

RY

**THE FISHERIES RESOURCES SURVEY
IN
FIJI AND TUVALU**

FIGURES AND TABLES

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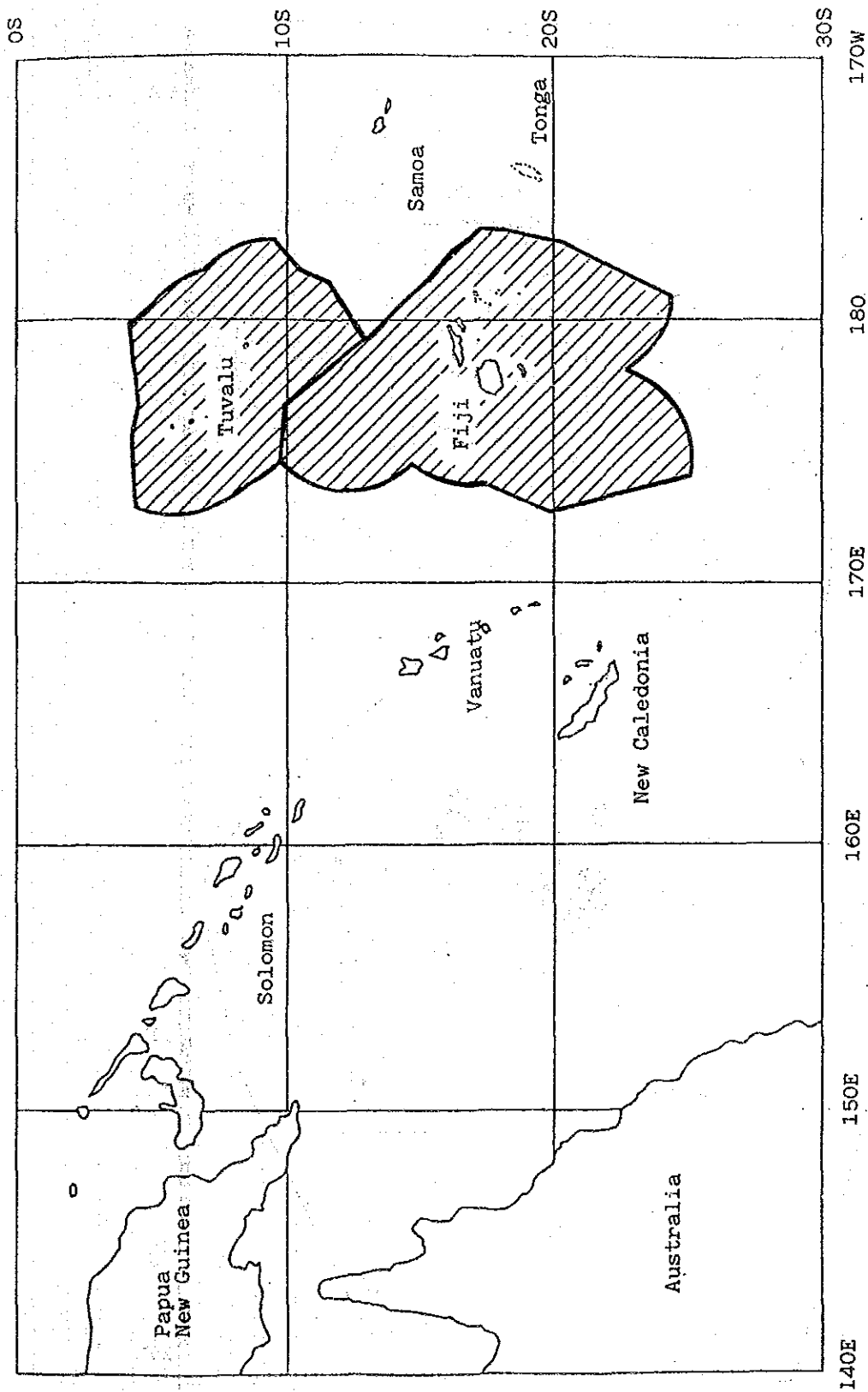


Fig. 1 Survey waters within the 200 mile zones of Fiji and Tuvalu.
 (The area were shown in shaded area in the figure)

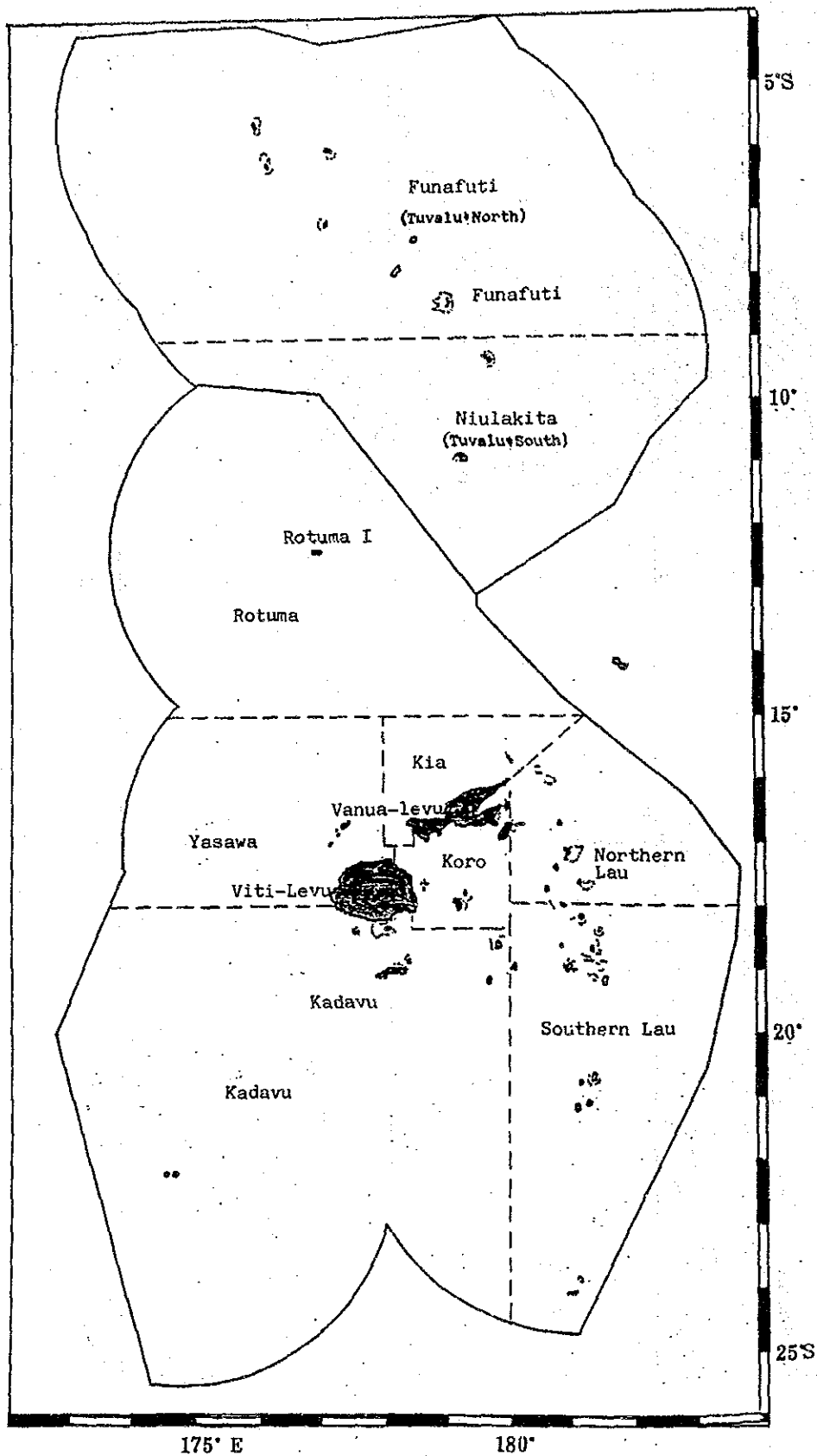


Fig. 2 Divided areas in the survey waters.
 (Tuvalu waters were separated to Tuvalu-North and Tuvalu-South
 in bottom line operation)

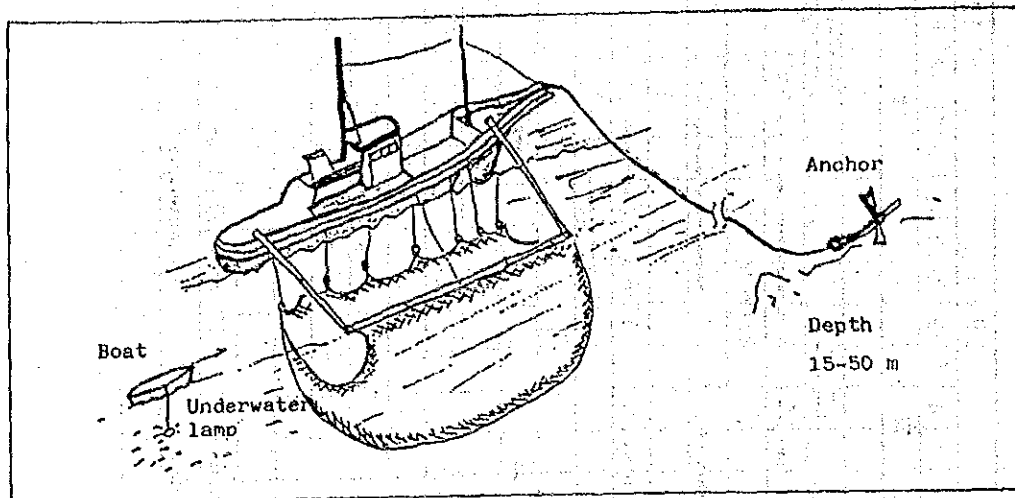


Fig. 4 A schematic illustration of stick-held dip net.

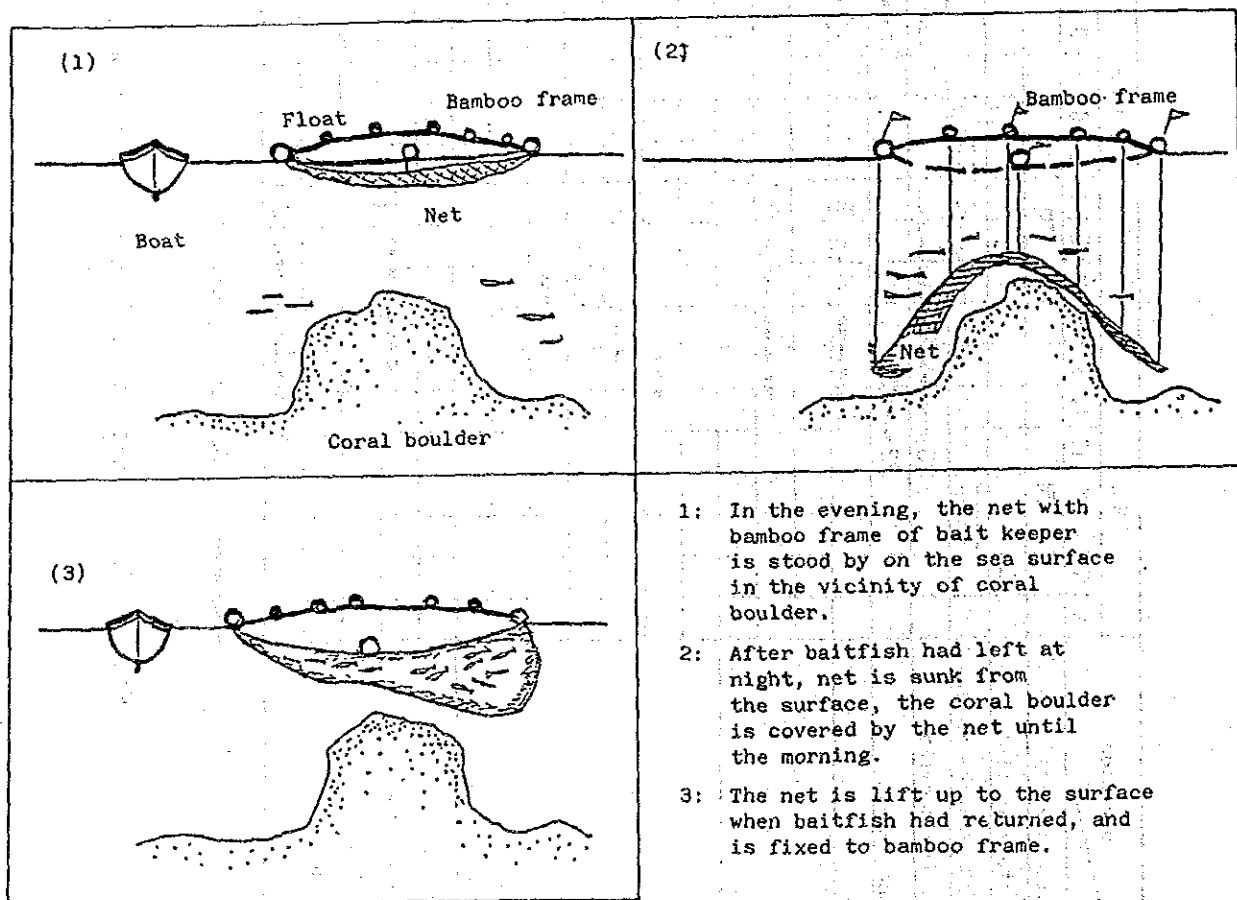
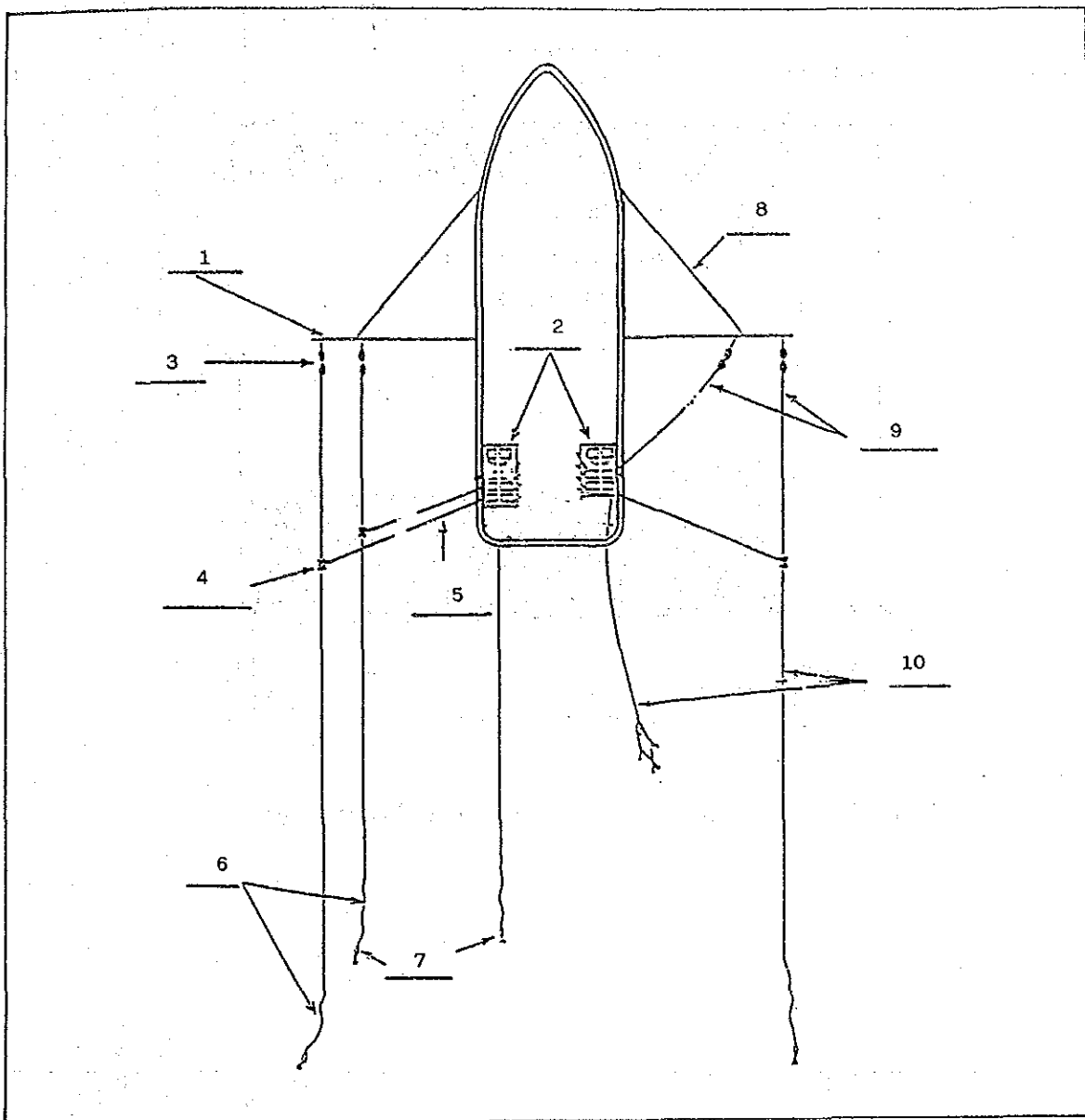


Fig. 5 Three stages of lift-net baitfishing on the coral boulder. (It was known that bait fish "cardinals" left the coral boulder during the night and returned in the morning.)



- | | |
|------------------|------------------|
| 1. Trolling pole | 6. Fishing snode |
| 2. Winch | 7. False bait |
| 3. Gum | 8. Stay |
| 4. Guide bushing | 9. Tug line |
| 5. In-hole line | 10. Main line |

Fig. 6 A schematic illustration of trolling operation.

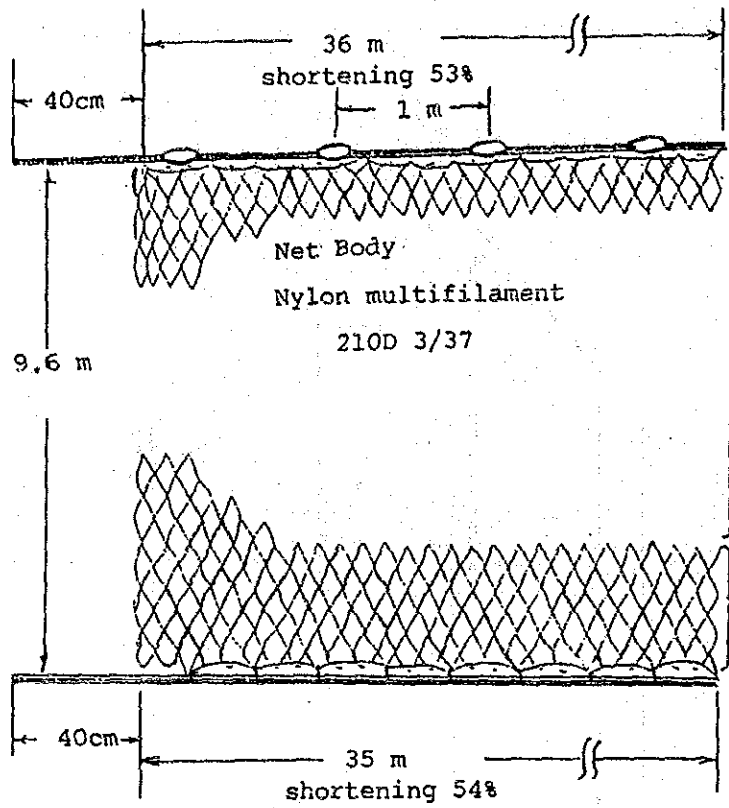
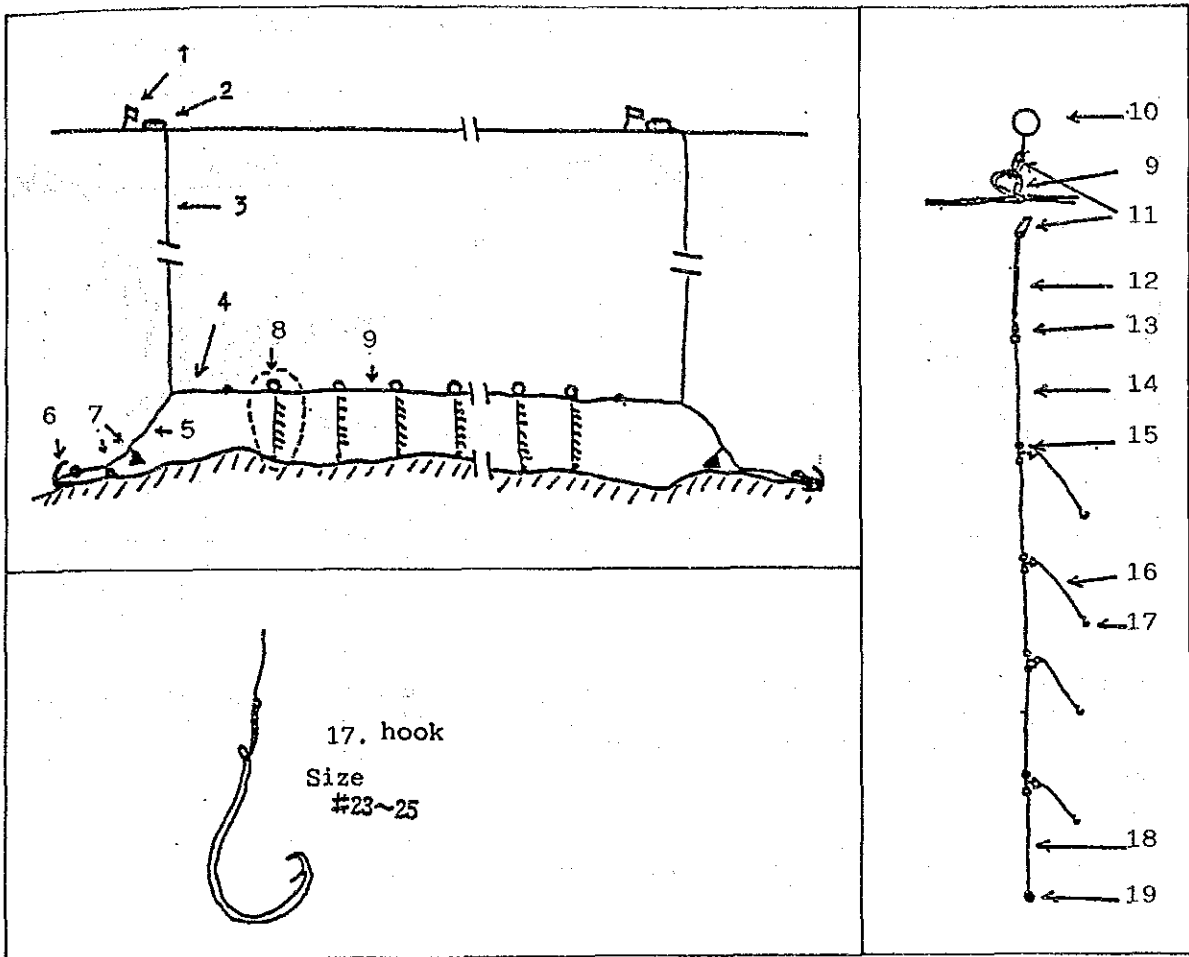


Fig. 7 A construction of surface gillnet gear.

Meshes 150mm	170mm	170mm	180mm	160mm	170mm	180mm
Thread 24F 3/21	24F 3/21	24F 3/27	24F 3/30	24F 3/24	24F 3/21	24F 3/30
Net color Light blue	light blue	Gray	Gray	Gray	Light blue	Light blue
Net depth 9.6 m	9.6 m	9.6 m	9.6 m	12.0 m	9.6 m	9.6 m
No. of tan 5 tan	10 tan	10 tan	10 tan	5 tan	5 tan	5 tan

Fig. 8 The combination placement of surface gillnet gear.



- | | |
|------------------------|--|
| 1. Flag | 11. Snap |
| 2. Buoy | 12. Nylon twine 3mm |
| 3. Buoy line 12mm rope | 13. Swivel (box type) |
| 4. Joint rope 9mm | 14. Lead line (monofilament #80) |
| 5. Anchor rope 6mm | 15. Three portion swivel(Oyako swivel) |
| 6. Pipe anchor | 16. Snood (monofilament #30) |
| 7. Weight | 17. Hook |
| 8. Branch line | 18. Weight line(monofilament #40) |
| 9. Main line 9mm | 19. Weight 1Kg |
| 10. Pressure float | |

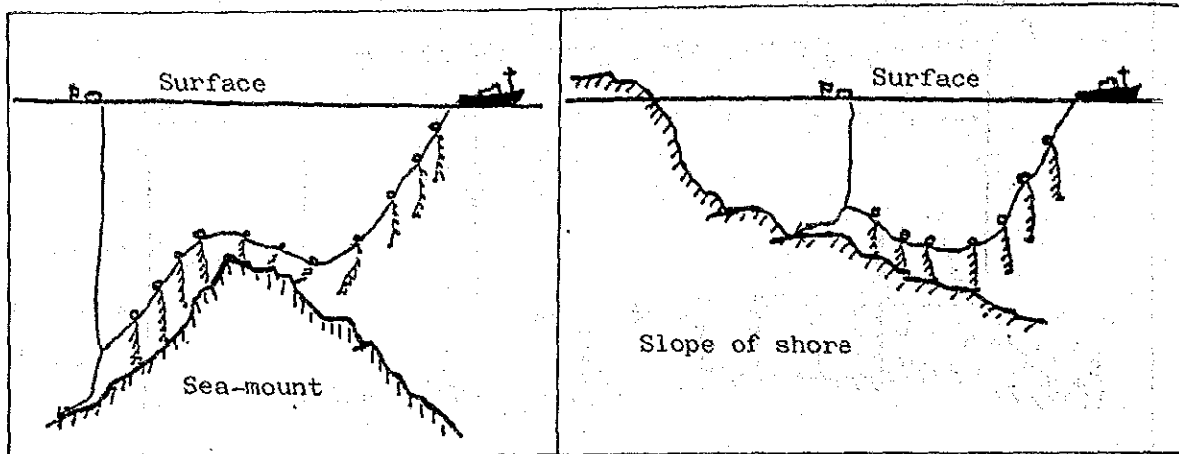
Breaking strength of Nylon fishing gut.

No.	Standard diameter (mm)	Breaking strength (Kg)	No.	Standard diameter (mm)	Breaking strength (Kg)
# 30	0.90	40	# 70	1.38	85
# 40	1.05	50	# 80	1.45	105
# 50	1.17	60	#100	1.65	130
# 60	1.28	75	#120	1.80	150

Fig. 9 A construction of bottom line gear.

(1) The vicinity of sea-mount

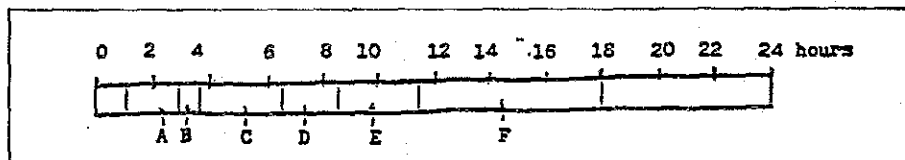
(2) The slope of shore



Lines are set at the stern in order of follows, buoy, buoy rope, pipe anchor, anchor rope and main line with hung branch.

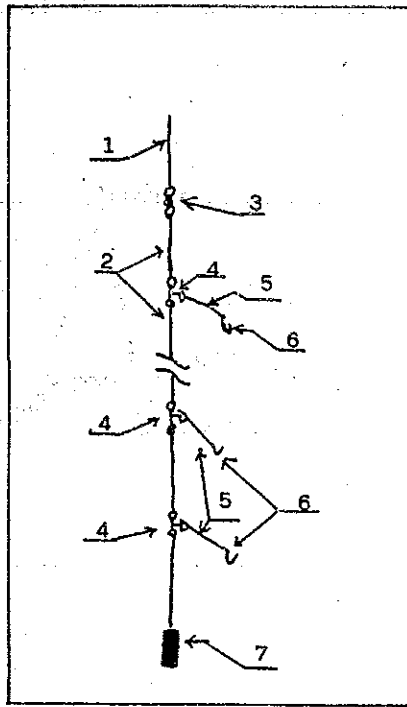
Method of setting are the same as the left.

(3) Time belt of the survey operation.



A: Stand by setting bottom line and fixing bait to the branch	-----	2.0 Hrs
B: Setting bottom line	-----	0.5 Hrs
C: Soaking time	-----	3.0 Hrs
D: Hauling the line	-----	2.0 Hrs
E: Resetting bottom line gears	-----	3.0 Hrs
F: Locating sea-mount using echo sounder	-----	6.0 Hrs
seamount using echo sounder	-----	6.0 Hrs

Fig.10 A illustration of bottom line fishery.



- 1. Main line
- 2. Lead line
- 3. Swivel
- 4. Three portion swivel
- 5. Branch line
- 6. Hook
- 7. Weight
(3-5 Kg)

Fig.11 A construction of drop line gear.

