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PRELIMINARY REPORT ON BIOLOGICAL OBSERVATIONS AND EXPLORATORY FISHING DATA COLLECTED IN THE SOUTH GEORGIA AREA DURING THE 1985/1986 CRUISE OF MT CARINA

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Abstract

A fish survey in South Georgia waters was undertaken from November 1985 to January 1986 as a part of the on-going fish stock monitoring program conducted by the Sea Fisheries Institute, Gdynia. Codends of two mesh sizes (47 and 60 mm) were used with a bottom trawl of 32 m headrope. Catch data were collected in 249 hauls using 60 mm mesh size outside the 12 nautical mile protected zone around South Georgia. Sampling tows, including some tows inside the 12 Nm zone, were made with 47 mm mesh size codends. Fifty six fish samples were taken for biological analysis. Random length measurements and detailed biological analyses were made of five species : Champsocephalus gunnari, Chaenocephalus aceratus, Pseudochaenichthys georgianus, Notothenia gibberifrons and N. rossii marmorata. Scales and otoliths were also collected for age determinations. The total catch with 60 mm mesh size codends was 1305.4 tons with a mean CPUE of 1822 kg/hour. C. gunnari comprised the bulk of the catch (62.5%), C. aceratus, P. georgianus and N. gibberifrons, 7.5 to 14% while N. rossii and D. eleginoides were present only as by-catch. In sampling catches two length groups of C. gunnari were found with modes of 18 and 28 cm. The length range of C. aceratus was 25-72 cm. P. georgianus was represented by three length groups : 20-24, 32-41 and 42-56 cm. N. gibberifrons was also represented by three length groups : 7-22/23, 22-31 and 31-49 cm. Weight/length ratios were calculated for all five species. The fish in samples were at maturity stages II to V with the majority at stage III. Feeding intensity was rather low for all species at the beginning of cruise. A rapid increase in feeding intensity of C. gunnari was observed between the second and third 10-day periods in December, while for P. georgianus and C. aceratus it remained low throughout the whole cruise. Some comparisons of the observed parameters were drawn between this and previous seasons.

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RAPPORT PRELIMINAIRE SUR LES OBSERVATIONS BIOLOGIQUES ET LES DONNEES DE PECHE EXPLORATOIRE RELEVEES DANS LA ZONE DE LA GEORGIE DU SUD PENDANT L'EXPEDITION DE 1985/1986 DU CHALUTIER CARINA

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Résumé

Une étude sur des poissons a été entreprise en Géorgie du Sud de novembre 1985 à janvier 1986 dans le cadre du programme continu de contrôle des stocks de poissons mené par l'Institut de la Pêche Maritime, Gdynis. Des rabans de cul de maillage de deux tailles (47 et 60 mm) ont été utilisés avec un chalut de fond de 32 mètres. Des données de prise ont été relevées au cours de 249 traits à l'aide d'un maillage de 60 mm en dehors de la zone protégée de 12 milles marins au large de la Géorgie du Sud. Des traits d'échantillonnage, y compris quelques-uns effectués à l'intérieur de la zone de 12 milles marins ont été réalisés au moyen de rabans de cul d'un maillage de 47 mm. Cinquante-six échantillons de poissons ont été prélevés pour analyse biologique. Des mesures de longueur de cinq espèces, Champsocephalus gunnari, Chaenocephalus aceratus, Pseudochaenichthys georgianus, Notothenia gibberifrons et N. rossii marmorata. ont été prises au hasard et des analyses biologiques ont été réalisées en détail sur ces espèces. Des écailles et des otolithes ont également été prélevées pour déterminer l'âge des poissons. La prise totale au moyen de maillages de 60 mm était de 1.305,4 tonnes avec une PUE moyenne de 1822 kg/heure. C. gunnari était l'espèce dominante de la prise (62,5%), C. aceratus, P. georgianus et N. gibberifrons, 7,5 à 14% alors que N. rossii et D. eleginoides étaient présents seulement en tant que prises secondaires. Dans les prises d'échantillonnage, deux catégories de longueurs de C. gunnari ont été découvertes avec des modes de 18 et 28 cm. La gamme de longueurs de C. aceratus était de 25 à 72 cm. P. georgianus était représenté par trois catégories de longueurs: 20-24, 32-41 et 42-56 cm. N. gibberifrons était également représenté par trois catégories de longueurs: 7-22/23, 22-31 et 31-49 cm. La relation poids/longueur a été calculée pour toutes les cinq espèces. Les poissons des échantillons avaient atteint les stades II à V de la maturité et la majorité d'entre eux en étaient au stade III. On a enregistré une intensité alimentaire assez faible pour toutes les espèces au début de l'expédition. Une hausse rapide de l'intensité alimentaire de C. gunnari a été observée

entre la seconde et la troisième période de 10 jours en décembre, alors que pour P. georgianus et C. aceratus, on a enregistré une intensité alimentaire assez faible pendant toute la période de l'expédition. Quelques comparaisons des paramètres observés ont pu être effectuées entre cette saison et la précédente.

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INFORME PRELIMINAR DE OBSERVACIONES BIOLOGICAS Y DATOS DE EXPLORACION PESQUERA RECOPILADOS EN EL AREA DE GEORGIA DEL SUR DURANTE EL CRUCERO DEL MT CARINA EN 1985/1986

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Resumen

Se realizó una prospección de peces en las aguas de Georgia del Sur de noviembre 1985 a enero 1986 como parte del programa continuo de control de la población pesquera realizado por el Instituto de Pesquerias Marinas, Gdynia. Se utilizaron coronas de dos tamaños de malla (47 mm y 60 mm) con un arrastre de fondo de 32 m. Se recopilaron datos de captura en 249 arrastres utilizando luz de malla de 60 mm fuera de la zona protegida de 12 millas náuticas alrededor de Georgia del Sur. Se realizaron arrastres de muestreo, incluyendo algunos arrastres dentro de la zona de 12 millas náuticas con coronas de arrastre de luz de malla de 47 mm. Se tomaron cincuenta y seis muestras de peces para análisis biológicos. Se realizaron mediciones de tamaño al azar y análisis biológicos detallados de cinco especies: Champsocephalus gunnari, Chaenocephalus aceratus, Pseudochaenichthys georgianus, Notothenia gibberifrons and N. rossii marmorata. Se recolectaron también escamas y otolitos para determinación de edades. La captura total con coronas de luz de malla de 60 mm fue de 1305.4 toneladas con un CPUE promedio de 1822 kls/hora. La mayor parte de la captura estaba compuesta por C. gunnari (62.5%), C. aceratus, P. georgianus y N. gibberifrons, 7.5% a 14%, mientras que N. rossii y D. eleginoides estuvieron presentes sólo como pesca accidental. En capturas de muestreo se encontraron dos grupos de tamaño de C. gunnari con modos de 18 y 28 cm. El rango de tamaño de C. aceratus fue de 25-72 cm. P. georgianus estuvo representado por tres grupos de tamaño: 20-24, 32-41 y 42-56 cm. N. gibberifrons también estuvo representado por tres grupos de tamaño: 7-22/23, 22-31 y 31-49 cm. Se calcularon las proporciones peso/tamaño para cada una de las cinco especies. Los peces en las muestras estaban en las

etapas de madurez II a V, con la mayoría en la etapa III. La intensidad de alimentación era relativamente baja para todas las especies al comienzo de la travesía. Se observó un rápido aumento en la intensidad de alimentación de C. gunnari entre el segundo y el tercer período de 10 días en diciembre, mientras que para P. georgianus y C. aceratus ésta permaneció baja durante toda la travesía. Se obtuvieron algunas comparaciones de los parámetros observados entre esta temporada y temporadas anteriores.

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ПРЕДВАРИТЕЛЬНЫЙ ОТЧЕТ ПО ДАННЫМ БИОЛОГИЧЕСКИХ НАБЛЮДЕНИЙ И ИССЛЕДОВАТЕЛЬСКОГО ПРОМЫСЛА, СОБРАННЫМ В РАЙОНЕ ЮЖНОЙ ГЕОРГИИ ВО ВРЕМЯ ПЛАВАНИЯ Т/Х "КАРИНА" В СЕЗОНЕ 1985/86 г.

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Резюме

С ноября 1985 г. по январь 1986 г. в водах Южной Георгии проводилась съемка рыбных запасов, что является частью продолжающейся программы мониторинга этих запасов, проводимой Институтом морского промысла в Гдыне. Использовались кутки с двумя размерами ячеи (47 и 60 мм) и донный трал с верхней подборой длиной в 32 м. Данные по улову были собраны во время 249 тралений тралами с ячеей в 60 мм за пределами 12-мильной охраняемой зоны вокруг Южной Георгии. Пробные траления проводились с использованием кутка с ячеей в 47 мм, включая несколько тралений внутри 12-мильной зоны. Для проведения биологического анализа было взято пятьдесят шесть проб рыб. Были проведены выборочные измерения длин и подробный биологический анализ пяти видов: Chamsocephalus gunnari, Chaenocephalus aceratus, Pseudochaenichthys georgianus, Notothenia gibberifrons и N. rossii marmorata. Для определения возраста также собирались чешуя и отолиты. Общий улов кутками с размером ячеи в 60 мм составил 1305,4 тонны при средней величине CPUE в 1822 кг/ч. Основную часть улова составил вид C. gunnari (62,5%), C. aceratus, P. georgianus и N. gibberifrons - от 7,5 до 14%, в то время как N. rossii и D. eleginoides входили только в прилов. В пробных уловах были отмечены две размерные группы C. gunnari - 18 и 28 см.

