compile.

3. 3. Survey Items

1) The Number of Fishing Boats

As to the number of fishing boats, this survey will use "the number of boats" classified by the type of fishery in taxation ledgers to estimate actual numbers of fishing boats, together with the results of questionnaires for which we will discuss later. We consider that data of taxation ledgers must be verified since criteria used to collect data for taxation ledgers may vary from prefecture to prefecture. For instance, some prefecture do not include non-powered boats in their taxation ledger, while others do. Before one relies on one single set of data, it is always better to check other data to verify it.

2) The Number of Fishing Unit

The term "fishing unit" may not sound familiar. The fishing unit is a group of fishing boats, more precisely a group of fishing boats and other boats such as transportation boats and light boats needed to carry out a certain fishery. It is very important to know the number of fishing unit because the fishing unit is the smallest operational unit for that fishery.

In order to know the number of fishing unit, it is recommended to examine different information sources such as records concerning fishing license, fishing gear license, and information from fishermen's cooperative associations. Again, it is better not to depend on one single source of information. In this survey, the number of fishing unit will be calculated from the number of fishing boats classified by type of fishery and from information obtained through questionnaires, which will include a question: "Do you catch fish by cooperating with other boats?" and "If so, how many boats are cooperating in your group?"

3) Catch in Quantity

a) Catch by the Type of Fishery

In this survey, we also assume a conservative position towards the reliability of the existing catch data. It means that we had better not to easily depend on the existing data and instead make every efforts to increase the reliability of data collected through this survey. As shown in Table 1 on page 6. This survey will select three fishing boats (or units) of the same size from each type of fishery. (However, in case of set net, the size of fishing boats is not an important factor due to its character of operations.)

Taking trawlers less than 8m as an example, let us first label their total monthly catch as TR1 (see Table 2 below). Similarly, we call TR2 for the total monthly catch from

all trawlers belonging to the class from 8m to 15m. This survey will pick up three boats as samples in each cell. The individual monthly catches of, for example, three sample trawlers less than 8m can be labeled as TR1.1, TR1.2, TR1.3 respectively. Of course, TR1.1 means a monthly catch of the first of the three trawlers.

Table. 2

	L<8m	8m<L<15m	15m<L<20m	20m<L	TOTAL
Trawl	TR1	TR2	TR3	TR4	TR
Purse Seine	PS1	PS2	PS3	PS4	PS
Gill Net	GN1	GN2	GN3	GN4	GN
Set Net	regardless of length of hull				SN
Lift Net	LN1	LN2	LN3	LN4	LN
Shrimp Trawl	ST1	ST2	ST3	ST4	ST
Other Fisheries	OF1	OF2	OF3	OF4	OF

With the formula below, we can calculate TR1 that is an estimated total catch by all trawlers belonging to the class less than 8m.

$$TR1 = (TR1.1 + T1.2 + T1.3) \div 3 \times \text{the Number of Boats in the Same Class}$$

Then total monthly catches by type of fishery can be obtained by adding up all catches of different sizes. For example, the total catch of all trawlers (TR) will be calculated with the formula below.

$$TR = TR1 + TR2 + TR3 + TR4$$

Lastly, the total fisheries production (TFP) -- that is, the grand sum of catches from all fisheries can be calculated with the formula below.

$$TFP = TR + PS + GN + SN + LN + ST + OF$$

b) Catch by Species

The calculation of catches classified by species is basically the same as that of catch classified by the type of fishery. By the same token, let us assume a conservative position towards the reliability of the existing catch data by species.

Catch data by species gathered through this survey will be filled out in a table like

Table 3. It is desirable to let fishermen fill out the tables by themselves if they volunteer to do so. In many cases, however, surveyors may have to fill them out through interviews with fishermen. The names of important species should be put in advance in the column of species as this will lessen burden on cooperating fishermen. Securing cooperation of fishermen is an important consideration in gathering accurate data effectively.

Table. 3

Trip Number		1	2	3	4	5	6	Total	Fish Price Per Kg	Notes
Species	Fish Name	12.3	23.4	34.5	45.6	56.7	67.8	240.3		average 40.05 Kg

Catches classified by species will also be calculated on a monthly basis. Let us practice it, taking an example from Table 3. This is a case that a fishing boat went out six fishing trips in the previous month. First, put catch volumes by species at individual fishing trips. The catch in the first trip was 12.3 kg. The catch in the second trip was 23.4 kg and so on. Next, sum up these catches and get the total catch of 240.3 kg. Then, put the average catch per trip in the last column.

This sum is the total catch by species harvested by a sample boat in the previous month. Since this survey will collect three samples in each cell in Table 1, the per boat average must be calculated for every cell. Finally, the total catch of a certain species in a cell can be estimated by multiplying the per boat (or per unit) average by the number of fishing boats (or units) in a cell.

Total Catch by Species in a Cell
= Average Catch by Species× the Number of Boats (or Units) in the Cell

Next, the total catch by species can be calculated on a fishery-by-fishery basis such as trawlers, purse seiners and gill netters, etc. by adding up all figures in cells under a certain type of fishery.

Total Catch by Species in a Fishery = Sum of Total Catches by Species in All Cells under the Fishery

Furthermore, the total catch by species from all fisheries can be derived by summing up these fishery-specific total catches.

Total Catch by Species in All Fisheries = Grand Sum of Total Catches by Species in Every Fishery

4) Fish Prices

Average fish prices could be easily calculated by dividing the total production value by volume if we have reliable data about the total catch (or production) volume and value. Nevertheless, as we set very cautious attitude about the reliability of the existing statistics, we should not jump to the conclusion in such a haste way. Again for fish prices, we have to collect data in the field by ourselves.

Fish prices can possibly be investigated in two places. One is fish markets where fish prices are formed through numerous negotiations between fishermen and various kinds of buyers. Checking fish prices in markets frequently is a basic requirement to know fish prices. Fish prices constantly change according to supply and demand in markets. Therefore, it is important to go to markets, check prices and identify factors affecting fish prices.

The other place is processors. The fish landed are divided into two streams; one stream is for fresh fish and flows to consumers through fish shops or venders, and the other stream flows to processors who produce various fish-based products such as canned, frozen, and dried fish, fertilizer, and so on. On the one hand, fresh fish usually pass through fish markets, and therefore, as far as fresh fish are concerned, it may suffice to survey prices in markets. On the other hand, some fish are directly purchased from fishermen by processors, bypassing fish markets, and it is thus necessary to go to processors to inquire fish prices for processing. It may be good enough to visit several big processors once or twice a month because they usually keep records of prices and quantities of purchased fish. Data gathered at processors may also be useful to crosscheck catch data we discussed in the previous sections.

5) Fishing Boats

We will study fishing boats by examining the following aspects with questionnaires.

- Hull: length, width, depth, capacity, materials.
- Engine: powered or non-powered, outboard engine or inboard engine, horse power, fuel.
- Year of Building
- Fishing Gear : major and subsidiary fishing gear used by fishing boats
- Fish Preservation Facility: facilities for freezing, cold storage, chilled watering, icing, salting.

6) Fishing Operations

We will also use questionnaires to study fishing operations, specifically in the following aspects.

- Average Length of Fishing Trips: Ideally, fishermen will be requested to record the number of days spent for each fishing trip. If difficult, let us check it through interviews.
- The Number of Crew Members
- Fishing Grounds: Questionnaires will include a simple chart with which fishermen can possibly locate their fishing grounds.
- Fishing Unit (Fleet) : If more than one boat catch fish together, we will clarify composition of fishing unit (or fleet) .
- Fish Preservation Method: This is closely related to "Fish Preservation Facility" discussed above. The difference is that this is aimed at knowing how fish are actually preserved onboard. Selection will be made among various preservation methods in the questionnaire.
- The Disposal of Trash Fish :Fish that cannot be sold for human consumption but have a limited economic value are categorically called as "trash fish." This survey will check how they are disposed. Trash fish may be discarded in the sea, may be used as raw material for fish meal or for fish sauce, or may be used for animal feed. A composition of choices in the questionnaire must properly reflect local situation.

7) Fisheries Infrastructure

Survey on fisheries infrastructure has an apparently different purpose from other types of surveys; this is aimed at shedding light on the present status of as well as future needs for fisheries infrastructure. Specifically, fishing port facilities, market facilities, and processing facilities will be checked out at each fishing port. Their capacities will be described in appropriate terms including m^2 , ton, Km, etc.

- Port Facility: landing pier (or jetty), mooring jetty, shipyard, anchorage, breakwater, port office, fuel tank, fuel station, water tank, water supply, sewage, crew lodging facility.

- Market Facility: market hall, market office, retail market, warehouse, cafeteria, communication facility, access road, parking lot, truck scale.
- Processing Facility: ice plant, ice storage, cold storage, standby generator house.

4. Important Considerations for Conducting Survey

In order to ensure successful implementation of this survey, there are several aspects to which those engaging in the survey should pay adequate attention. Here, let us focus on a few of them which we consider are particularly relevant to this survey.

First, it is very critical to have a good questionnaire which include an appropriate set of questions and answer choices. The questionnaire should not be too long and be contained within a time limit of respondents patience. It would be helpful for communication between respondents and surveyors if surveyors have i) cards (rather than books) illustrating important species and fishing gear and ii) maps and charts.

Second, we must be aware that some survey items are relatively constant regardless of timing of survey while data on other items would be highly changeable and time-specific. The former type of items include the numbers of fishing boats and fishing units which do change over time but most likely in a predictable pace. Fishing boat and fisheries infrastructure would not change rapidly either. On the other hand, the latter type of items include catch data, fish prices and fishing operations. It is always desirable to follow up these items regularly so that we will be able to know their changes in a time series. Nevertheless, since we are always under constraints in terms of time, budget and manpower, it is impractical to expect a perfect survey. Often the best approach to this problem is to construct questionnaire covering over a certain period of time, maybe last six months or last twelve months and to pay attention to the changeable nature of these survey items.

Last but not least, we must be very careful about the attitude of surveyors during fieldwork. In some countries, surveyors who are usually government officials and university students are not always polite towards respondents such as fishermen and middlemen because of their social status and influence. If this actually happens, we may not be able to expect cooperation and honest answers from respondents. In order not to intimidate respondents, surveyors must wear, ask and talk in a locally amicable manner. It is also important for surveyors to clearly explain respondents that their survey is not intended to collect more tax.

5. Analysis and Compilation of Survey Results

On page 3 of this manual, remember that we have listed the eight important aspects we aim to understand through this survey. Now, let us return them and discuss how to analyze and compile survey results in the context of these eight aspects. It is also useful to

consider how to present survey results effectively.

(1) Catches in Quantity and Value and Their Seasonal Changes

Our survey already covers both quantity and value of catches. Seasonal catch changes can be better understood with graphs of monthly catch data.

(2) Fish Species Composition and Fish Prices

Fish species composition can be understood by calculating the catch ratio of each species against the total catch. A raider type graph may be suited to visually present fish species composition. Fish prices can be known with information from sample fishing boats and be double-checked through investigation at fish markets and processors.

(3) Ratio of Trash Fish to Total Catch

Approximate ratio of trash fish can be calculated from information from fishing boats.

(4) Freshness and Post-Harvest Loss

Our survey will investigate preservation methods adopted by fishing boats. We can also check the freshness of fish and how they are landed at the five fishing ports. All these kind of information will help us estimate post-harvest loss.

(5) Fishing Grounds

Information from sample fishing boats on fishing grounds can be visualized by plotting the number of boats operating in grids on charts. Data should be presented by the type of fishery and on a seasonal basis.

(6) Fishing Boats and Gear

The survey is designed to have an adequate coverage over fishing boats and gear. However, we have yet to find out ways to present the survey results effectively.

(7) Fishing Productivity

Fishing productivity can be derived from various data on the number of fishing boats (units), catches, fish prices and operation costs. We will be able to present with graphs productivities in the cross section of different types of fisheries.

(8) Fishery Infrastructure

Maps of fishing ports showing the location of various facilities will help understand the present condition of fishery infrastructure. A matrix of existence (○) and nonexistence (X) will also be a good idea to compile survey results.

QUESTIONNAIRE

Sample No.

Province : _____ District : _____ Date : _____
Name of boat : _____ Name of major landing center : _____

◎FISHING BOAT

- Tonnage : _____t.
- Dimension of hull Length : _____m Width : _____m Dipth : _____m
- ☐Powerd Boat → Horsepower_____Hp
  ☐Non-powerd Boat
- Fuel in use ☐Gasoline ☐Diesel Oil ☐Others
- Name of Registrated Port : _____
- Year of building : _____
- Material used for hull : ☐Wood ☐Steel ☐Fibreglass ☐Others

◎OPERATIONS

- Type of Gear

[Trawl]	[Set net]	[Lift net]
☐Double rig shrimp trawl	☐Large set net	☐Boat/Raft lift net
☐Otter trawl	☐Small set net	☐Scoop net
☐Other trawls		☐Other lift net

[Purse seine]	[Hook and line]	
☐Purse seine	☐Tuna long line	
☐Beach seine	☐Drift long line other than Tuna	
	☐Set long line	
[Gill net]	☐Skipjack pole and line	[Trap]
☐Drift gill net	☐Other pole and lines	☐Stow net
☐Encircling gill net	☐Troll lines	☐Portable trap
☐Shrimp gill net		☐Other traps
☐Set gill net		

- Fishing place : _____
- Number of crew : _____
- Do you catch fish, forming fishing fleet? :
  ☐Yes → Fleet composition : _____
- Preservation method : ☐Freezing ☐Icing ☐Others( )
  ☐Chilling water ☐Refrigerating ☐Salting
- Quantity of Trash Fish Quantity or Percentage : _____kg/_____%.
- Disposal of Trash Fish _____

- The cost of maintenance/year : _____

◎FISHERIES INFRASTRUCTURE

[Port Facility]	[Market Facility]	[Processing Facility]
☐Landing Pier (or jetty)	☐Market hall	☐Ice plant
☐Mooring jetty	☐Market Office	☐Ice storage
☐Shipyard	☐Retail market	☐Cold storage
☐Anchorage	☐Warehouse	☐Standby generator house
☐Breakwater	☐Communication facilities	
☐Port office	☐Access road	
☐Fuel tank	☐Parking lot	
☐Water tand	☐Truck scale	
☐Water supply		
☐Sewage facilities		
☐Crew lodging		

Catch by Species in Each Trip

No.Trip	1	2	3	4	5	6	Total	Catch in Value/Kg	Notes
Trip Days									
Date									
Gear									
NAME OF FISH 1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
Trash Fish									
TOTAL									

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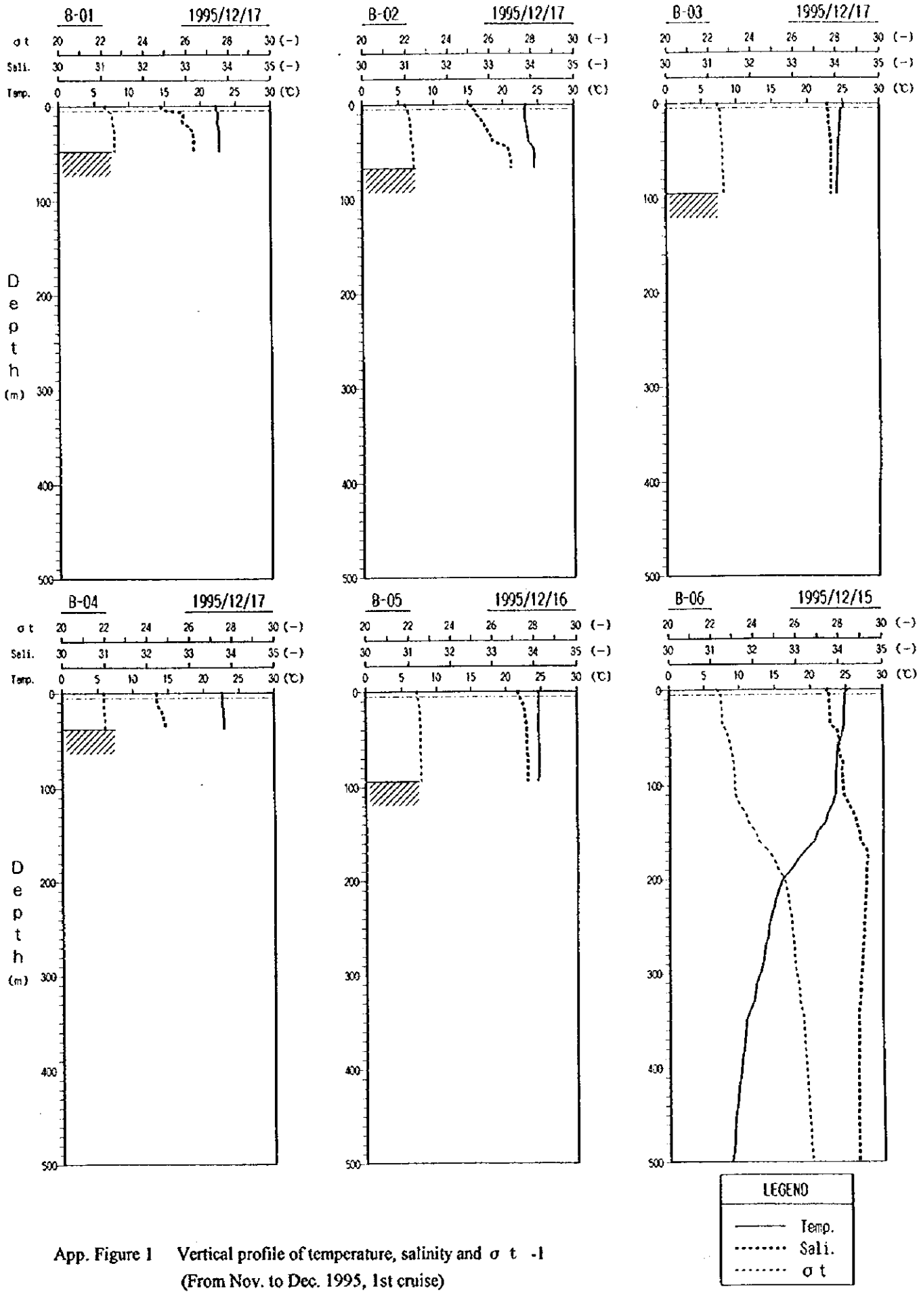
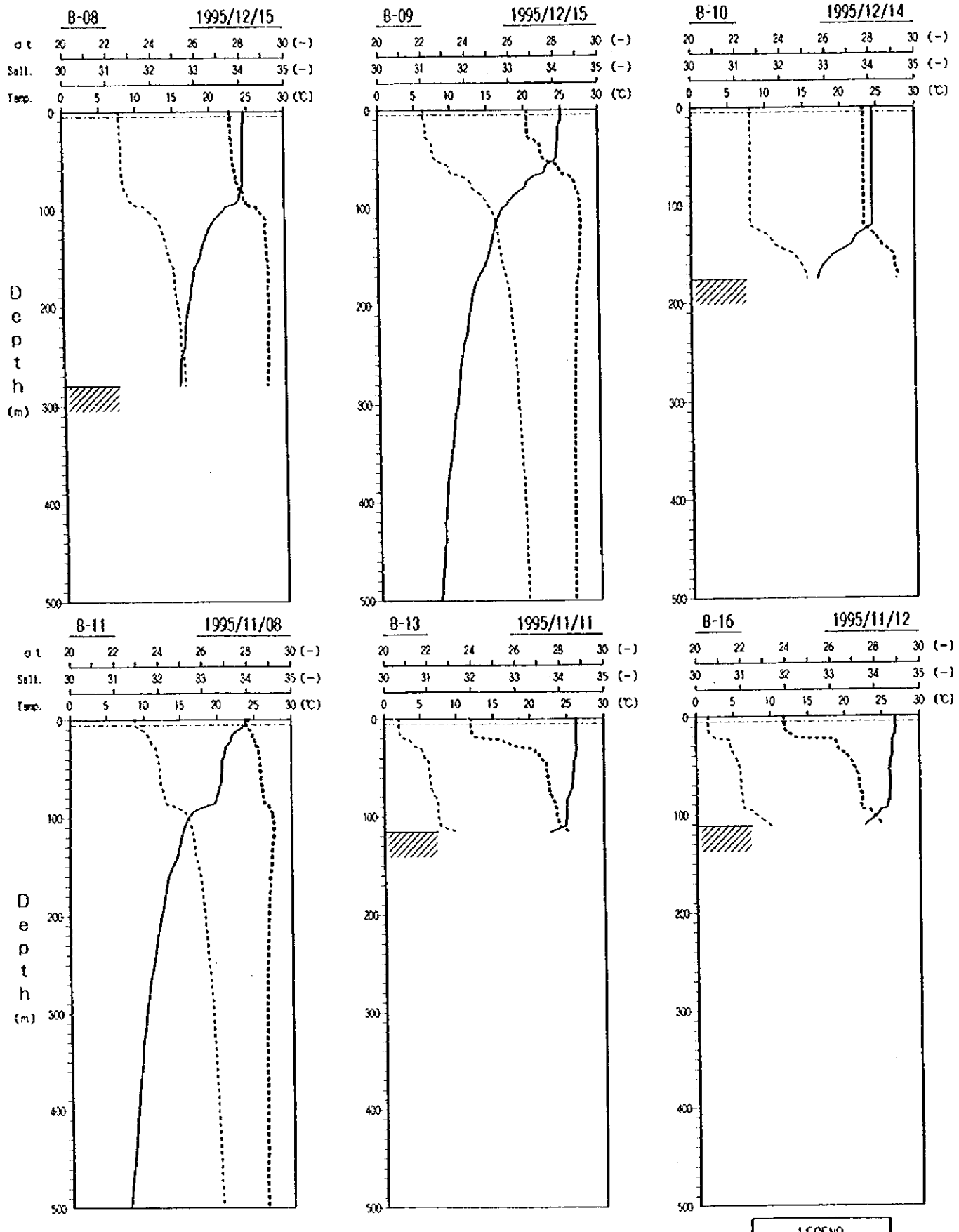
Appendix Figures

List of Appendix Figure



App. Figure 1 Vertical profile of temperature, salinity and σ t -1
(From Nov. to Dec. 1995, 1st cruise)