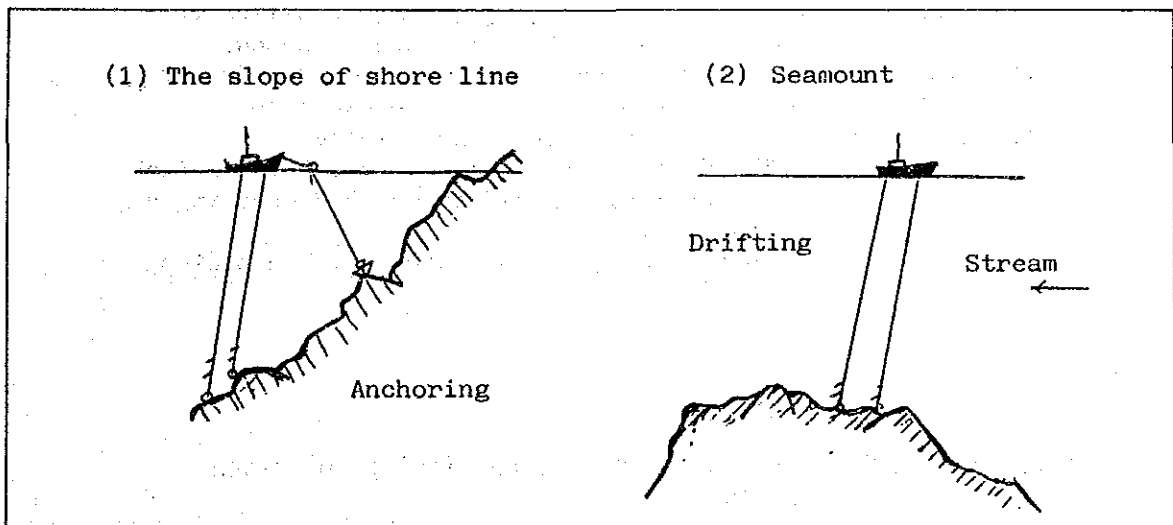
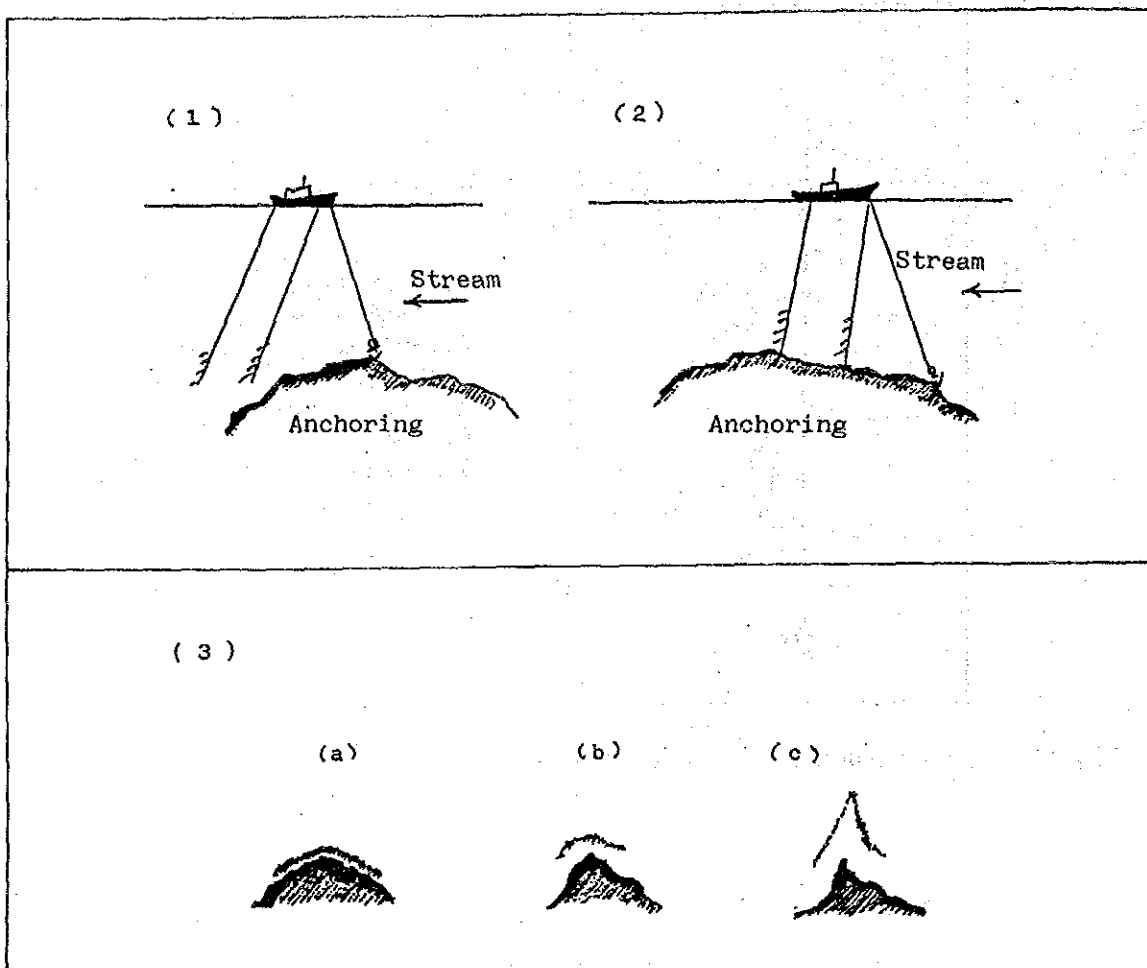
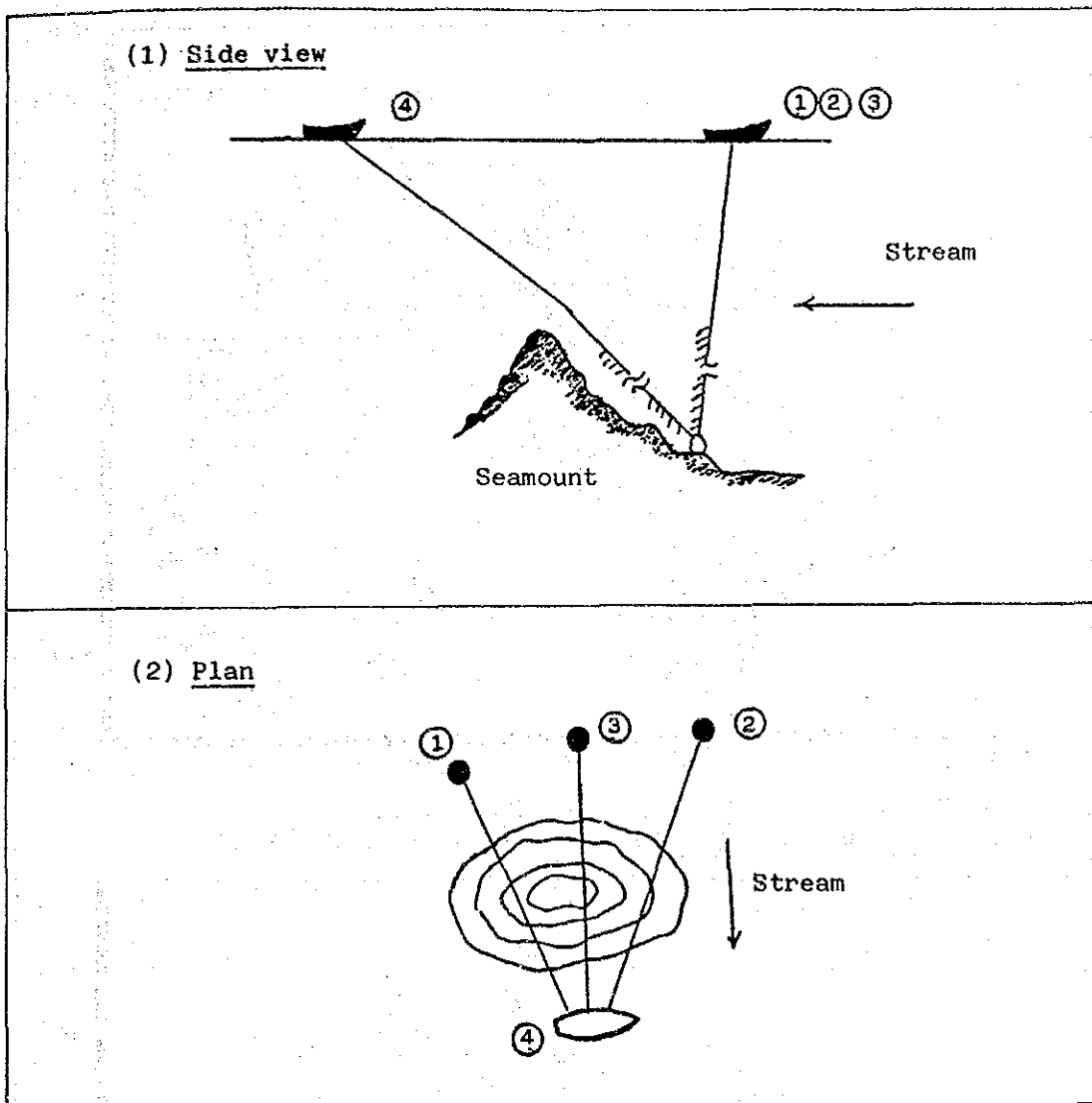


Fig.12-(1) A illustration of drop line fishery.



- (1) Lines are set the lower stream from top of seamount.
----- Small catch are expected.
- (2) Lines are set the upper stream from top of seamount.
----- Good catch are expected.
- (3) Relationship of catch and fish finder image.
----- The distance from school to bottom on fish
finder image increased, catch decreasing are
expected.
In case of (a) ----- Good catch expected.

Fig.12-(2) A illustration of drop line fishing operation at anchoring.



Branch line are set ① ② ③ in order on the upper stream from top of seamount.
 After setting at ③, drifted to the position ④ and hauling the line.

Fig.13 A illustration of drop line operation at drifting.

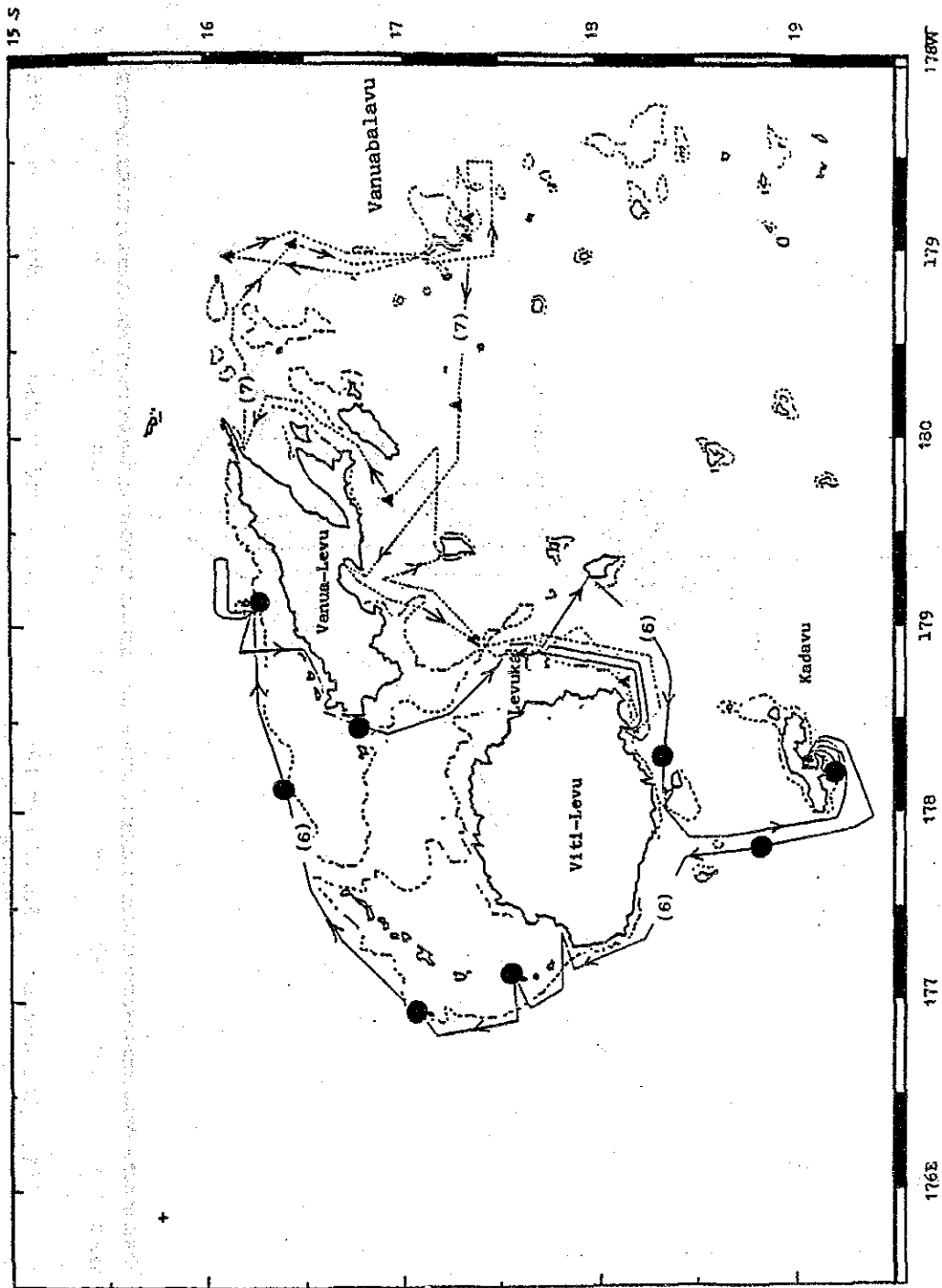
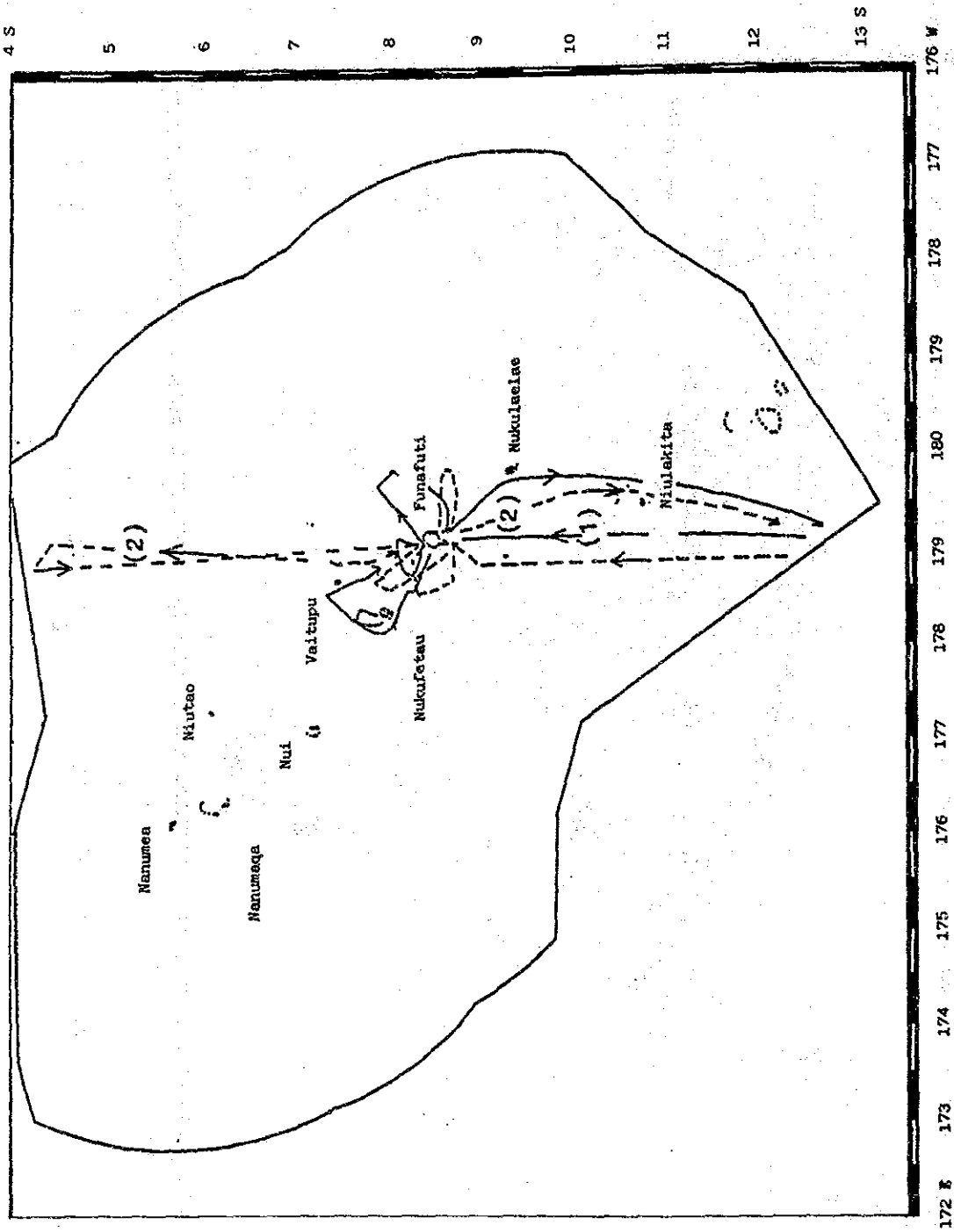
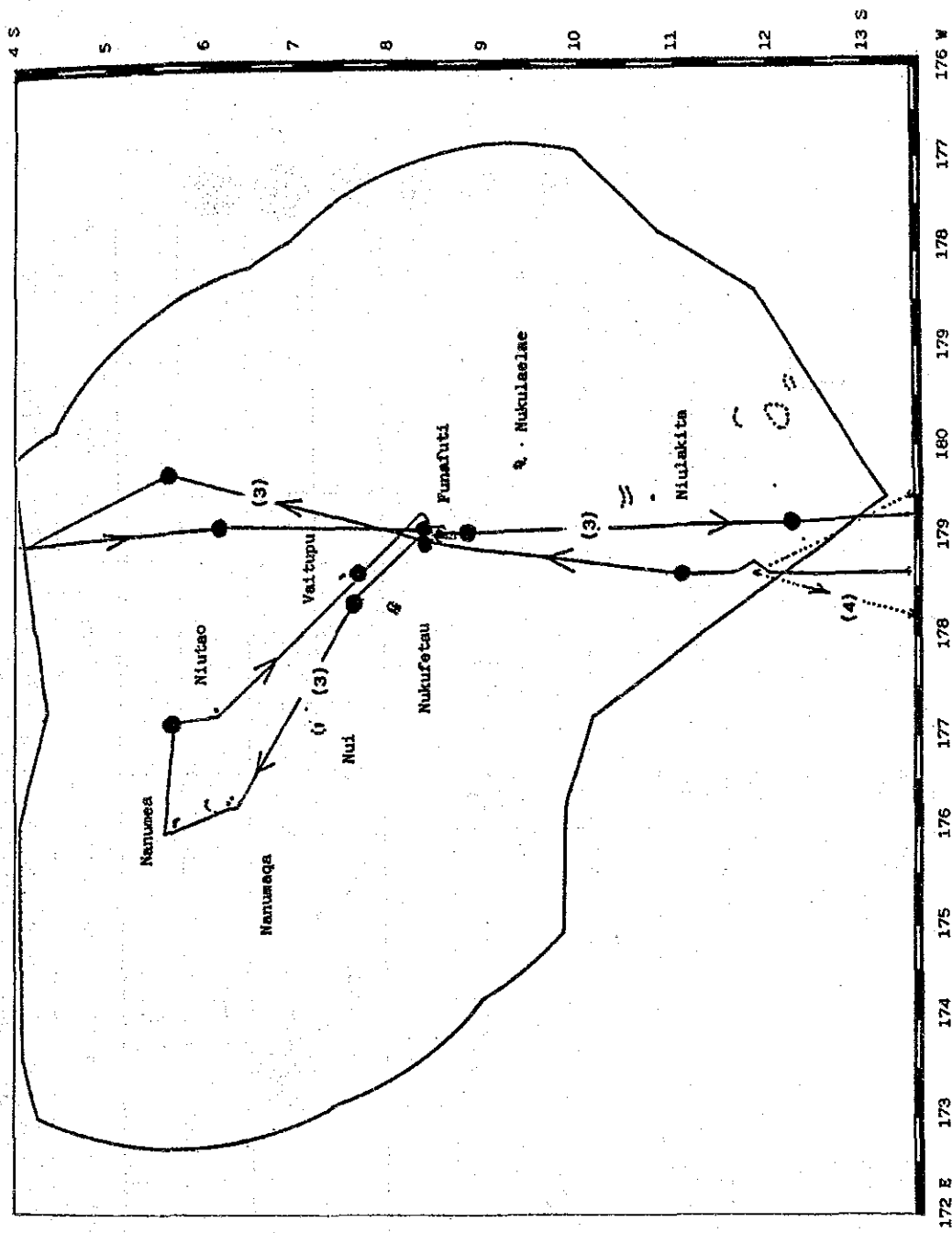


Fig.14-(2) Continued.



(1) 1st cruise September 12-October 8, 1985. (2) 2nd cruise October 9-28, 1985.

Fig.15-(1) Cruise track of pole-and-line operation in the waters of Tuvalu.



(3) 3rd cruise July 24-August 8, 1986 (4) 3rd cruise August 9-18, 1986

Fig. 15-(2) Continued.

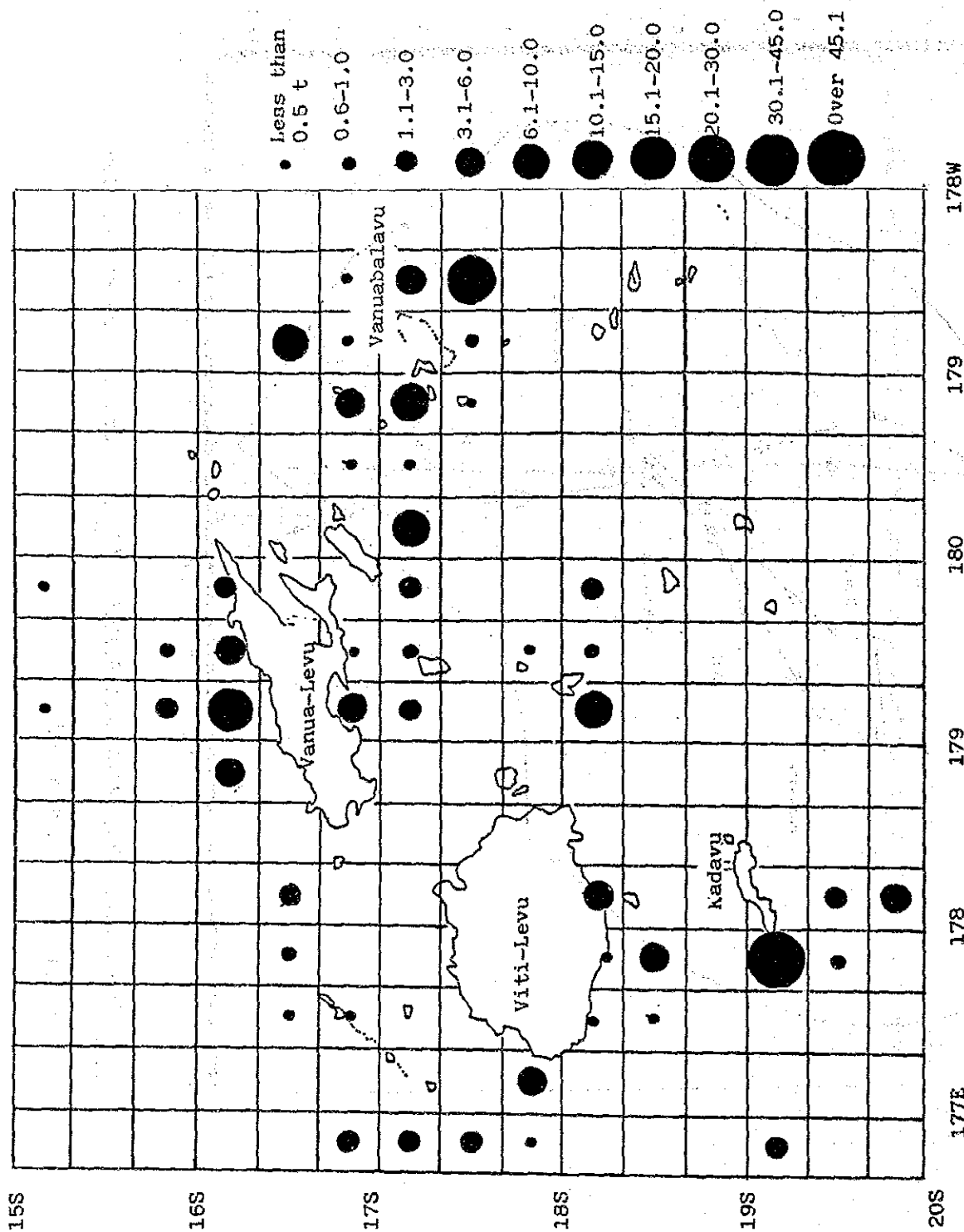


Fig.16-(1) Catch weight with the grouping catch weight(Kg) by fishing area in pole-and-line operation in the waters of Fiji.

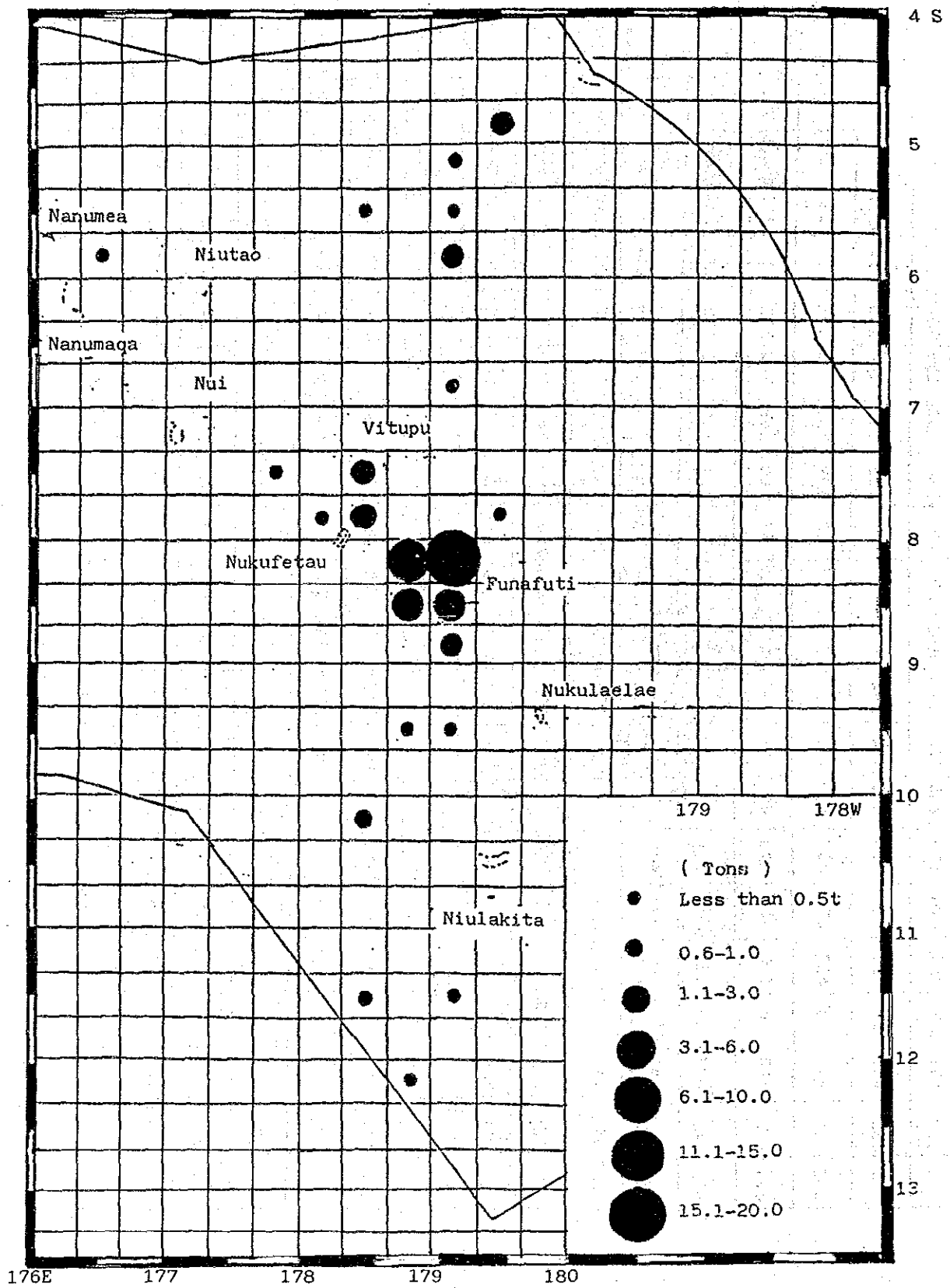
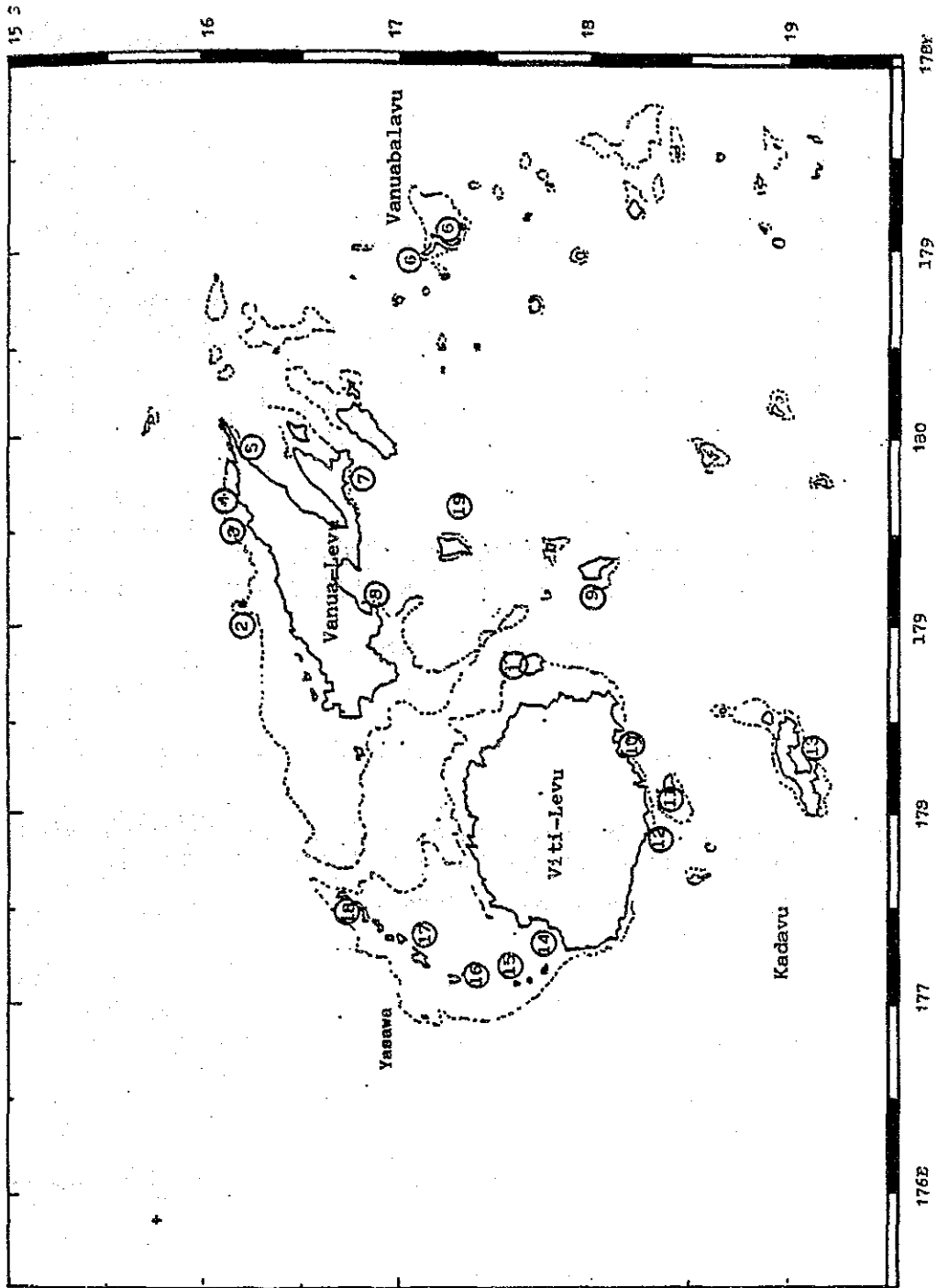


Fig.17 Catch by fishing area in pole-and-line operation in the waters of Tuvalu.