Размерный диапазон длин у C. aceratus был 25-72 см. P. georgianus был представлен тремя размерными группами: 20-24 см, 32-41 см и 42-56 см. N. gibberifrons был представлен также тремя размерными группами: 7-22/23 см, 22-31 см и 31-49 см. Были вычислены величины отношения веса к длине для всех пяти видов. Рыба в пробах находилась на стадиях половозрелости от II до V; большинство - на стадии III. Интенсивность питания в начале плавания была довольно низкой для всех пяти видов. Резкий рост интенсивности питания у C. gunnari был замечен в конце второй-начале третьей декады декабря, тогда как для P. georgianus и C. aceratus она оставалась низкой в продолжение всего плавания. Проведено несколько сравнений величин параметров, полученных в этом и предыдущих сезонах.

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PRELIMINARY REPORT ON BIOLOGICAL OBSERVATIONS AND EXPLORATORY FISHING DATA COLLECTED IN THE SOUTH GEORGIA AREA DURING THE 1985/86 CRUISE OF MT CARINA

INTRODUCTION

Since 1976, the Sea Fisheries Institute in Gdynia has conducted fish stock monitoring in the South Georgia area by means of exploratory vessels or research vessels of the same size and fishing power. In the 1985/86 season, the trawler Carina, operating on the shelf of South Georgia as a scouting vessel, was engaged in an SFI research program. Investigations and fishing were carried out from 28 November 1985 to 19 January 1986 and covered the north-eastern part of the shelf. Permission for conducting fishing for scientific research purposes by Carina was issued by the Maritime Office in Szczecin in accordance with the CCAMLR conservation measures 1/III and 2/III.

MATERIALS AND METHODS

Catch data have been collected from 249 hauls. For biological analysis 56 fish samples were taken. Bottom trawls with 32 m headrope and two kinds of codend (mesh size 47 and 60 mm) were employed. Sampling tows were made using 47 mm mesh. The 60 mm mesh was used on the fishing grounds to make c.p.u.e. values comparable with those obtained in previous years. The trawler entered 12 Nm zone for sampling purposes exclusively.

Biological sampling comprised random length measurements and detailed biological analyses of five species : Champsocephalus gunnari, Chaenocephalus aceratus, Pseudochaenichthys georgianus, Notothenia gibberifrons and Notothenia rossii marmorata. The biological analysis of samples included : measurements of total length (to the nearest cm below) and weight, determination of sex and gonad maturity (according to Maier's scale) and degree of stomach fullness on a 5-grade scale (0-4). Scales and otoliths were collected for later ageing of fish.

Catch data and length composition of catches are presented in this report by rectangles 0.5 x 1^{o} (subdivisions of the FAO statistical subarea 48.3, after Everson, 1984). To retain fishing grounds undivided, hauls crossing boundaries of rectangles 56/57 and 61/62 were included to 56 and 61 respectively (Figure 1). A compensatory factor was introduced to take into account proportions between the catch rate of a particular tow and the size of a sample.

RESULTS OF FISHING ACTIVITIES

Fishing grounds and the location of sampling tows are shown in Figure 1. Towing depth ranged from 120 to 300 m. Total catch was 1305.4 tons (Table I). The c.p.u.e. in particular decades* (except for 3 days of fishing in November) ranged from 1273 to 3642 kg/h, mean in the whole period being 1822 kg/h. The best catch rates in the first decade of December were attained, when 379.4 tons of fish were caught with mean c.p.u.e. of 3642 kg/h. In the remaining decades, catch rates were lower, no more than 1800 kg/h. C. gunnari was the predominant species (62.5%). The percentage share of C. aceratus, P. georgianus, and N. gibberifrons in the total catch fluctuated from 7.5 to 14%. The by-catch consisted of N. rossii and D. eleginoides.

It is not possible to compare the catch results of the MT Carina with the catches made in the 1984/85 season. Fishing operations at that time started earlier (in October) and ended at the end of November/beginning of December because of low c.p.u.e. (Table II). The expected concentrations of C. gunnari did not appear in this period. The fleet concentrated its fishing operations on four different species of fish (C. aceratus, P. georgianus, N. gibberifrons and N. rossii) within the whole shelf area of South Georgia. In the 1983/84 season, as in the previous year, the predominance of C. gunnari in catches was observed.

* "decade" is used here to mean a period of 10 days - Editor

Fishing operations concentrated in the same subdivisions (56 and 61, Table II) as in the 1985/86 season because the highest yields were attained there. The c.p.u.e. for C. gunnari was similar, except that in 1983/84, the highest values were noted in subdivision 61 while in the last season they were highest in subdivision 56. Next to C. gunnari, c.p.u.e. for P. georgianus in the 1983/84 season was also high, something not observed during fishing operations of the MT Carina, in which the by-catch of C. gunnari consisted of three species with similar shares : C. aceratus, P. georgianus and N. gibberifrons.

LENGTH COMPOSITION

The total length of C. gunnari ranged from 14 to 46 cm (Figure 2). In research catches, two length groups of fish were present : 14-22 cm and 22-46 cm with the modes of 18 cm and 28 cm, respectively. Fish measured during commercial catches belonged mainly to the second length group (84%, by number). The length range of C. aceratus was 25-72 cm (Figure 3) with total length of 47-65 cm predominating in commercial catches. Length distribution of P. georgianus in research catches in subdivision 61 consisted of three separate length groups : 20-24, 32-41 and 42-56 cm. The latter was observed in commercial catches in the same area and north of South Georgia in subdivision 55 (Figure 4). There were also three length groups in some length distributions of N. gibberifrons caught east of South Georgia. The first group comprised specimens with a total length of 7-22/23 cm, the second 22-31 cm and the third 31-49 cm (Figure 6). The last one occurred in commercial catches and in the deep waters of subdivisions 55 and 60. N. rossii was present as a by-catch in commercial tows in subdivision 61 and in single research hauls in subdivision 62. The length-frequency distributions of this species had similar patterns, consisting of specimens with lengths of 36/42-69 cm (Figure 5).

For comparison, unpublished age and length frequency distributions of the investigated species in the 1983/84 and 1984/85 seasons are presented in Figure 7-11. The bulk of C. gunnari catches in those two seasons consisted of the year class of 1980 (Sosinski, unpublished). In the catches of the MT Carina made with a 60 mm mesh size trawl, the

predominance of the same length/age group[1] was observed as in the 1983/84 season. In the catches of C. aceratus in previous seasons there were more young fish (with lengths of 30-45 cm), which were not observed in catches made with the 60 mm trawl in 1985/86[2]. The same may be said when analysing length distributions for both nototheniids. The length distribution of P. georgianus, especially in the last two years, did not undergo significant changes.

LENGTH-WEIGHT RELATIONSHIP

Specimens collected for the detailed biological anaylsis were weighed by length classes. On the basis of mean weights in length classes, the relations between weight and length for each species were calculated (remarkable sex dimorphism in C. aceratus should be stressed [Figure 12]). The following equations are the results of these calculations :

C. gunnari	$- W = 0.00141072 \times L^{3.433}$
P. georgianus	$- W = 0.00475029 \times L^{3.17903}$
C. aceratus	$- W = 0.000468096 \times L^{3.68063}$
	$- W = 0.000679441 \times L^{3.57088}$
N. rossii m.	$- W = 0.0364521 \times L2.^{74576}$
N. gibberifrons	$- W = 0.00302616 \times L^{3.33353}$

1 according to Sosinski (unpublished), in that season, age group III was characterized by smaller than usual length of fish, which explains the difference in modal lengths between the two seasons.

2 length and age composition of C. aceratus from the 1984/85 season is not representative of Polish catches of this species (Sosinski, personal communication). The presence of juvenile C. aceratus from age groups I and II was observed in single tows. The bulk of catches of this species consisted of fish with lengths of 34-68 cm (Sosinski and Mucha, unpublished).

MATURATION

The fish examined in samples were at maturity stages from II to V. The prevailing number of fish were at maturity stage III (Figure 13). From December, an increasing percentage of gonads at stage IV in male specimens of C. gunnari was observed. Female gonads of this species were less developed, generally at grade II and III. In contrast, male specimens of C. aceratus had their gonads at stages II and III but females had some gonads developed at grade IV. There was not a big difference in the rate of maturation between males and females of P. georgianus. Maturation was similar in females although in the third decade of December single specimens having ripe stage V gonads appeared in the samples. The process of maturation of N. gibberifrons was similar in males and females. Gonads of both sexes were mostly at stage II and III. Maturation of gonads of N. rossii m. was observed during the period of the second and third decade of December only. Female gonads were mostly at stage II and III or maturity, whereas males had more developed gonads, at stage III and IV.