App. Figure 2 Vertical profile of temperature, salinity and σ t -2
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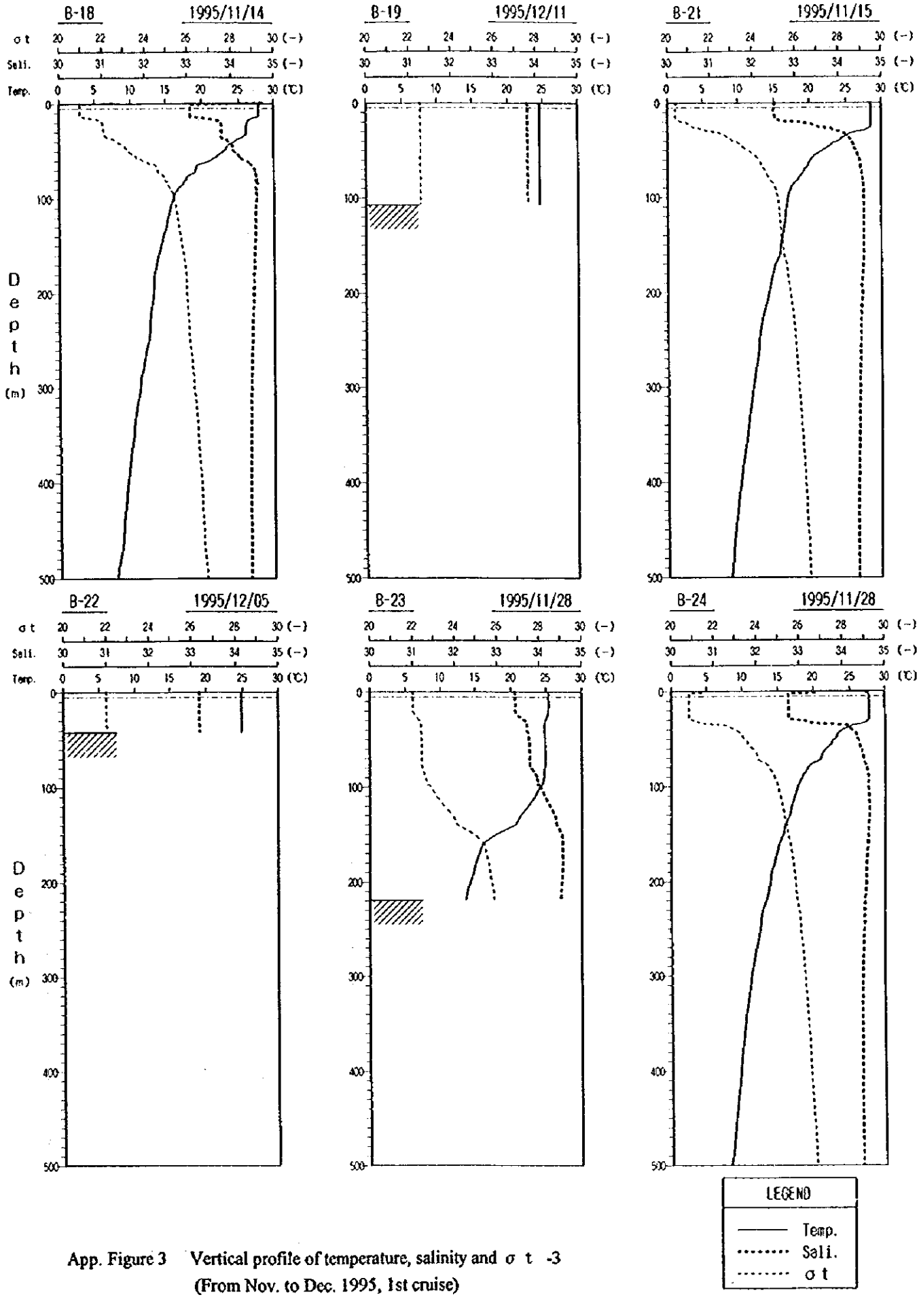
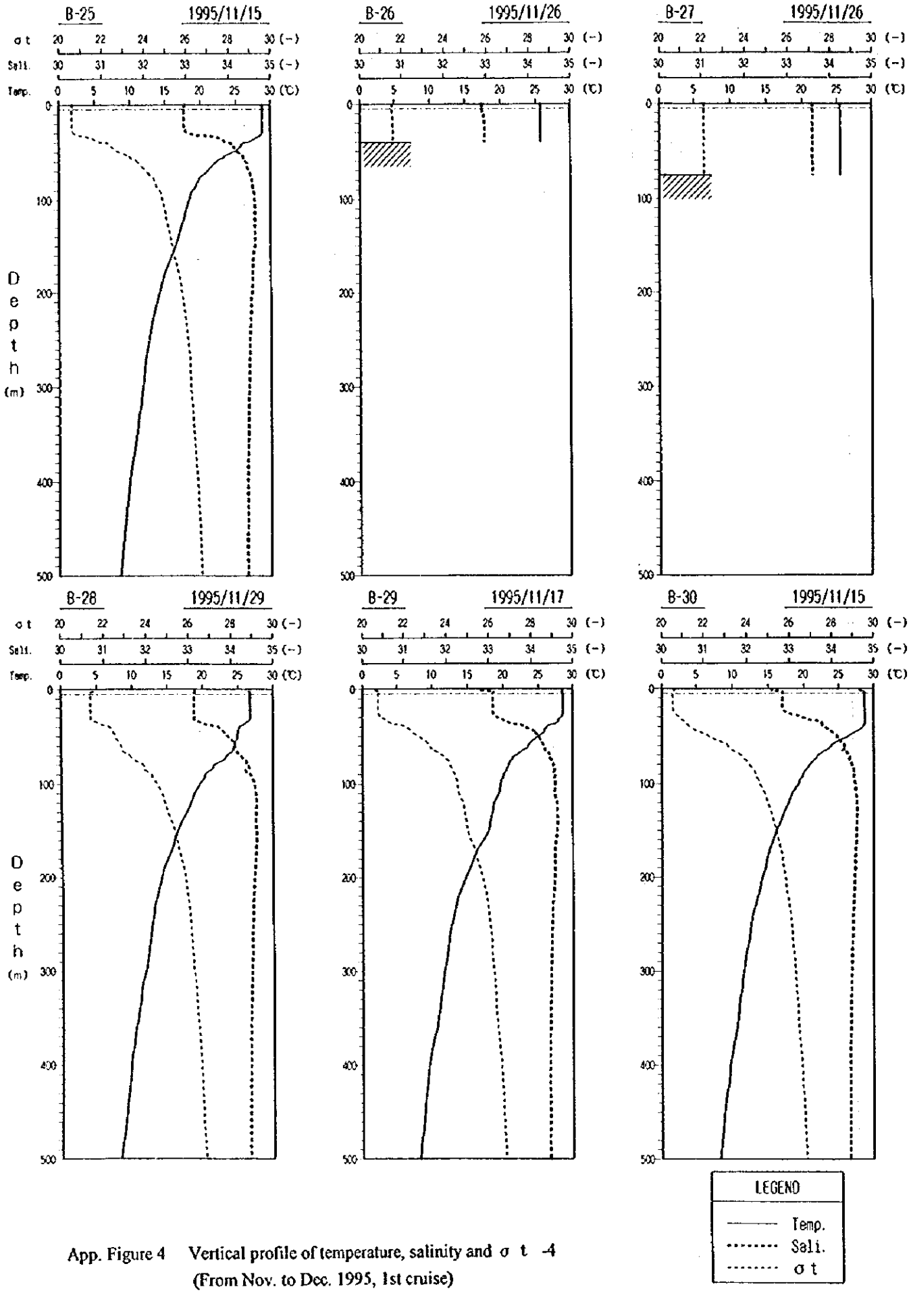
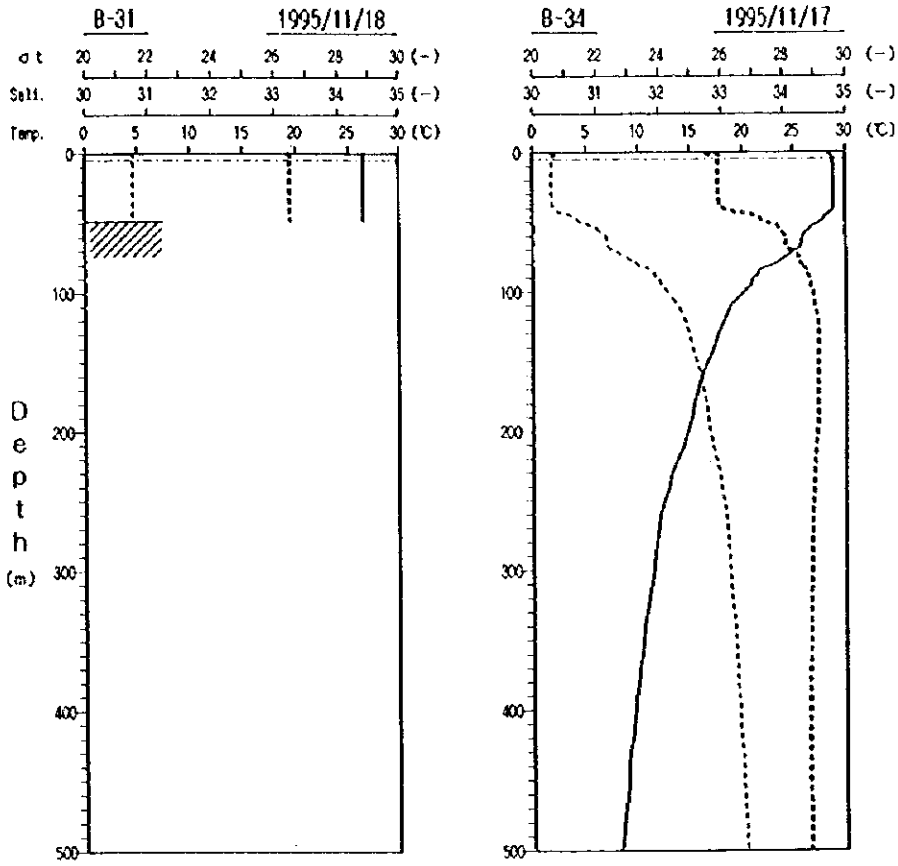


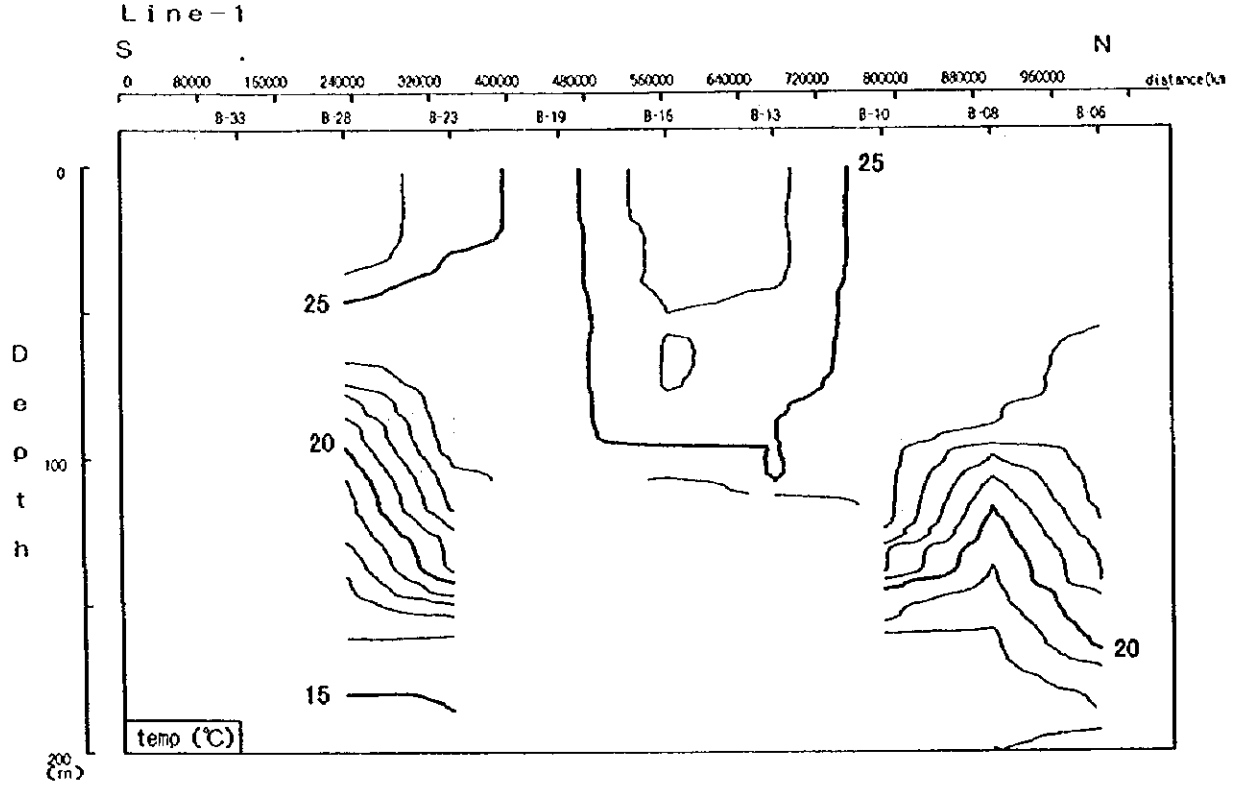
App. Figure 3 Vertical profile of temperature, salinity and σ t -3
(From Nov. to Dec. 1995, 1st cruise)

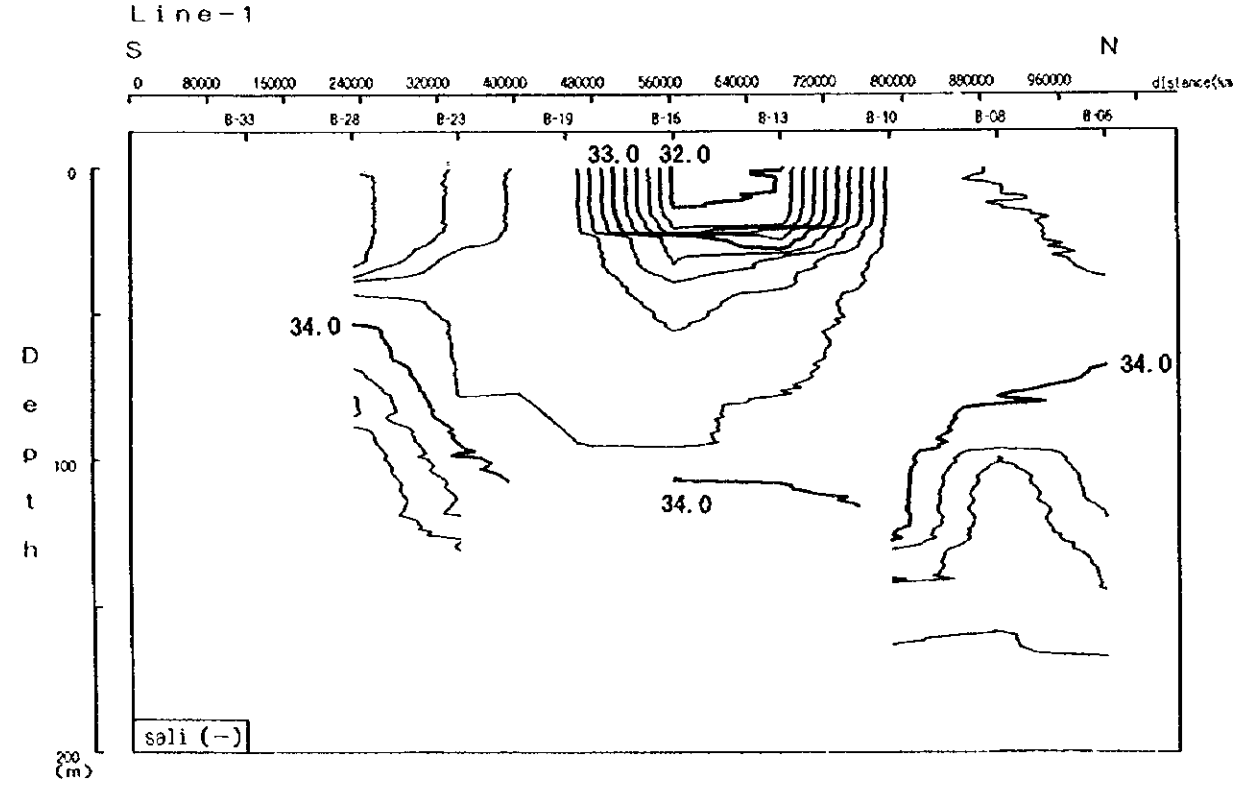


App. Figure 4 Vertical profile of temperature, salinity and σ t -4
(From Nov. to Dec. 1995, 1st cruise)

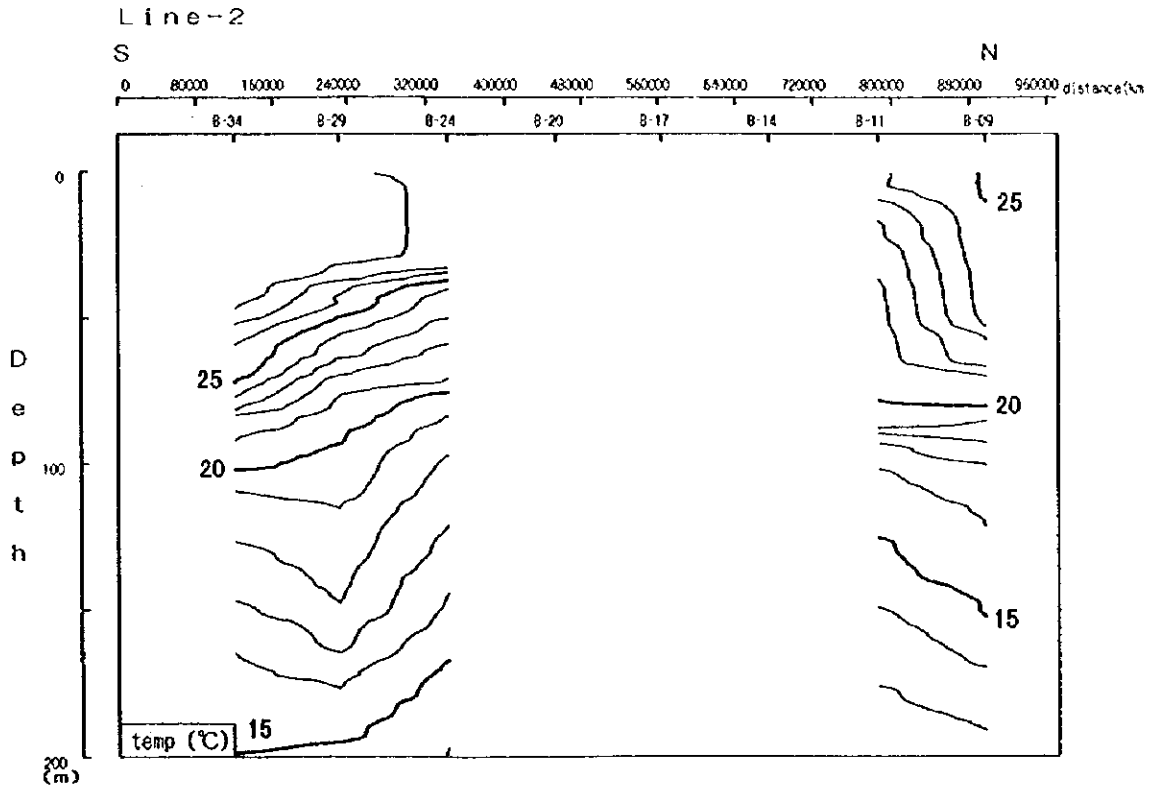


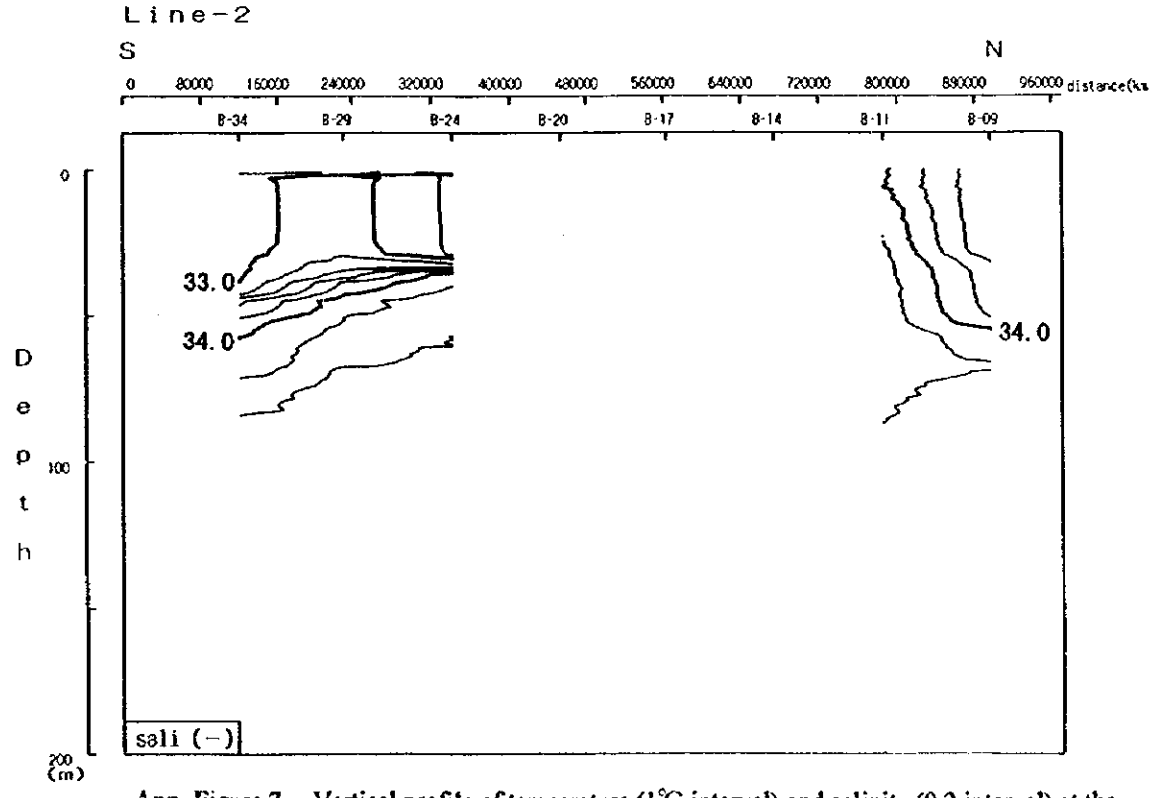
App. Figure 5 Vertical profile of temperature, salinity and σ t -5
(From Nov. to Dec. 1995, 1st cruise)