1. Rukuruku
2. Kia
3. Mali
4. Sausau
5. Yasawa harbor
6. Vanueabalavu
7. Viani bay
8. Nasonisoni
9. Ngau
10. Suva
11. Mbeqa
12. Serua
13. Ngaloa
14. Momi
15. Mana
16. Yanuya
17. Namubukelu
18. Land harbor
19. Koro

Fig.18 Location of the baitfishing ground in Fiji.

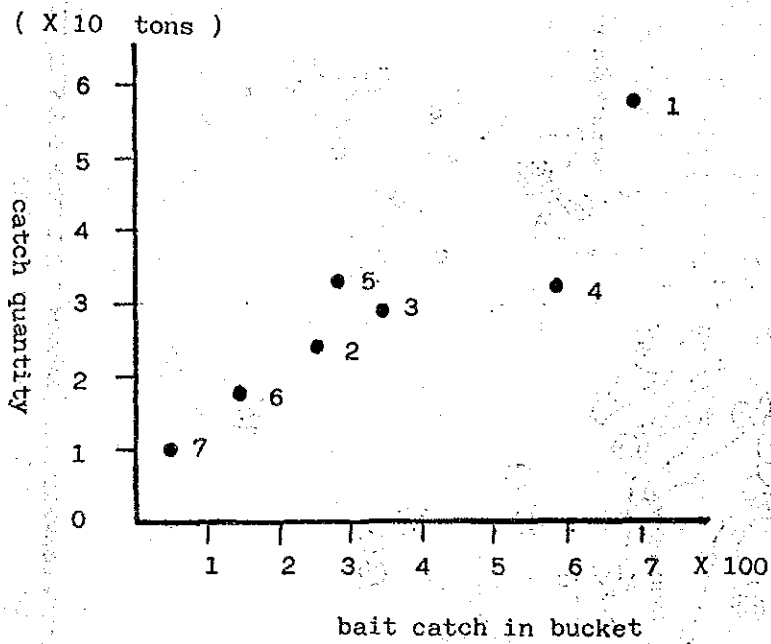


Fig.19 Relationship between the catch quantity (ton) and baitfish catch by cruise in pole-and-line operation in the waters of Fiji. (Cruise No. were shown in the figure)

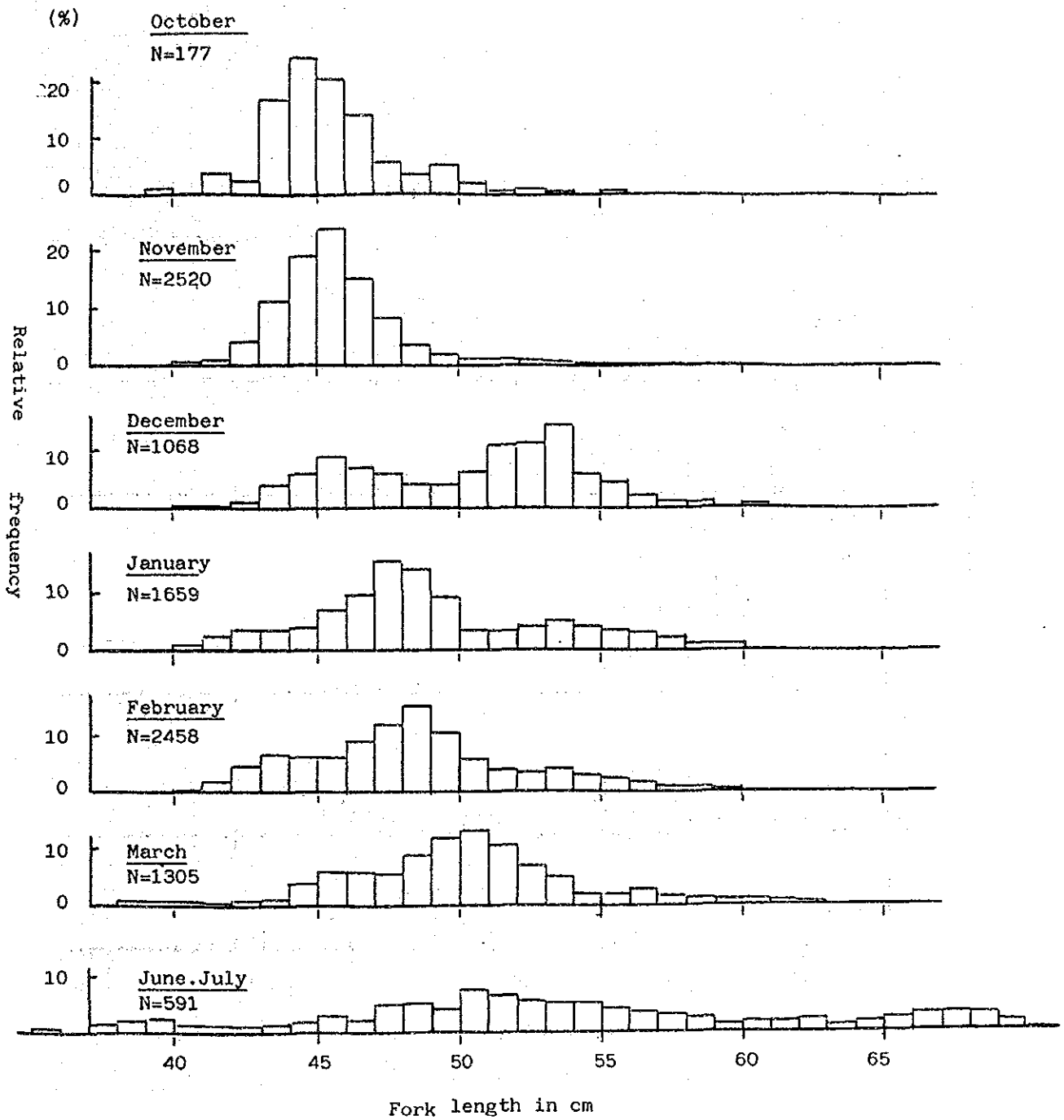


Fig.20 Monthly fork length frequency of skipjack caught in pole-and-line operation in the waters of Fiji.

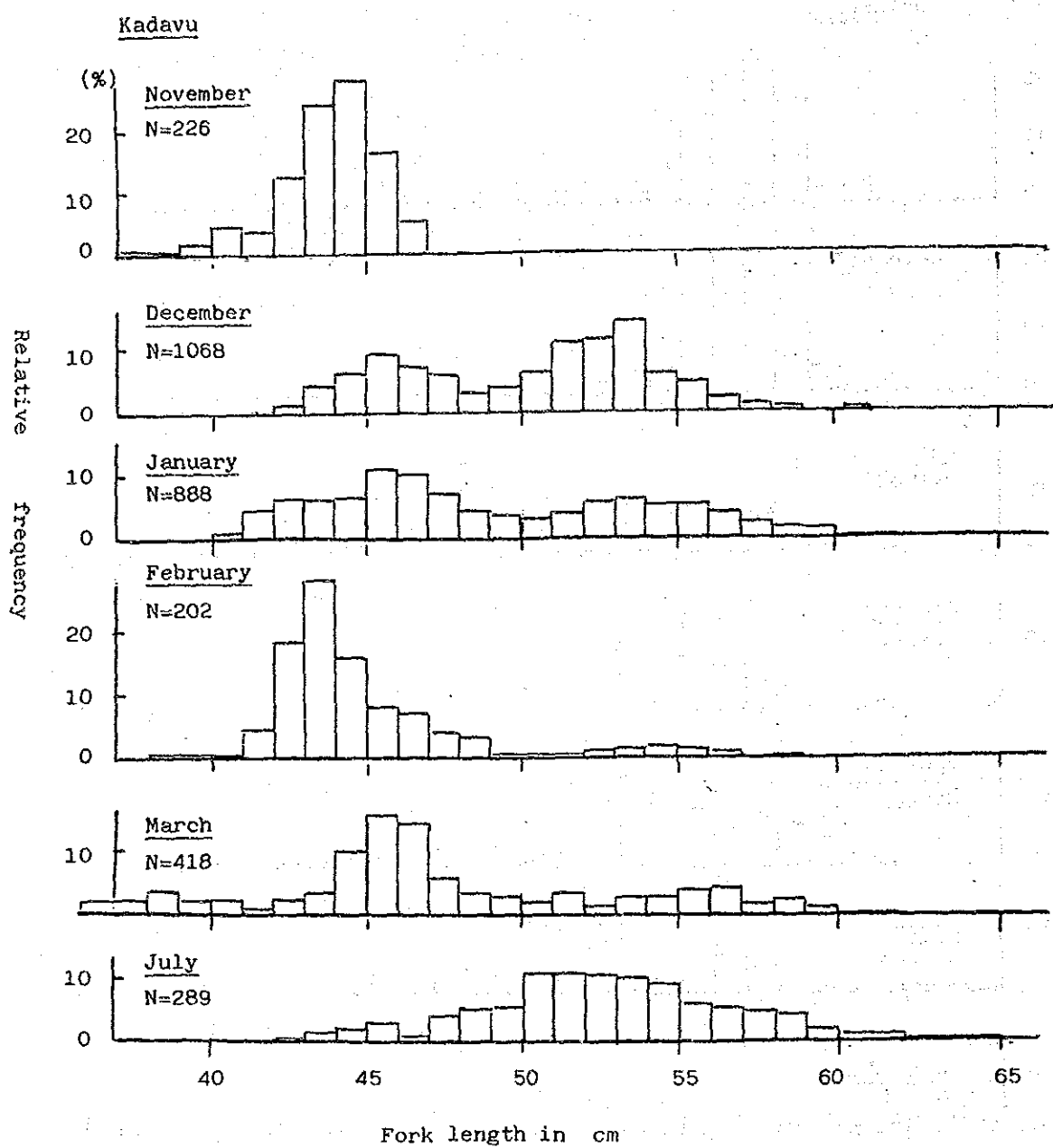


Fig.21-(1) Monthly fork length frequency of skipjack caught in pole-and-line operation in the area of Kadavu.

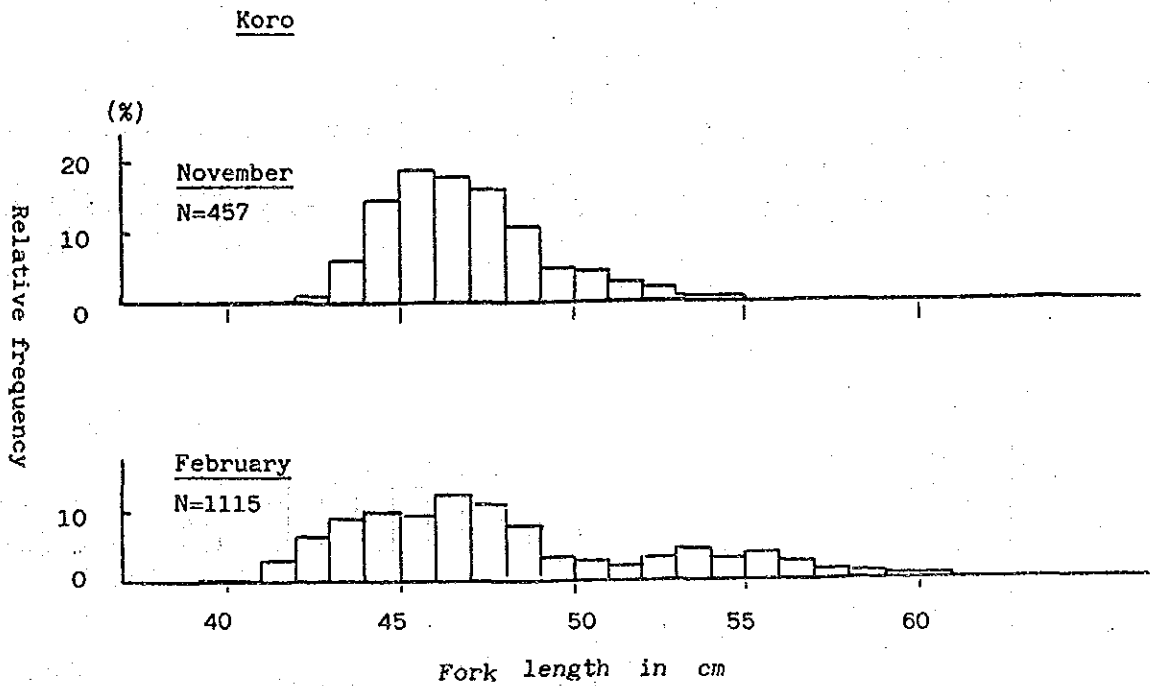
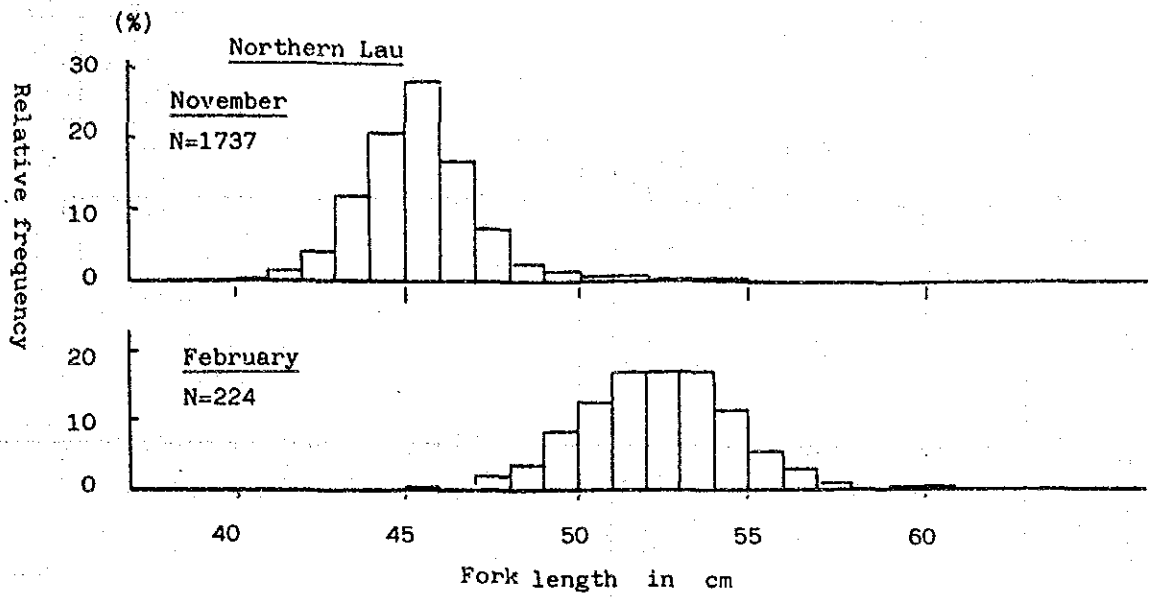


Fig.21-(2) Monthly fork length frequency of skipjack caught in pole-and-line operation in the area of Northern Lau and Koro.

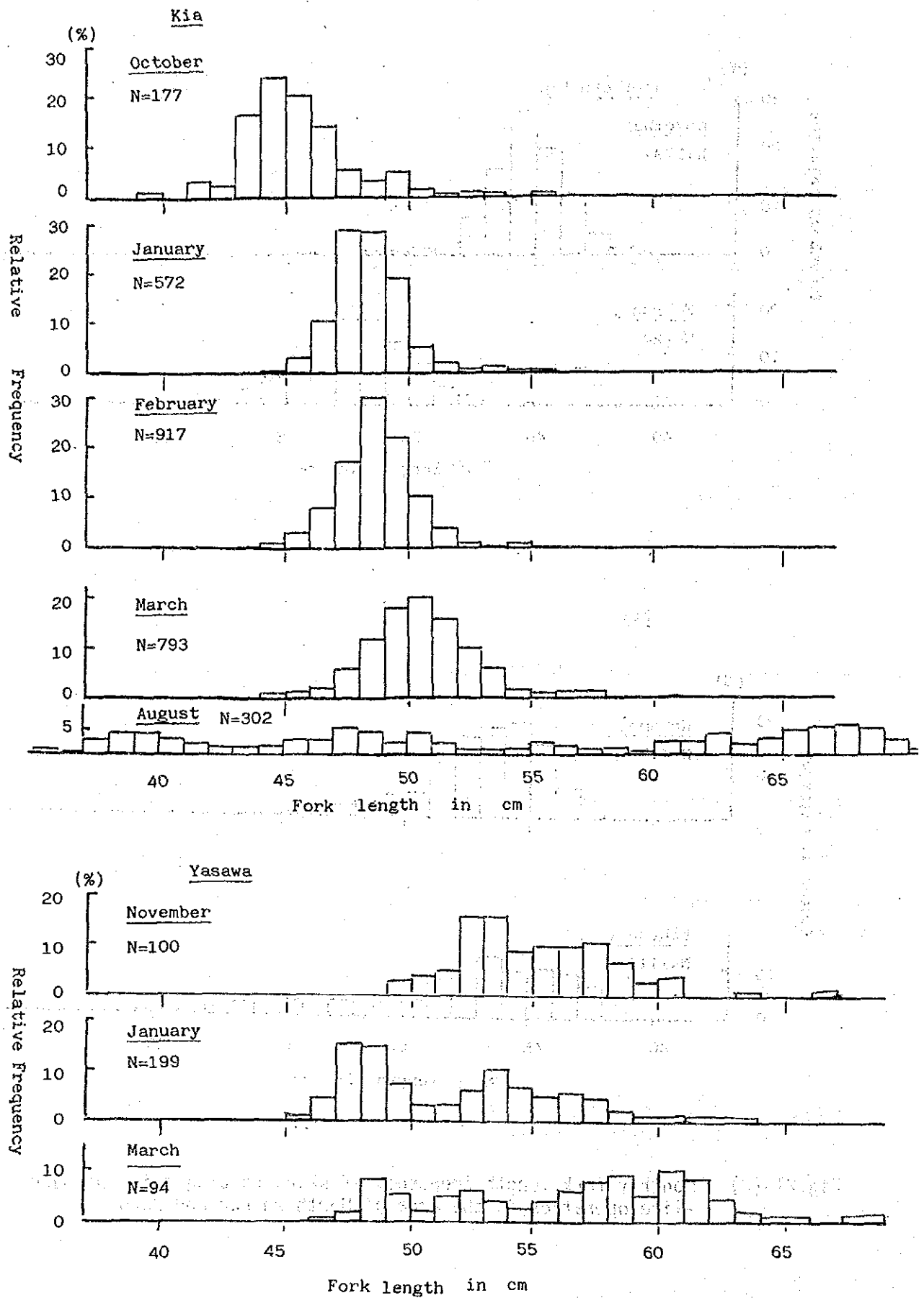


Fig.21-(3) Monthly fork length frequency of skipjack caught in pole-and-line operation in the area of Kia and Yasawa.

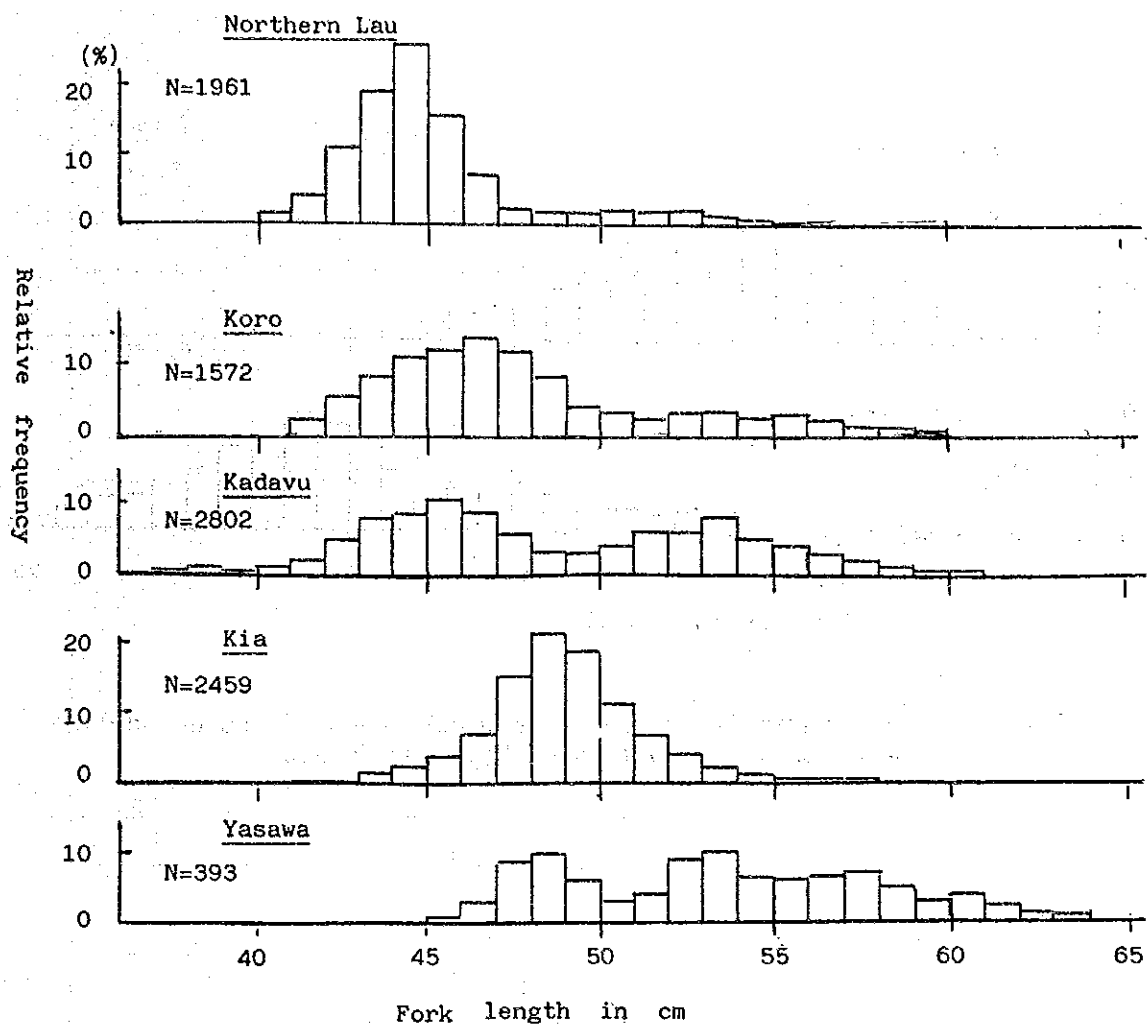


Fig.22 Fork length frequency of skipjack by area caught in pole-and-line operation in the waters of Fiji.

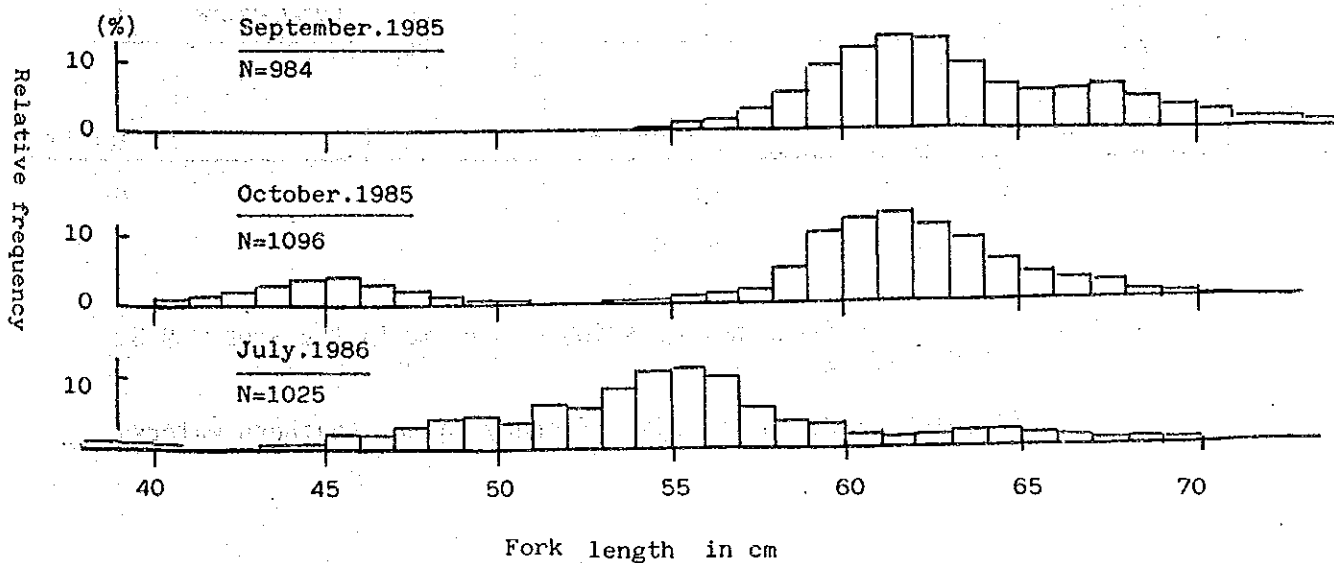


Fig.23 Monthly fork length frequency of skipjack caught in pole-and-line operation in the waters of Tuvalu.

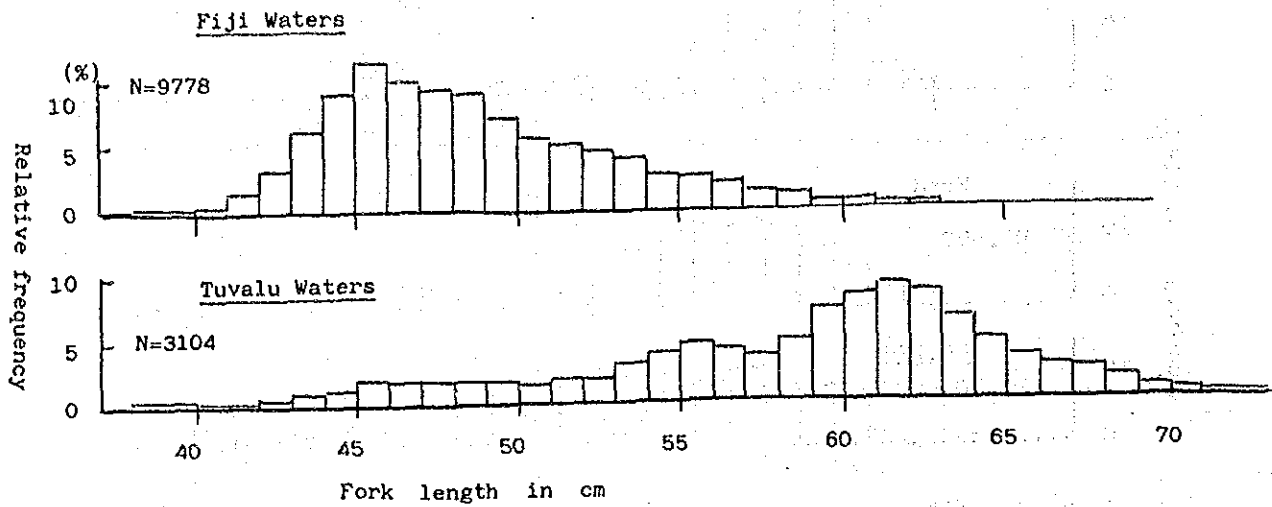


Fig.24 Fork length frequency of skipjack caught in pole-and-line operation in the waters of Fiji and Tuvalu.

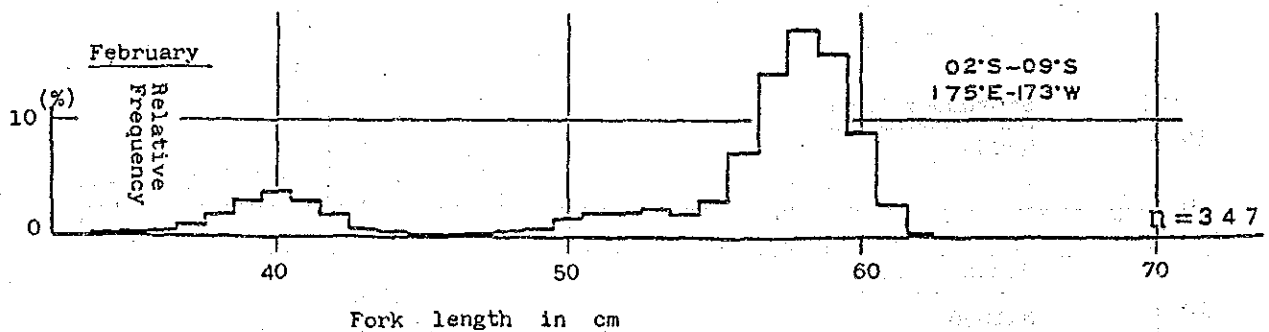


Fig.25 Fork length frequency of skipjack caught in the area 2-9 S, 175 E - 173 W.

(FISHING CHART for skipjack fishery in the southern waters)

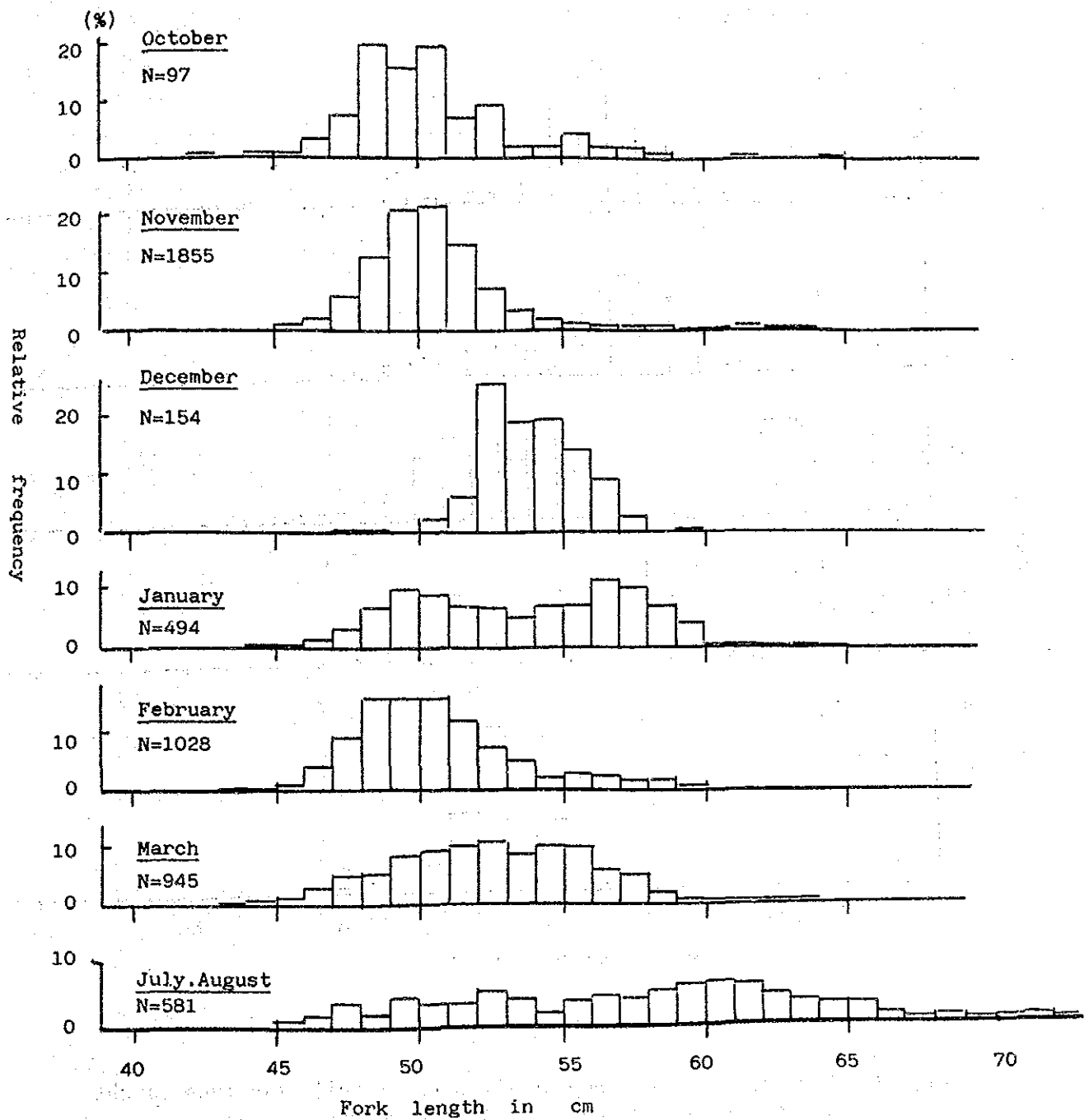


Fig.26 Monthly fork length frequency of yellowfin tuna caught in pole-and-line operation in the waters of Fiji.