FEEDING

The feeding intensity of all examined species was rather low at the beginning of the cruise (Figure 14). The rapid increase in the feeding intensity of C. gunnari was observed between the first and the second decade of December. Later, the average degree of their stomach fullness stayed at grade 3. Fish stomachs were filled with krill. The feeding intensity of two other channichthyids, P. georgianus and C. aceratus remained low throughout the whole period of the investigations. Stomachs of P. georgianus contained juvenile C. gunnari and krill, while those of C. aceratus contained juvenile C. gunnari only. Average degree of stomach fullness of N. gibberifrons at the end of the cruise was much the same as that of C. gunnari, although the process of feeding of this species was more even and remained close to grade 2. N. gibberifrons fed on benthic organisms. In the case of N. rossii only two samples were taken for biological analysis, in the second and third decades of December. Average degree of stomach fullness was about 1. Stomachs contained mainly krill and benthic organisms.

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Table 1 Catch and effort data, M.T. Carina, South Georgia, 1985/86

Month	Decade	Days fished	No.of hauls	Time fished	Total catch /tons/	Catch /tons/ per day	Catch /kg/ per hour fished							
							T o t a l	Champsocephalus gunnari	Chaenocephalus aceratus	Pseudochaenichthys georgianus	Notothenia gibberifrons	Notothenia rossii marmorata	Dissostichus eleginoides	Miscellaneous marine fishes
Nov.	III	3	15	36 h 40′	19.2	6.4	524	95	56	41	179	8		145
Dec.	I	10	49	104 h 10′	379.4	37.9	3642	3008	250	2	222	1		159
	II	10	45	140 h 30′	178.9	17.9	1273	635	300	76	191	26	1	44
	III	11	55	172 h 20′	290.0	26.4	1683	894	294	210	202	32	2	49
Jan.	I	10	50	153 h 35′	241.7	24.2	1574	975	196	144	167	31		61
	II	8	35	109 h 20′	196.2	24.5	1795	963	287	248	209	17	5	66
Total		52	249	716 h 35′	1305.4									
Mean c.p.u.e.						25.1	1822	1138	255	136	195	23	1	74
Catch composition /%/								62.4	14.0	7.5	10.7	1.3	0.1	4.0

Table 2 Catch rates (kg per hour fished) in the Polish commercial fishing MT Taurus 1983/84 and 1984/85 in the South Georgia area, compared with CPUE values of MT Carina 1985/86

Species	Subdiv.	55				56				60				61				62			
	Months	X	XI	XII	I	X	XI	XII	I	X	XI	XII	I	X	XI	XII	I	X	XI	XII	I
	Seasons																				
Champsocephalus gunnari	1983/84			350		1749		354	246			290			3751	1633	1082				
	1984/85					61					205			42	20			34	76		
	1985/86			120	25			3242	1073			94	525			694	1005				80
Chaenocephalus aceratus	1983/84			94				113	511		326	70				20	643				
	1984/85					138				135	146			371	339			206	144		
	1985/86			40	95			309	266			55	113			290	237				11
Pseudochaenichthys georgianus	1983/84			937				828	438		394	170				33	1378				
	1984/85					91				483	191			301	516			303	42		
	1985/86			60	152			15	44			17	23			155	240				11
Notothenia gibberifrons	1983/84			455				72	130		195	140				21	229				
	1984/85					94				151	150			352	97			518	212		
	1985/86			120	429			231	86			88	38			201	209				69
Notothenia rossii marmorata	1983/84			45				52			399	60				1					
	1984/85					289				1146	189			890	235			223	280		
	1985/86							3	1							31	34				11
Dissostichus eleginoides	1983/84																				
	1984/85													2	1			8			
	1985/86				76											1					
Miscellaneous marine fishes	1983/84																				
	1984/85																				
	1985/86			40	44			148	73			77	38			49	62				149

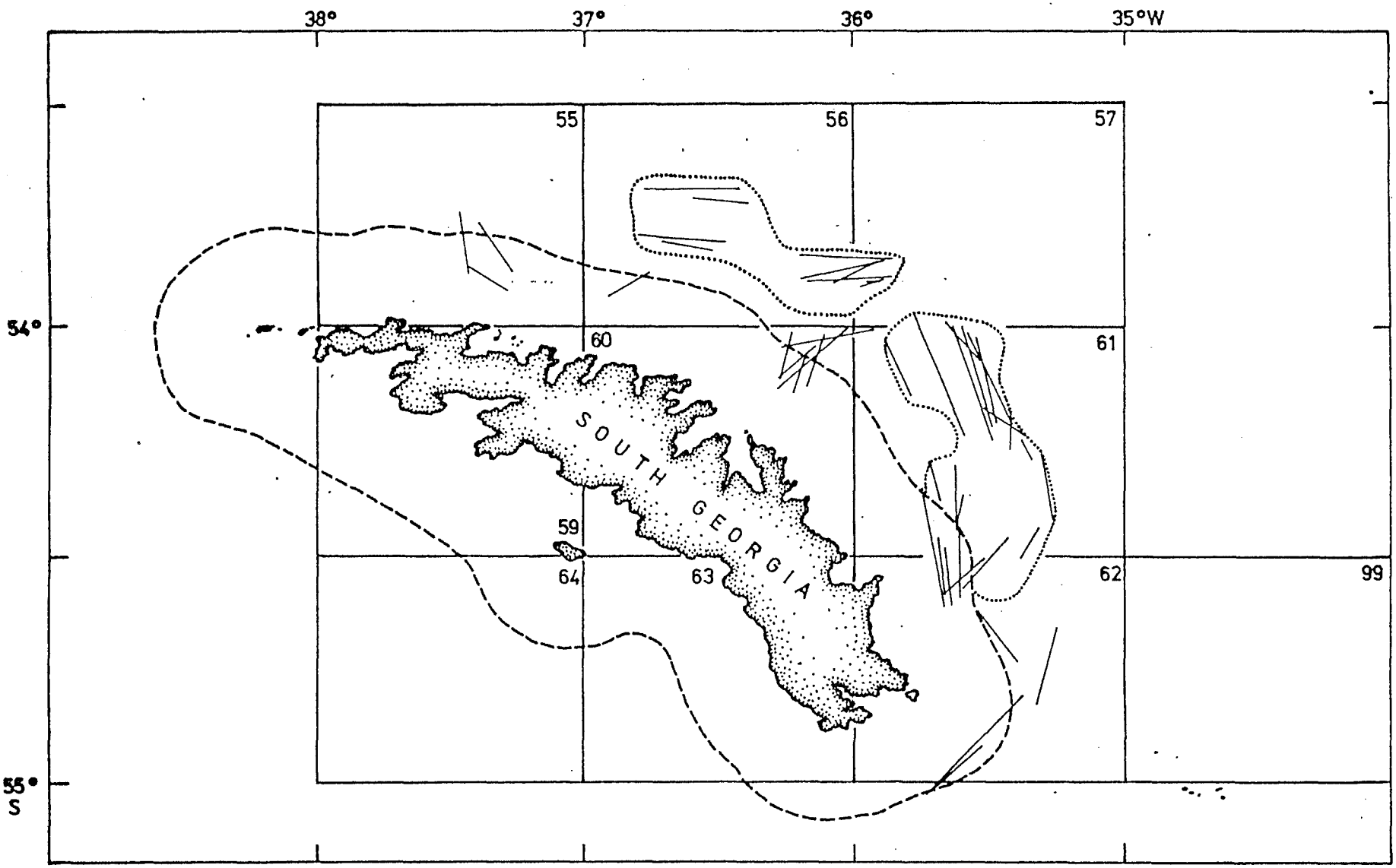


Figure 1 Area of sampling and fishing operations of MT Carina : location of sampling and search tows, boundaries of fishing grounds (dotted line) and 12 Nm zone (dashed line). Numbers 55-64 and 99 are subdivisions by Everson (1984)