App. Figure 6 Vertical profile of temperature (1℃ interval) and salinity (0.2 interval) at the cross section of LINE-1. (From Nov. to Dec. 1995, 1st cruise)





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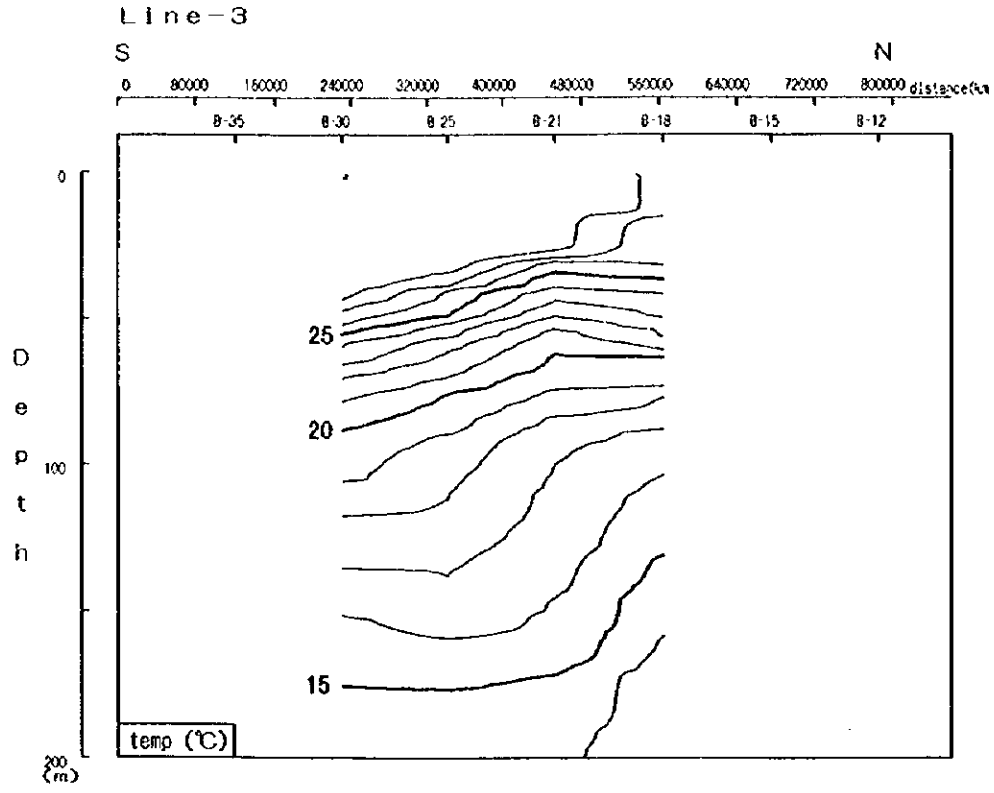

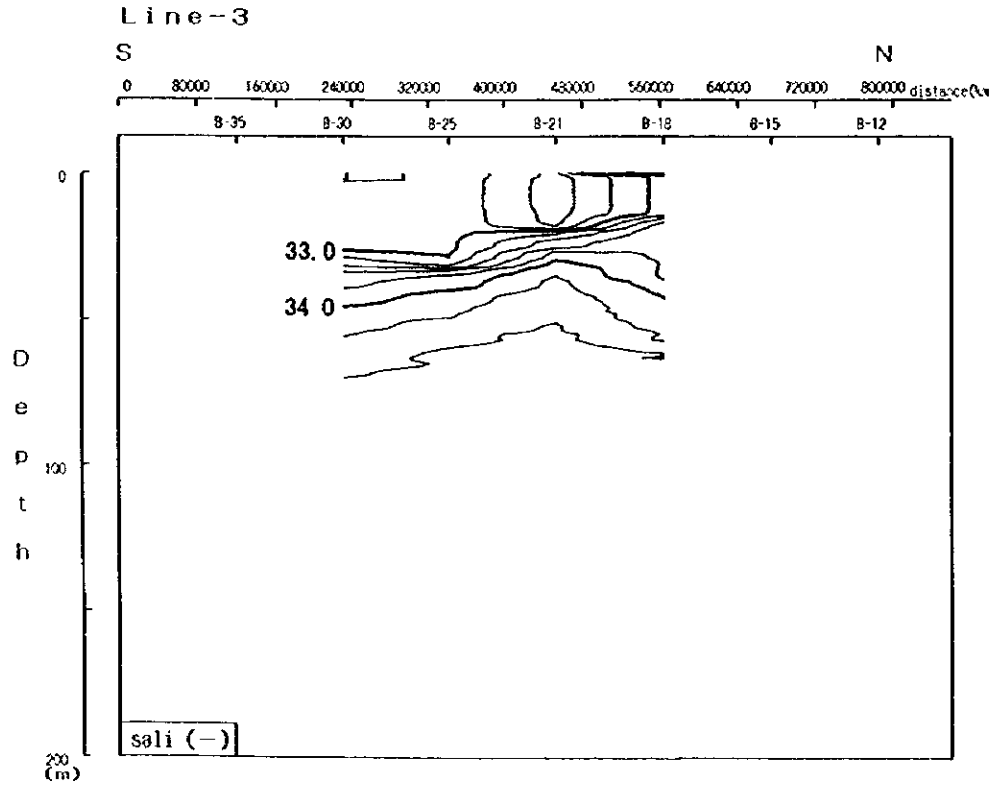

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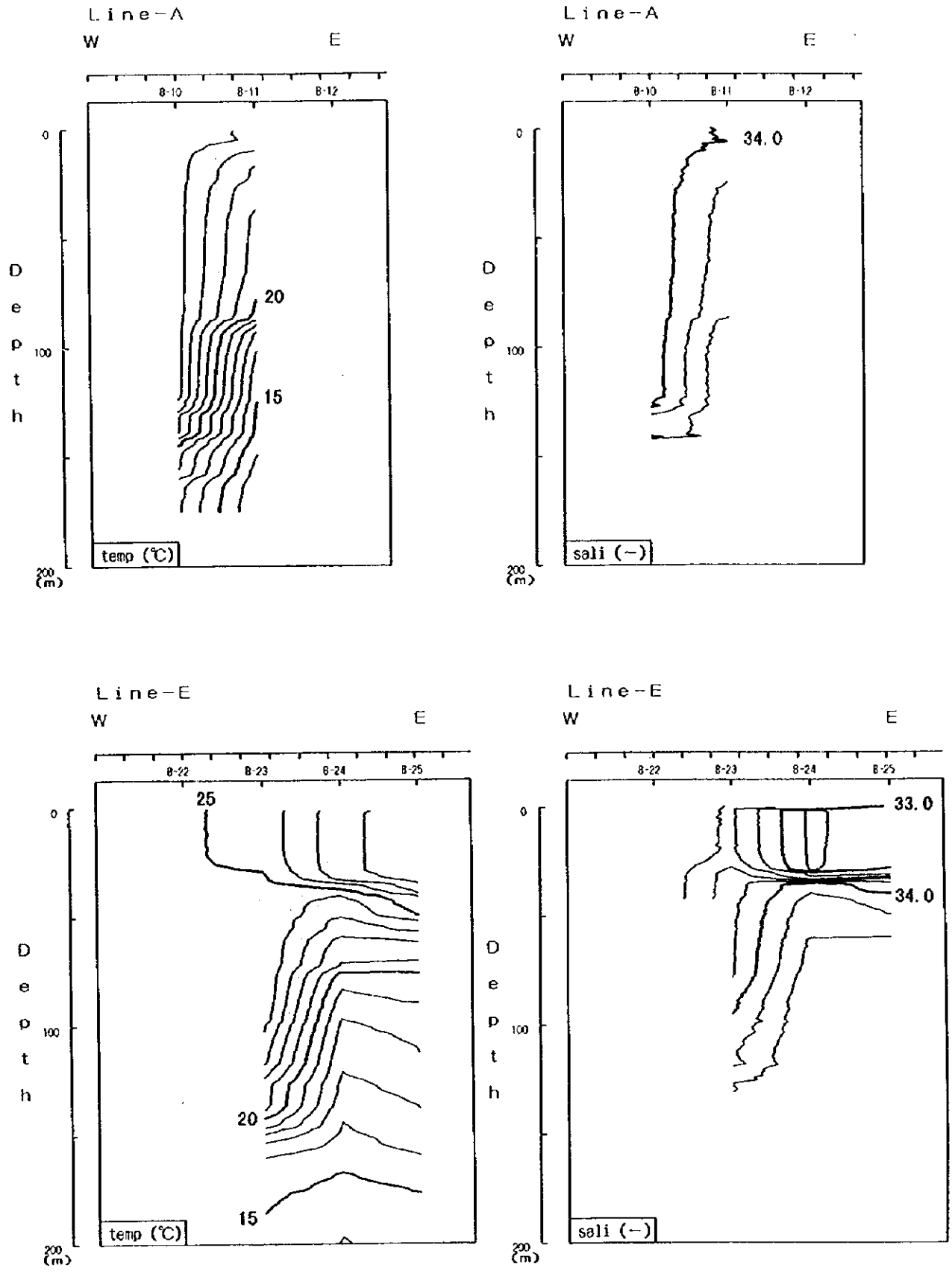
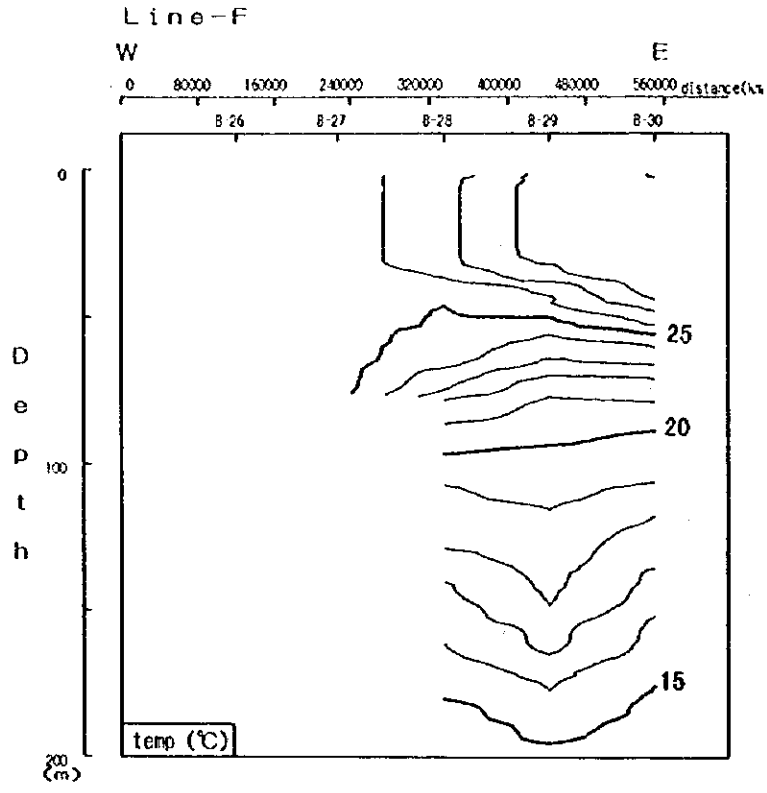
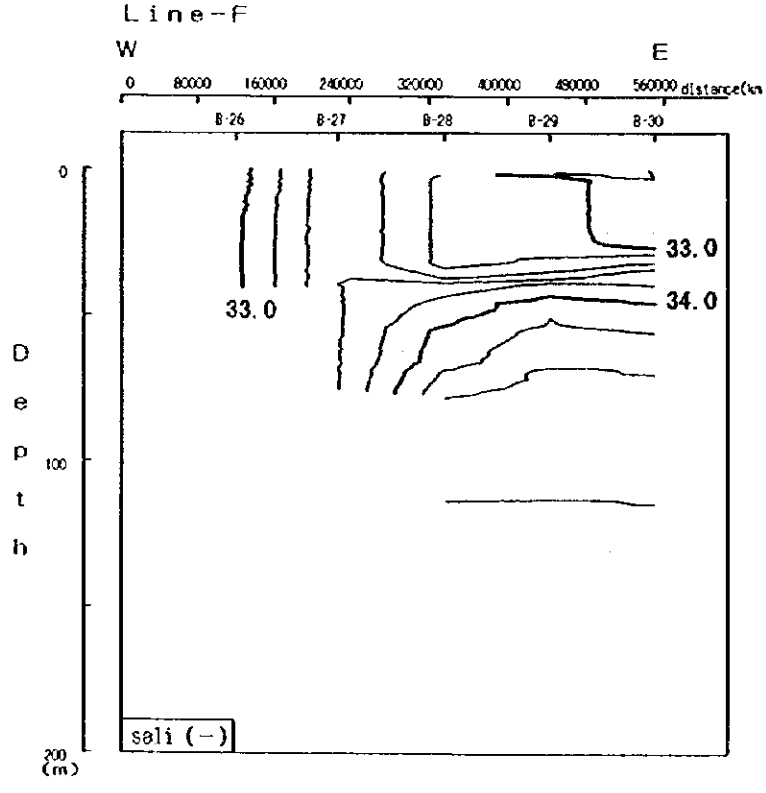
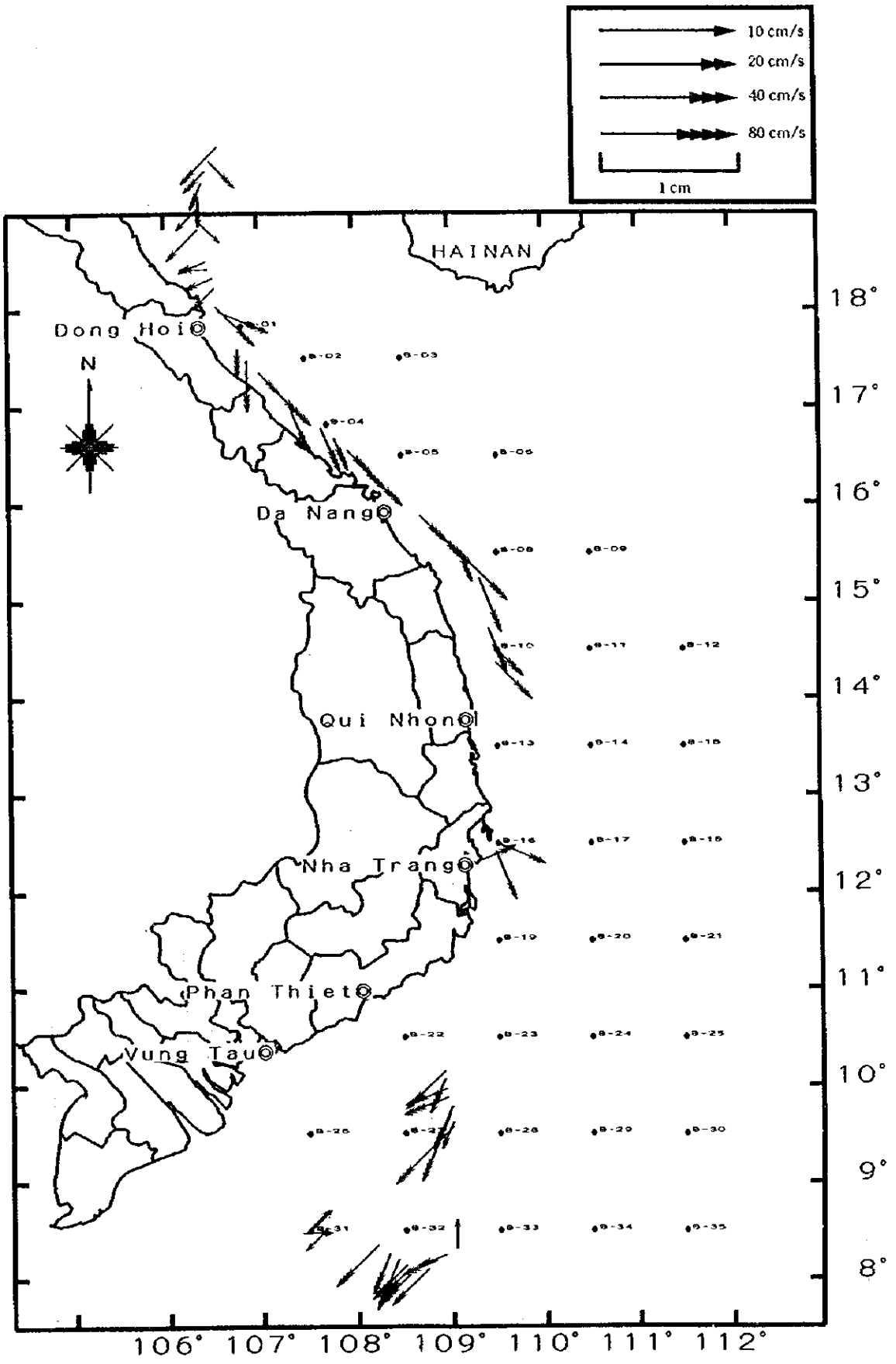


App. Figure 9 Vertical profile of temperature (1℃ interval) and salinity (0.2 interval) at the cross section of LINE-A and E. (From Nov. to Dec. 1995, 1st cruise)

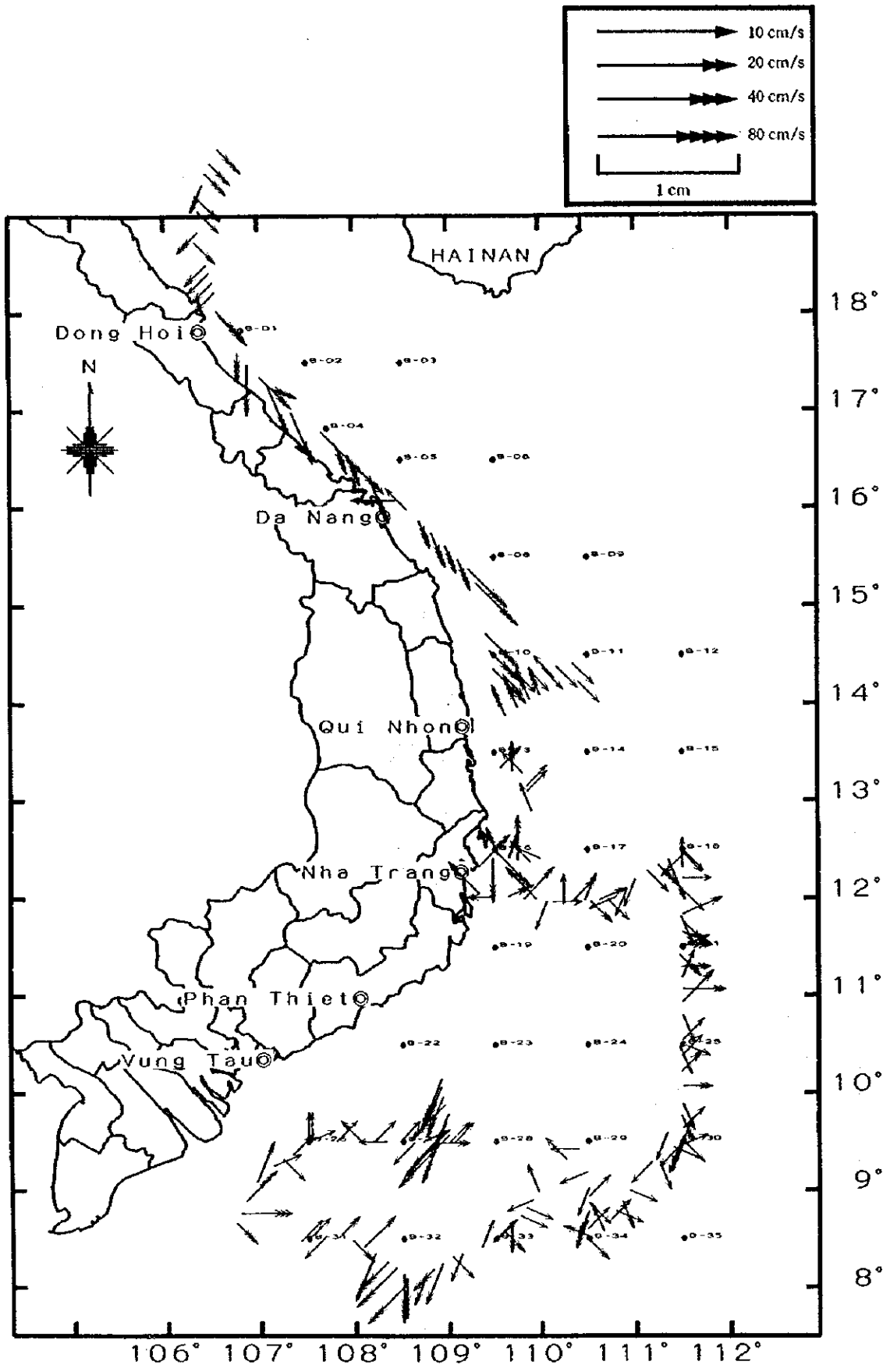




App. Figure 10 Vertical profile of temperature (1℃ interval) and salinity (0.2 interval) at the cross section of LINE-F. (From Nov. to Dec. 1995, 1st cruise)



App. Figure 11 Distribution of current direction and velocity at 2m depth (Nov. in 1995)