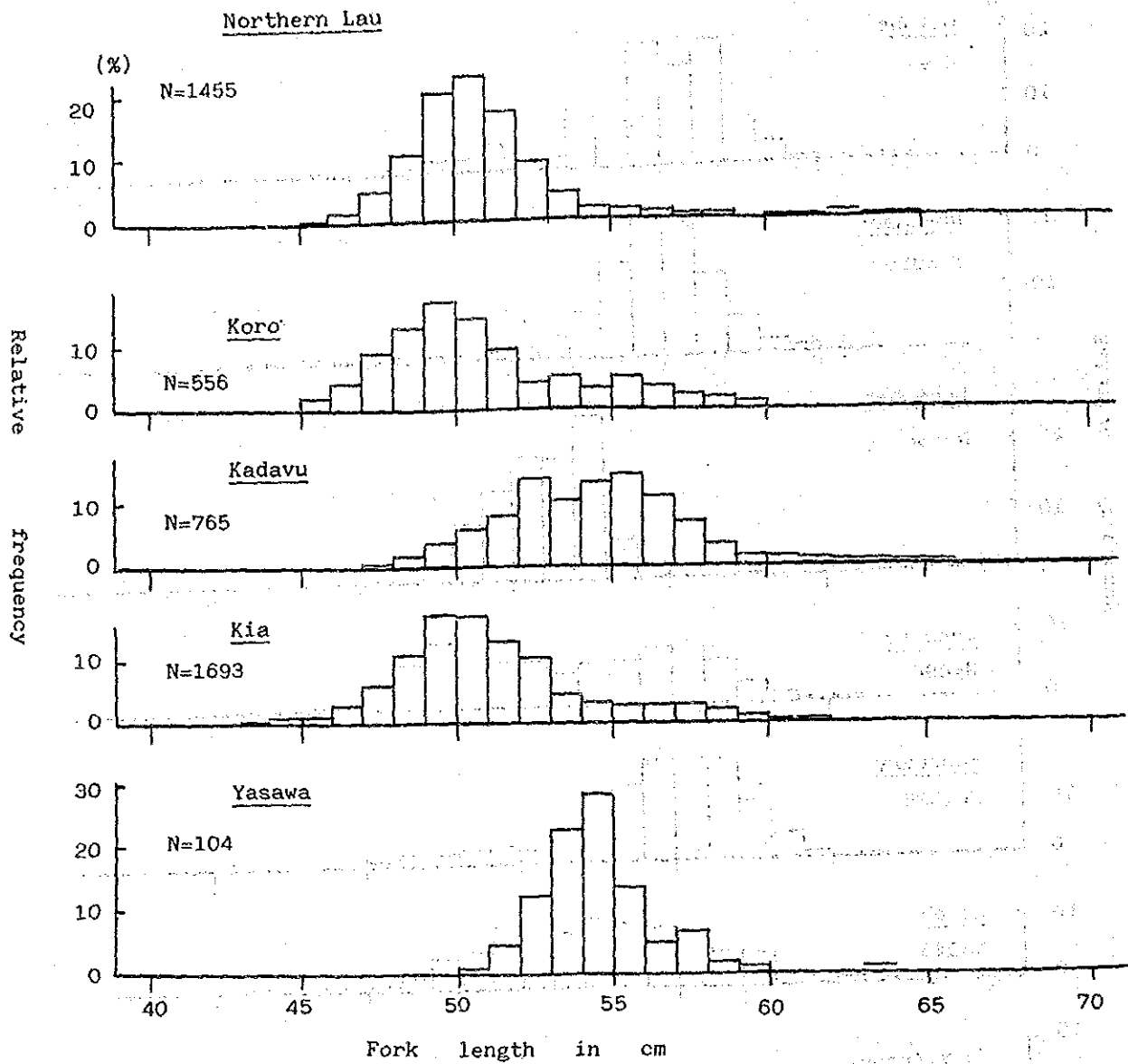


Fig.27 Fork length frequency by the area of yellowfin tuna caught in pole-and-line operation in the waters of Fiji.

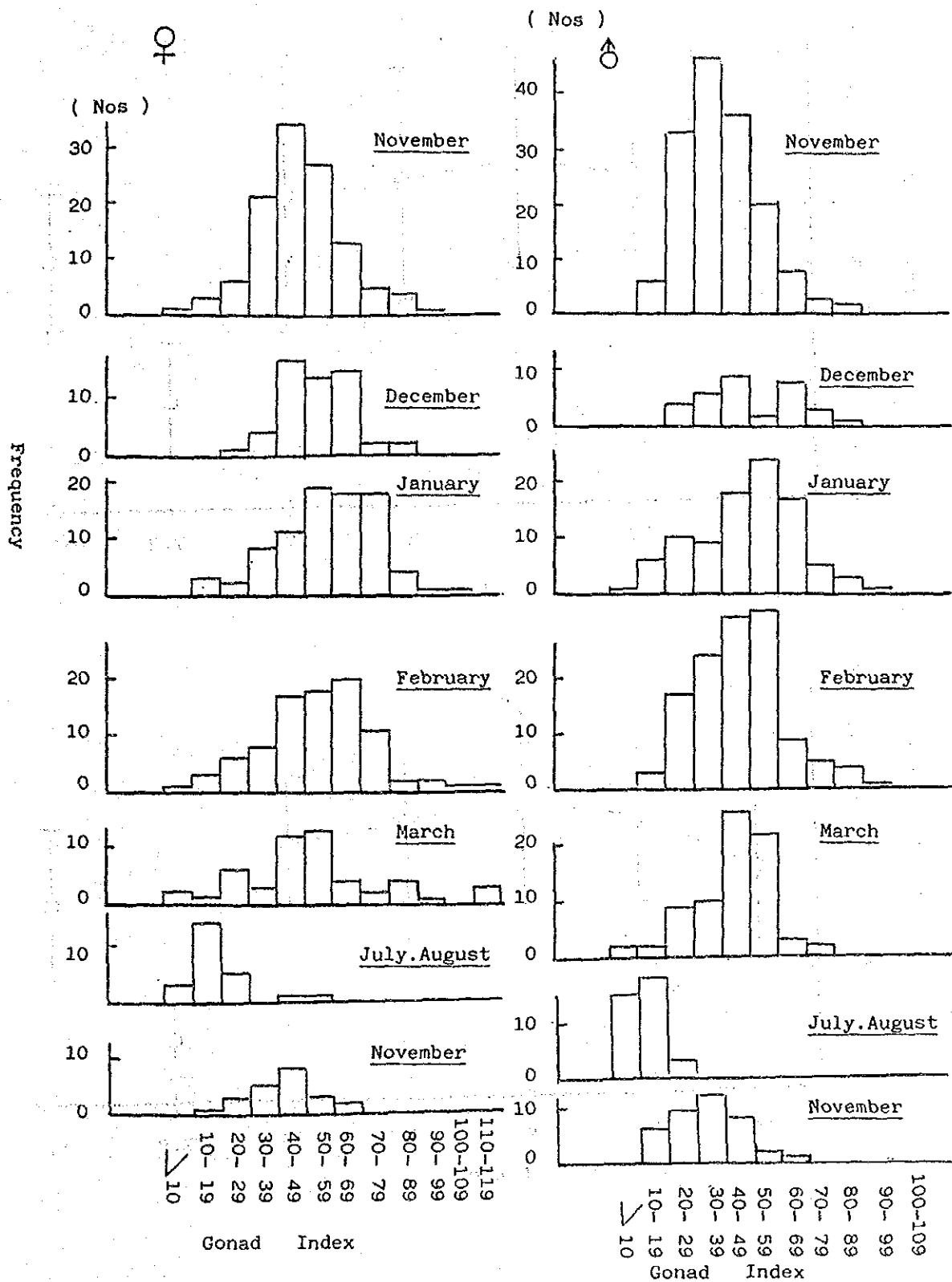


Fig.28 Monthly group maturity composition by sex of skipjack caught in pole-and-line operation in the waters of Fiji.

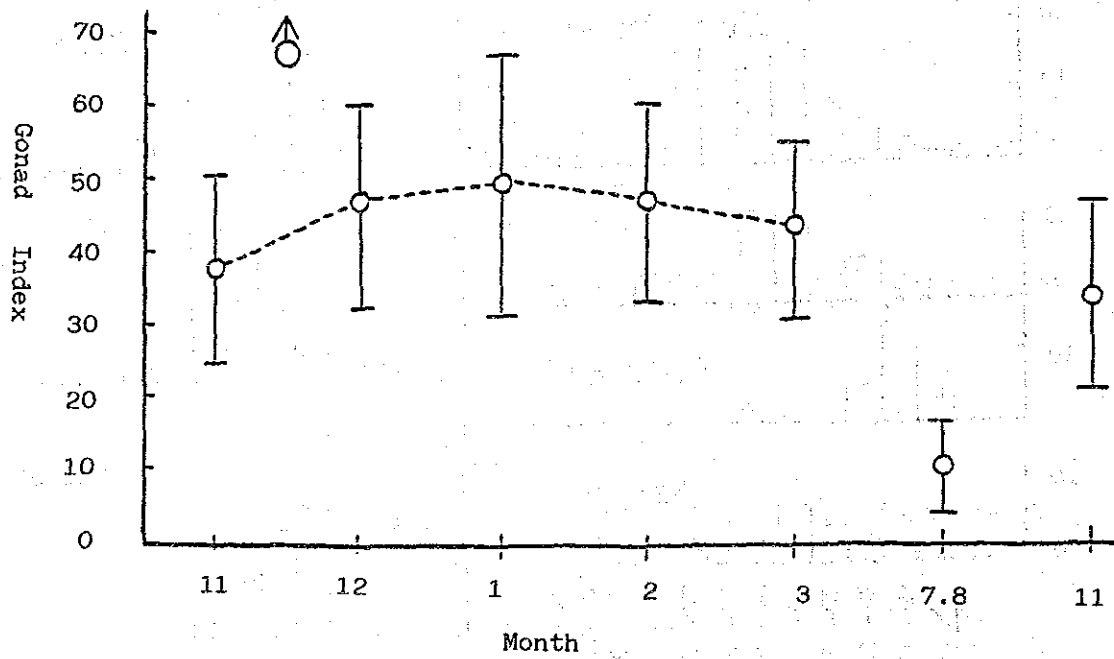
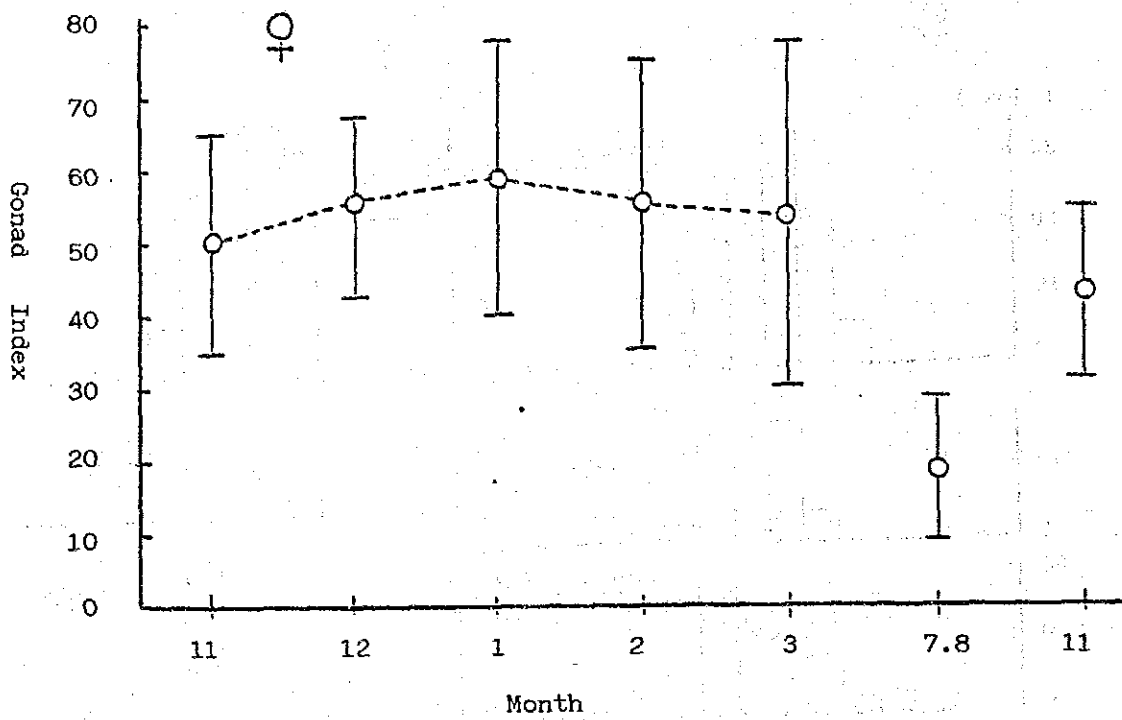


Fig.29 Monthly change of gonad index by sex of skipjack caught in pole-and-line operation in the waters of Fiji.
 (Standard deviation were shown as vertical line)

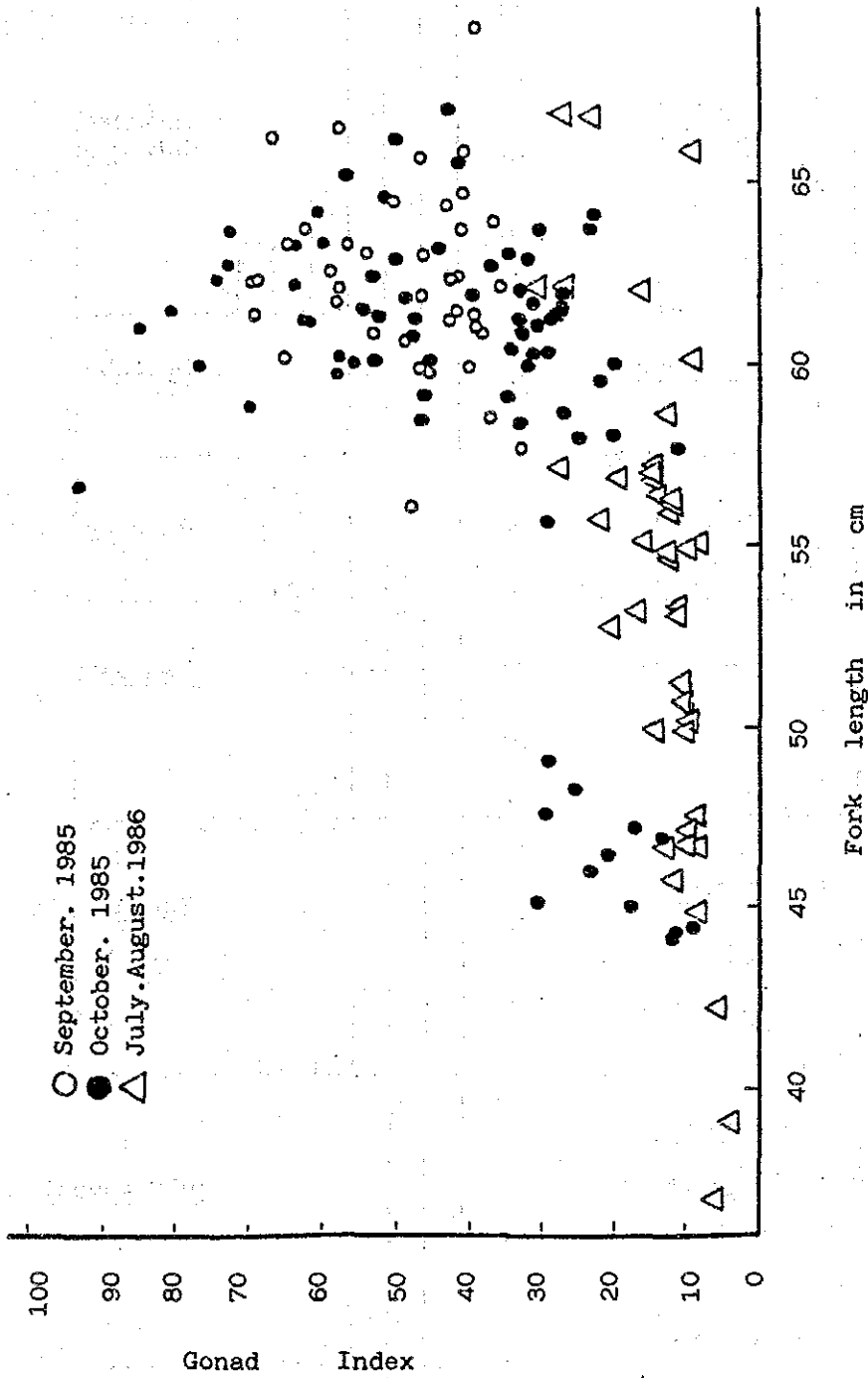


Fig.30 Relationship between gonad index and fork length of skipjack caught in pole-and-line operation in the waters of Tuvalu.

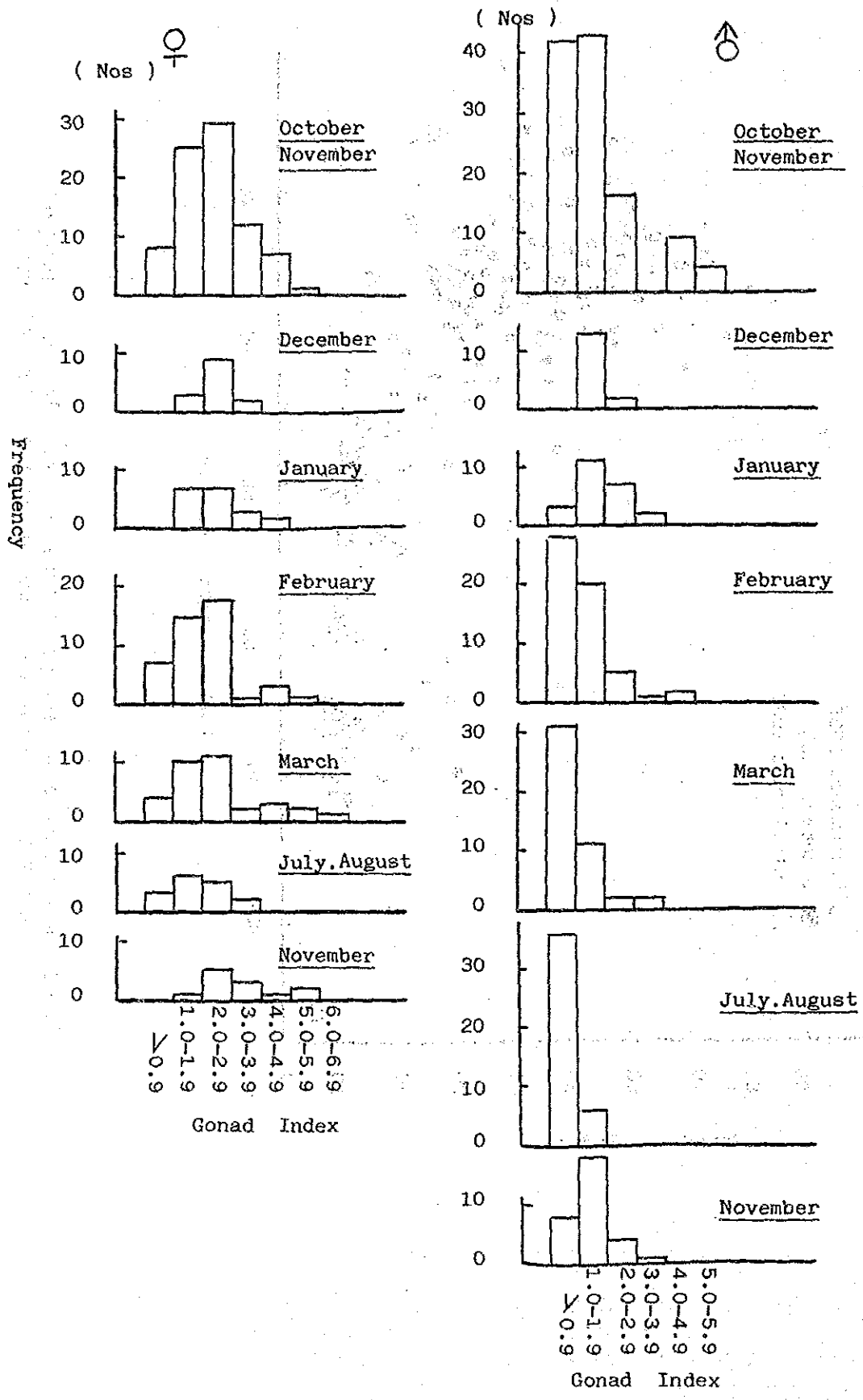


Fig.31 Monthly group maturity composition by sex of yellowfin tuna caught in pole-and-line operation in the waters of Fiji.

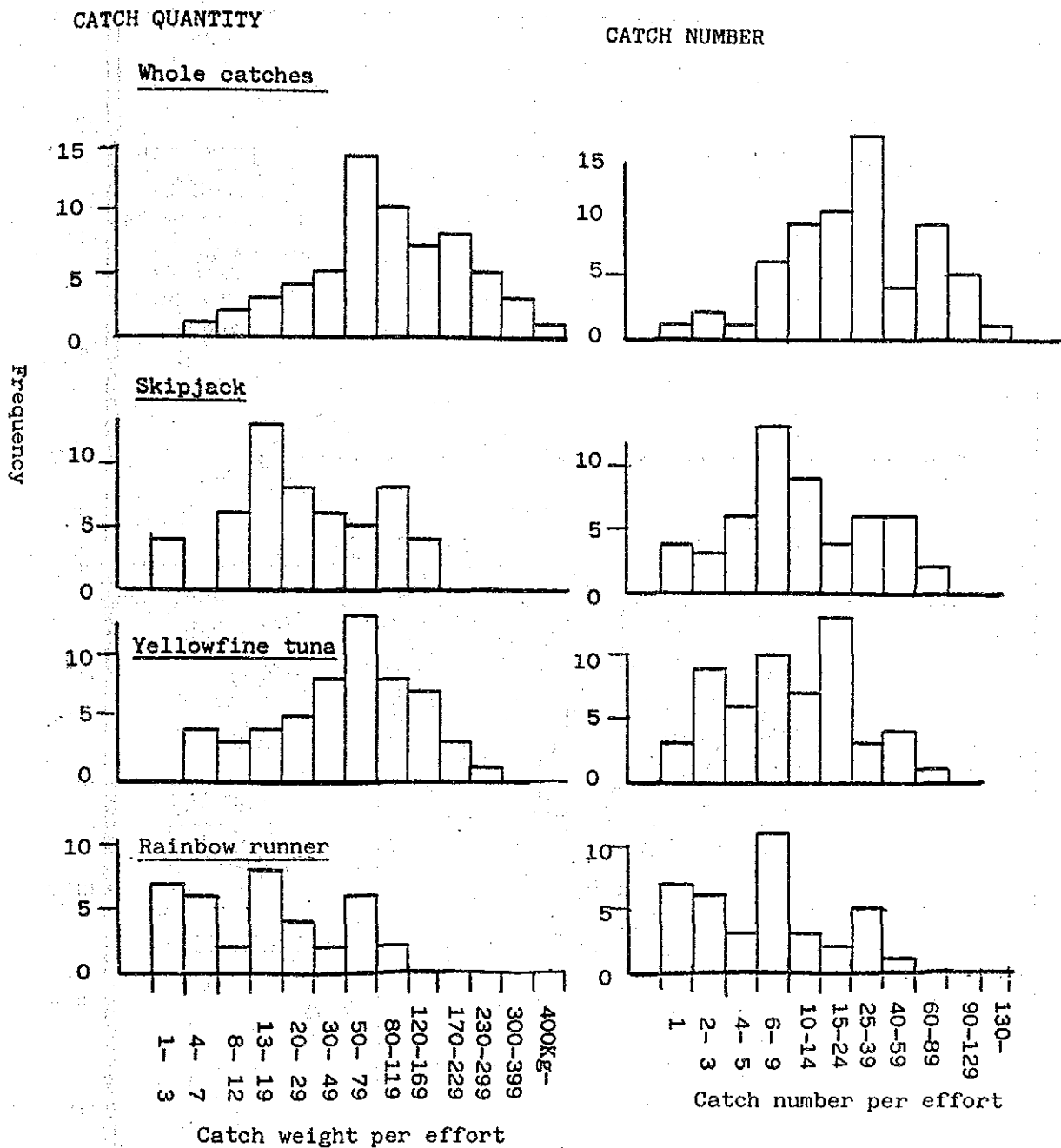


Fig.32 Frequency distribution of catch weight(Kg) and catch number per effort in major species caught in trolling operation.

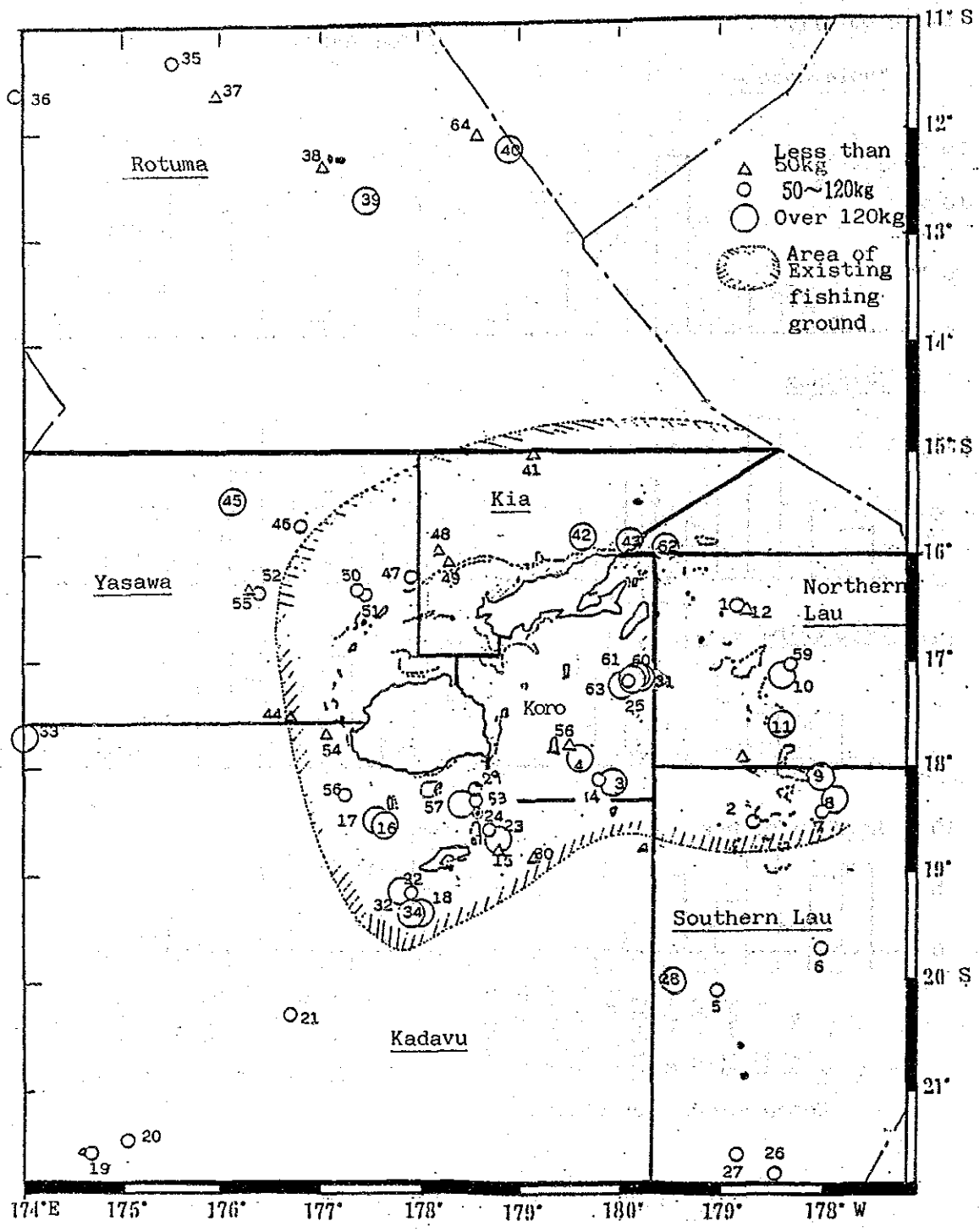


Fig.33 Catch weight per effort with catch weight group by the area in troling operation in the inside and outside of the existing fishing ground.
 (Operation No. were shown in the figure)

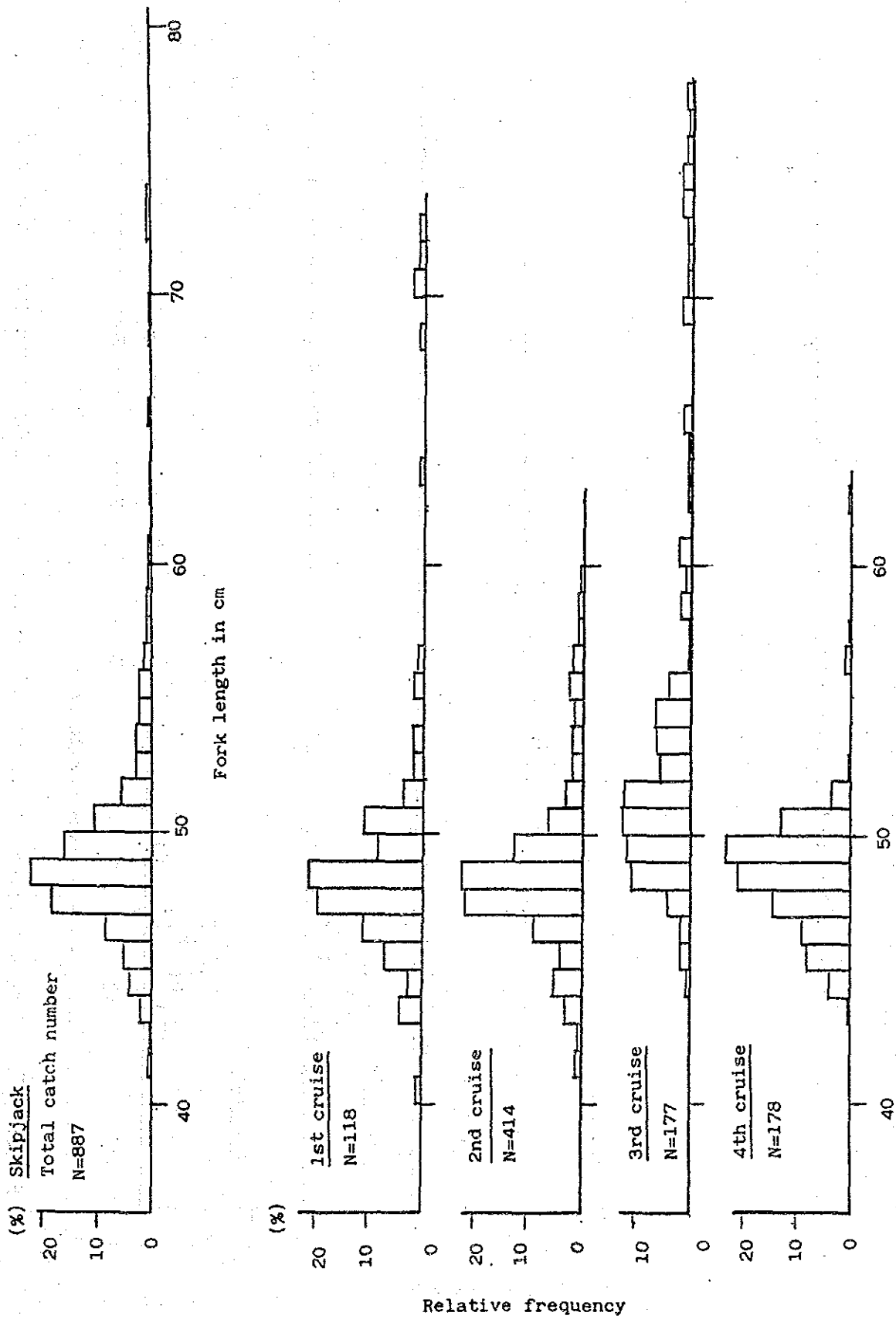


Fig.34 Fork length frequency by cruise of skipjack caught in trolling operation.