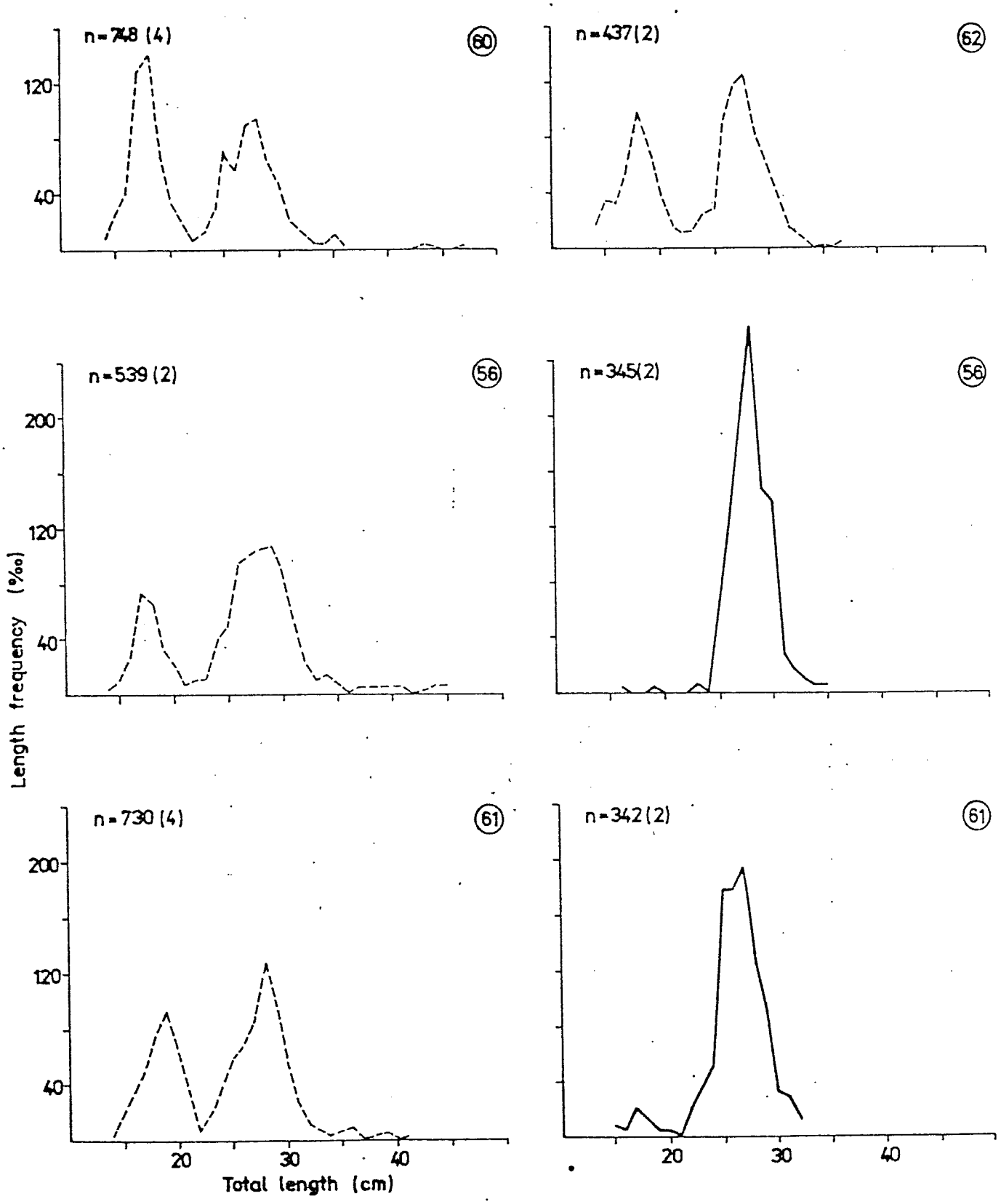


Figure 2 Length frequency distribution of Champsocephalus gunnari (South Georgia, December-January 1985/86). Solid line distributions refer to 60 mm mesh size, dashed line is 47 mm mesh size; "n" is number of fish measured; number of samples is given in brackets; encircled numbers are subdivisions by Everson (1984)

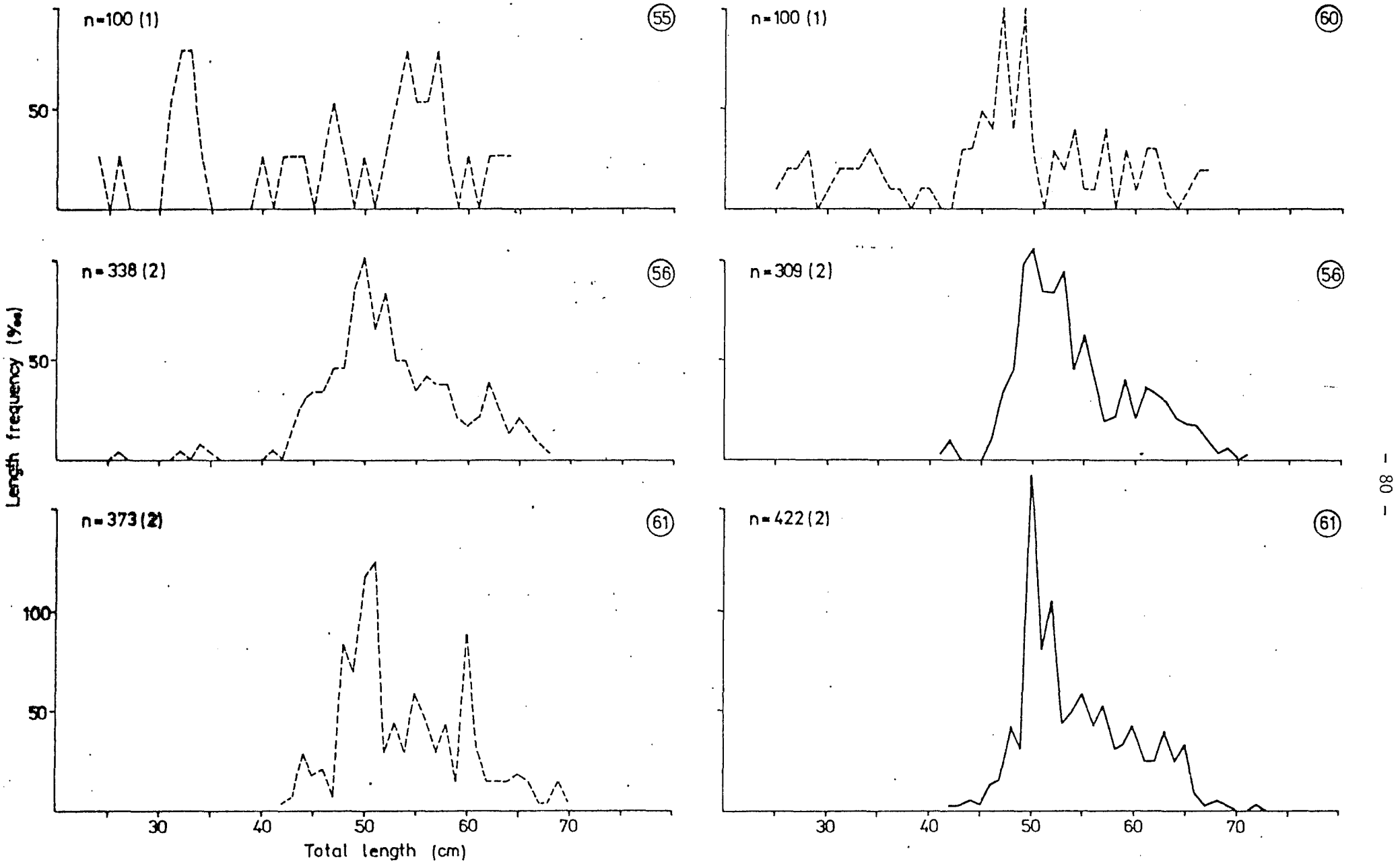


Figure 3 Length frequency distribution of Chaenocephalus aceratus (South Georgia, December-January 1985/86)

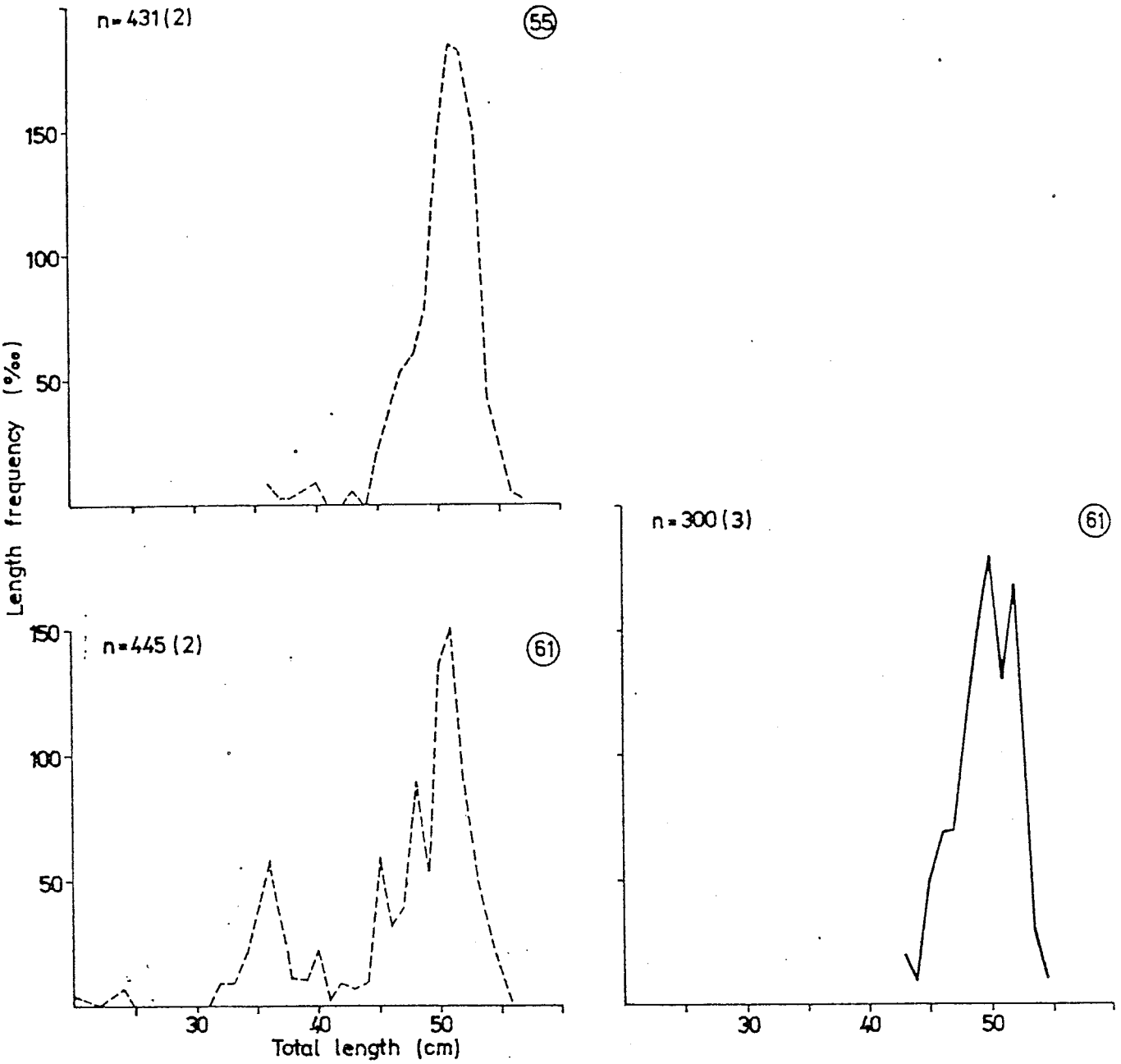


Figure 4 Length frequency distribution of Pseudochaenichthys georgianus (South Georgia, December-January 1985/86)