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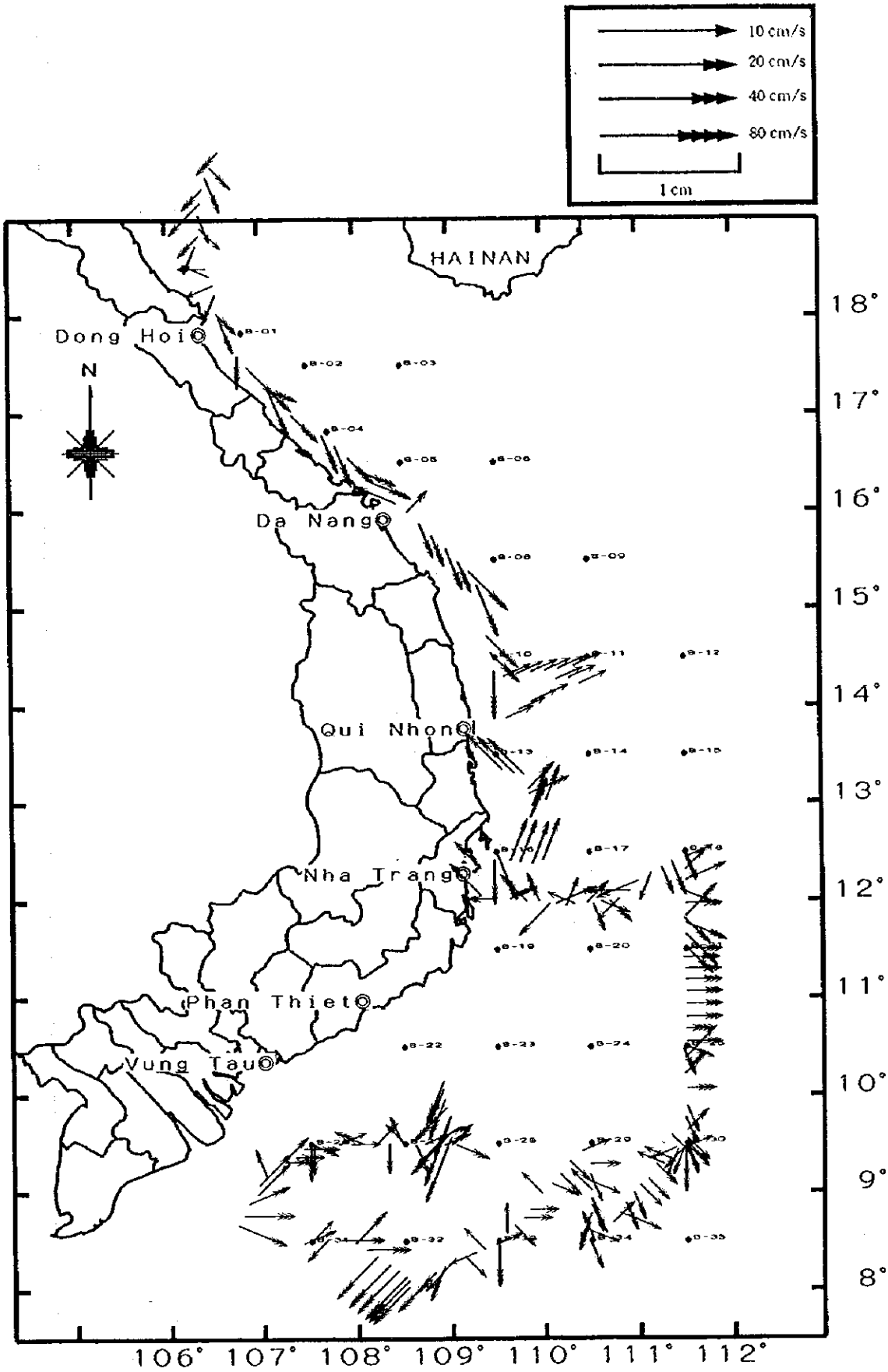

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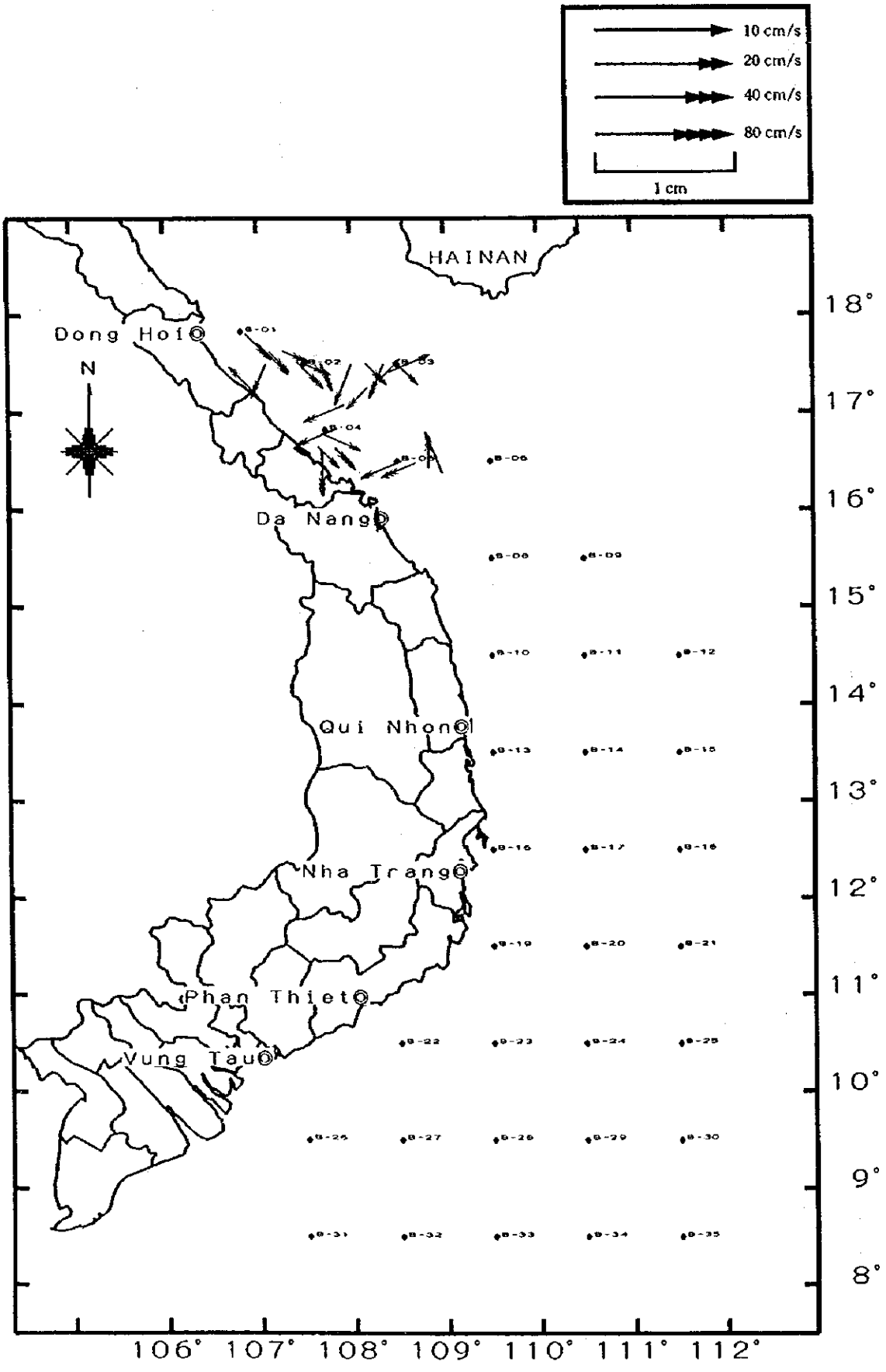

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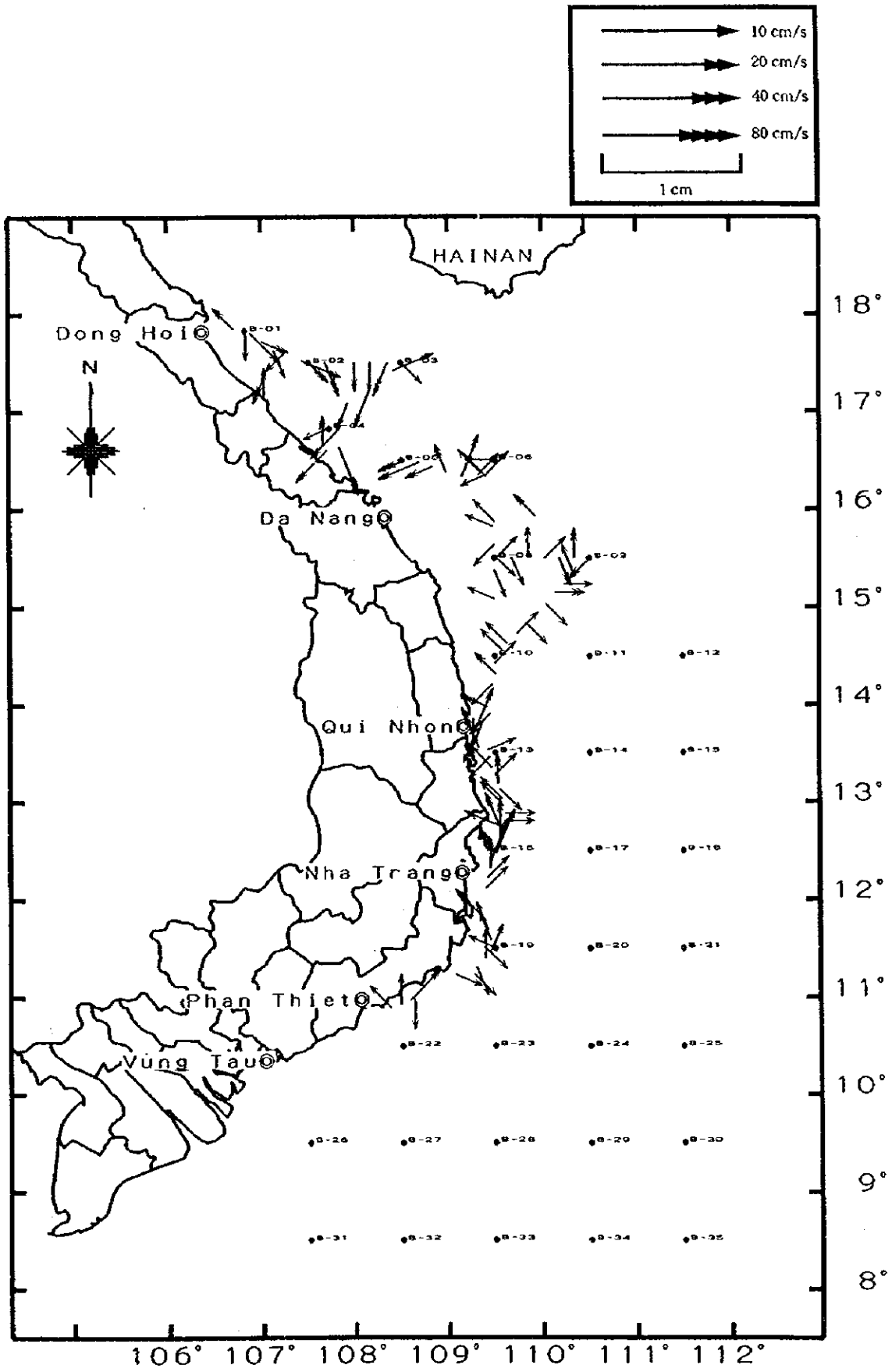

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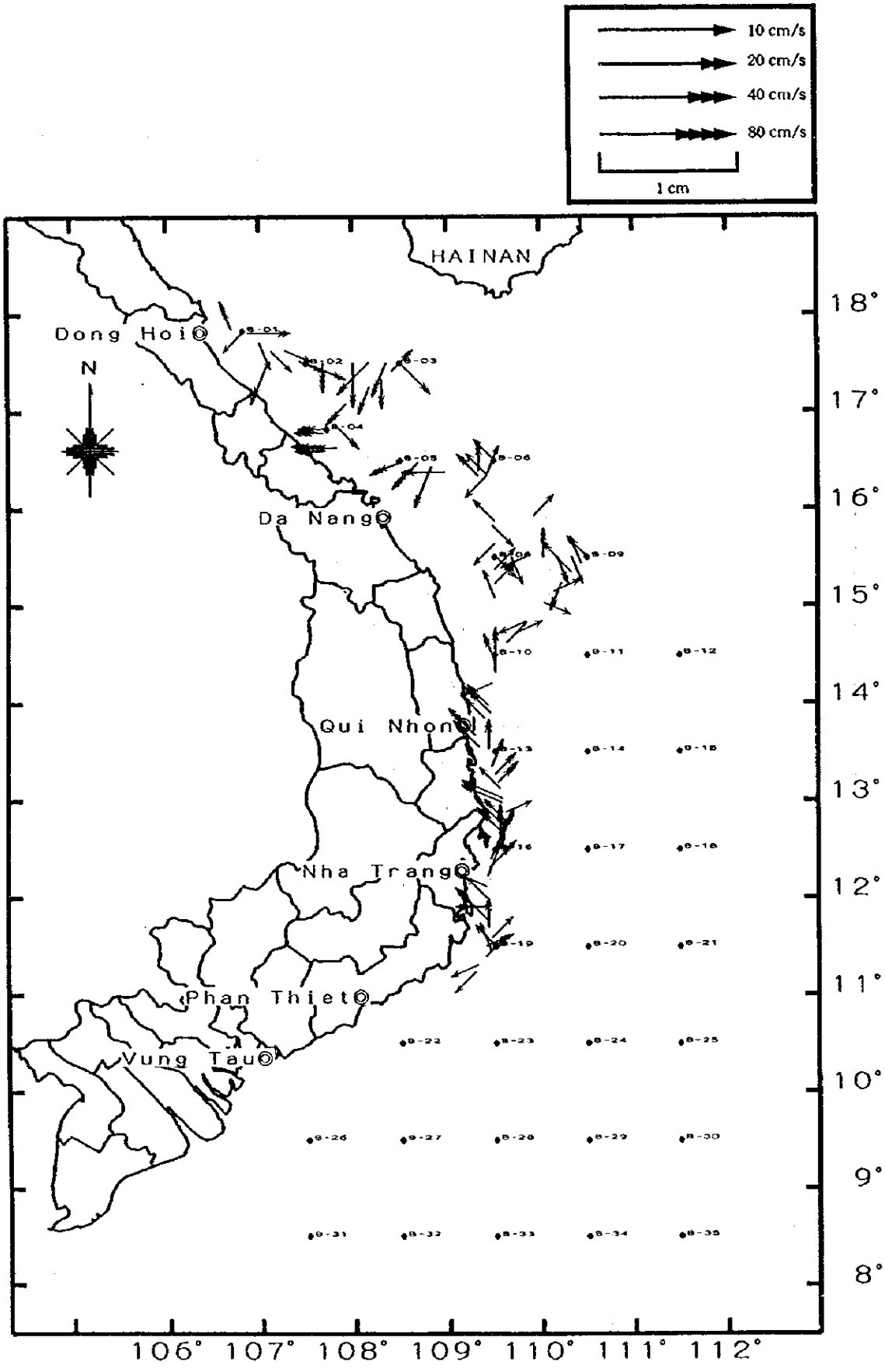

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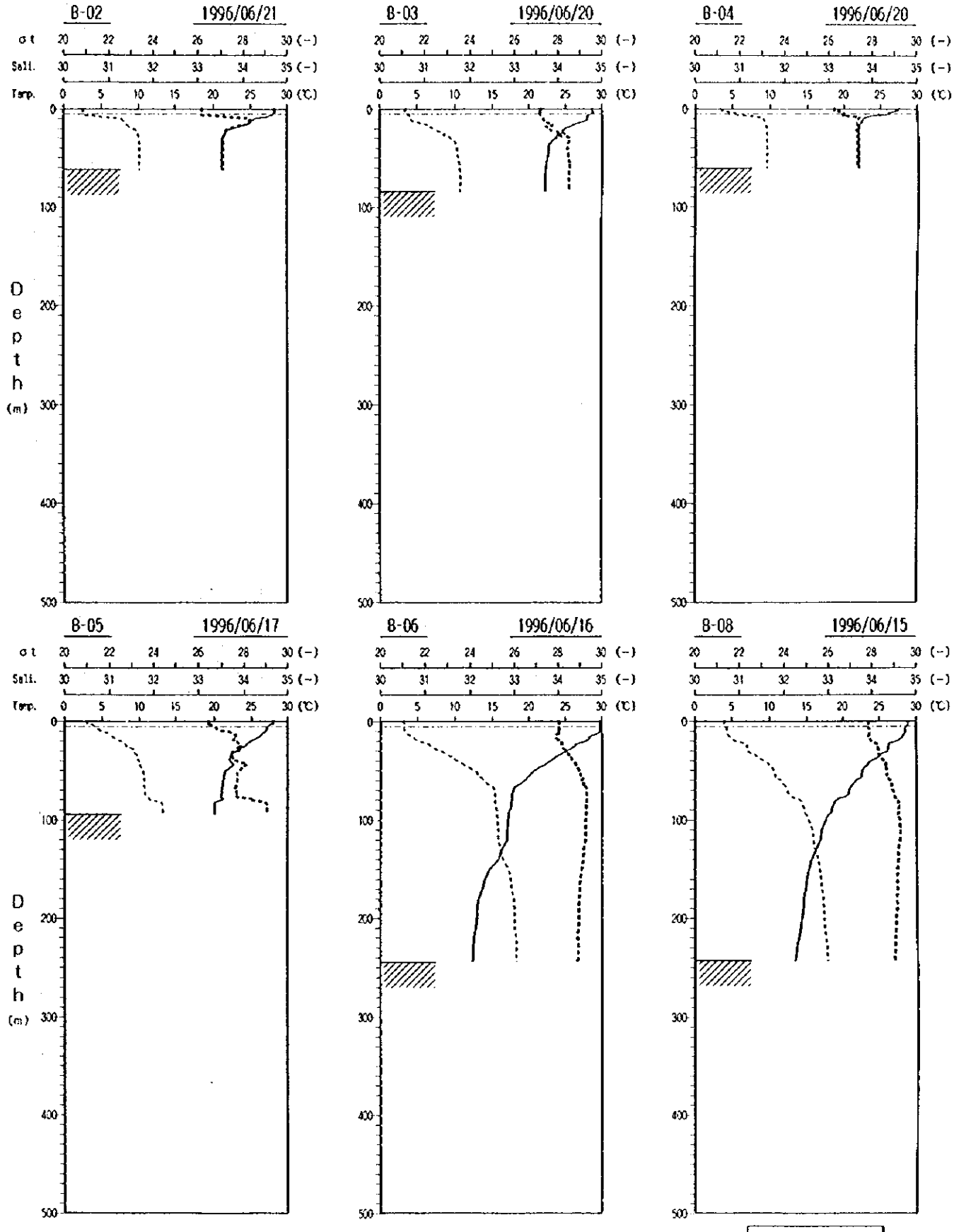
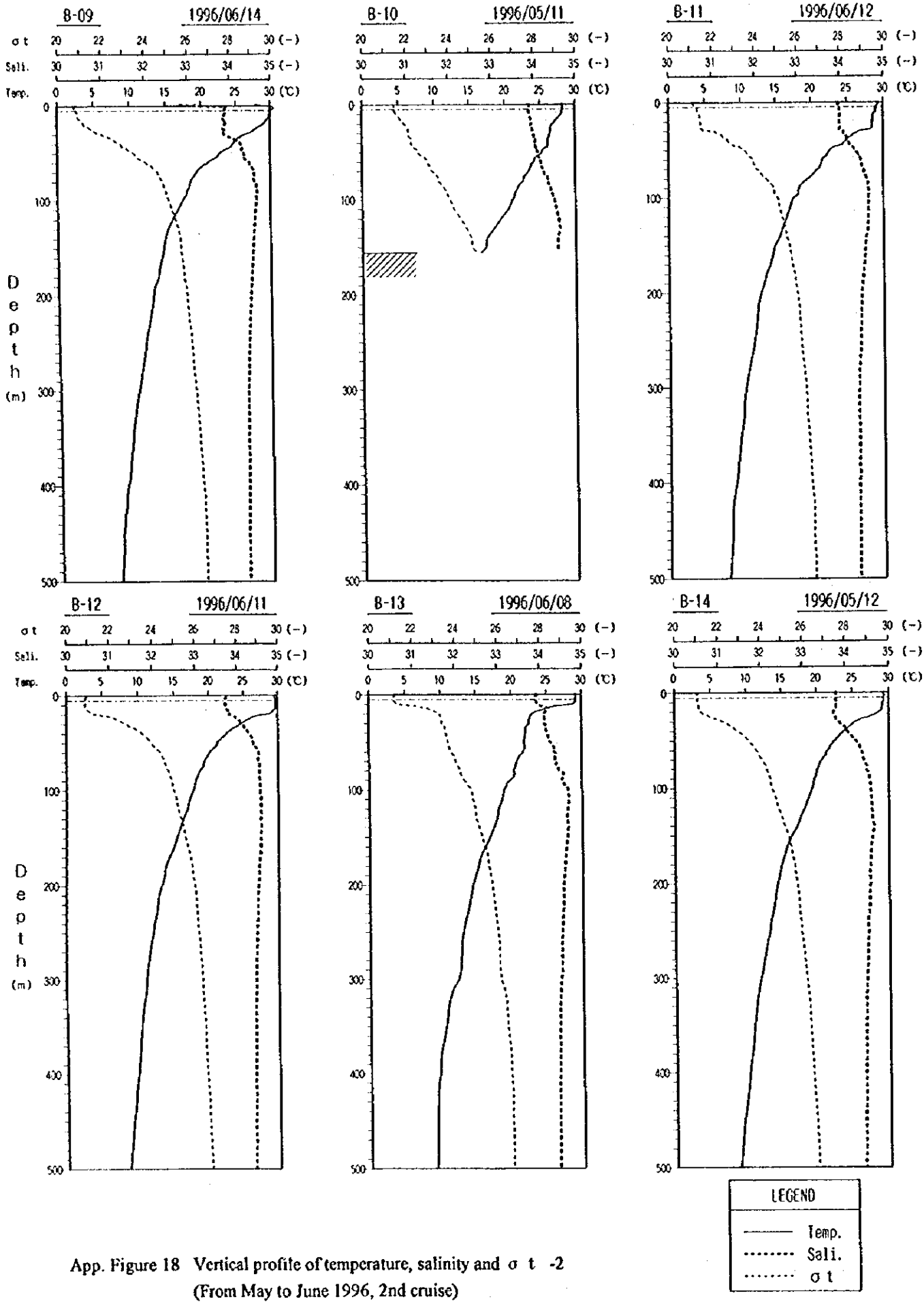


App. Figure 17 Vertical profile of temperature, salinity and σ t -1
(From May to June 1996, 2nd cruise)