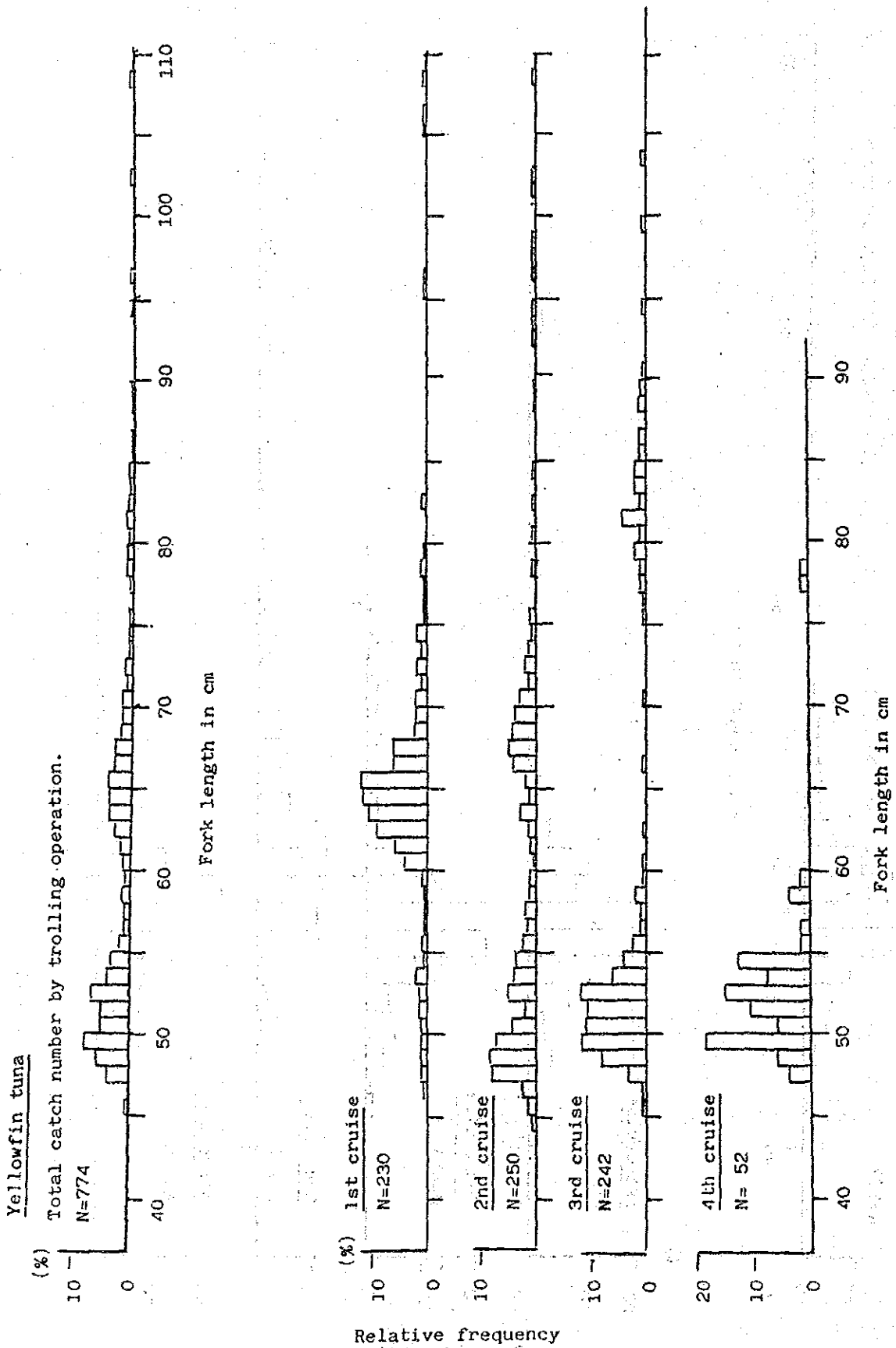
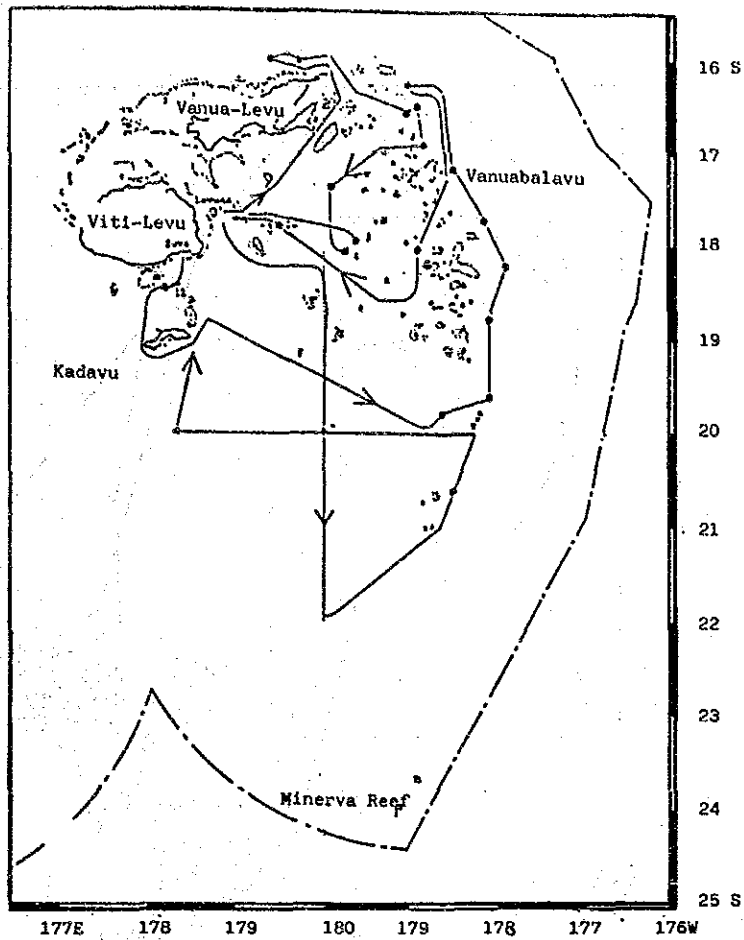
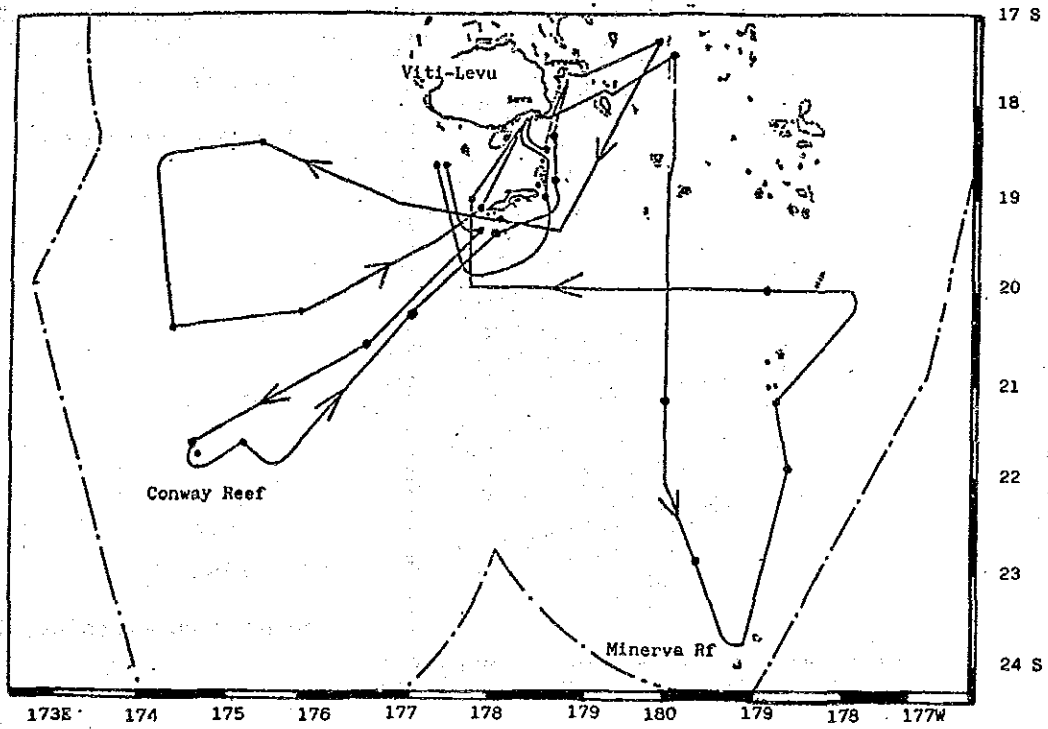


Fig.35 Fork length frequency by cruise of yellowfin tuna caught in trolling operation.



1st cruise November 26-December 22, 1984.



2nd cruise December 23, 1984 - January 28, 1985

Fig.36-(1) Cruise track of surface gillnet operation.

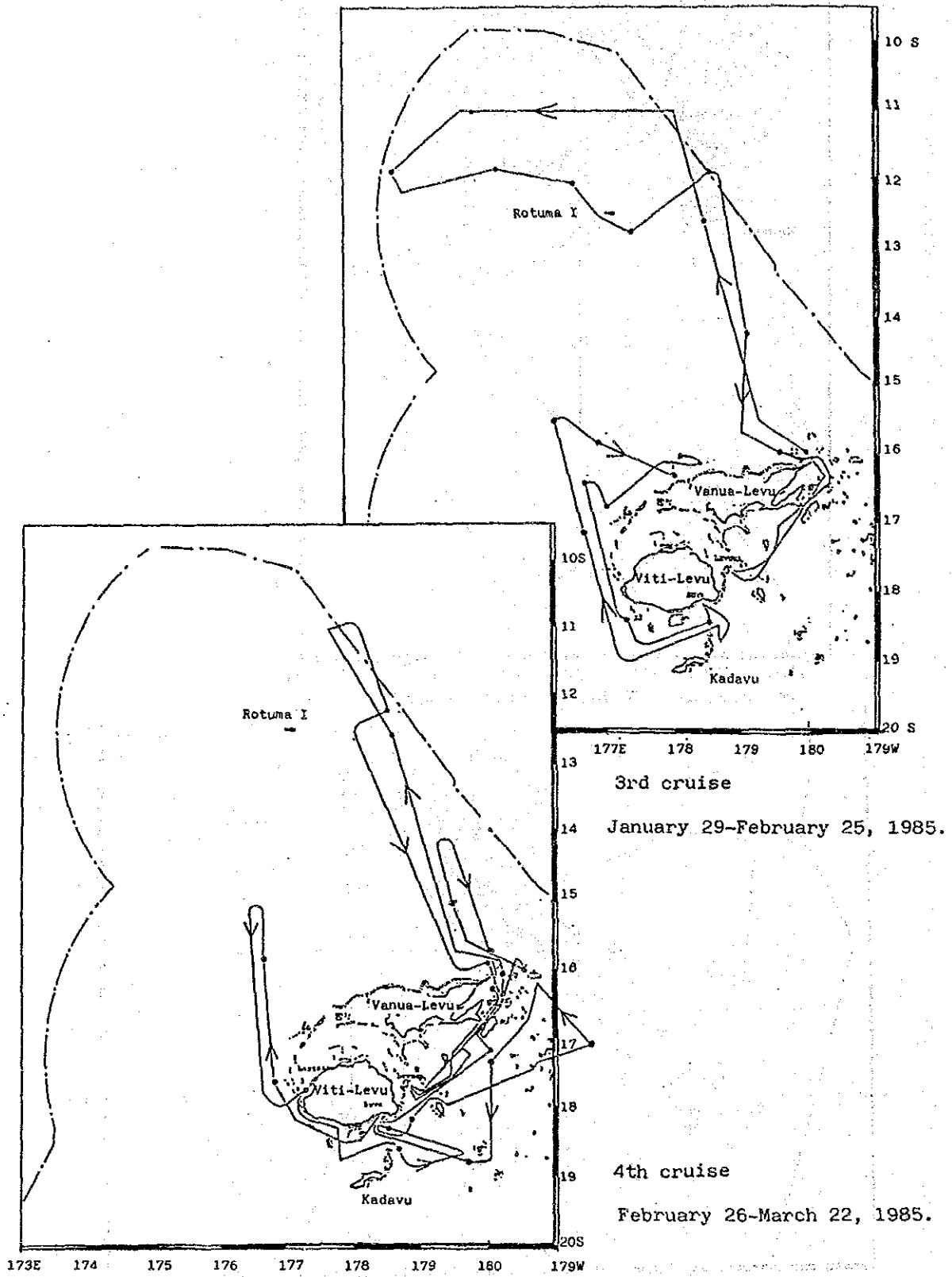


Fig.36-(2) Continued.



Fig.37 Frequency distribution of catch weight(Kg) and catch number per effort in surface gill net operation.

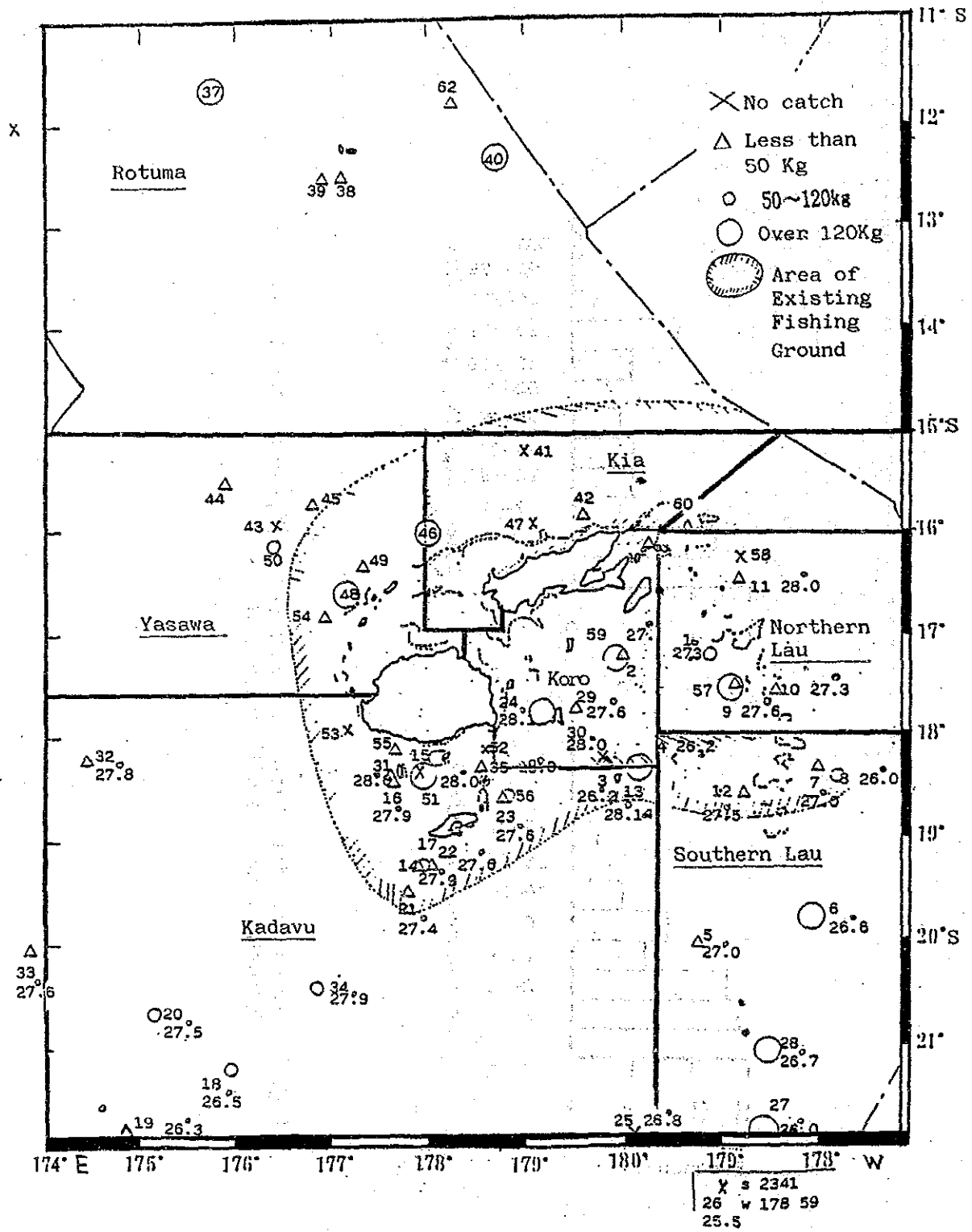


Fig.38 Catch weight per effort by the area in surface gillnet operation in the inside and outside of the existing fishing ground.
 (Operation No. and surface water temperature were shown in the figure)

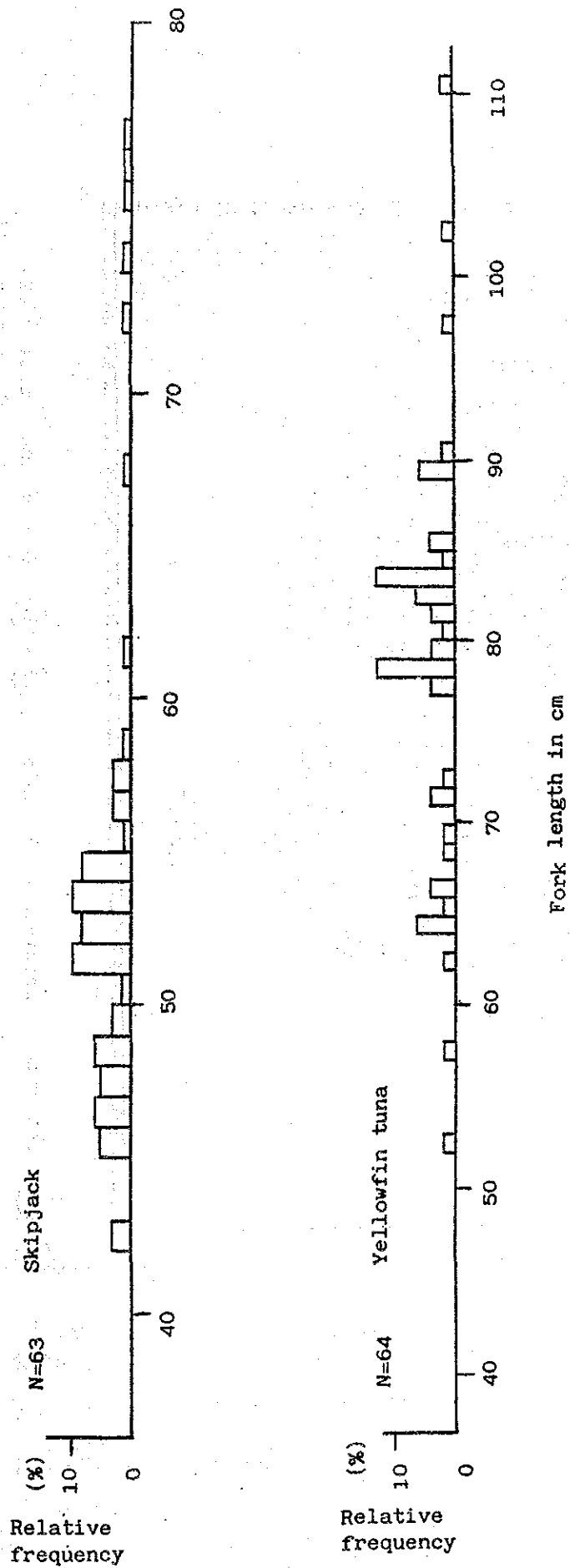
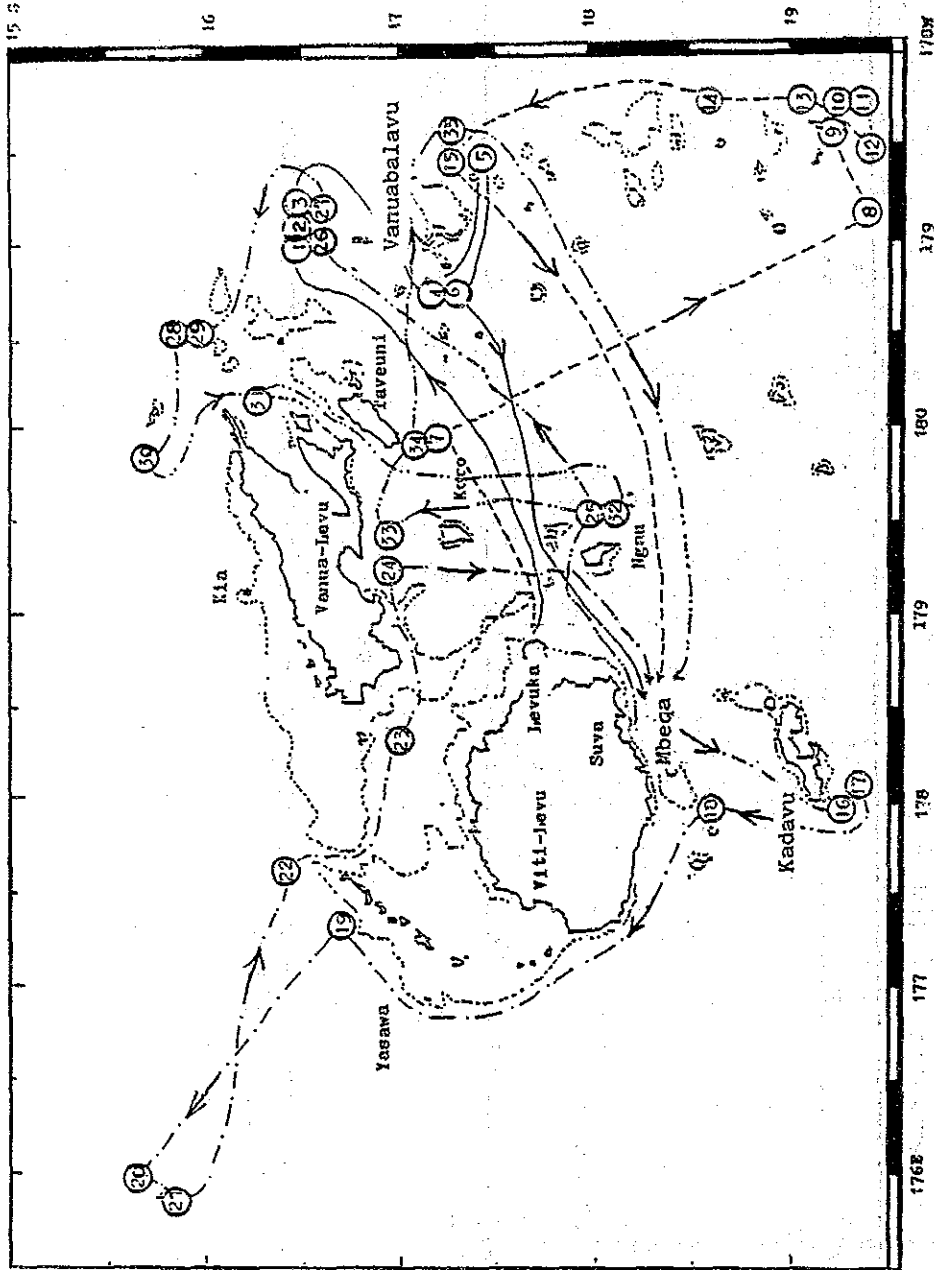
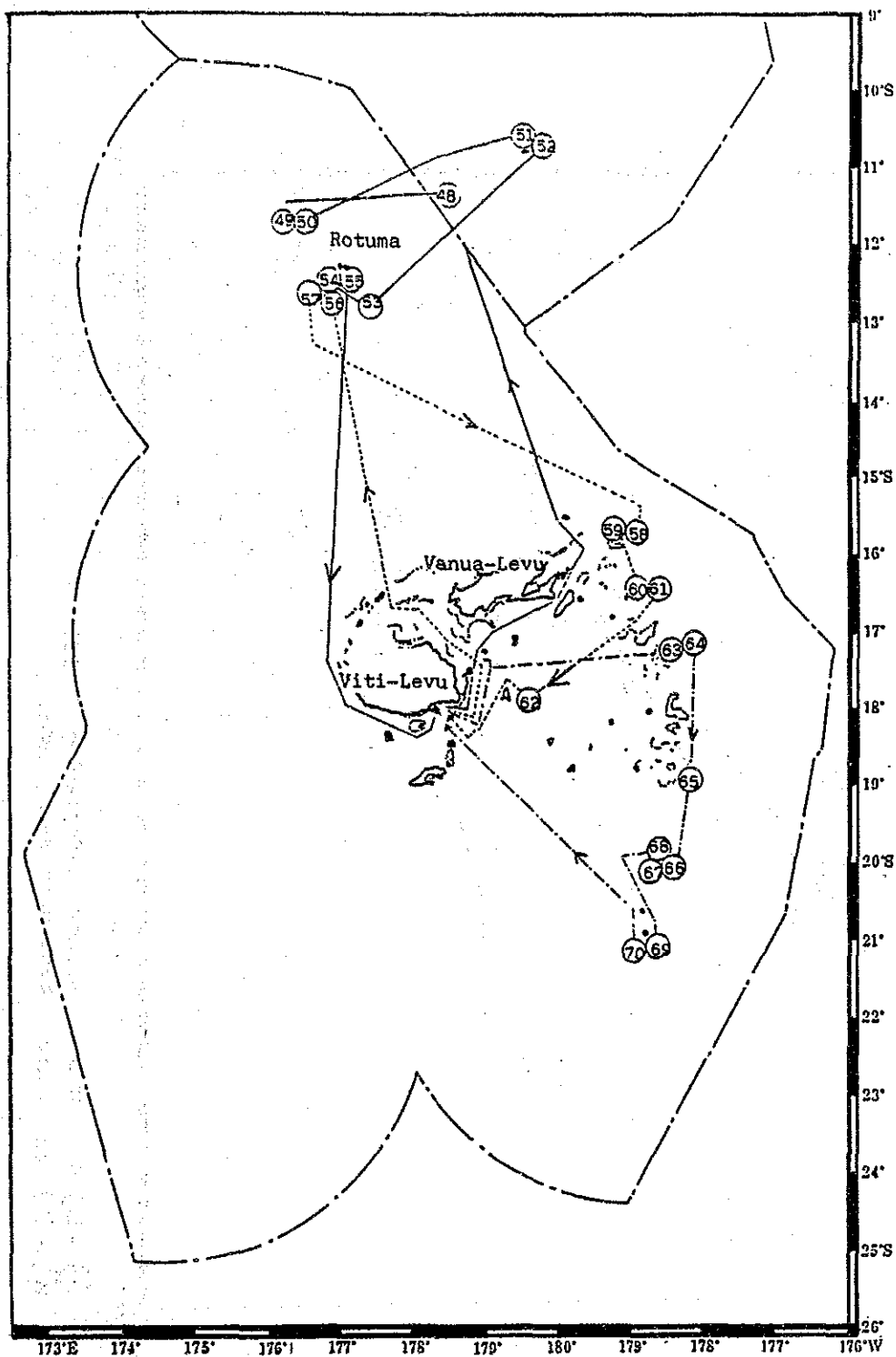


Fig.39 Fork length frequency of skipjack and yellowfin tuna caught in surface gillnet operation.