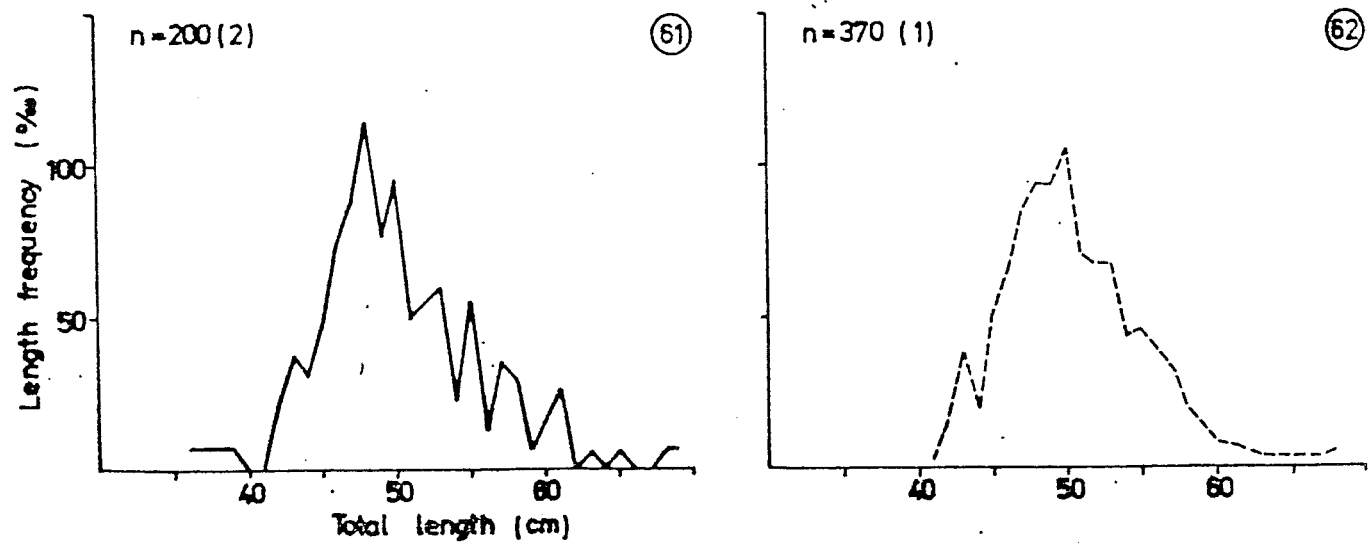
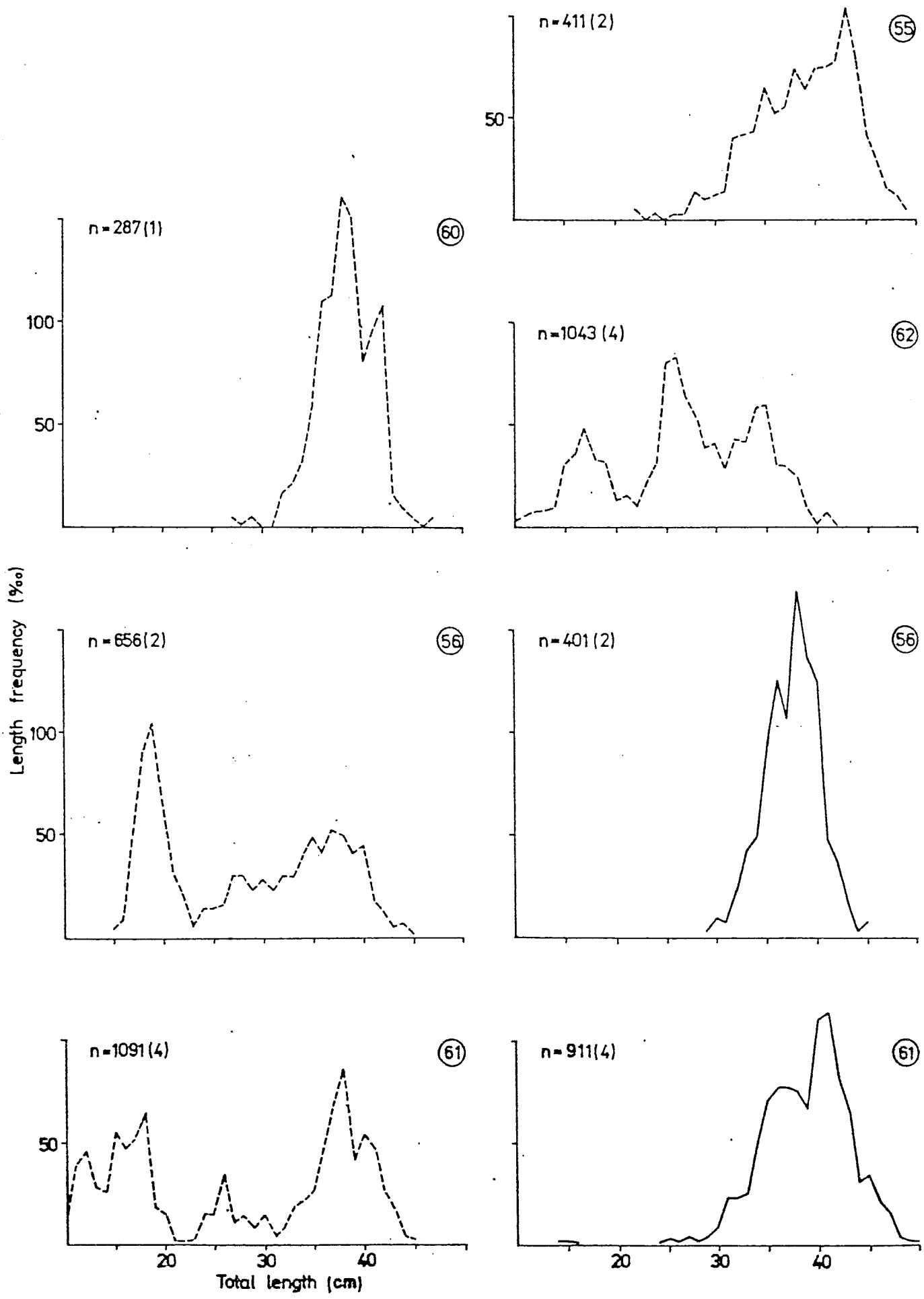


Figure 5 Length frequency distribution of Notothenia rossii marmorata (South Georgia, December-January 1985/86)