App. Figure 18 Vertical profile of temperature, salinity and σ t -2
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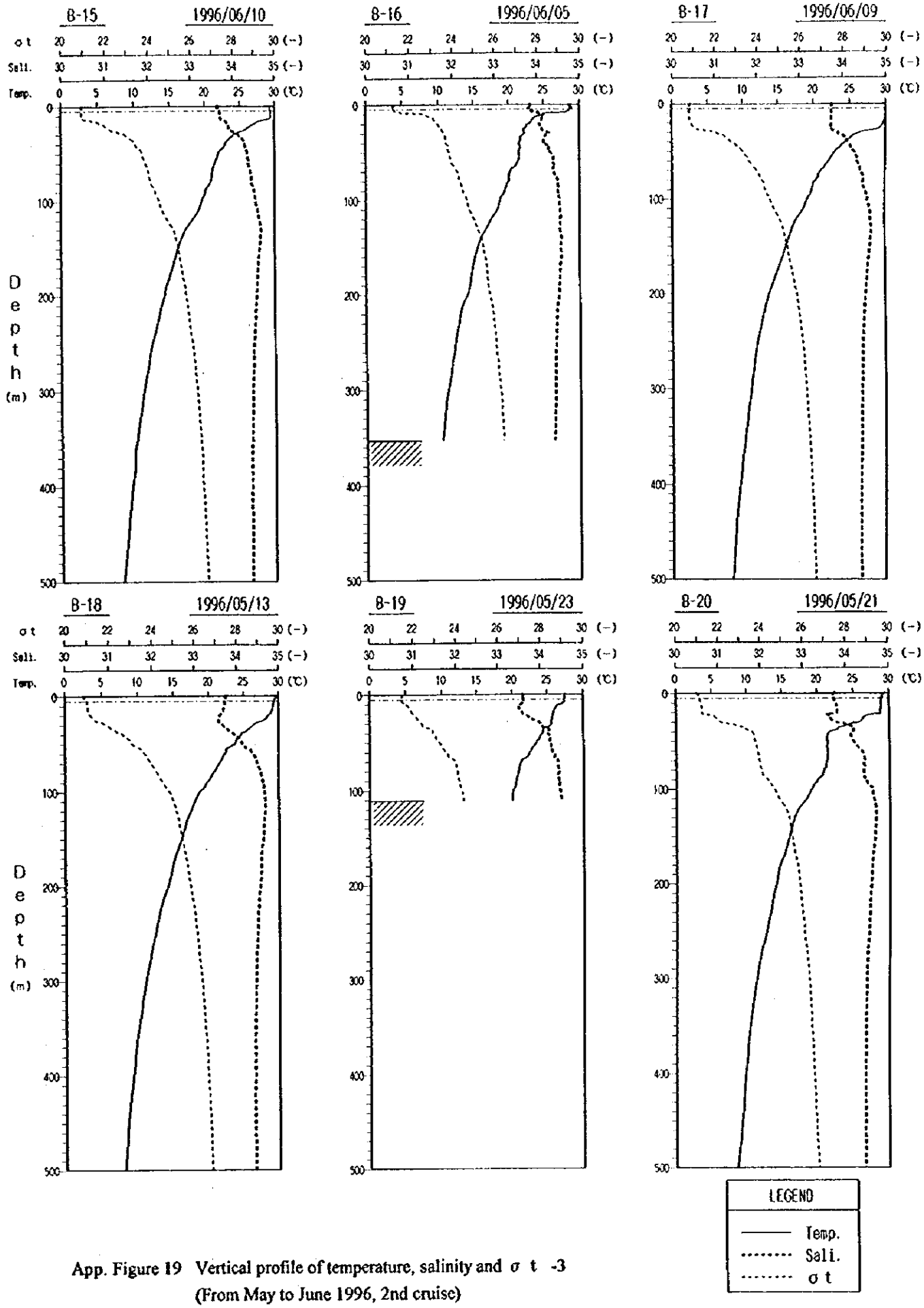

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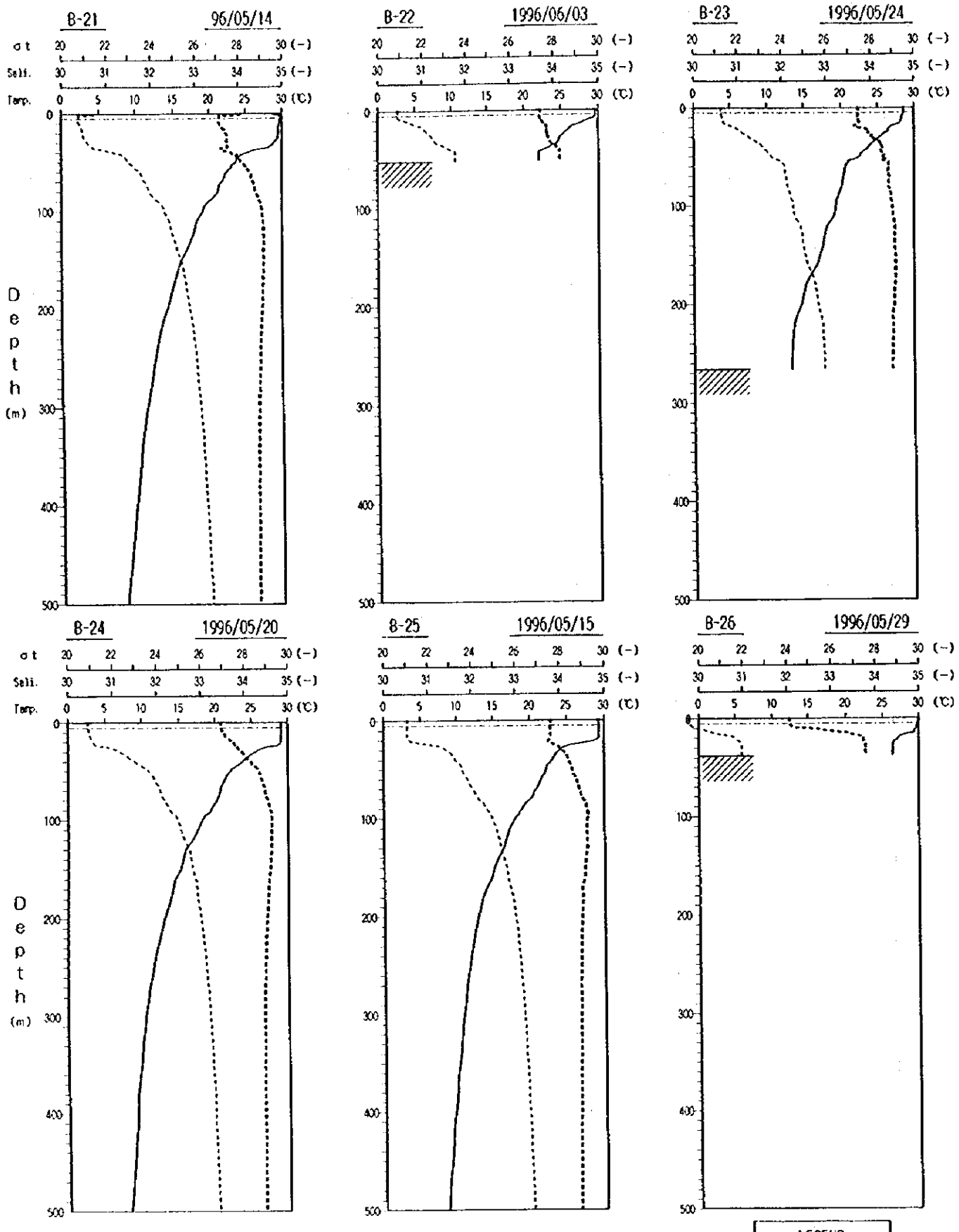

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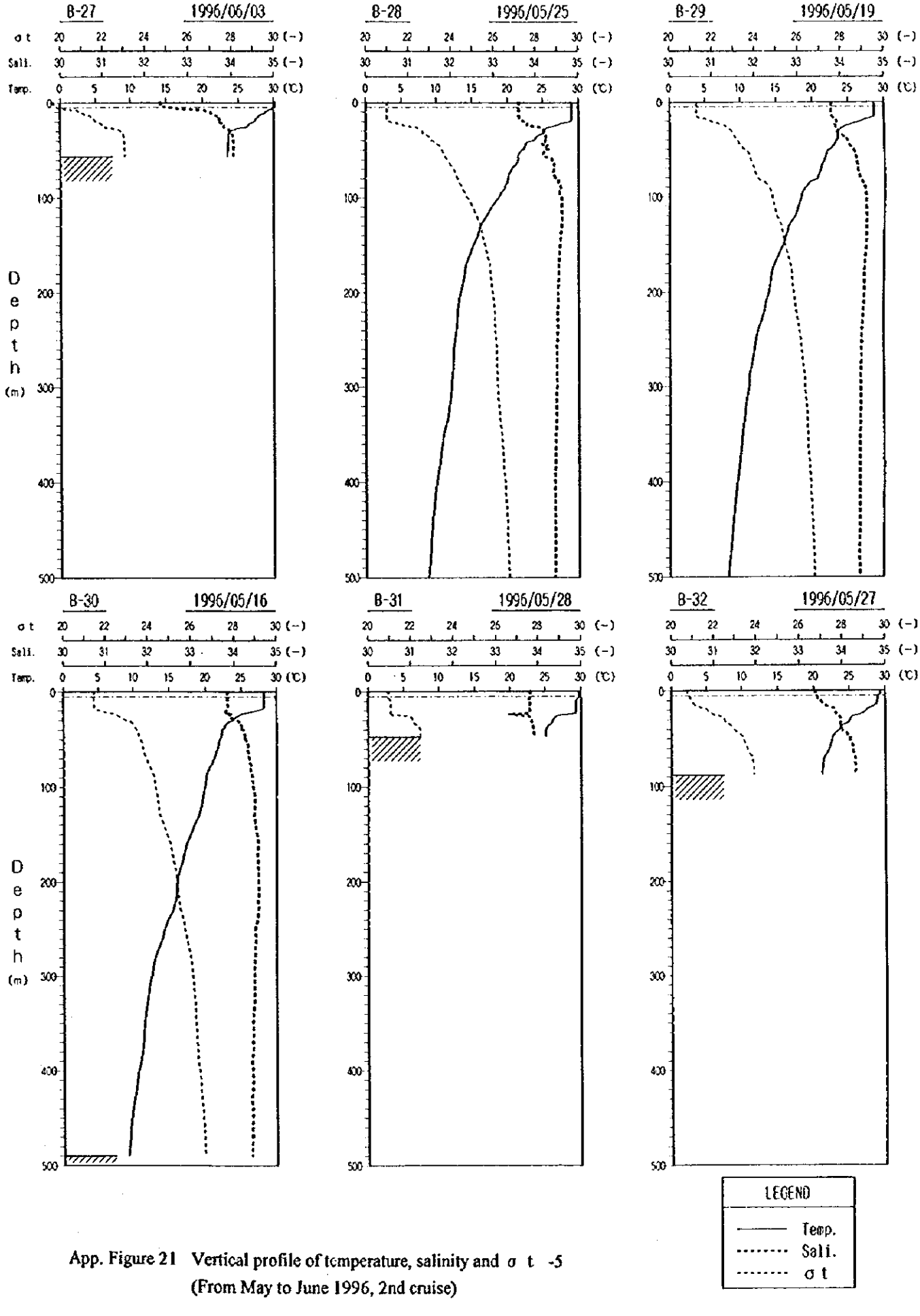

App. Figure 21 Vertical profile of temperature, salinity and σ t -5
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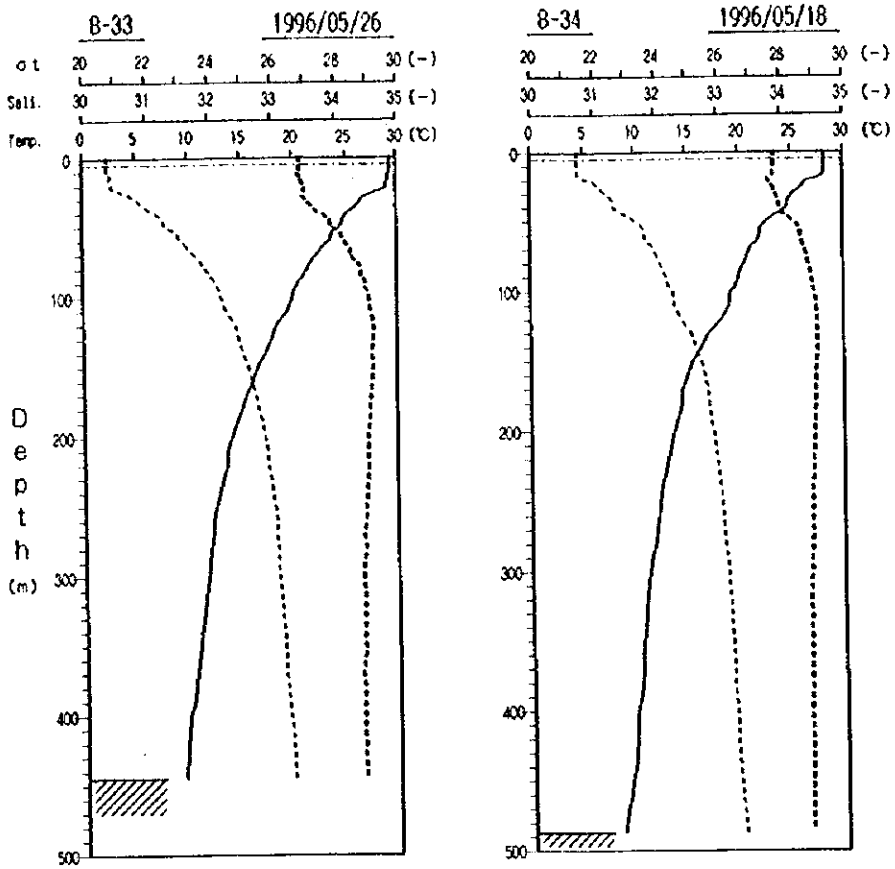

App. Figure 22 Vertical profile of temperature, salinity and σ t -6
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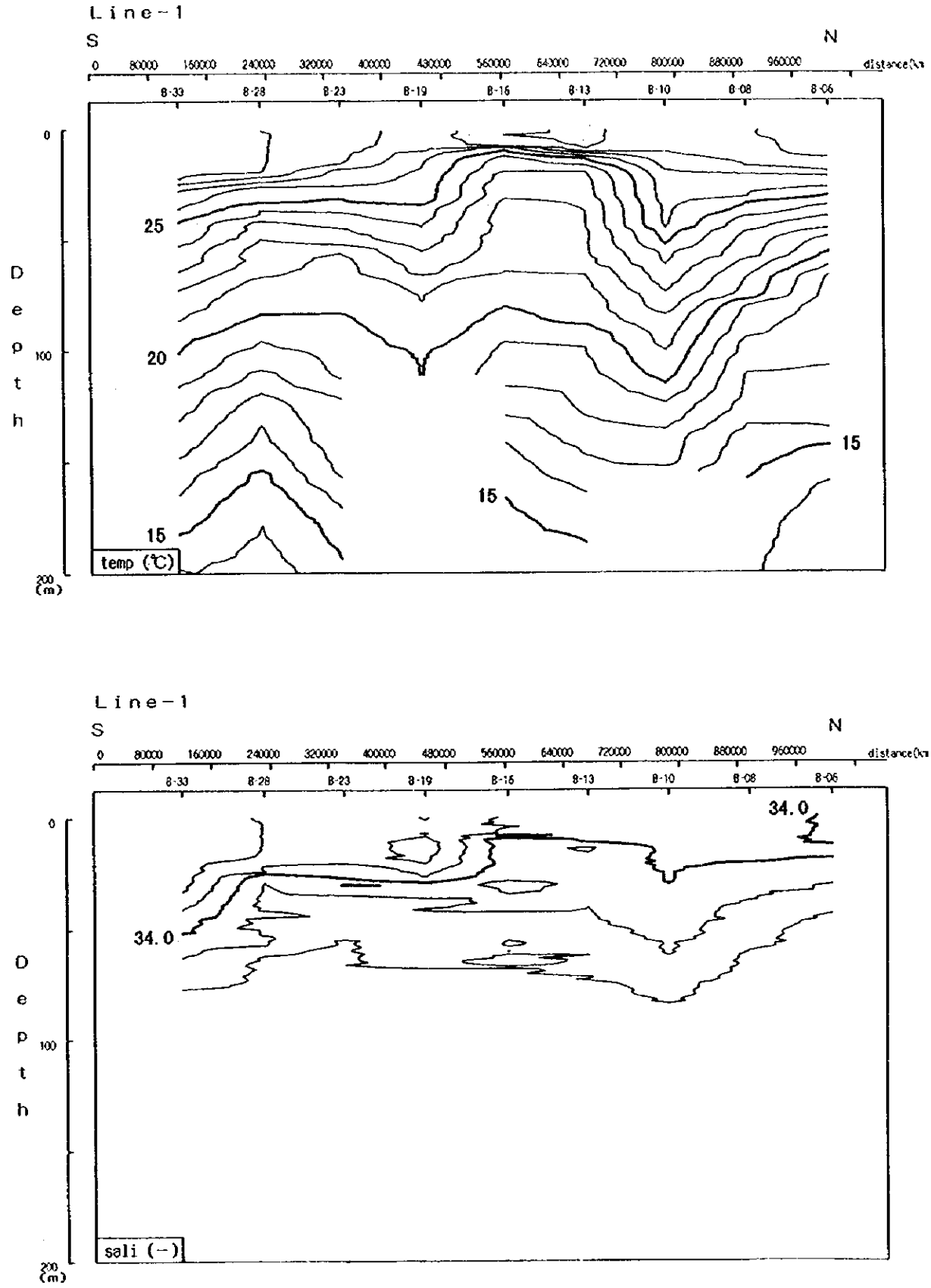
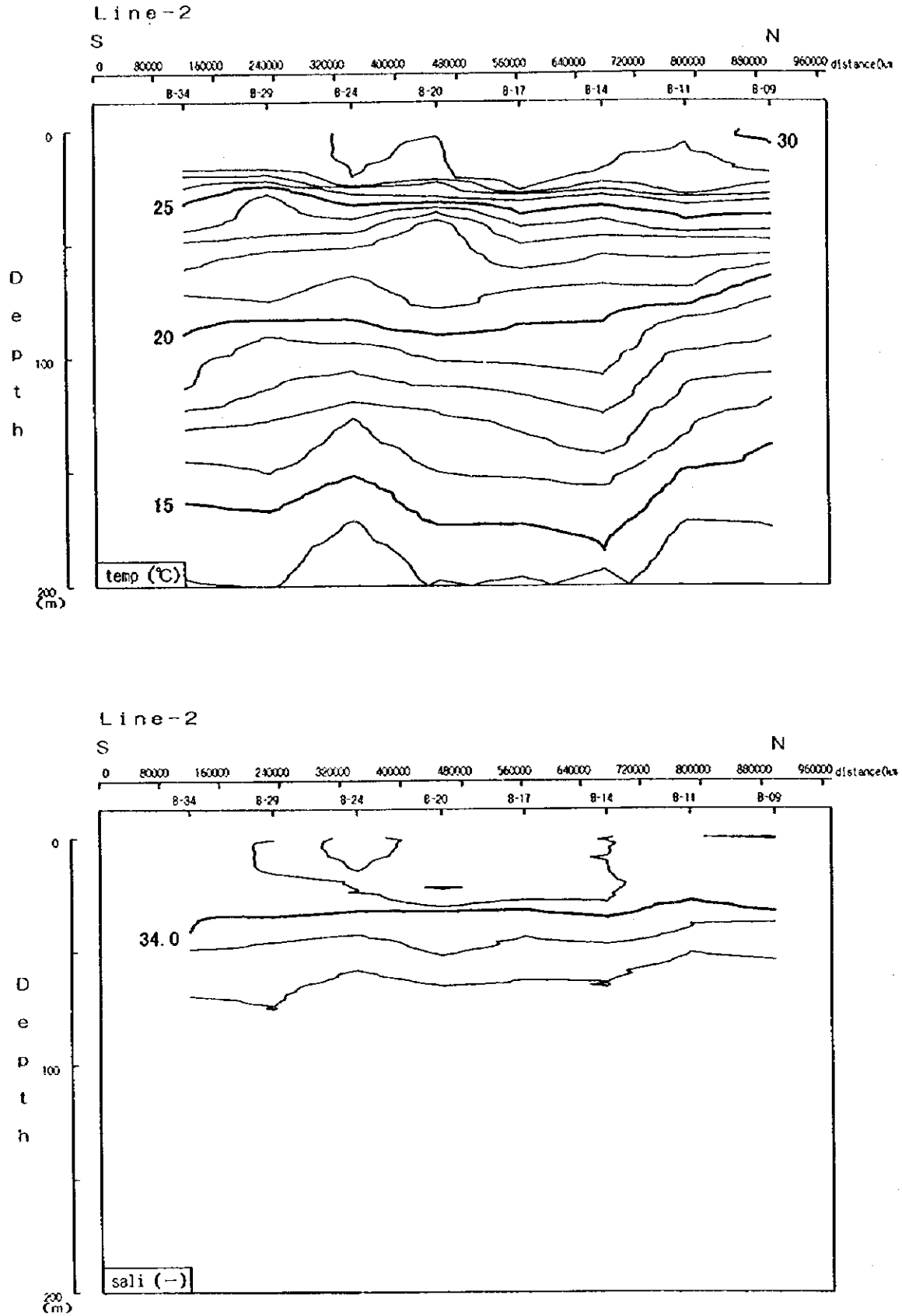


App. Figure 23 Vertical profile of temperature (1℃ interval) and salinity (0.2 interval) at the cross section of LINE-1. (From May to June 1996, 2nd cruise)