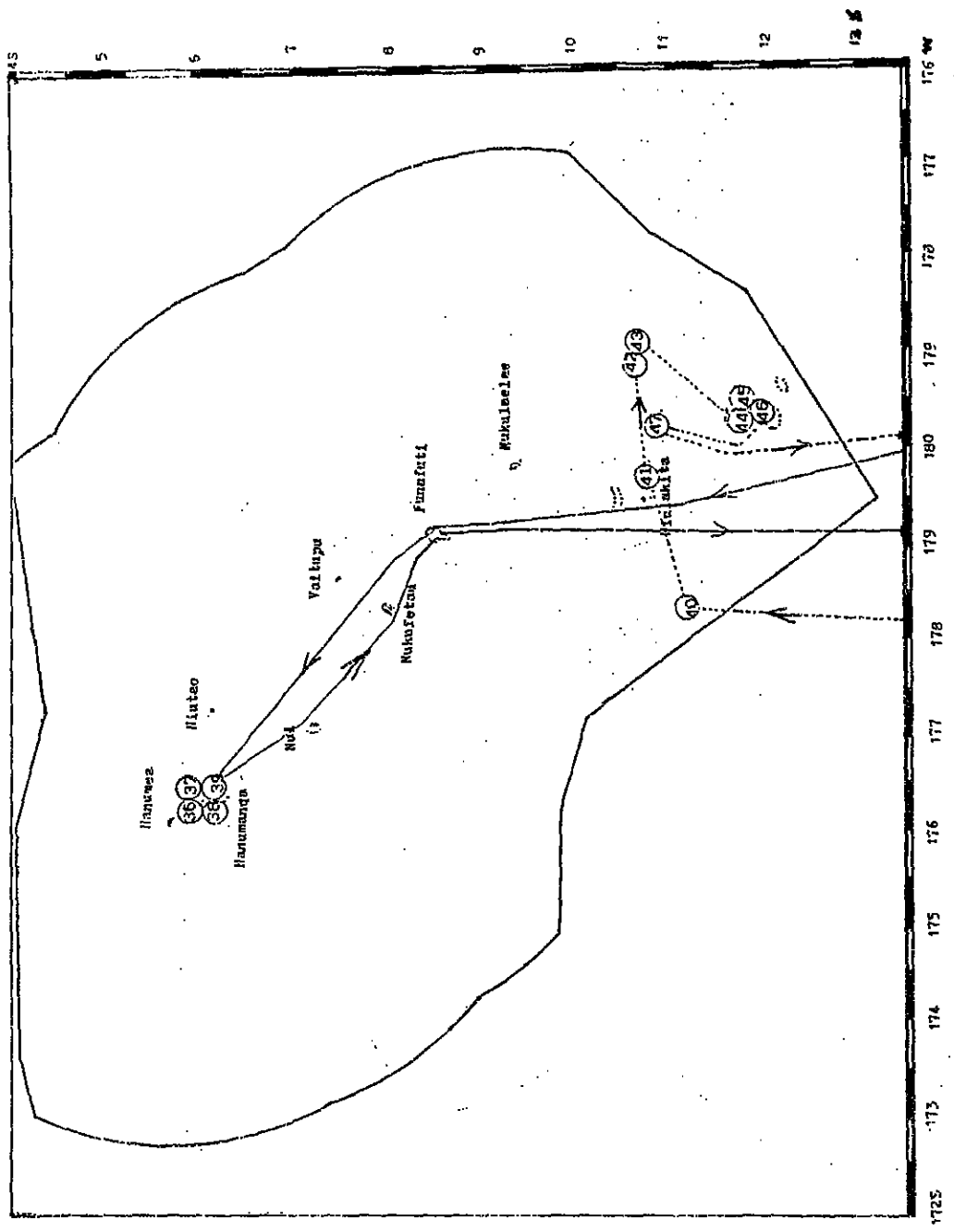
- ①-⑥ 1st cruise December 4-12, 1985. ①⑥-②④ 3rd cruise January 22-February 6, 1986.
- ⑦-⑮ 2nd cruise December 24, 1985-January 6, 1986. ⑮-⑳ 4th cruise February 22-March 11, 1986.

Fig.40-(1) Cruise track and fishing position of bottom line operation.
 (Operation No. were shown in the figure)



- ④⑧ - ⑤⑤ 7th Cruise September 23-October 8, 1986.
- ⑤⑥ - ⑥② 8th Cruise October 9-20, 1986.
- ⑥③ - ⑦① 9th Cruise October 21-November 4, 1986.

Fig.40-(2) Continued.



36 - 39 5th cruise August 19-September 8, 1986
 40 - 47 6th cruise September 9-22, 1986.

Fig. 40-(3) Continued.

1. Ribbon tail
2. Short tail
3. Red snapper
4. Red job fish
5. Red tail opakapaka
6. Yellowfinned opakapaka
7. Broed alforsino
8. Cow shark
9. Japanese gray shark
10. White hound shark
11. White tip shark
12. Seven gilled shark
13. Requiem shark
14. Spiny dogfish
15. Dogfish sharks
16. Barbed spiny dogfish
17. Granulose shark
18. Beach conger
19. Pike eel
20. Soldier fish
21. Beard fishes
22. Slender sea pike
23. Forster's barracuda
24. Temperate basses
25. Curve banded grouper
26. Longfinned amberjack
27. Sweeper pomfret
28. Crimson snapper
29. Obliquebanded snapper
30. Flower job fish
31. *Randallichthys filamentosus*
32. Kusakar's snapper
33. Stone's snapper
34. Large eye bream
35. Dog tooth tuna
36. King barracuda
37. *Promethichthyus prometheus*
38. *Thysitoides marleyi*

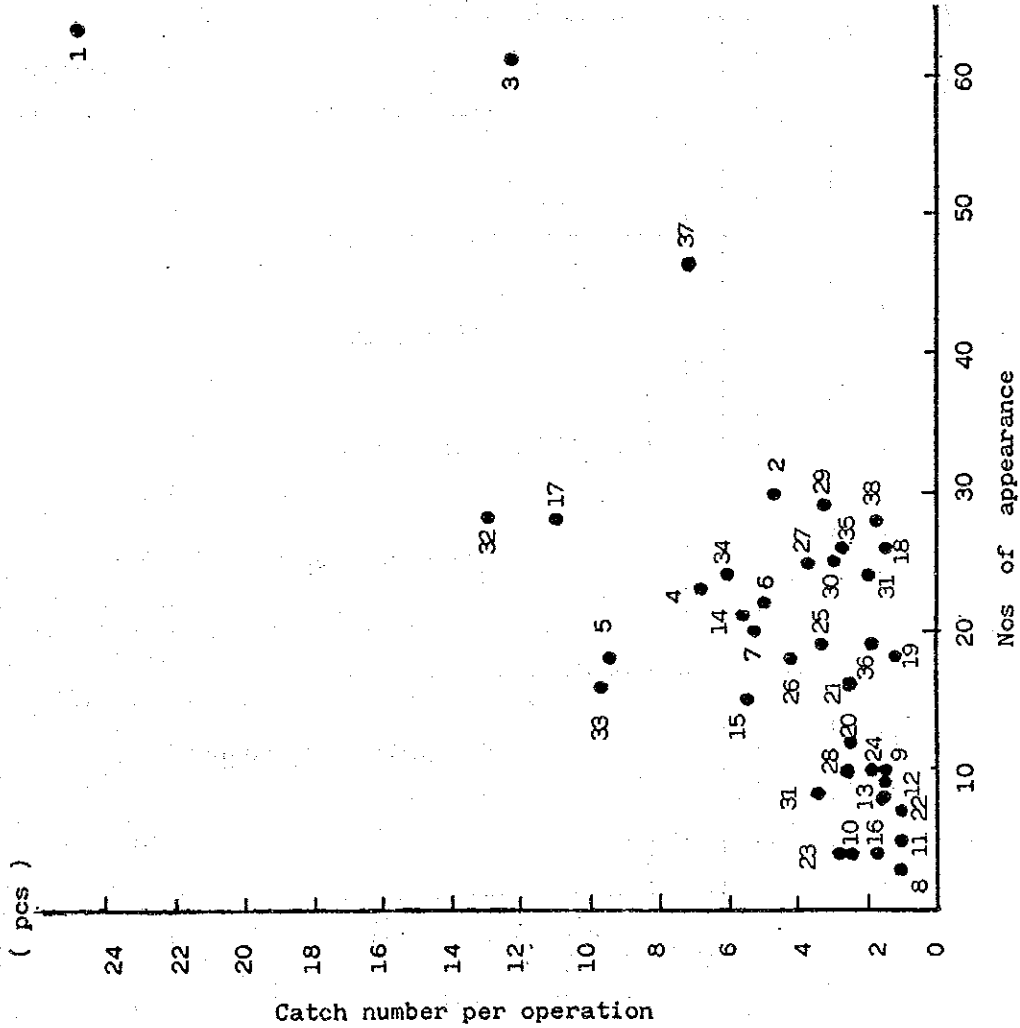


Fig.41 Relationship between nos of appearance and catch number per effort by species caught in bottom line operation
 (Species name on the margine were shown as No. in the figure)

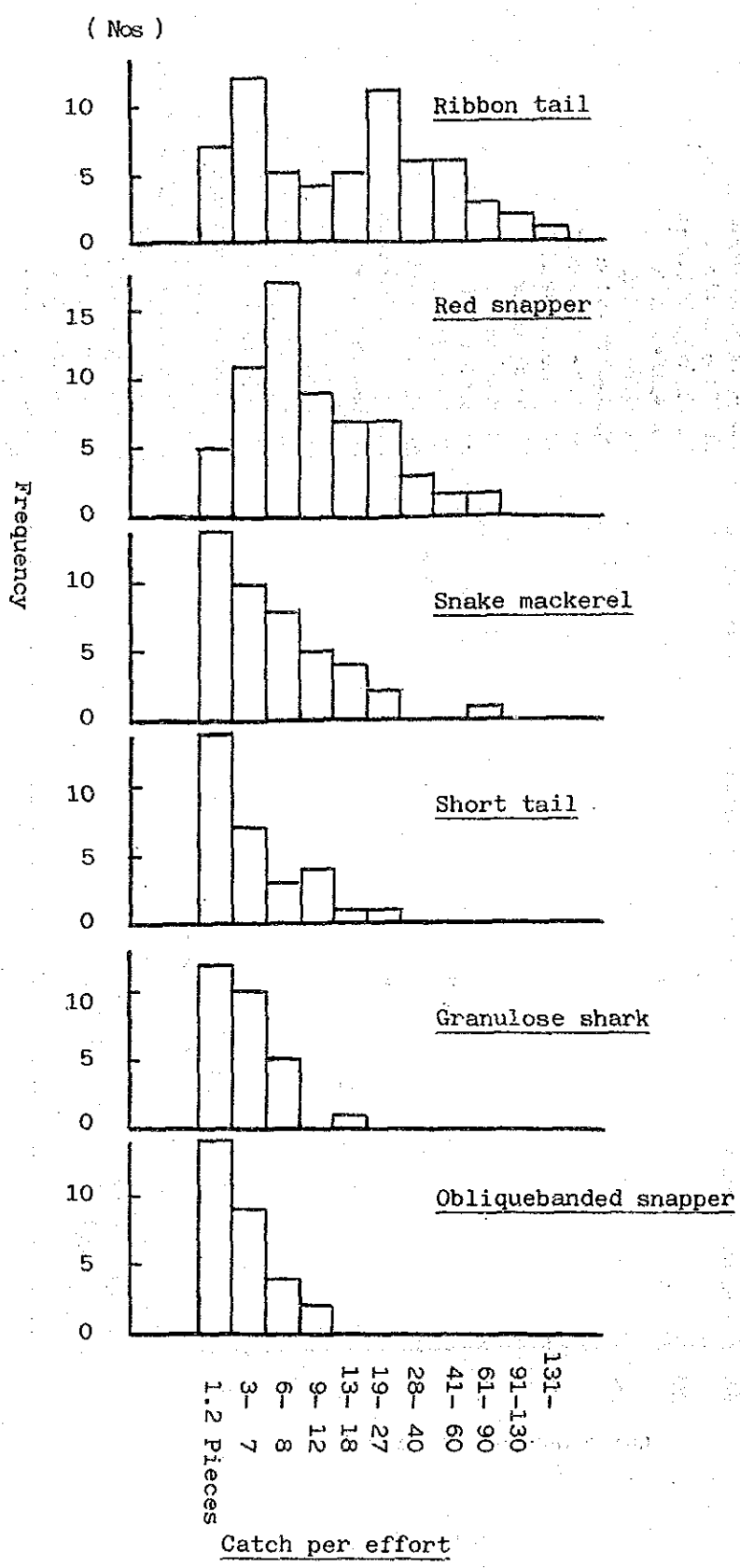


Fig.42 Frequency distribution of nos of operation with catch number per effort by major species caught in bottom line operation.

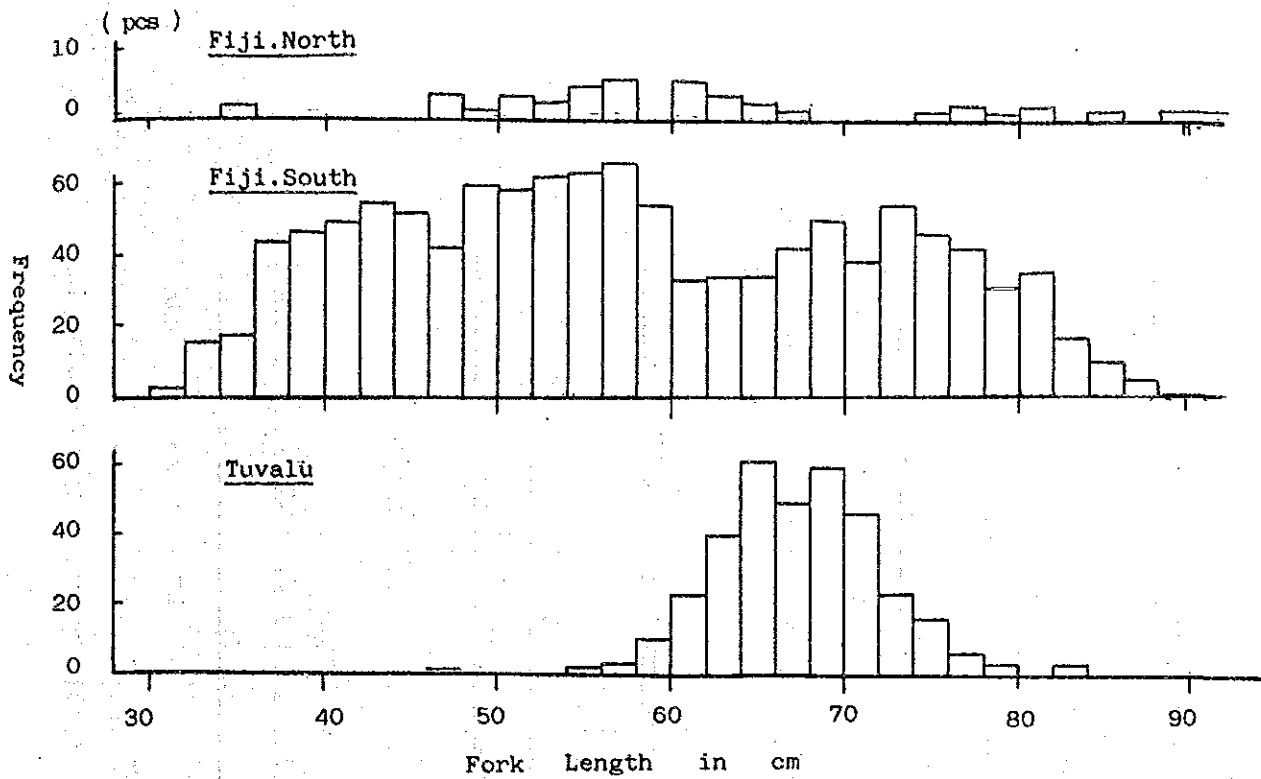


Fig.43 Frequency distribution in fork length of ribbon tail by the survey area caught in bottom line operation.

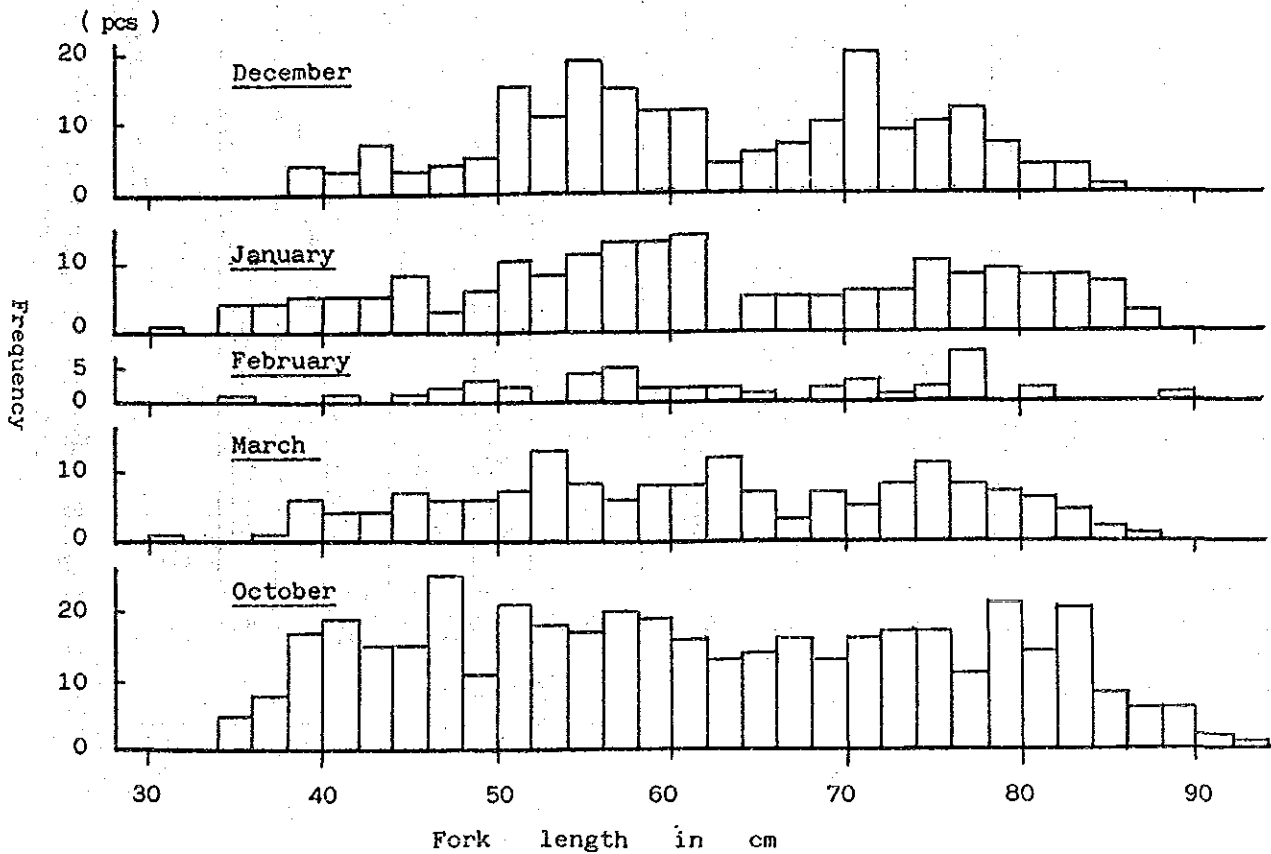


Fig.44 Monthly frequency distribution in fork length of ribbon tail caught in bottom line operation in the waters of Fiji.

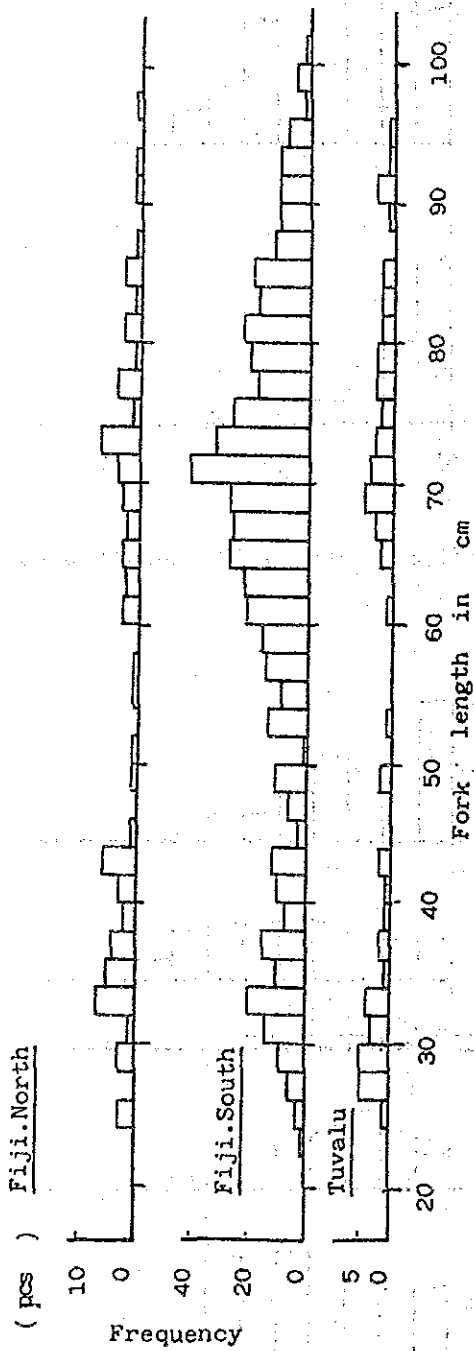


Fig.45 Monthly frequency distribution in fork length of red snapper by the survey area in bottom line operation.

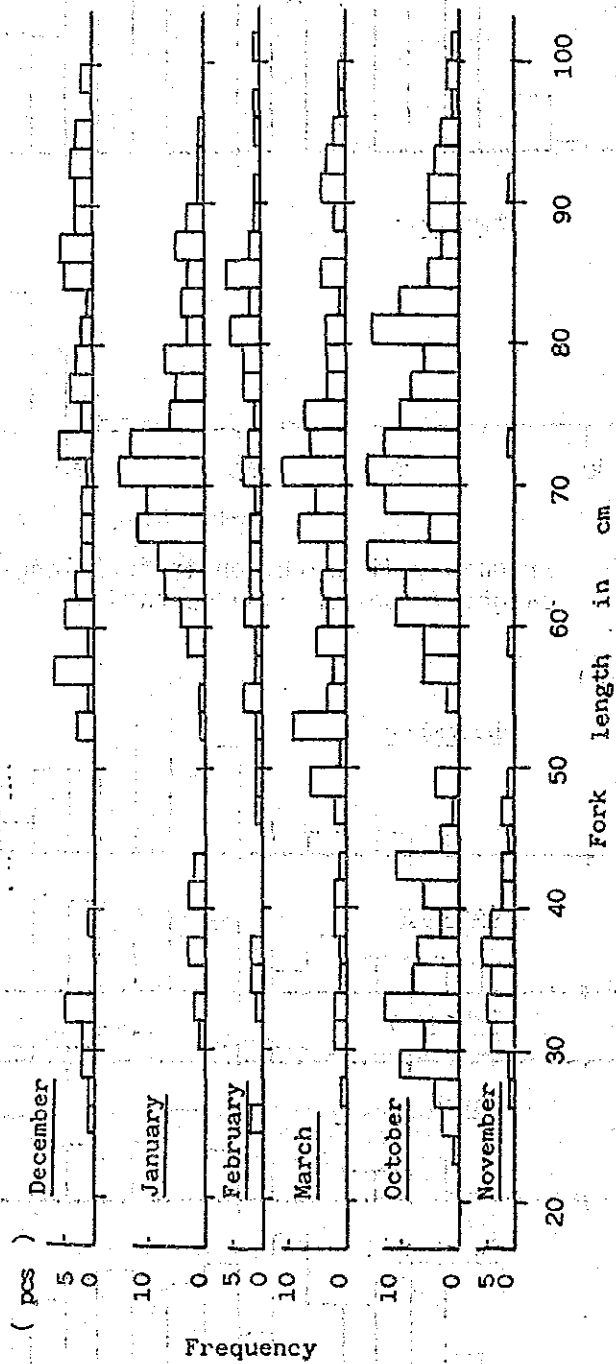


Fig.46 Monthly frequency distribution in fork length of red snapper caught in bottom line operation.

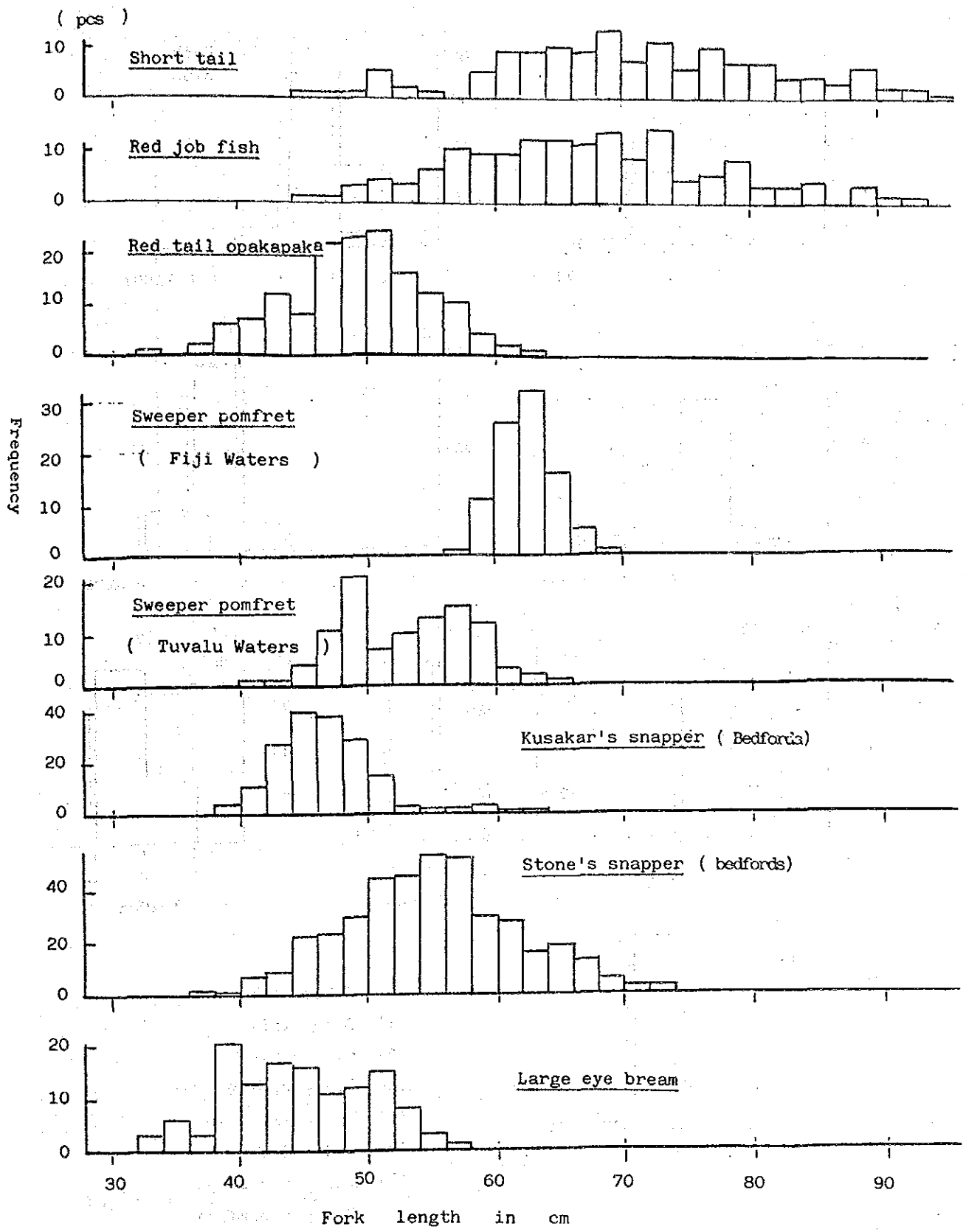


Fig.47 Frequency distribution in fork length of major species except ribbon tail and red snapper caught in bottom line operation.