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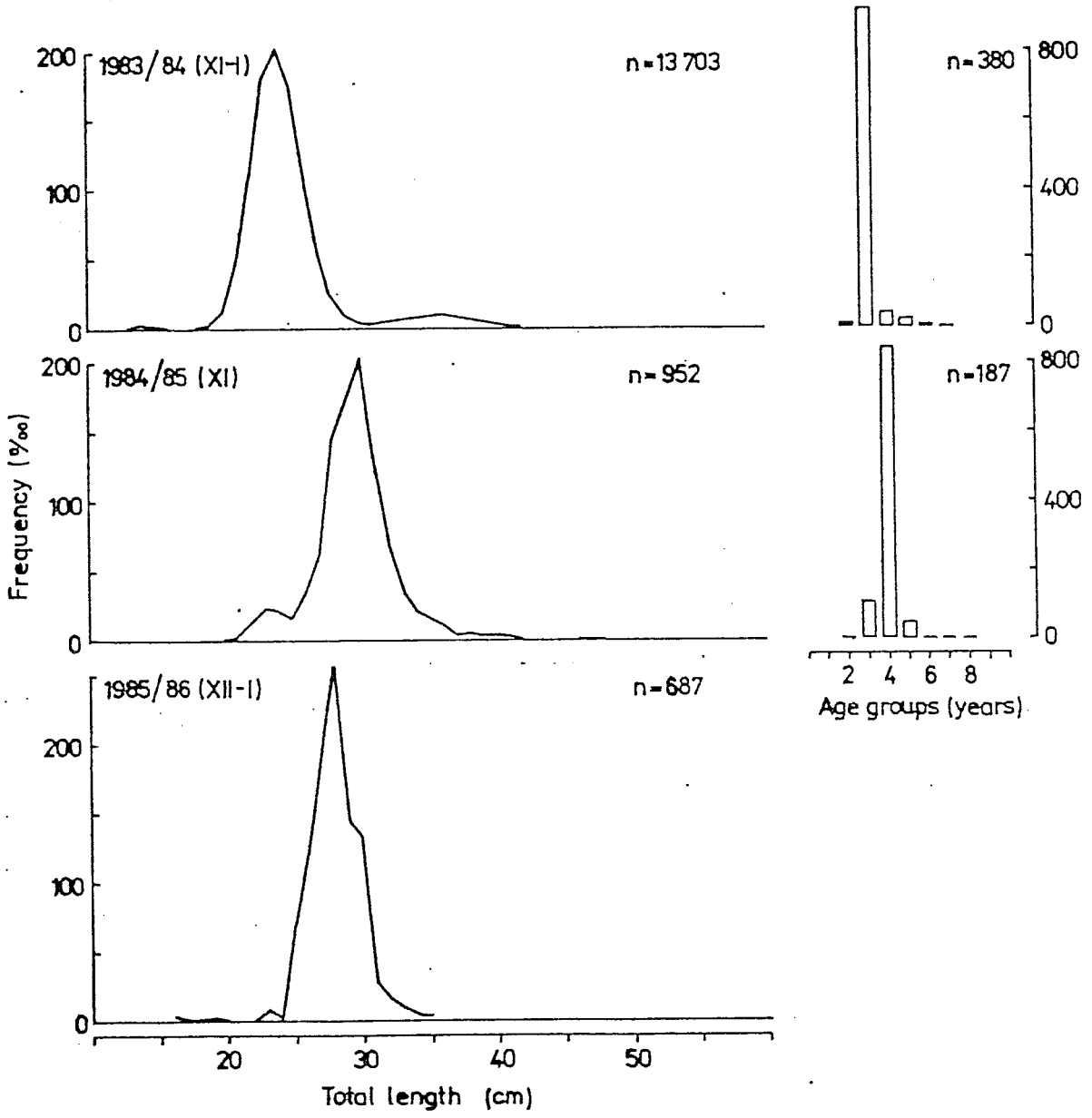

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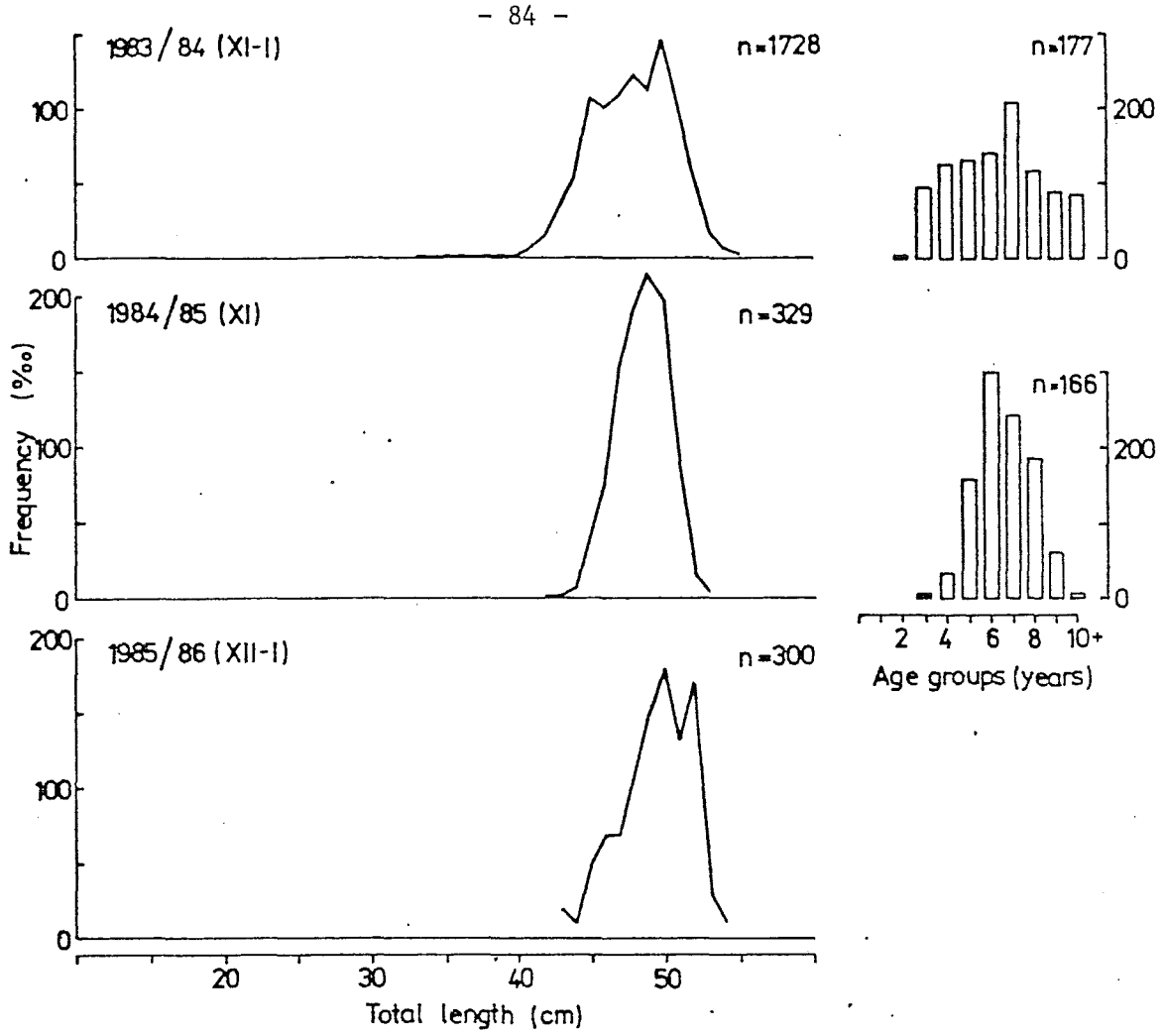

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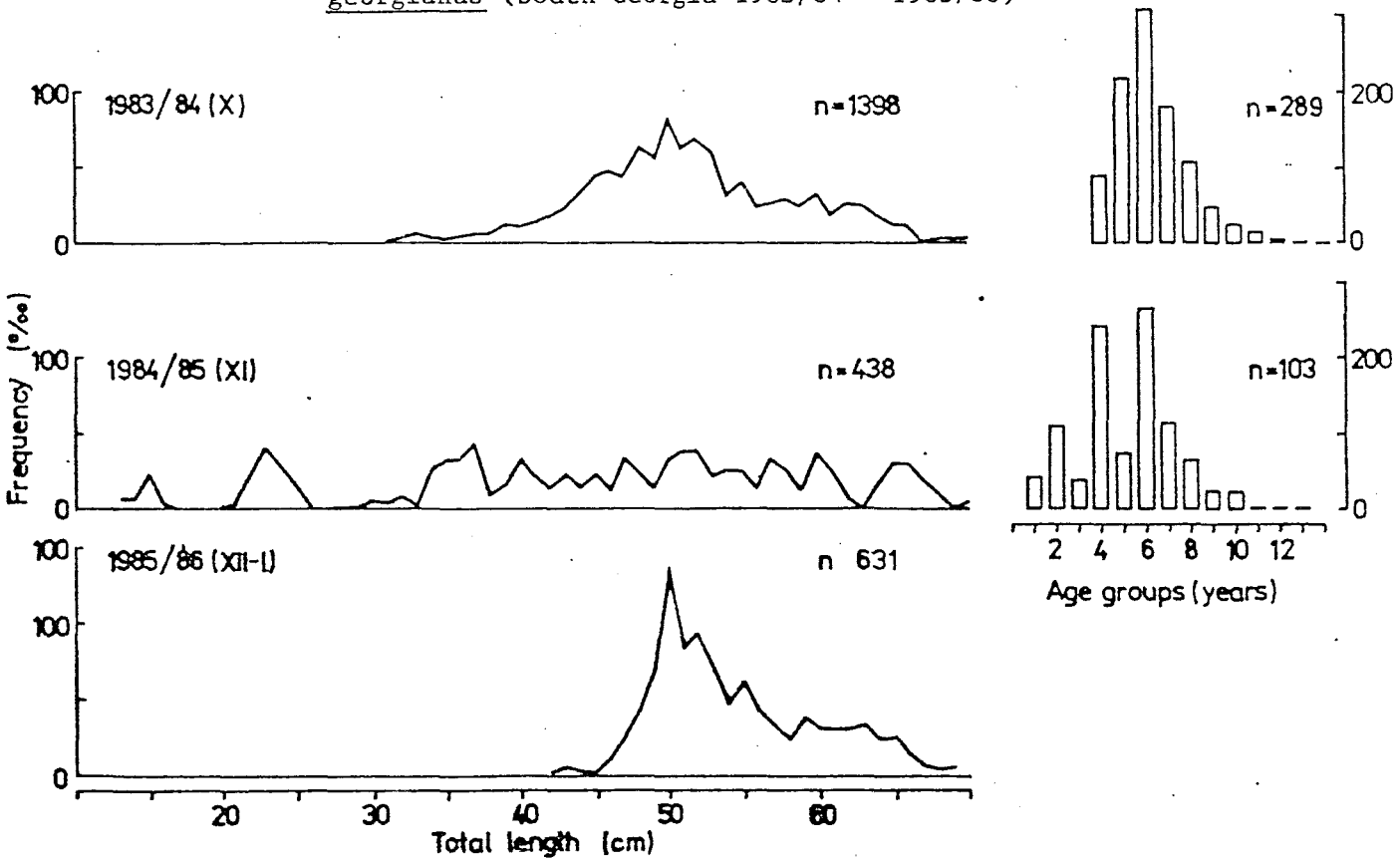