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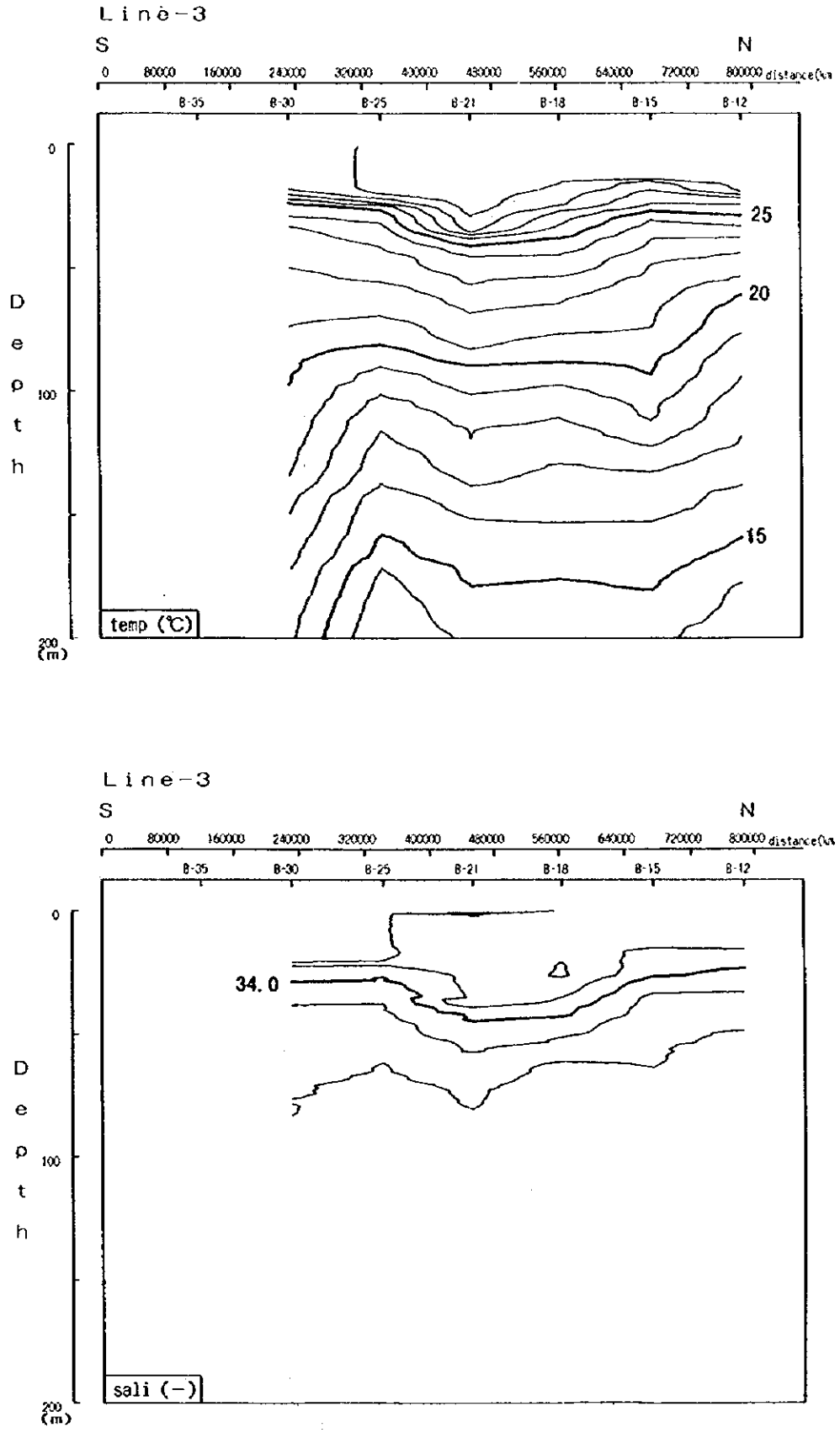
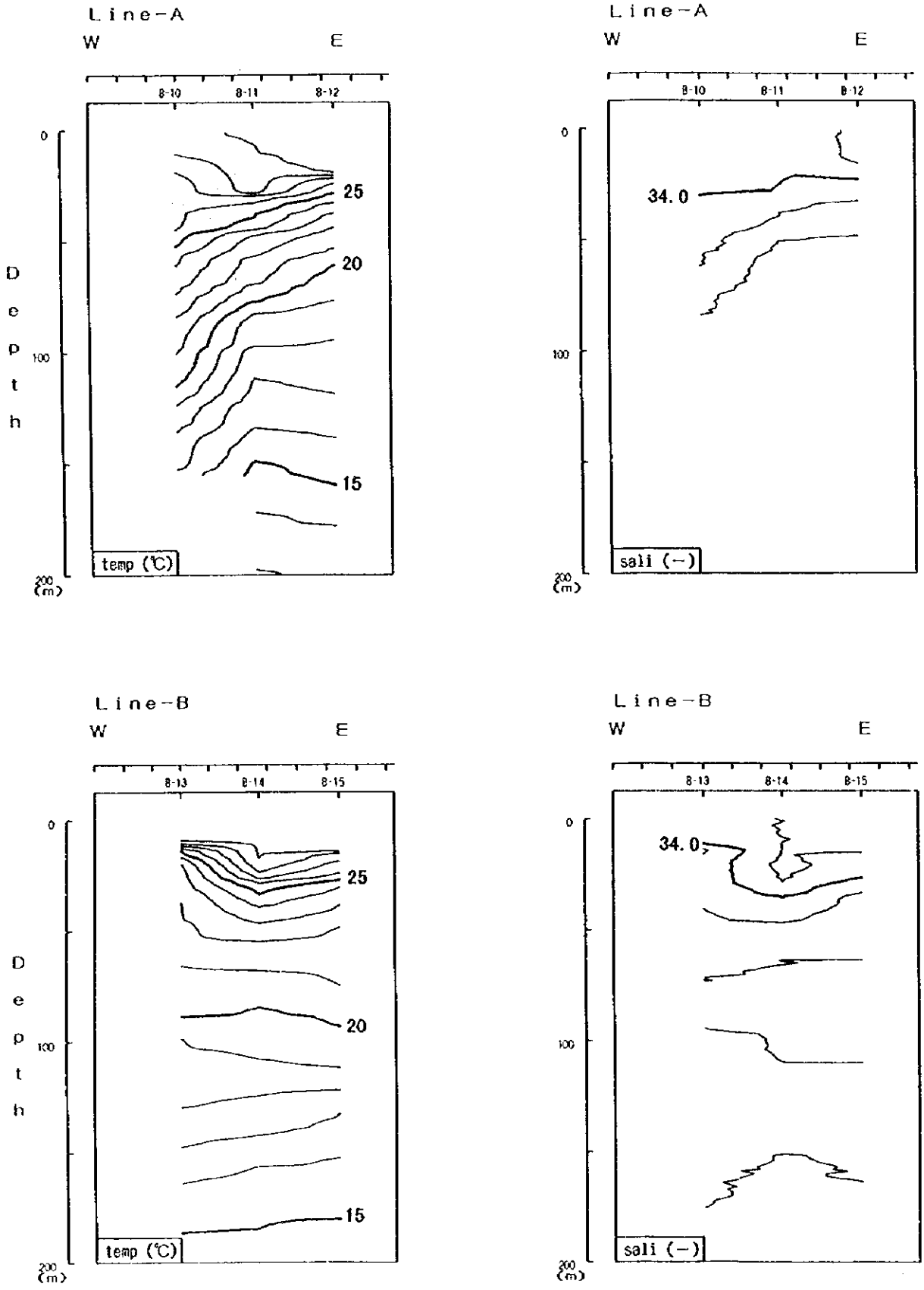
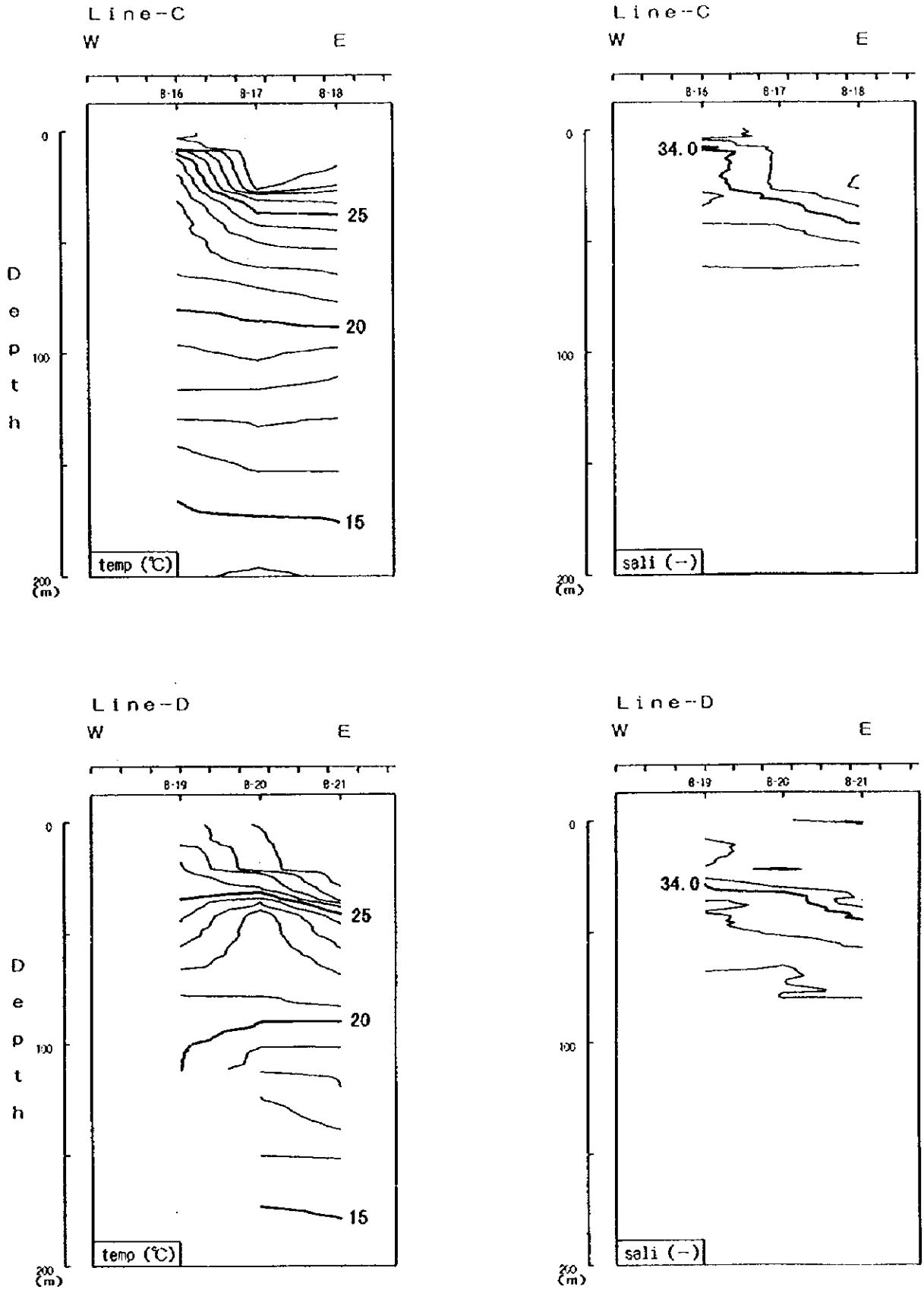


App. Figure 25 Vertical profile of temperature (1℃ interval) and salinity (0.2 interval) at the cross section of LINE-3. (From May to June 1996, 2nd cruise)



App. Figure 26 Vertical profile of temperature (1℃ interval) and salinity (0.2 interval) at the cross section of LINE-A and B. (From May to June 1996, 2nd cruise)



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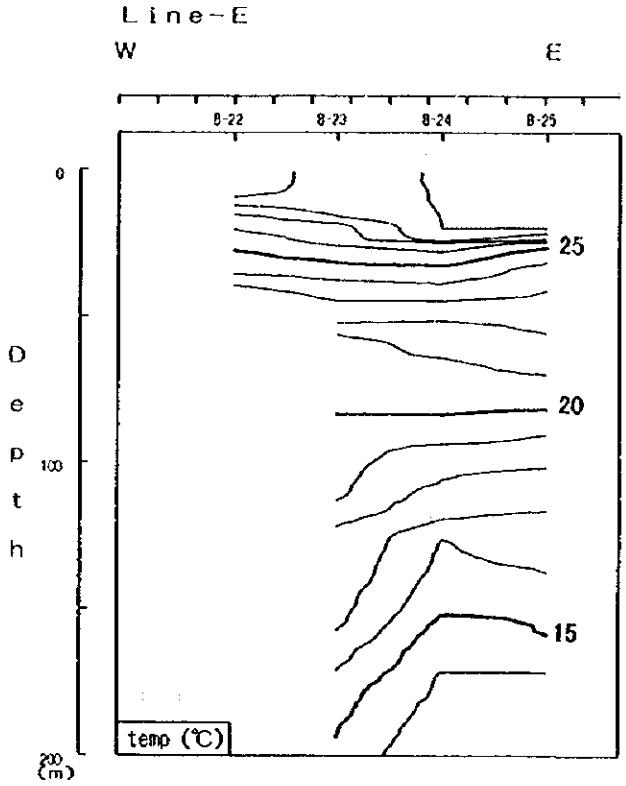

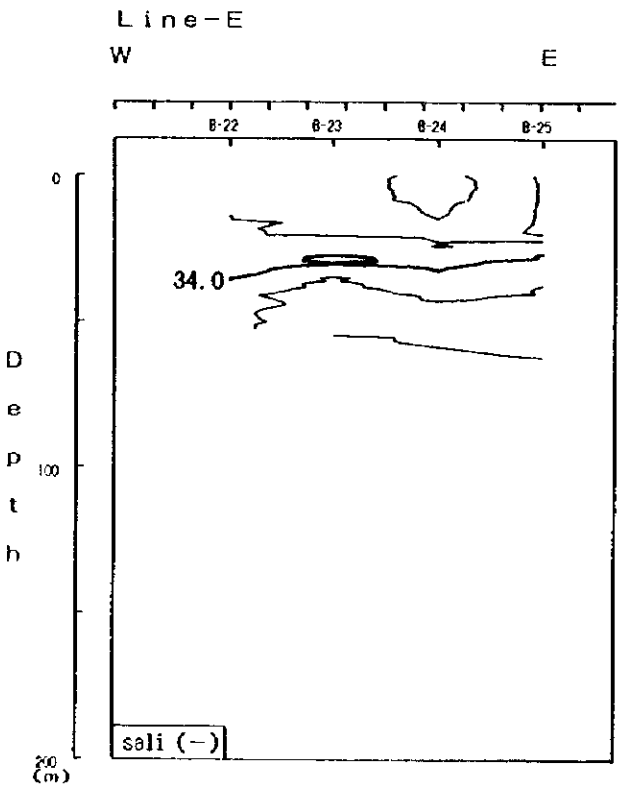

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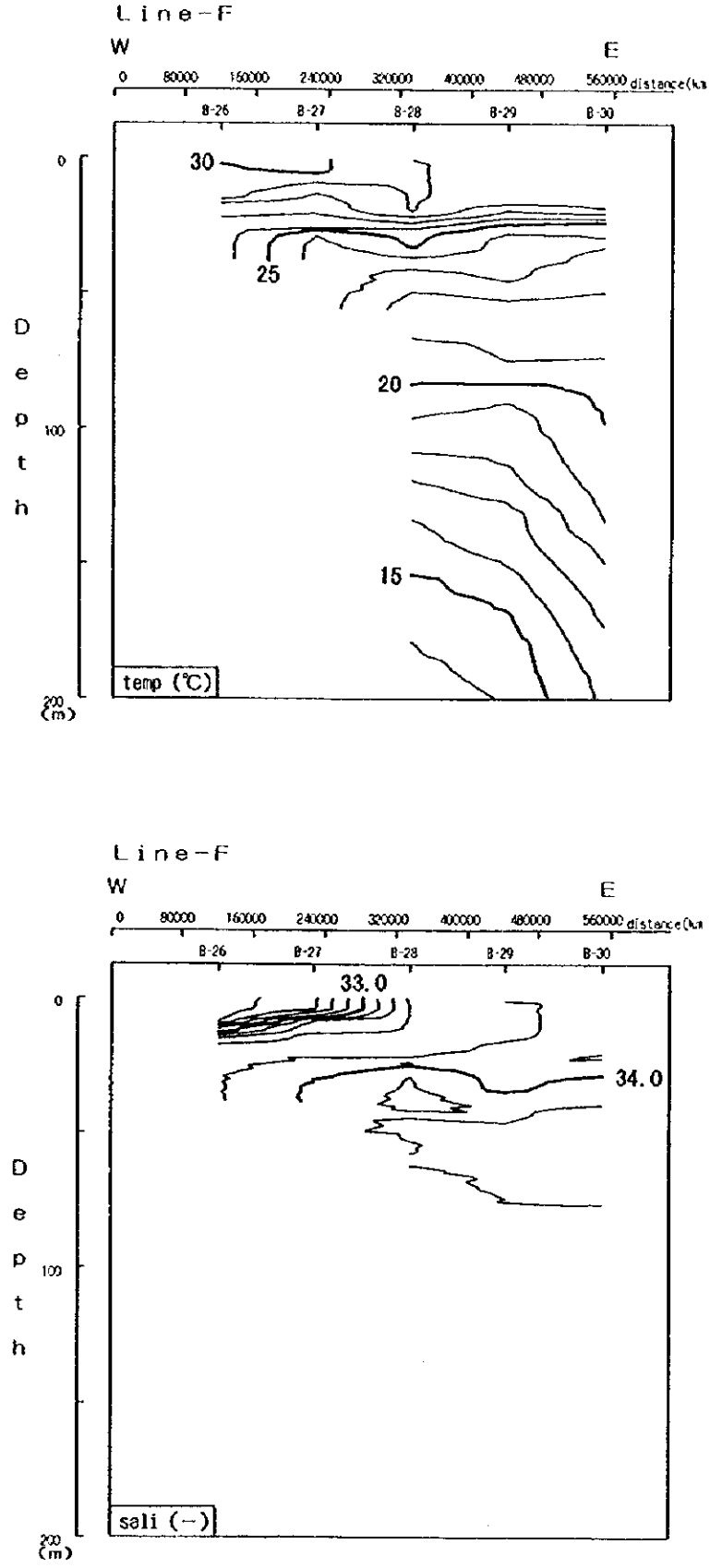

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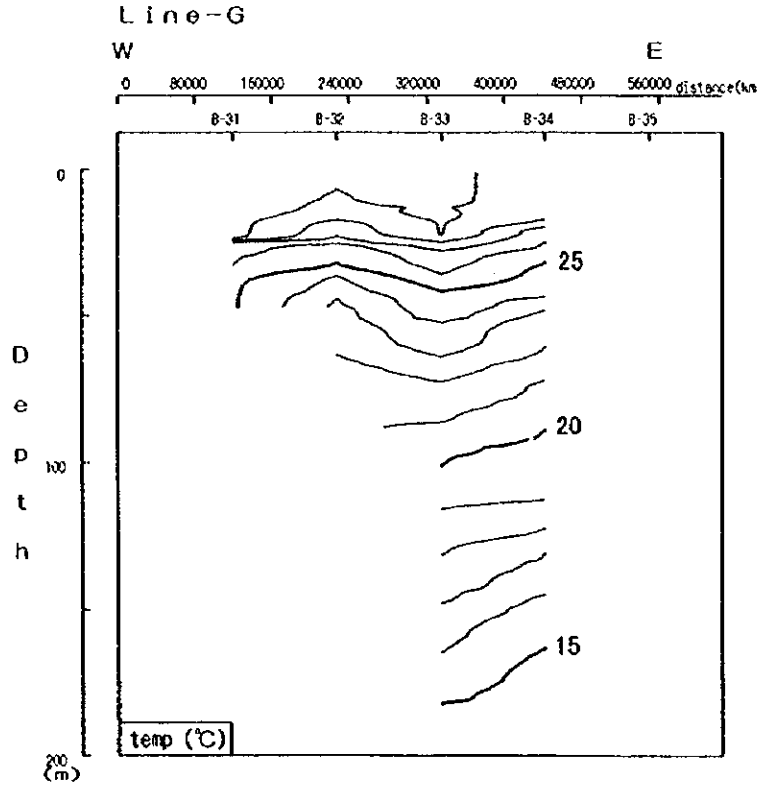
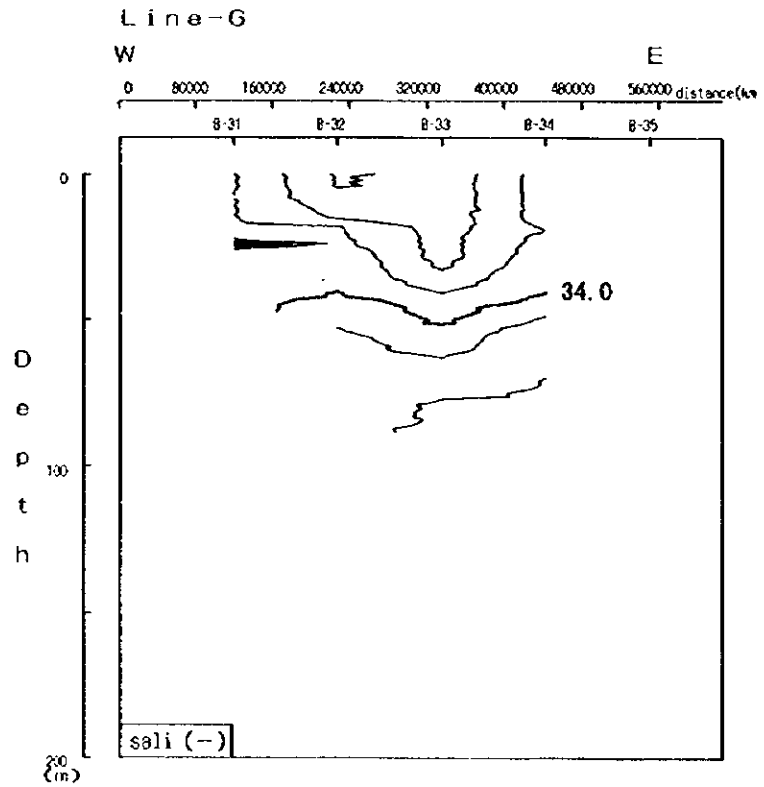
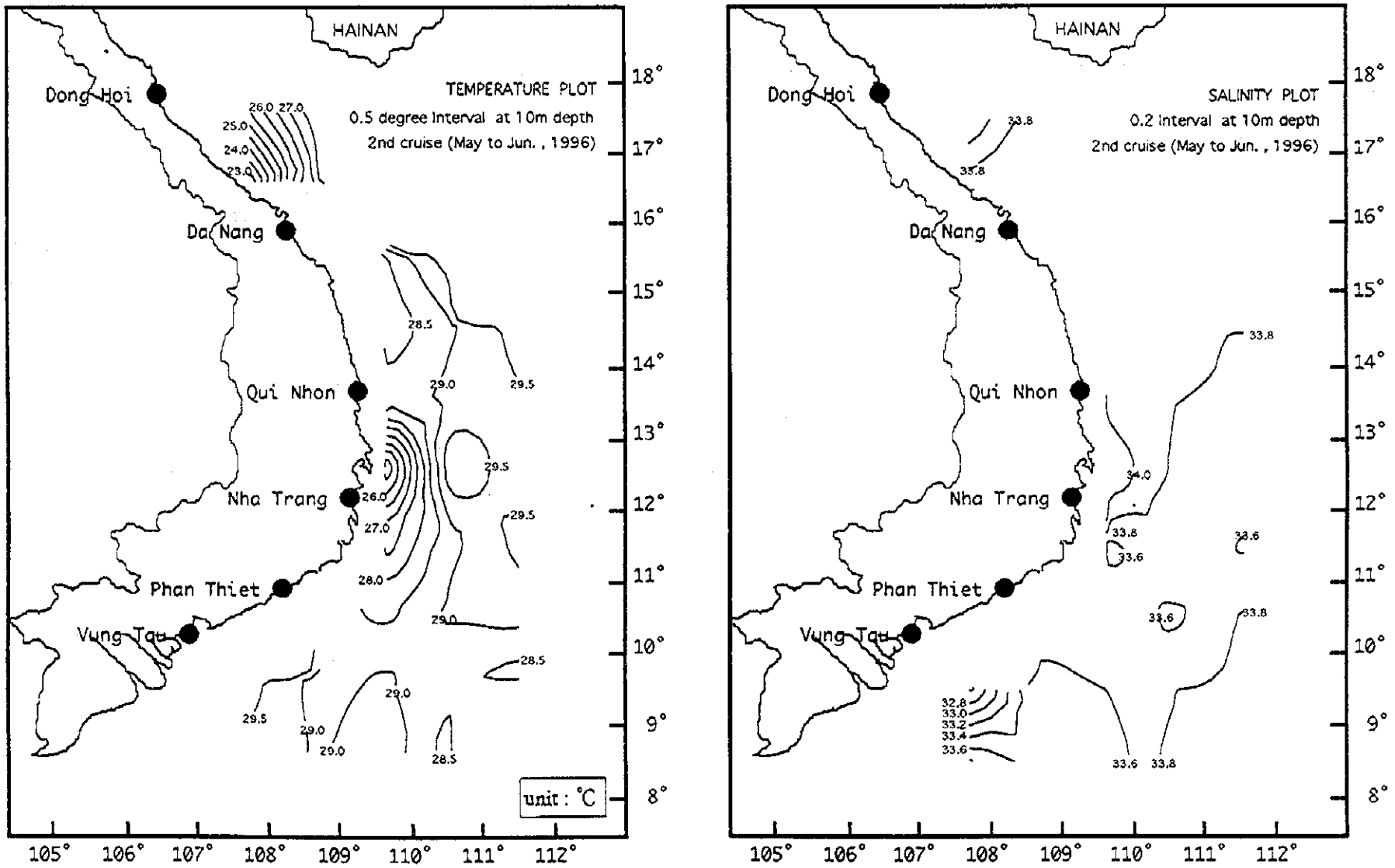