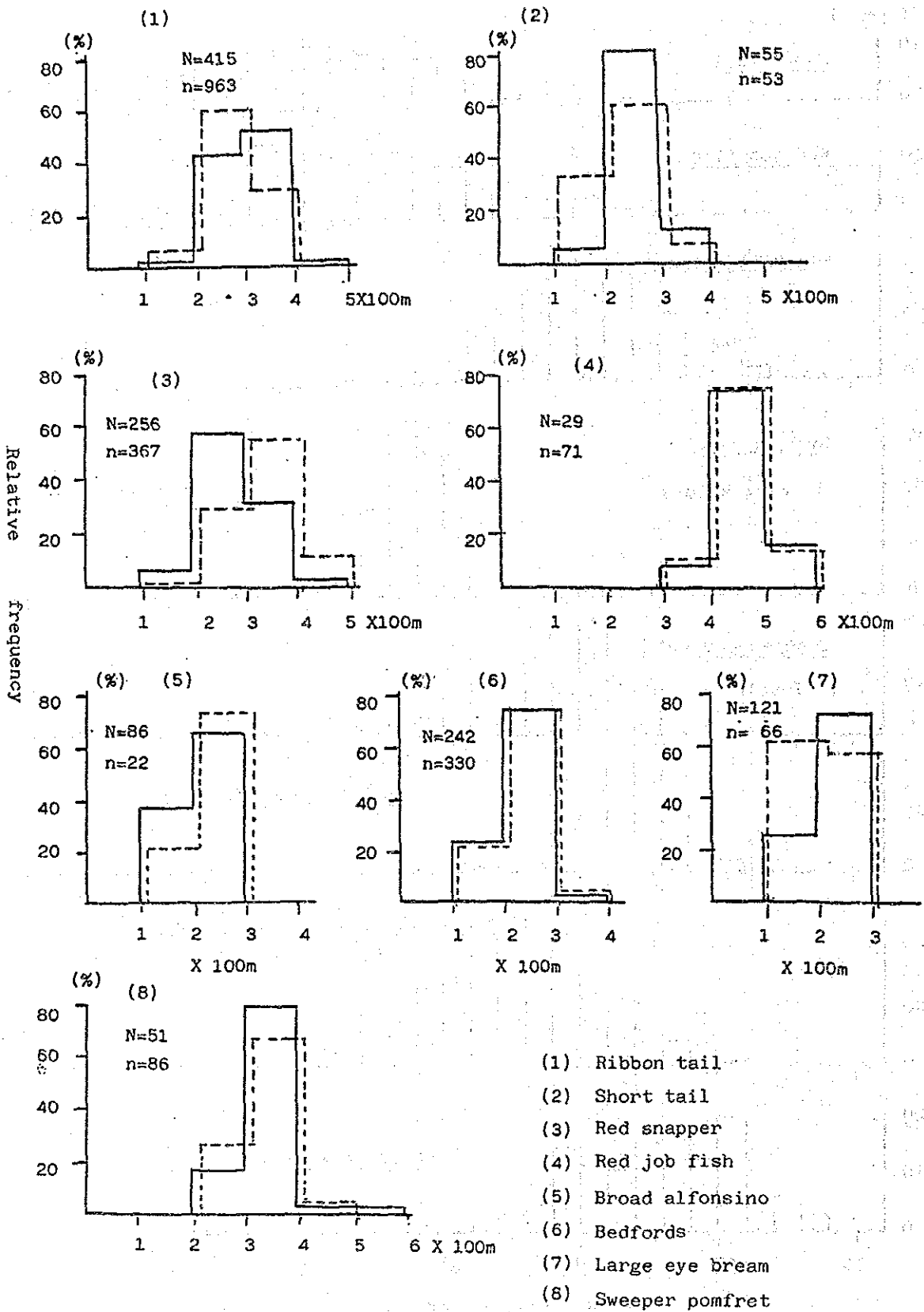


Fig.48 Vertical distribution pattern of major species caught in bottom line operation.
 (———, N -- 1985 year period, - - - - - , n -- 1986 year period)

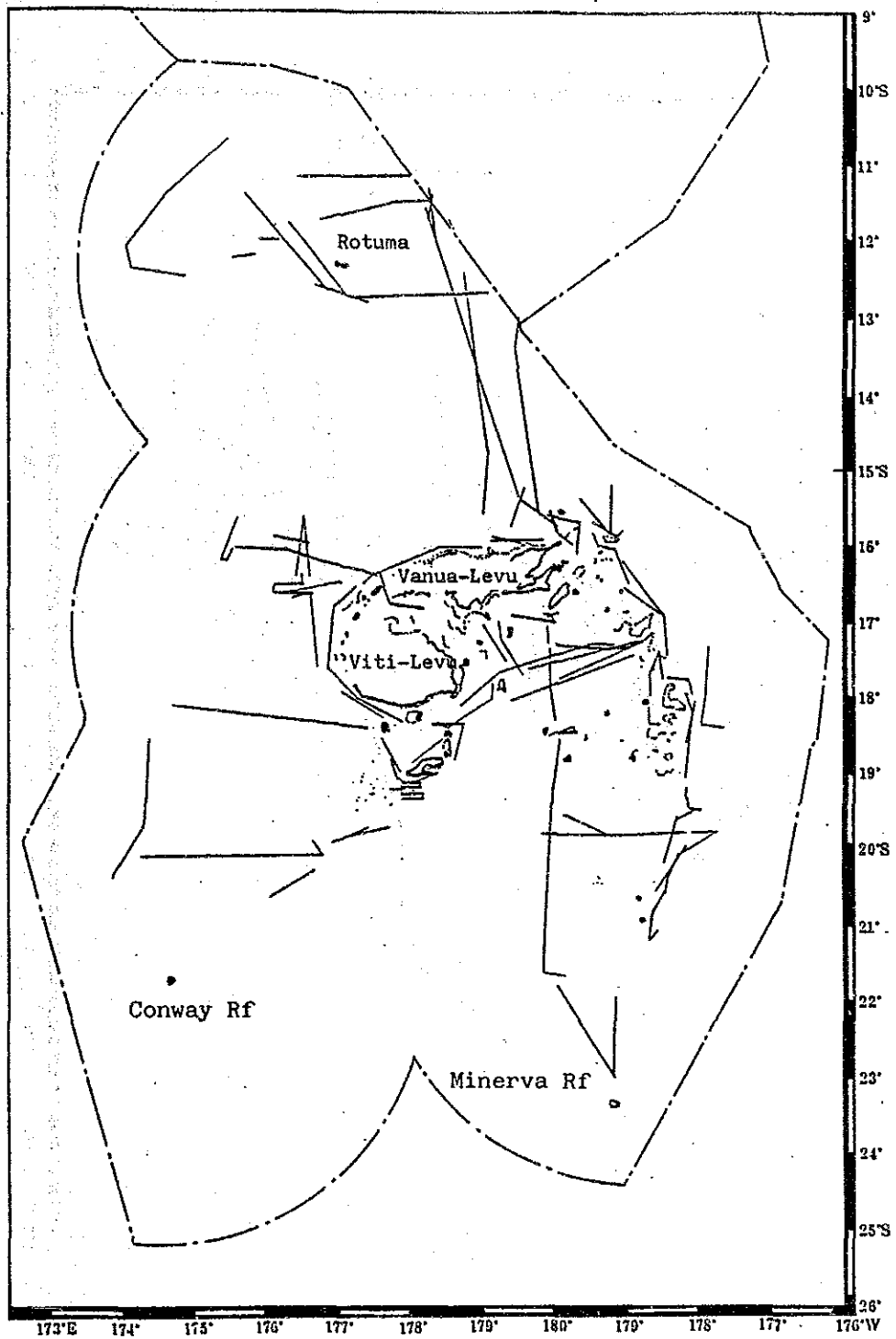


Fig.49-(1) Cruise track for the seamount survey in the waters of Fiji.

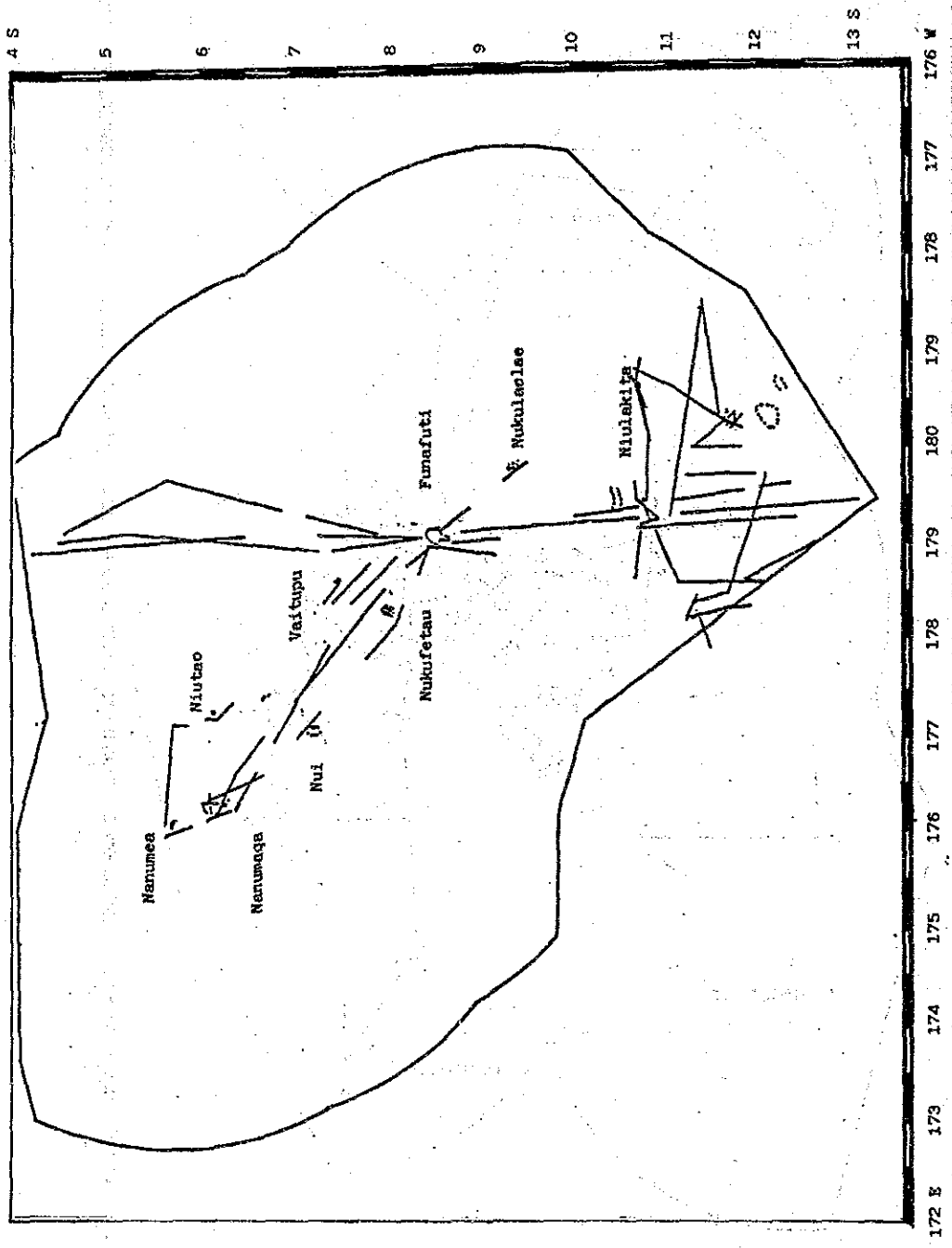
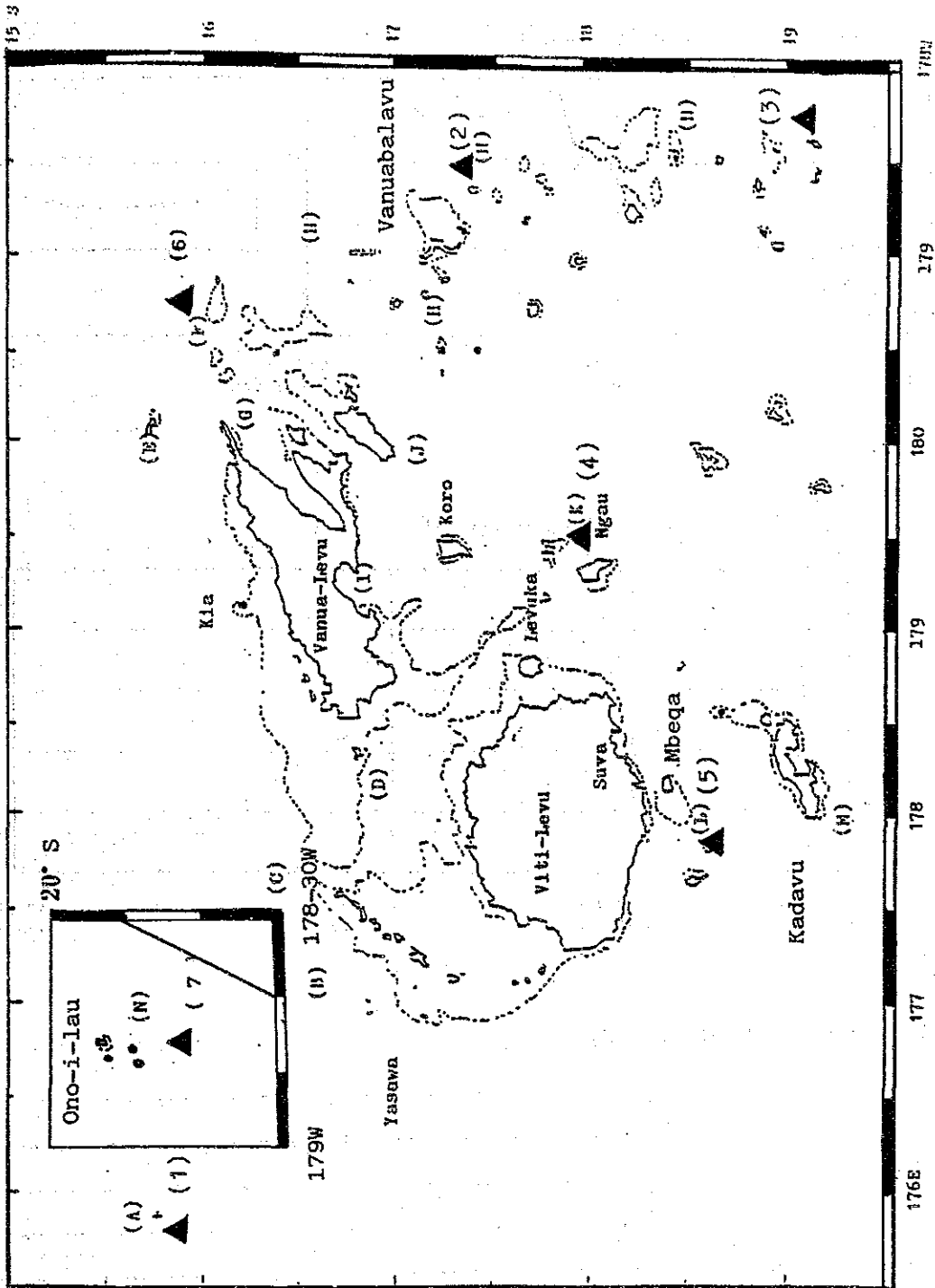


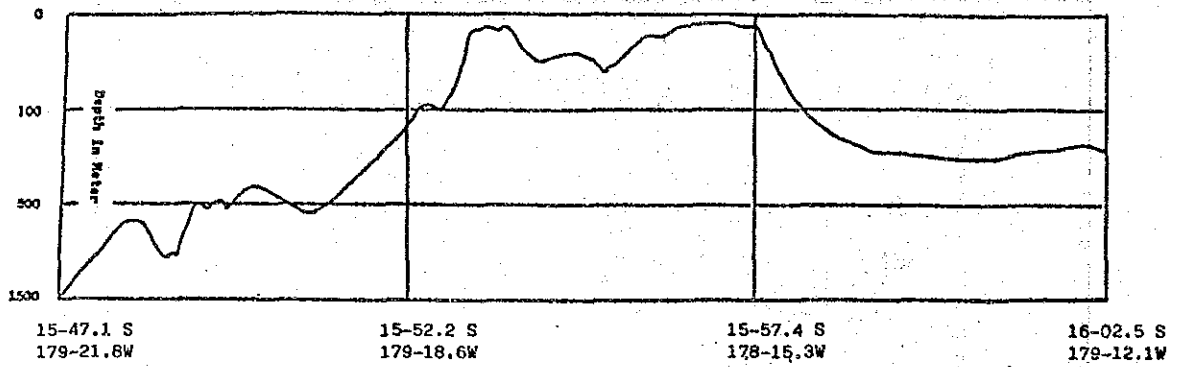
Fig.49-(2) Cruise track for the seamount survey in the waters of Tuvalu.



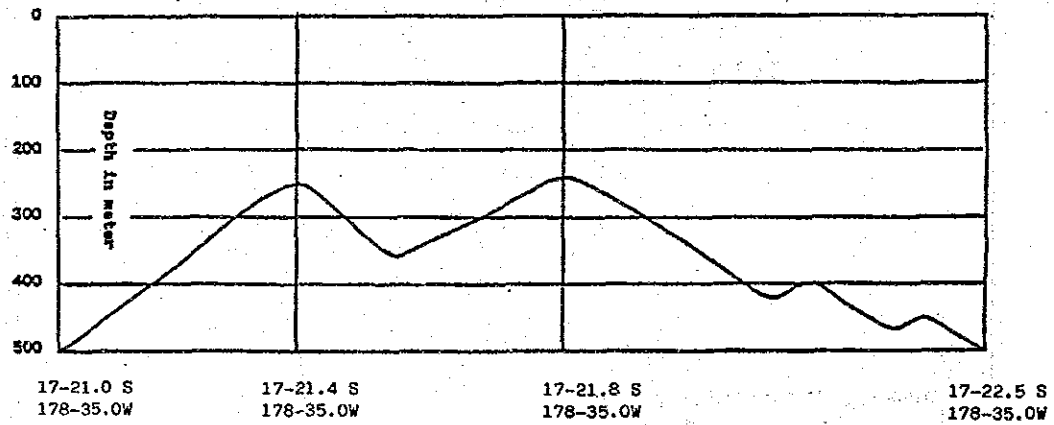
- (A) Balmoral-reef
- (B) Land harbor
- (C) Round I passage
- (D) Braigh Waters
- (E) Thicombia
- (F) Ngelelevu
- (G) Natewa bay
- (H) Lau
- (I) Savusavu
- (J) Taveuni
- (K) Ngau
- (L) Mbeqa
- (M) Kadavu
- (N) Tuvana-i-tholo

Fig.50 Location of the newly found seamount.

(1) Ngelelevu (Newly found)



(2) Vanuabalavu South (Newly found)



(3) Yagasa (Newly found)

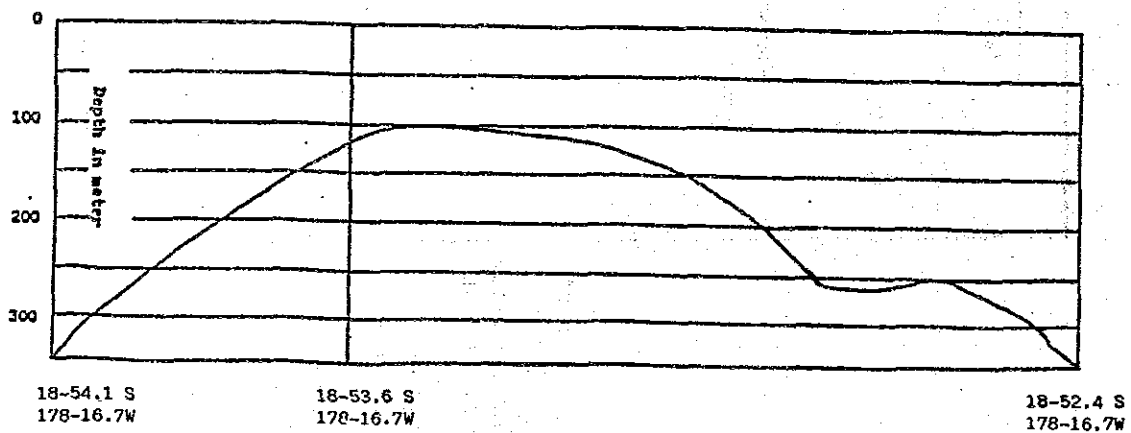
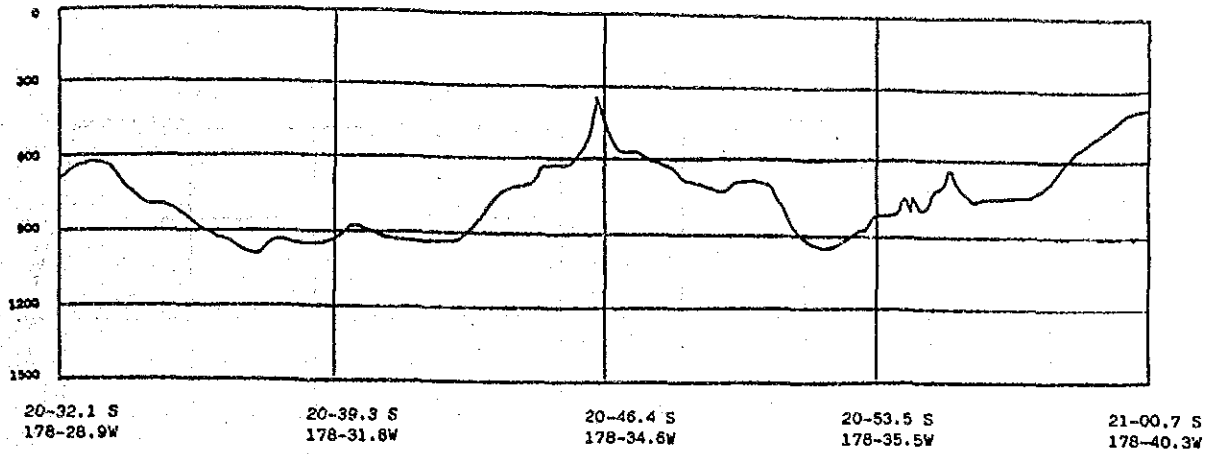
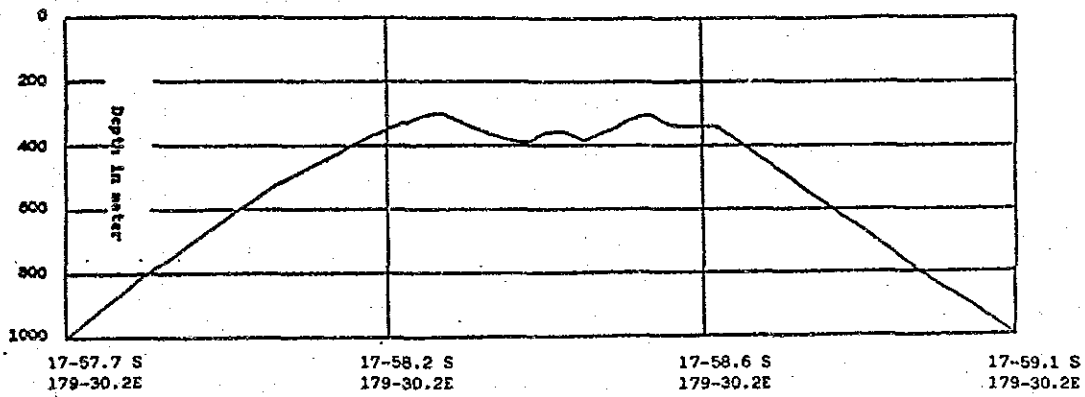


Fig.51-(1) Cross section along the survey track for the seamount survey.

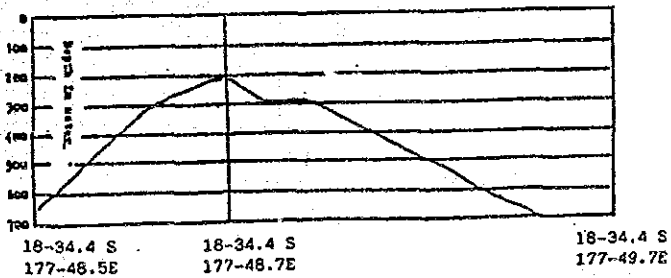
(4) Tuvana-i-tholo (Newly found)



(5) Ngau (Newly found)



(6) Mbeqa (Newly found)



(7) Balmoral Reef (Newly found)

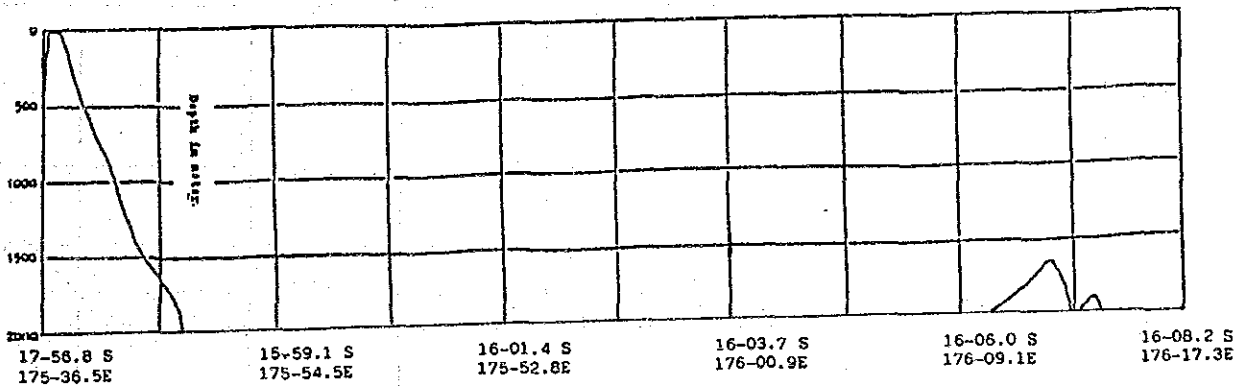


Fig.51-(2) Continued.

(12) Nanumanga (Tuvalu.North)

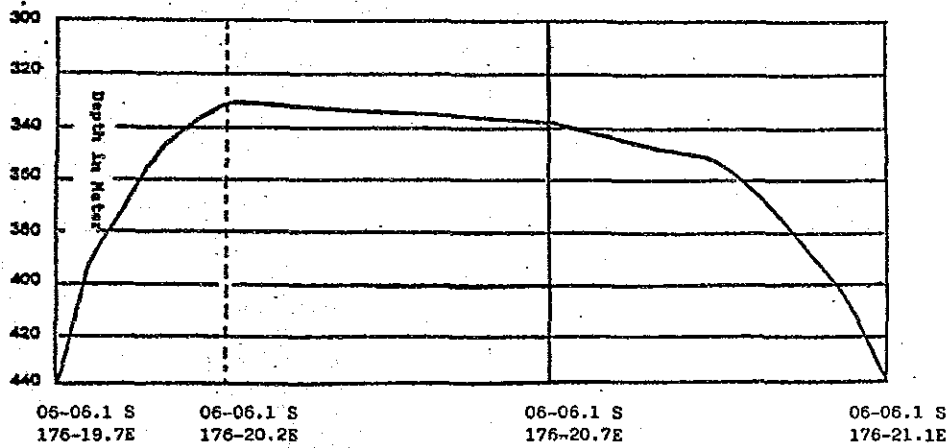
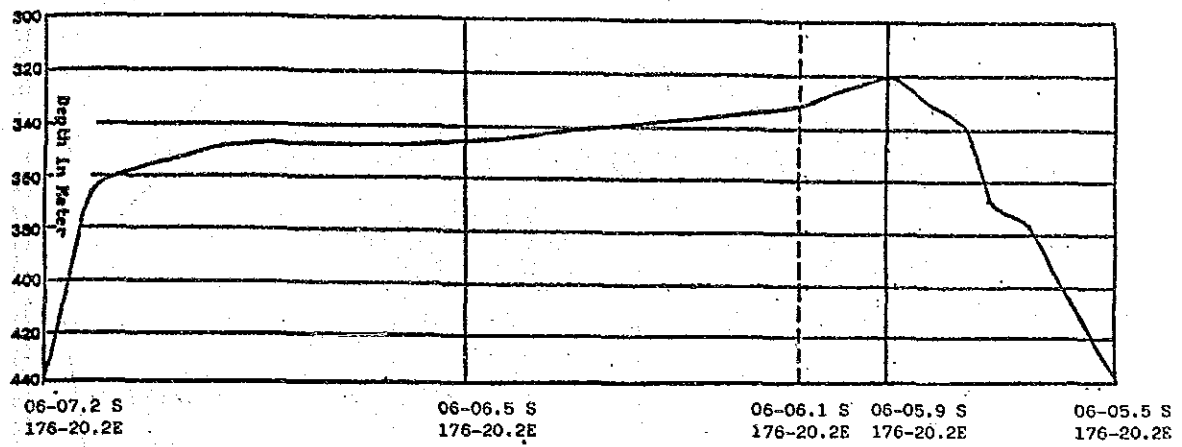


Fig.51-(4) Continued.

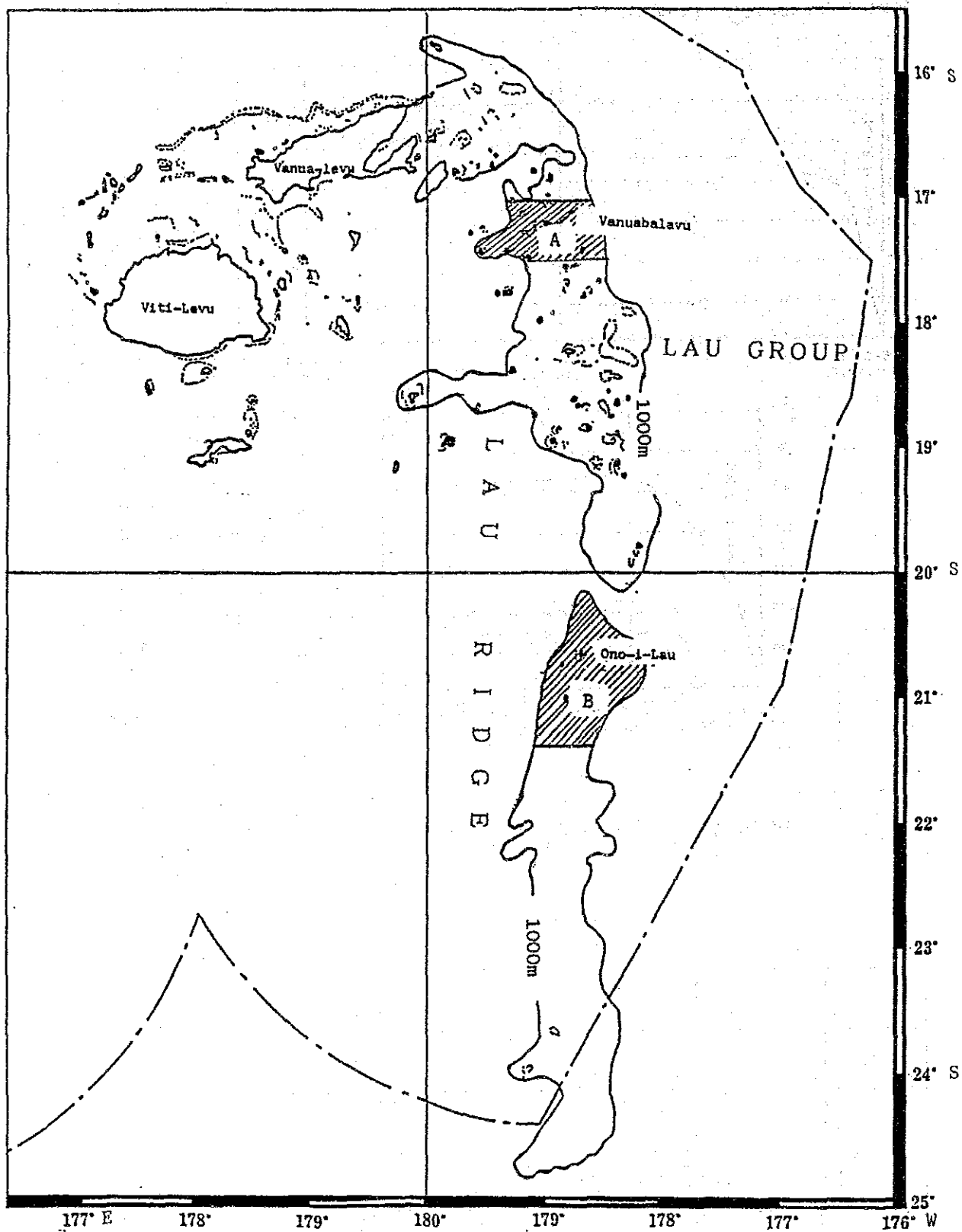


Fig.52 The 1,000 meters water depth area on Lau Ridge.