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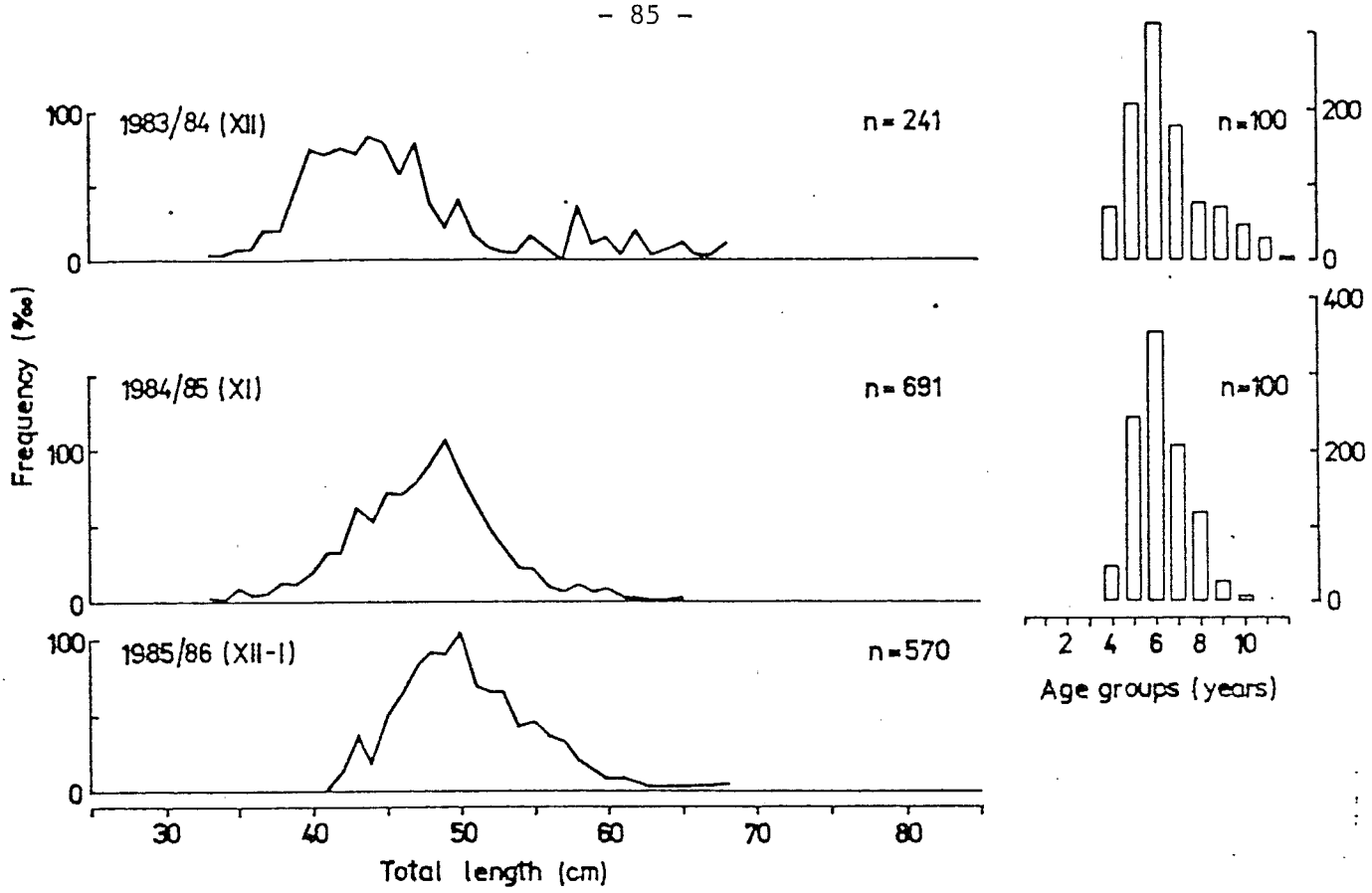

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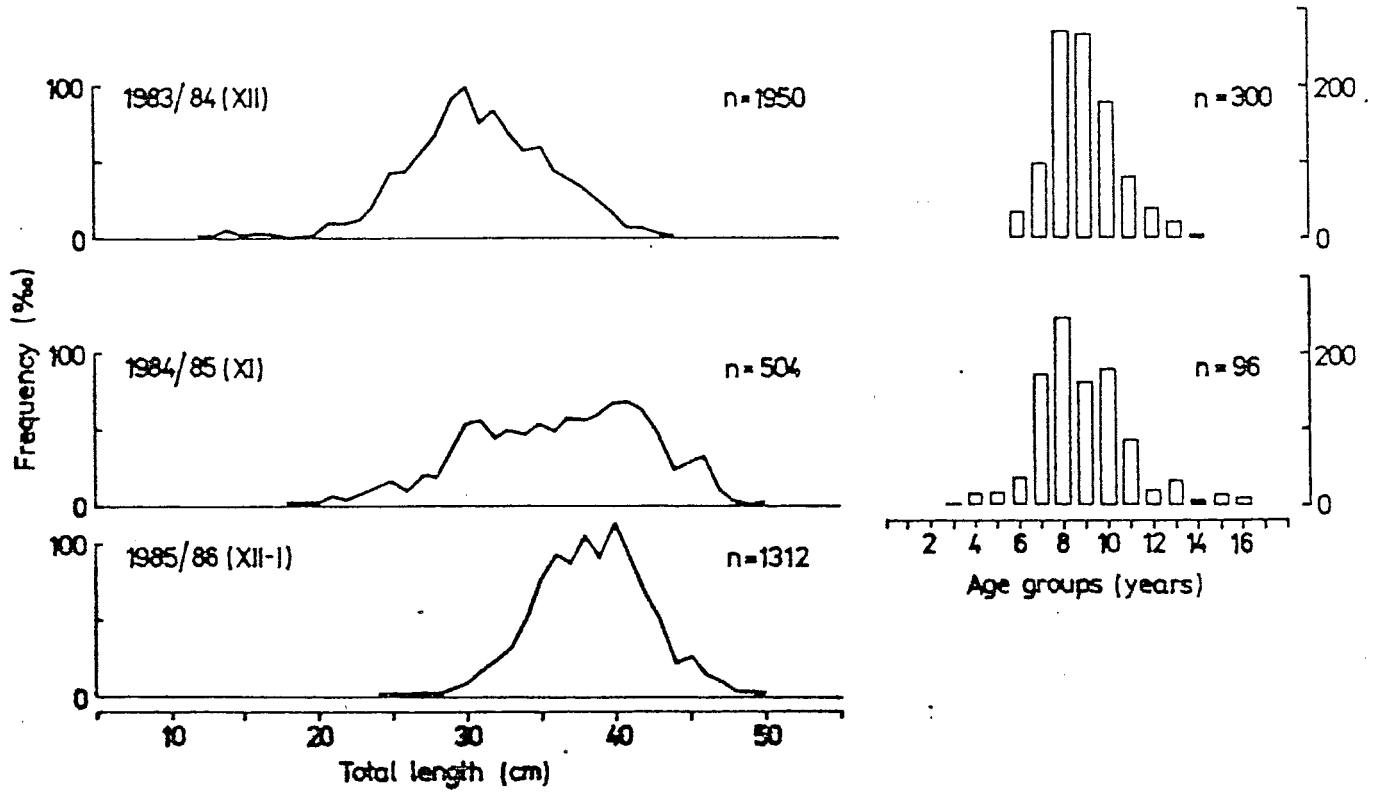