App. Figure 30 Vertical profile of temperature (1℃ interval) and salinity (0.2 interval) at the cross section of LINE-F. (From May to June 1996, 2nd cruise)



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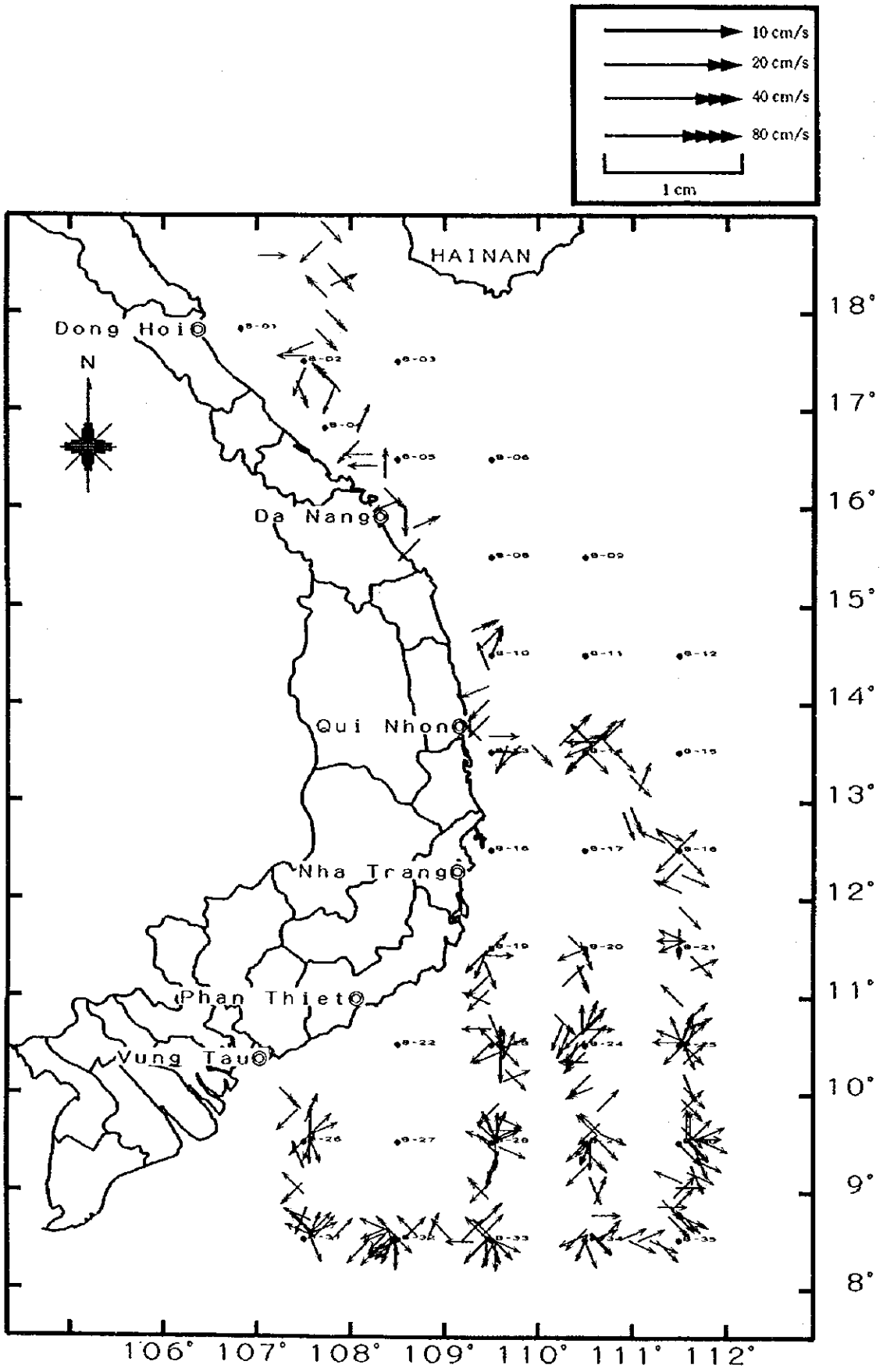

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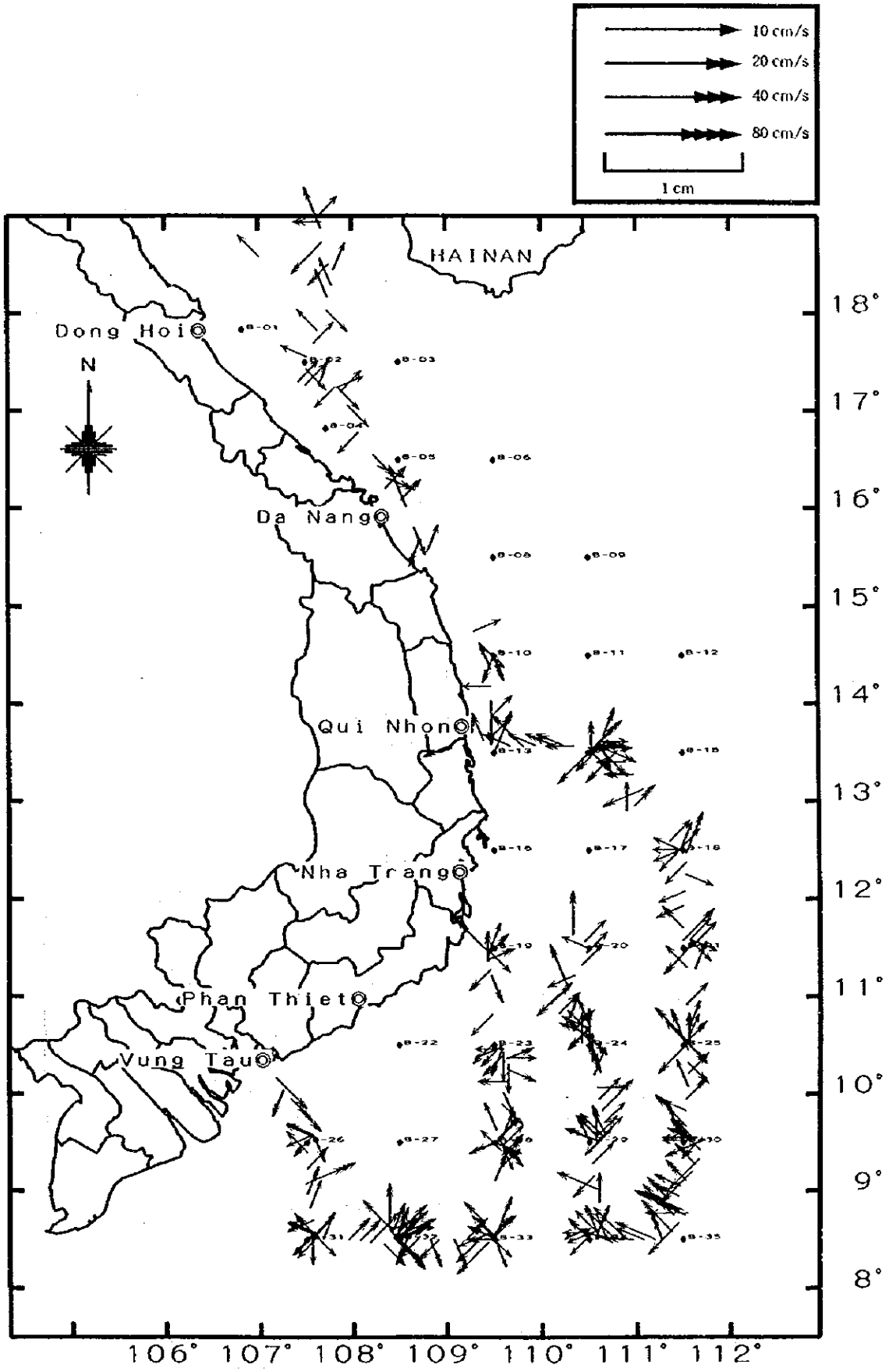

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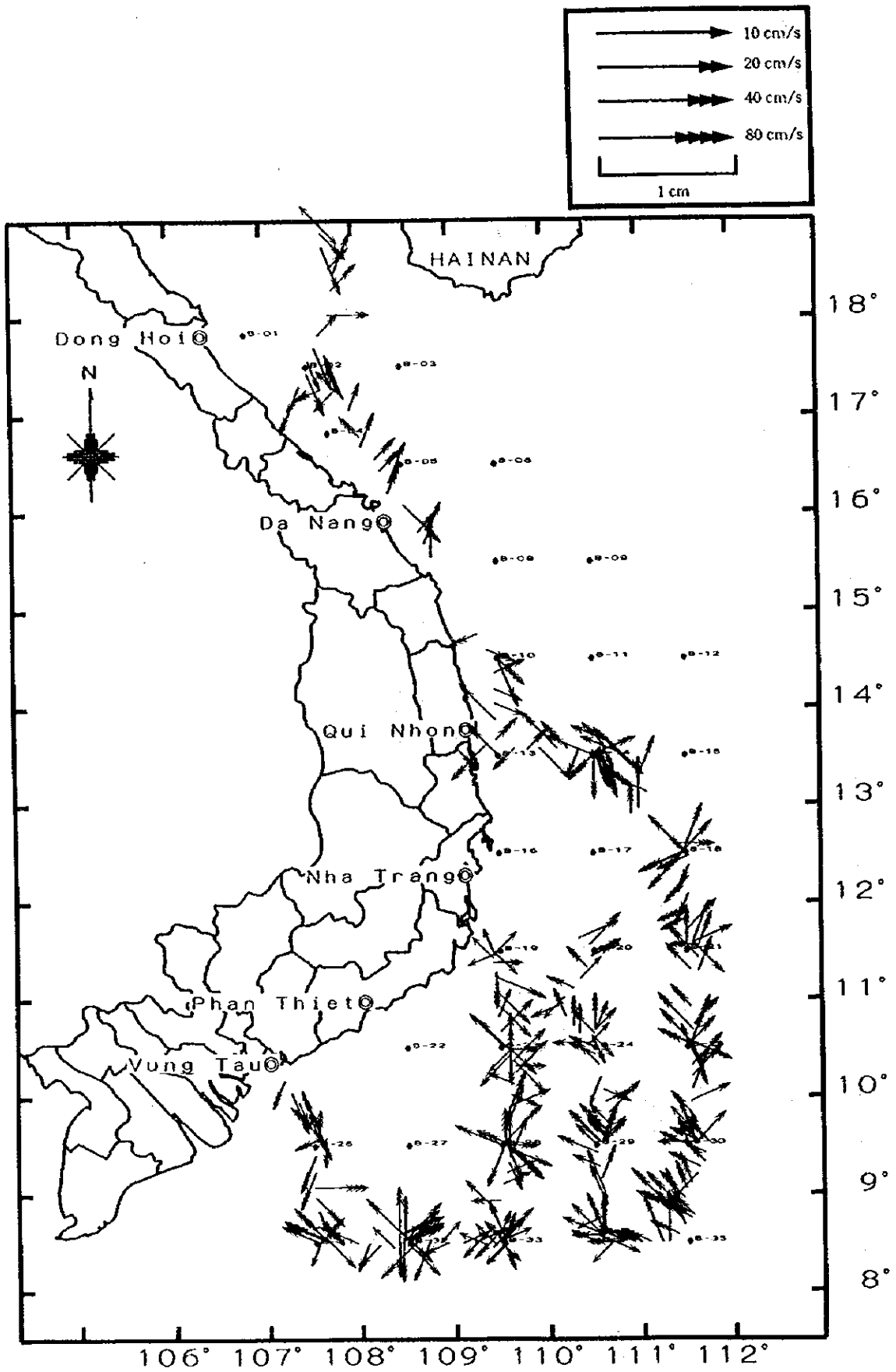

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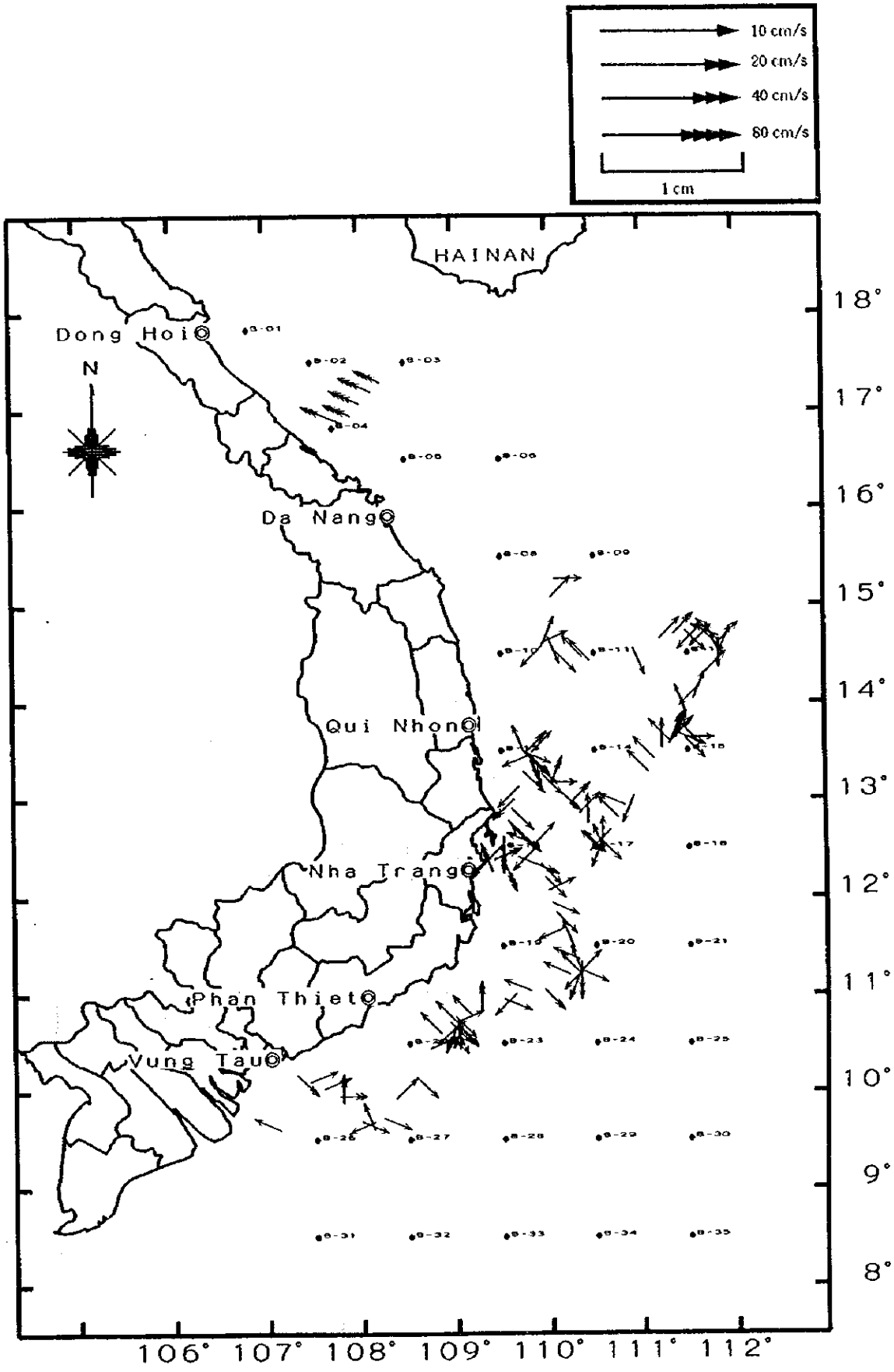

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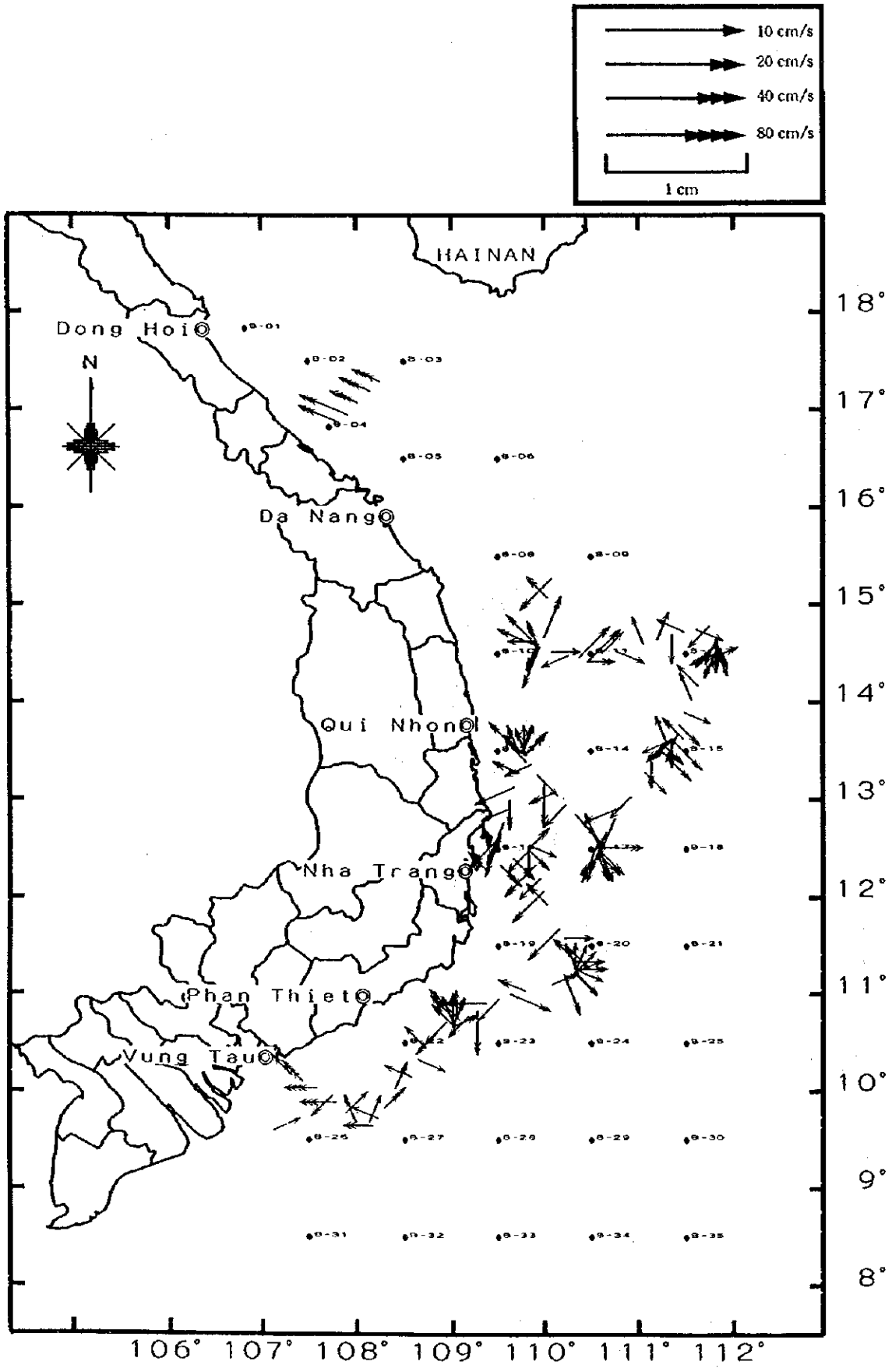