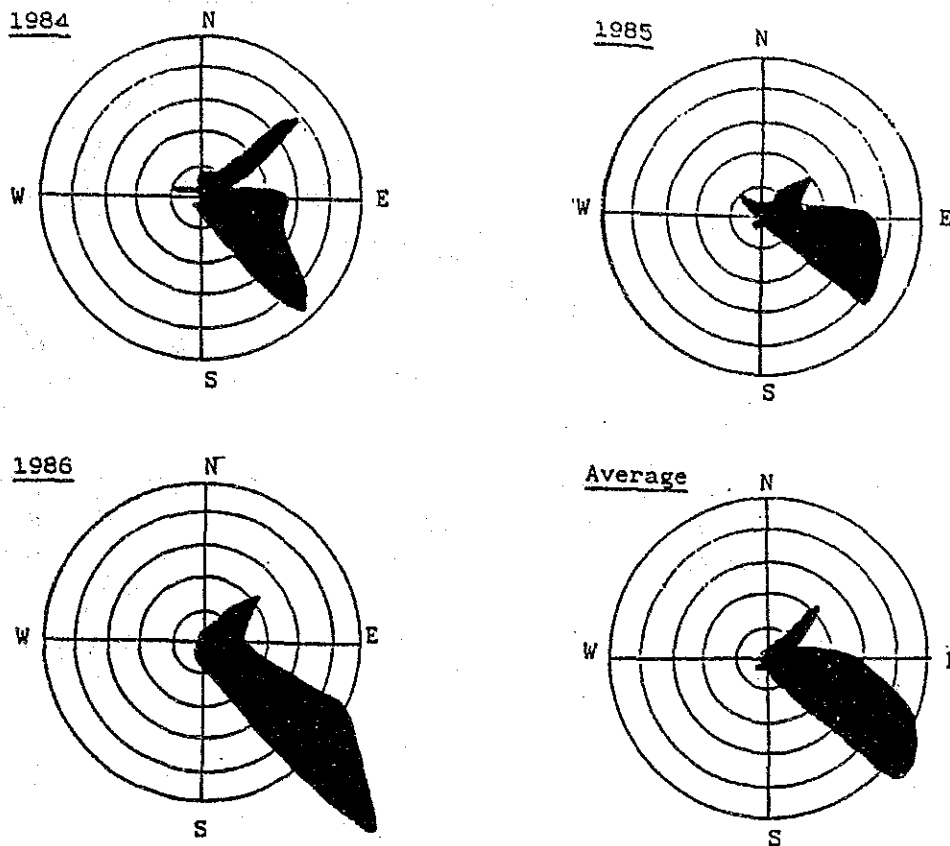


Fig.53 Yearly appearance rate of wind direction during the 1984-1986 survey year period.

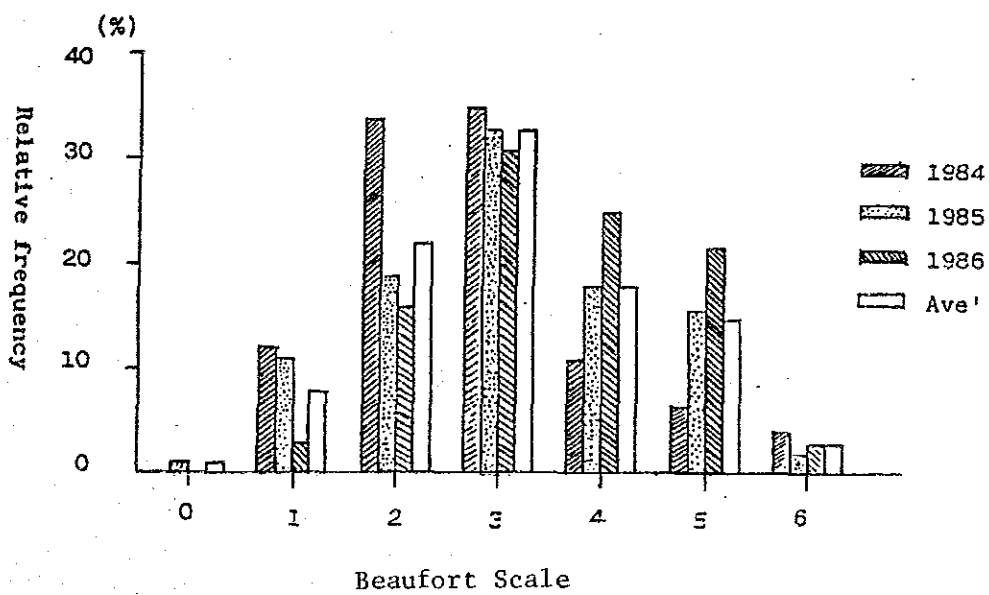


Fig.54 Yearly appearance rate of wind force in Beaufort Scale during the 1984-1986 survey year period.

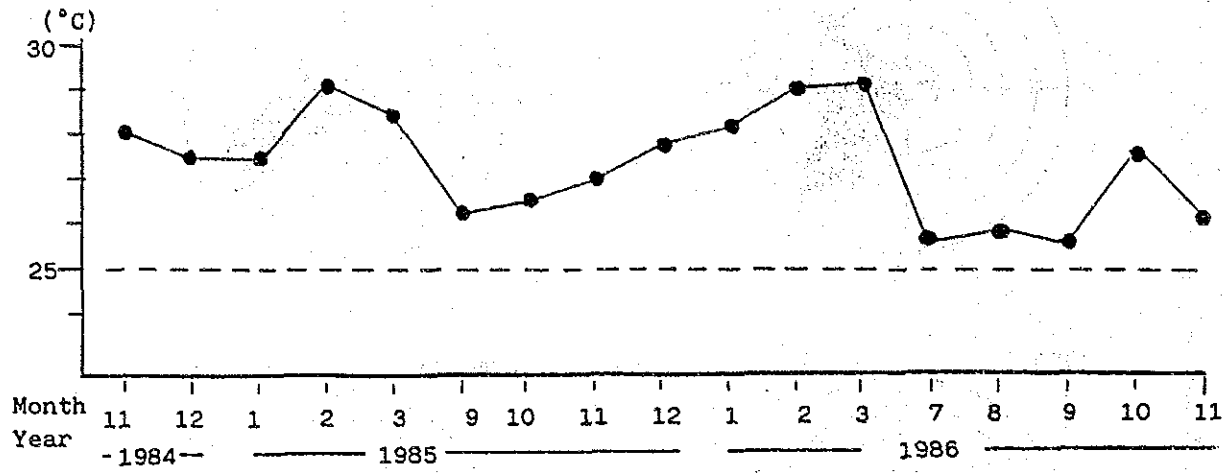


Fig.55 Monthly average surface water temperature in the survey area except Funafuti and Rotuma area.

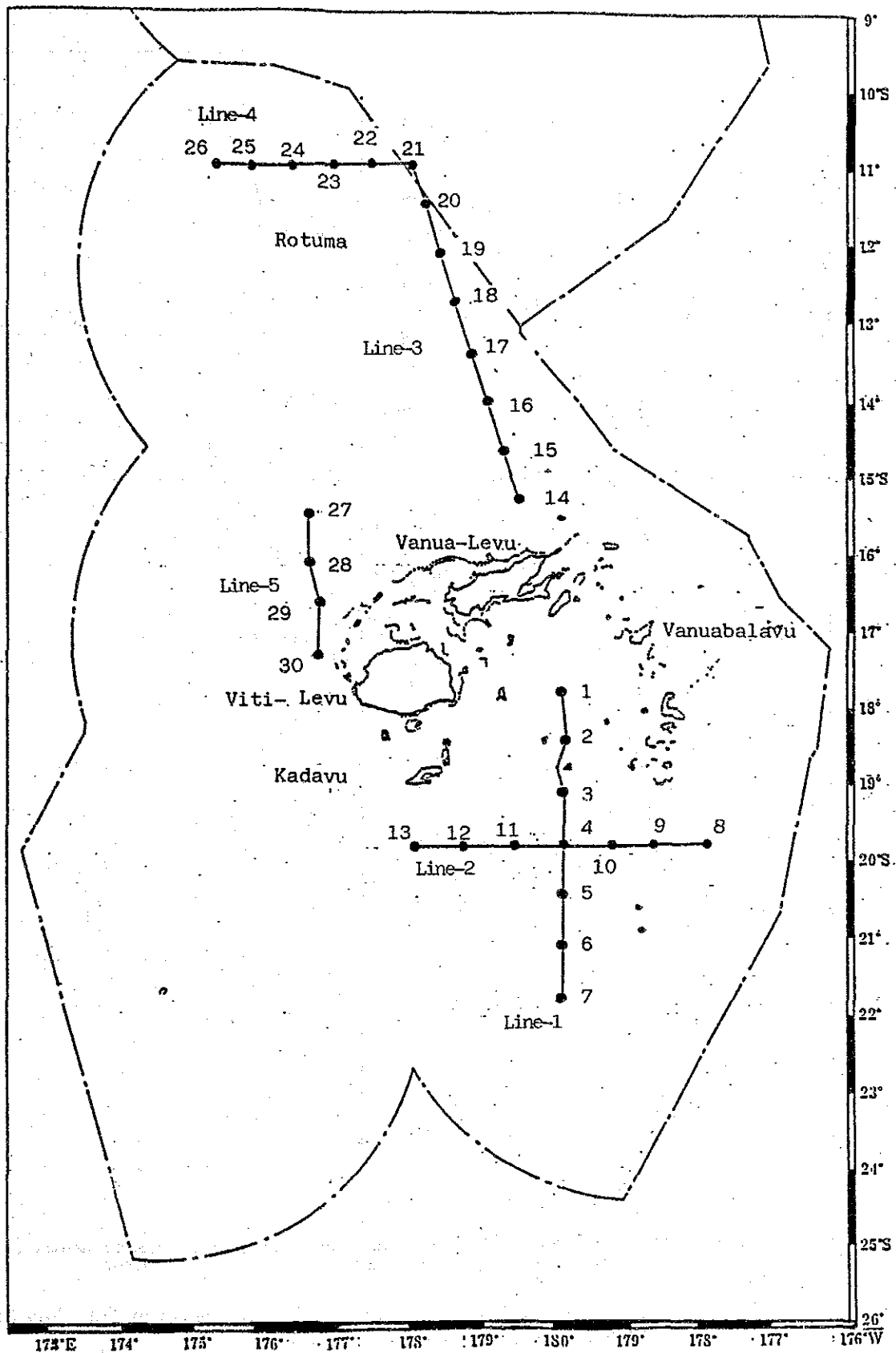


Fig.56-(1) Location of the station of X.B.T. observation for the 1984 survey year period.

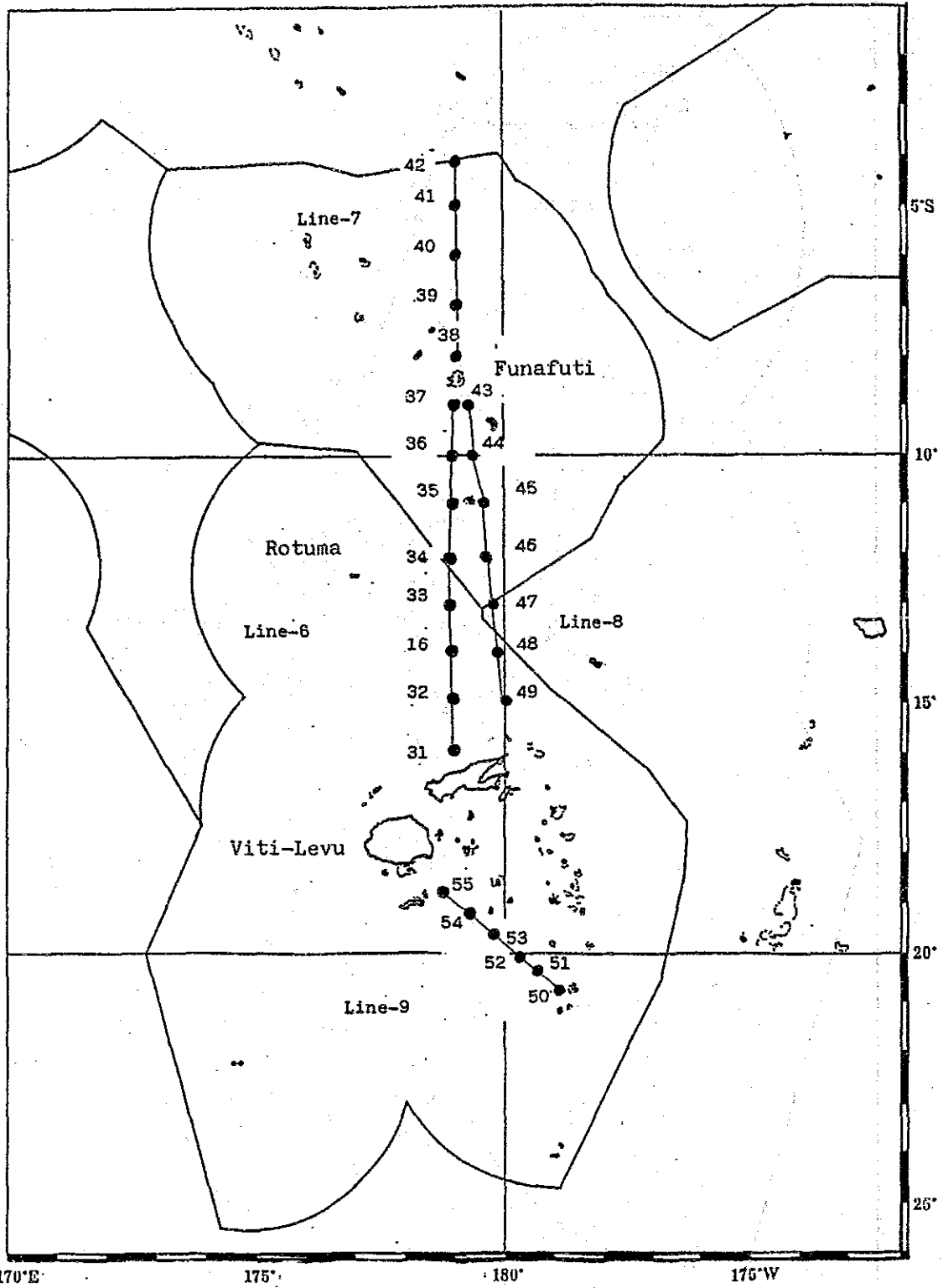


Fig.56-(2) Location of the station for X.B.T. observation for duration the 1985-1986 survey year period.

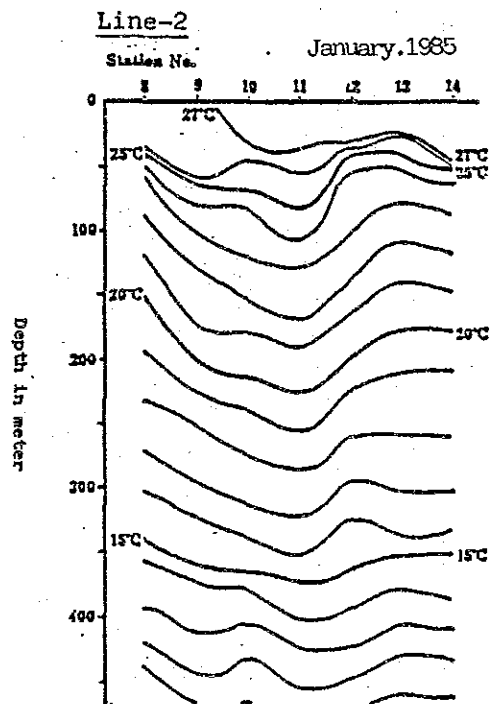
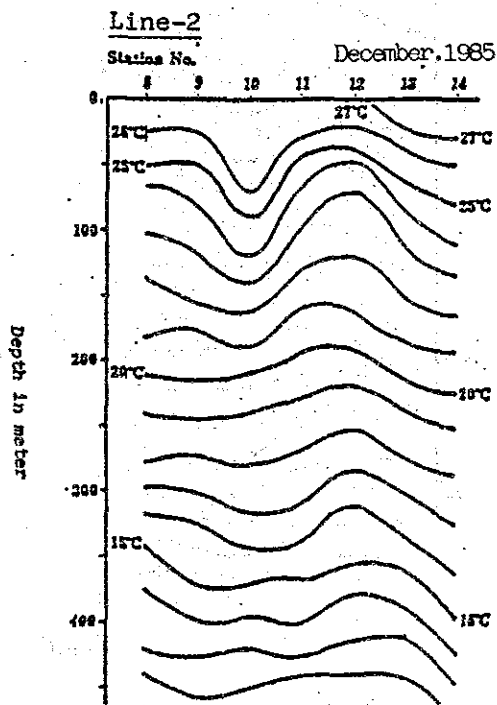
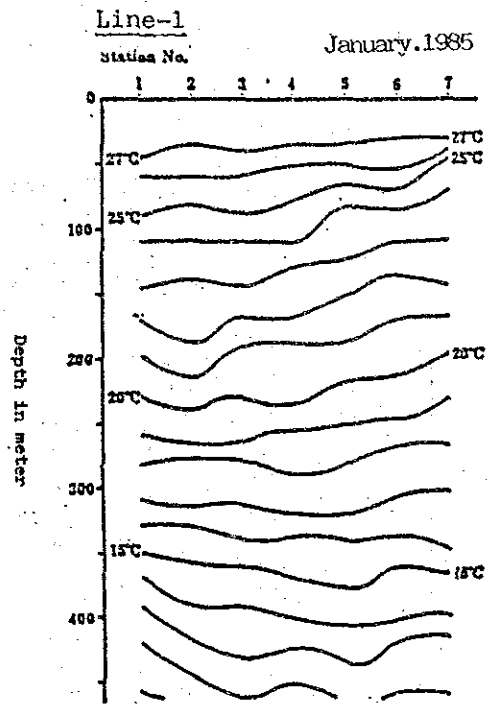
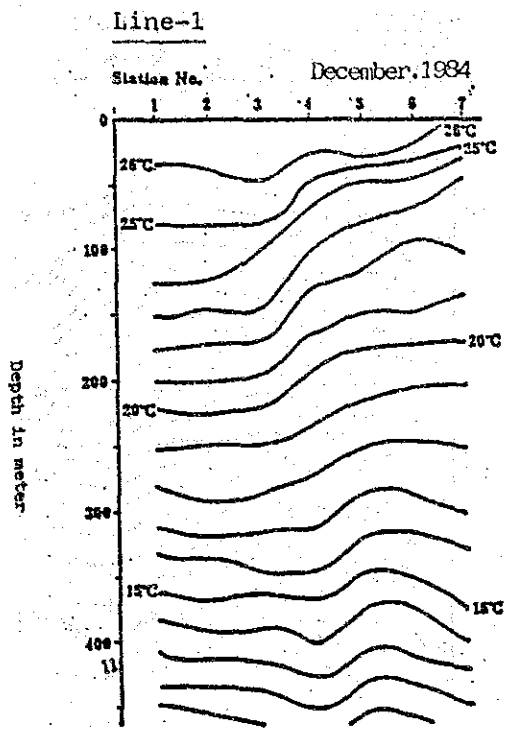


Fig. 57-(1) Cross sectional vertical water temperature along the observation line.

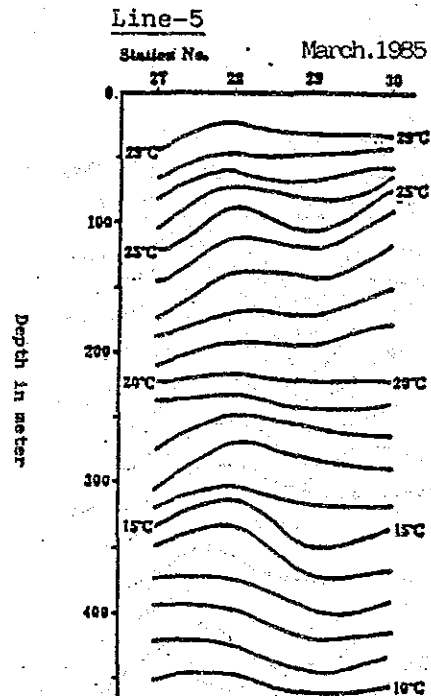
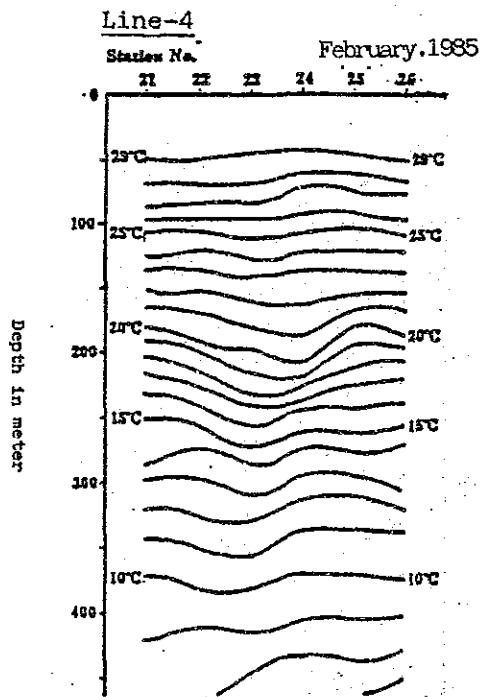
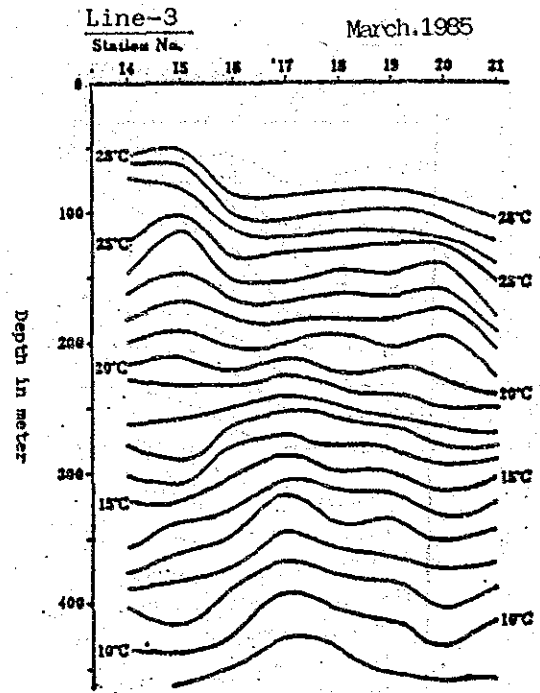
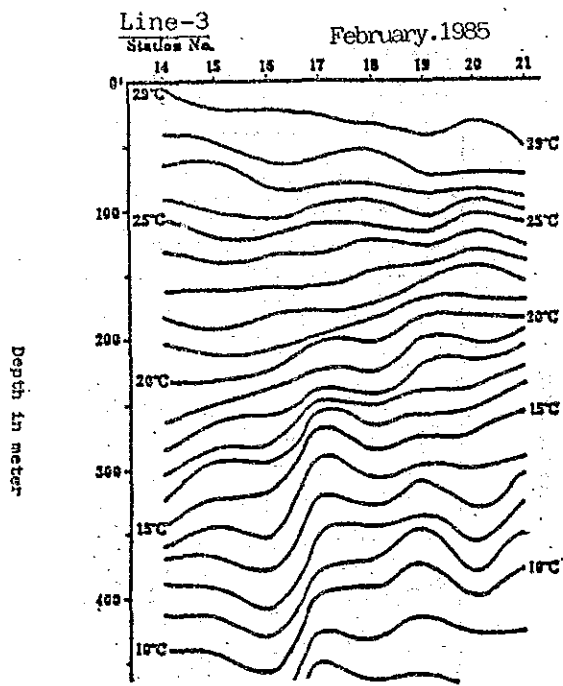


Fig. 57-(2) Continued.

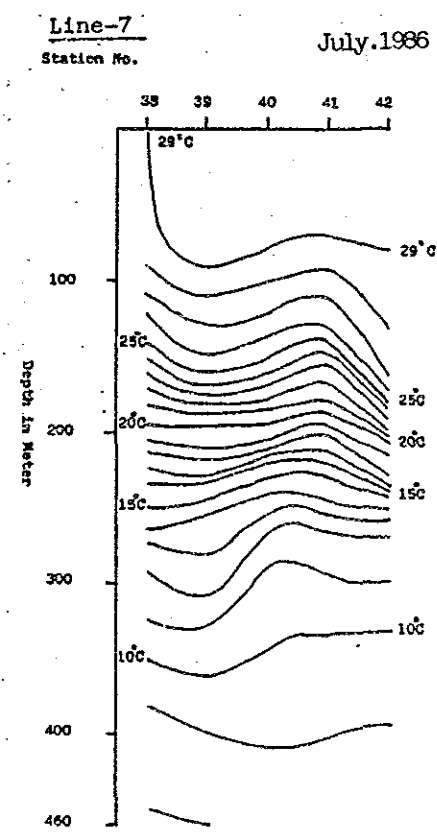
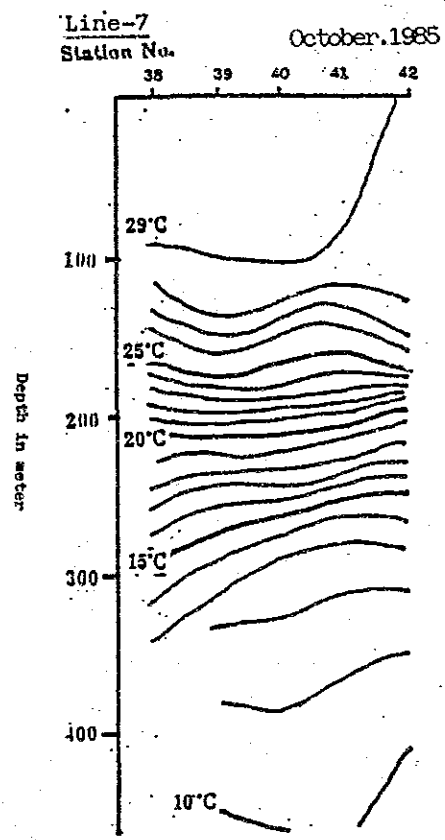
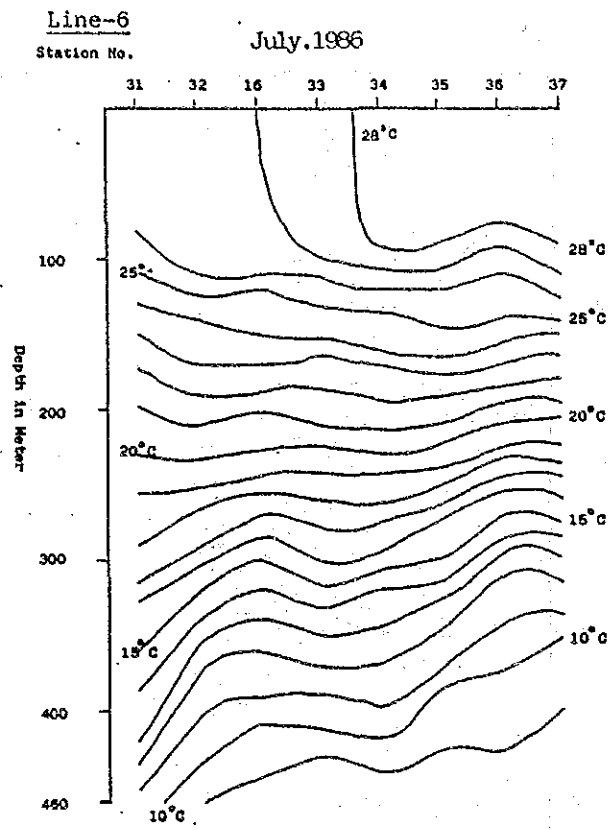
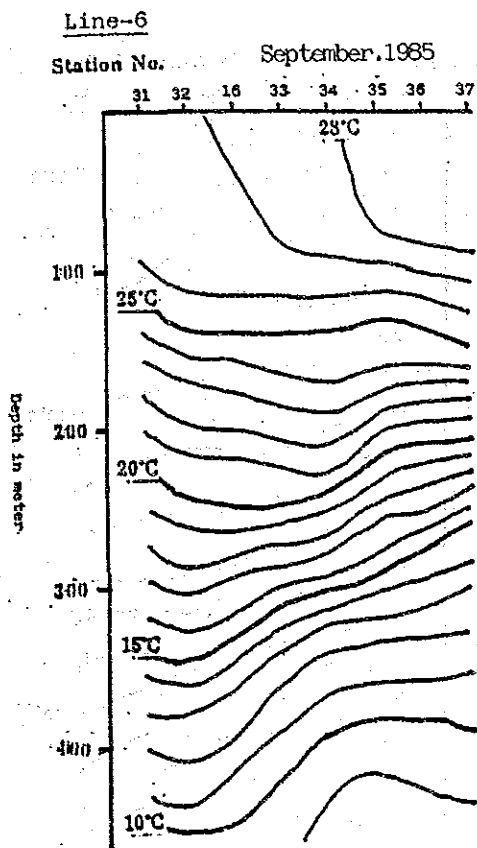


Fig. 57-(3) Continued.

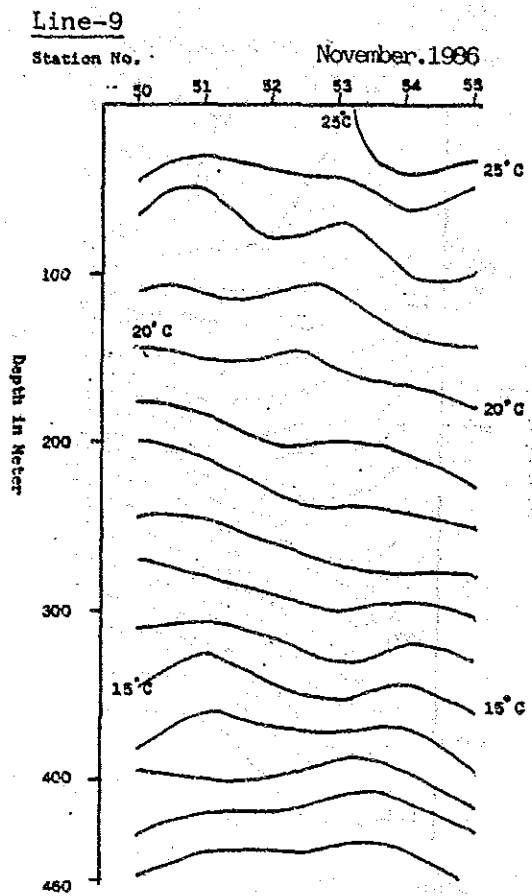
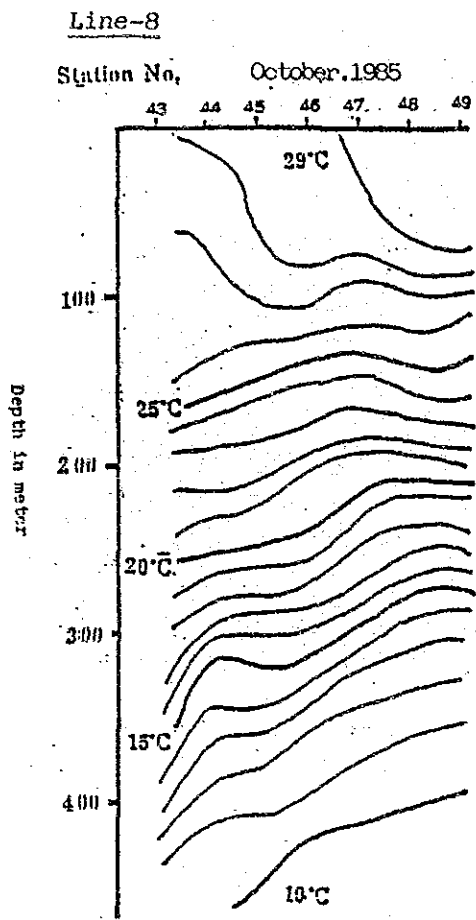


Fig.57-(4) Continued.