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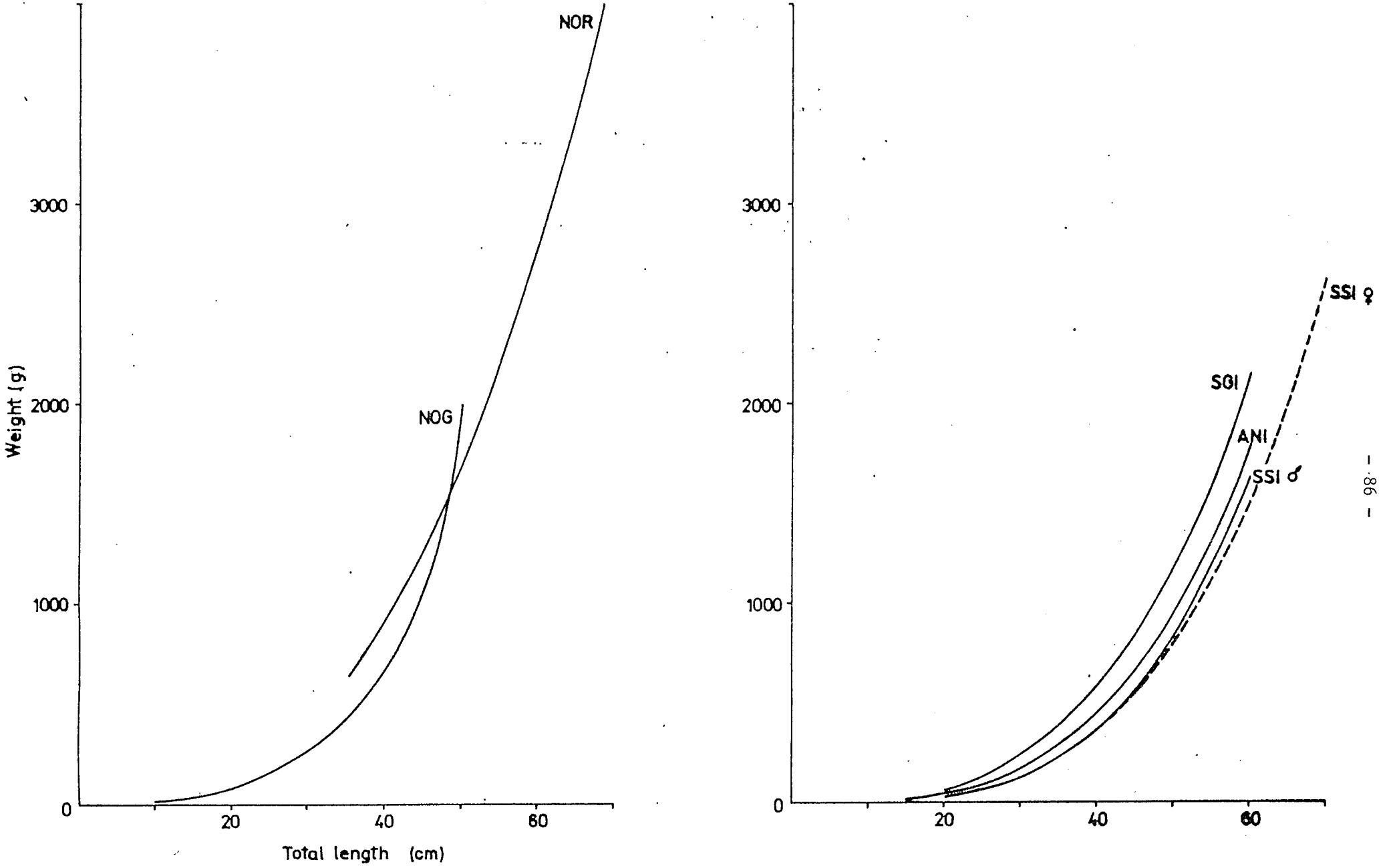

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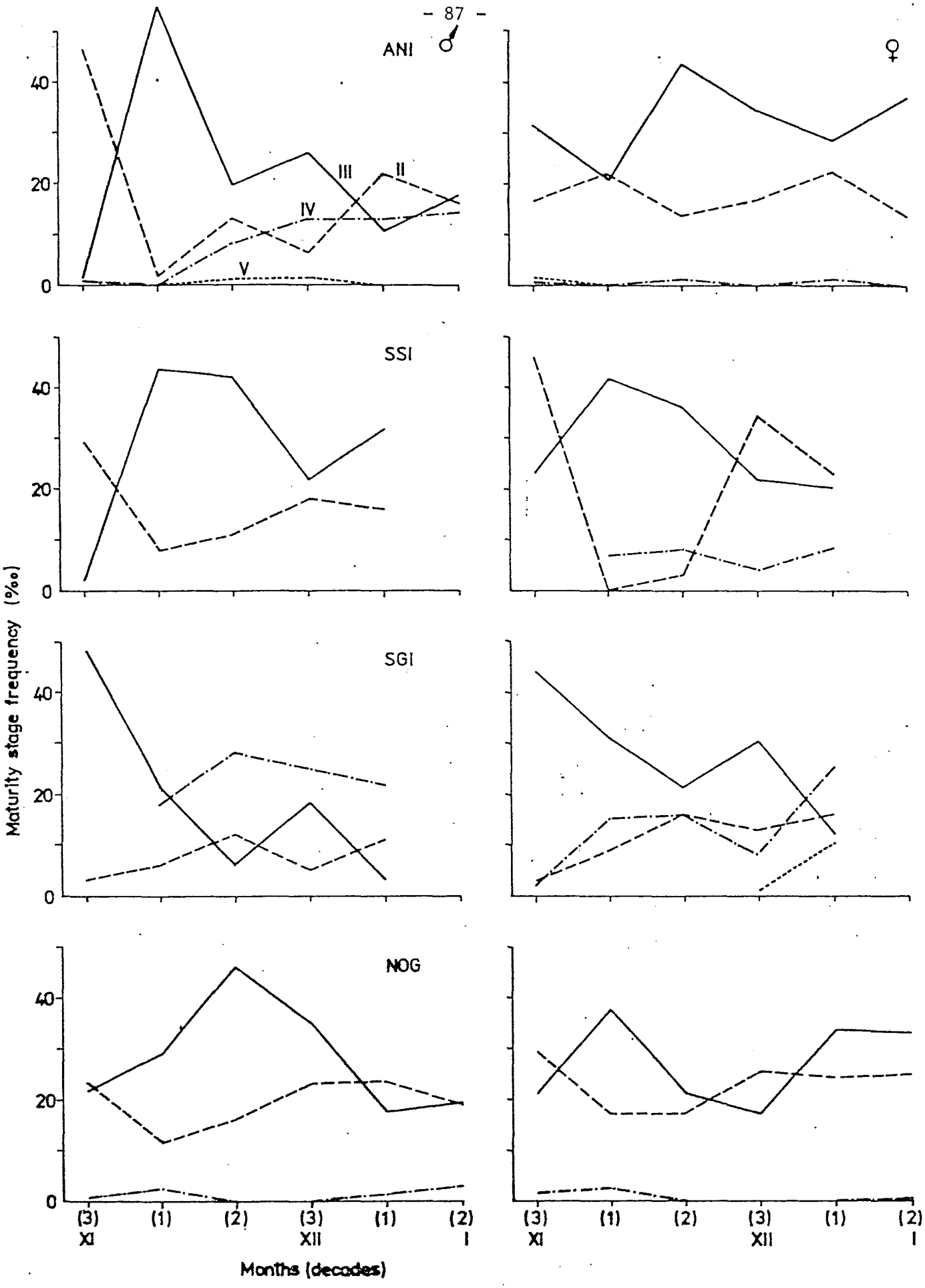

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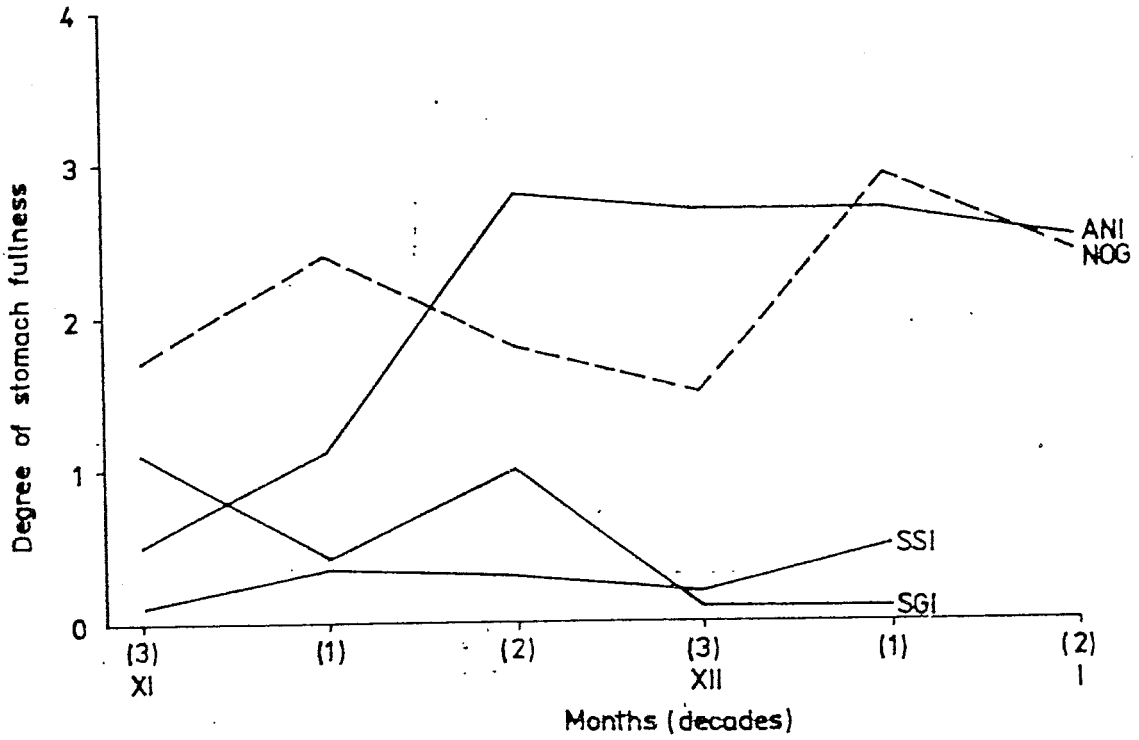

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