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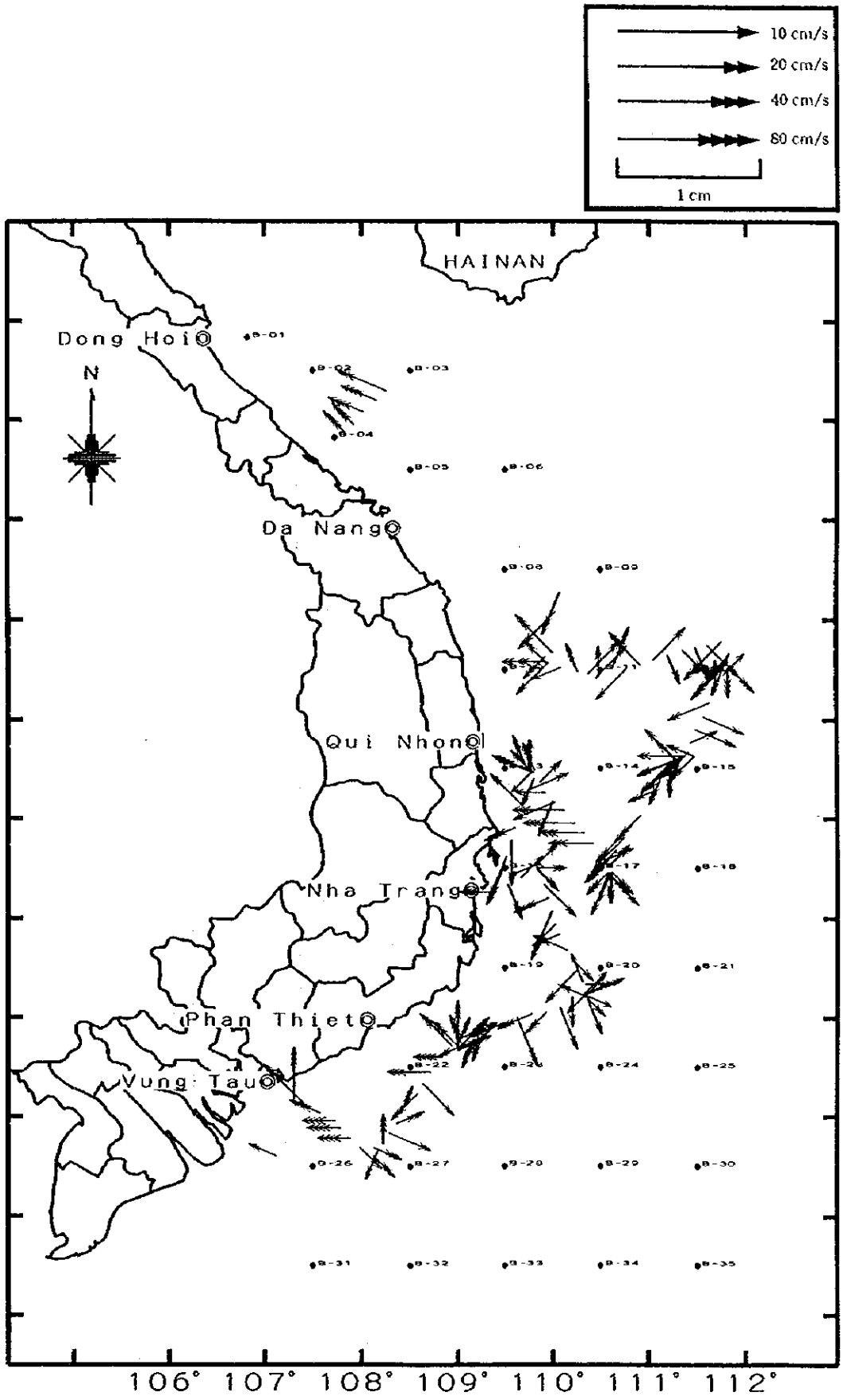

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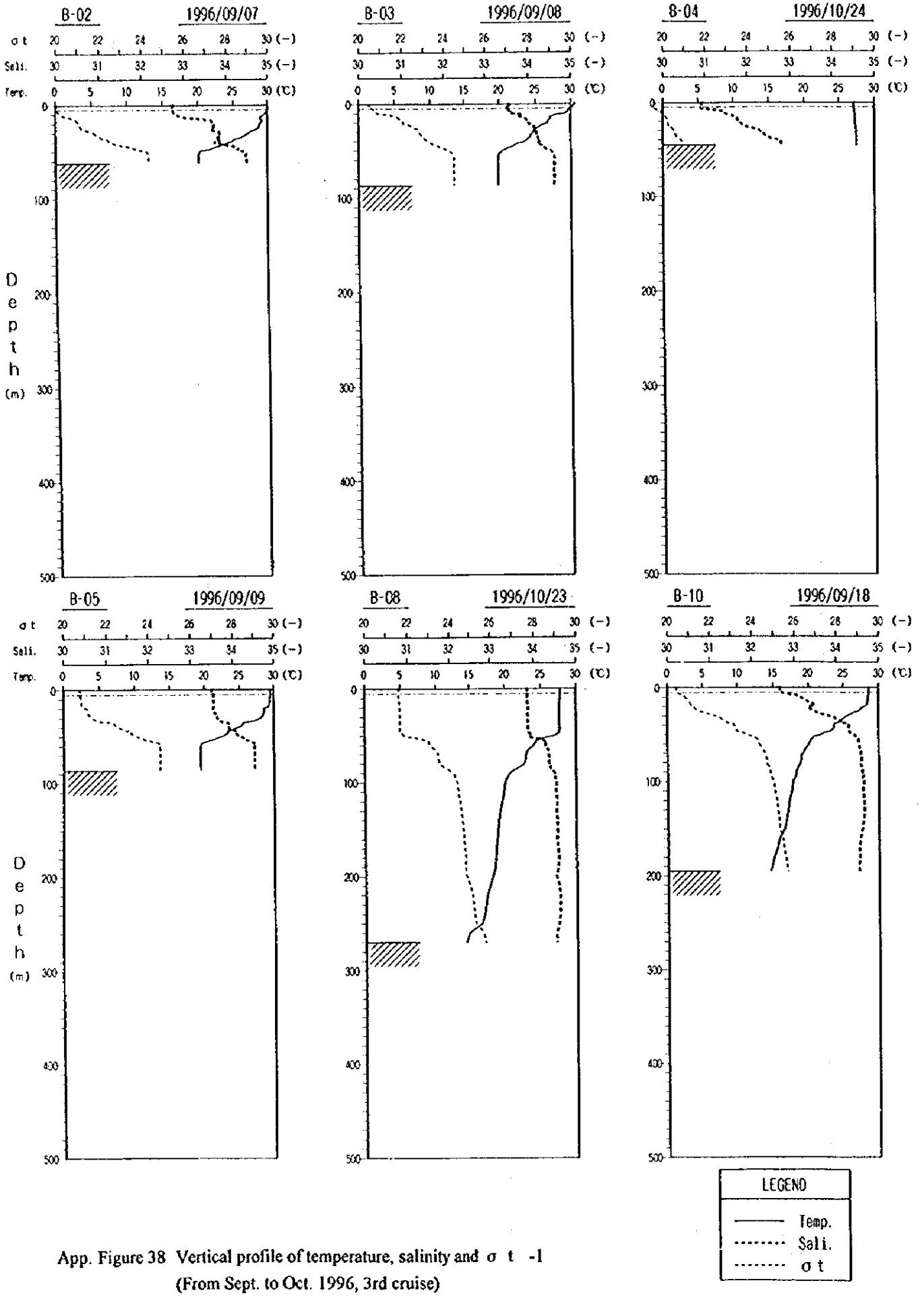
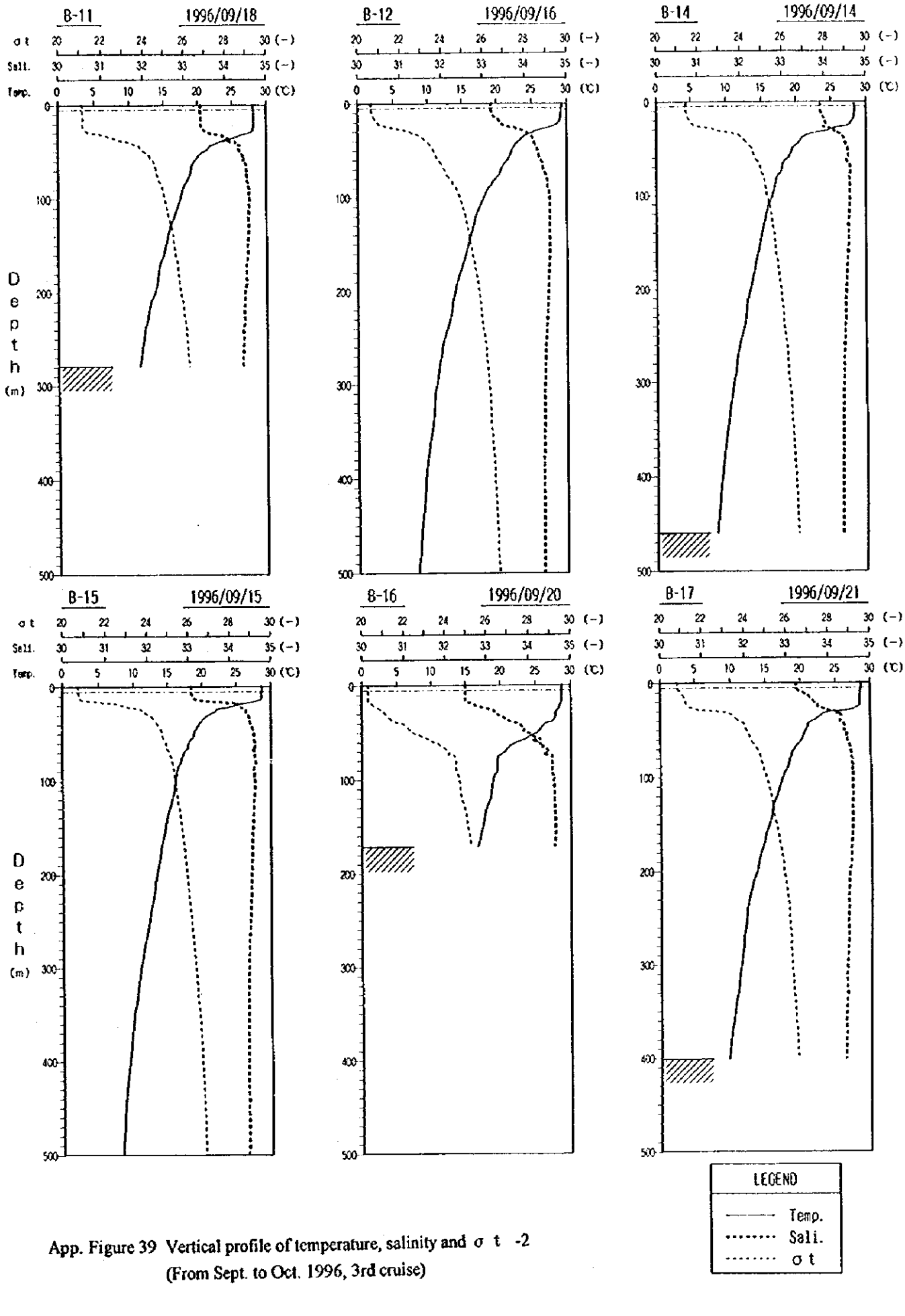
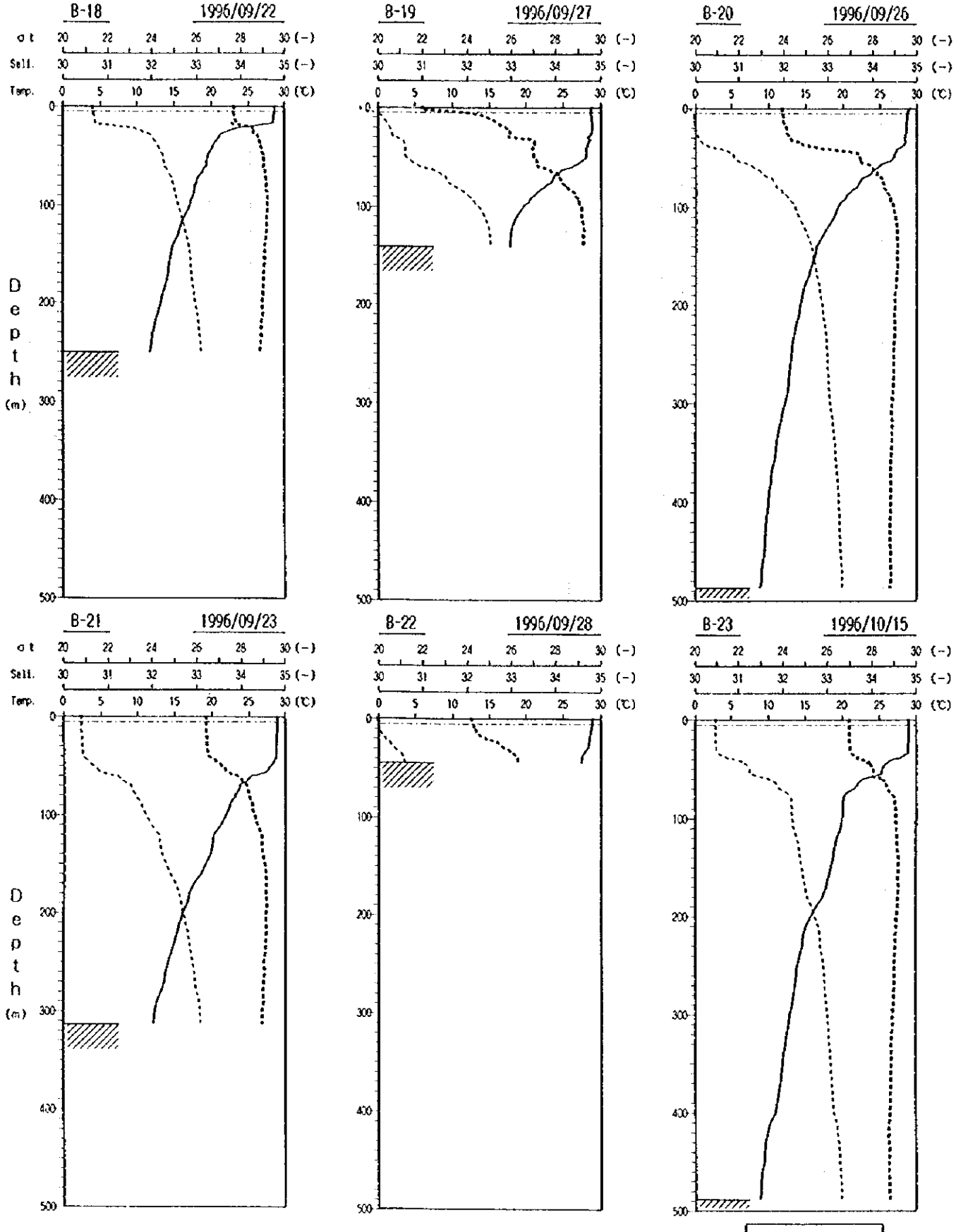


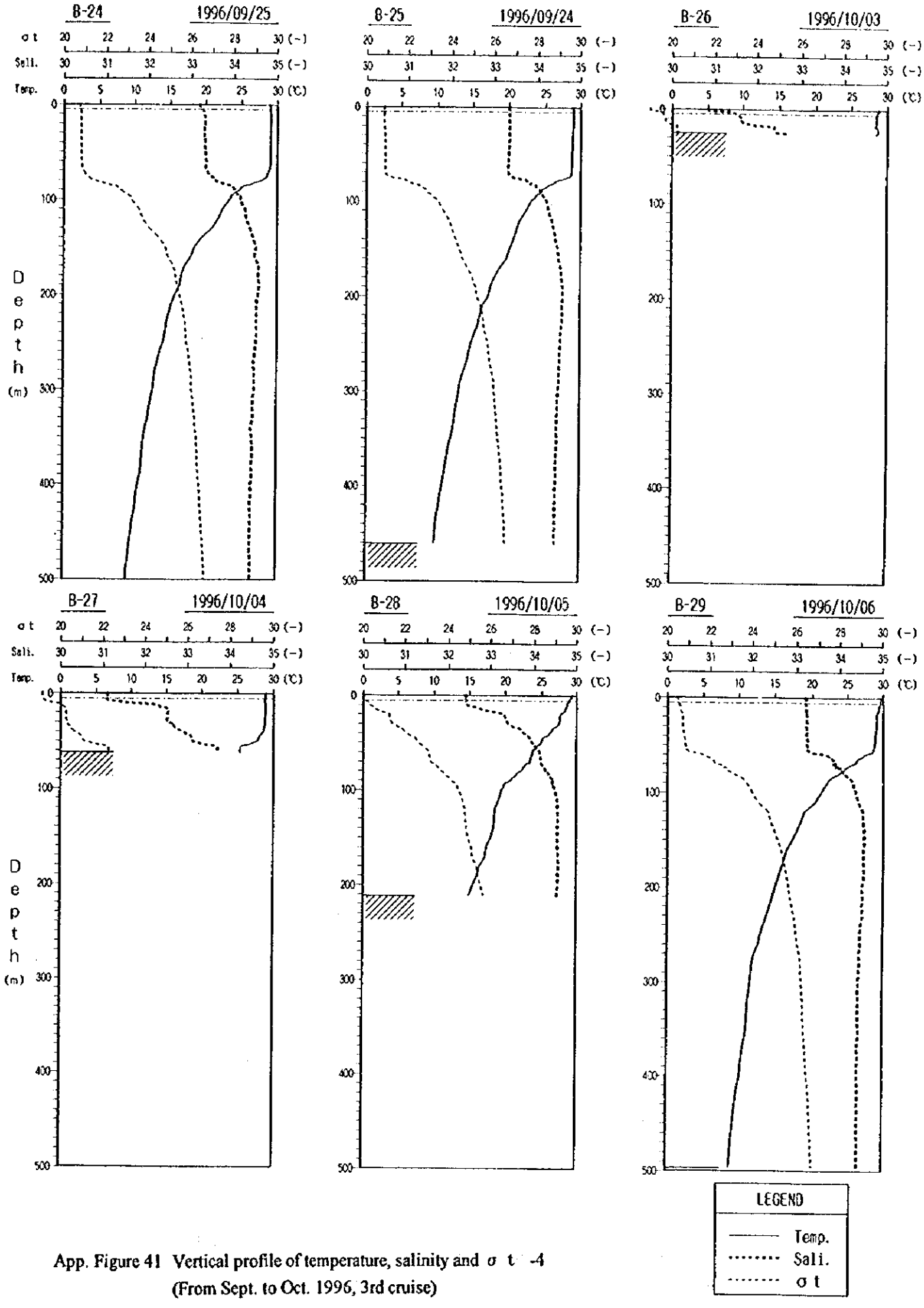
App. Figure 38 Vertical profile of temperature, salinity and σ t -1
(From Sept. to Oct. 1996, 3rd cruise)



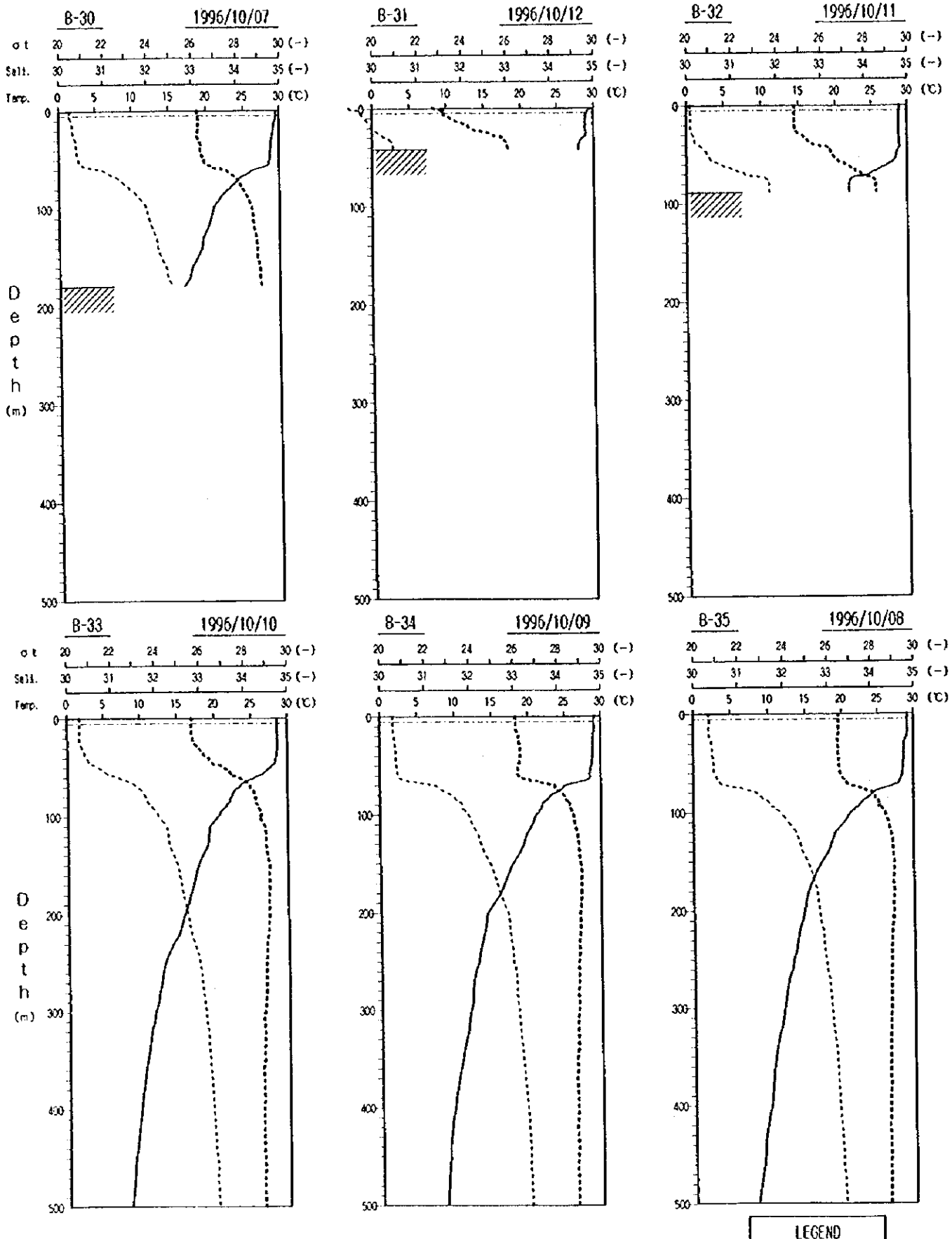
App. Figure 39 Vertical profile of temperature, salinity and σ t -2
(From Sept. to Oct. 1996, 3rd cruise)



App. Figure 40 Vertical profile of temperature, salinity and σ t -3
(From Sept. to Oct. 1996, 3rd cruise)



App. Figure 41 Vertical profile of temperature, salinity and σ t -4
(From Sept. to Oct. 1996, 3rd cruise)



App. Figure 42 Vertical profile of temperature, salinity and σ t -5
(From Sept. to Oct. 1996, 3rd cruise)