EVALUATION OF THE RESULTS OF TRAWL SELECTIVITY EXPERIMENTS BY POLAND, SPAIN AND USSR IN 1978/79, 1981/82 AND 1986/87

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Abstract

Trawl selectivity for several species of Antarctic fish was evaluated taking into account additional data obtained by Poland, Spain and USSR during selectivity experiments in Statistical Area 48 in 1978/79, 1981/82 and 1986/87 seasons. These data comprise different characteristics of experimental codends, length frequency distribution of stocks sampled, catch rates and catch composition. Details of these data were analyzed and minimum mesh sizes for several species were calculated. It is recommended that introduction of these mesh sizes should be considered for commercial fishery in Statistical Area 48.

Résumé

La sélectivité des chaluts pour plusieurs espèces de poissons de l'Antarctique a été évaluée, compte tenu des données complémentaires obtenues par la Pologne, l'Espagne et l'URSS au cours des expériences de sélectivité dans la zone statistique 48 pendant les saisons 1978/79, 1981/82 et 1986/87. Ces données comprennent les différentes caractéristiques de culs de chalut expérimentaux, la distribution de fréquences de longueurs des stocks échantillonnés, les taux de capture et la composition des captures. Les détails de ces données ont été analysés et les tailles minimales du maillage ont été calculées pour plusieurs espèces. Il est recommandé que l'introduction de ces tailles du maillage soit considérée pour la pêcherie commerciale dans la zone statistique 48.

Резюме

Селективность трала для нескольких видов антарктических рыб была оценена с учетом дополнительных данных, полученных в ходе экспериментов по селективности в Статистическом районе 48, проводившихся Польшей, Испанией и СССР в течение сезонов 1978/79, 1981/82 и 1986/87 гг. Эти данные включают различные характеристики экспериментальных кутков, частотное распределение длины в запасах, где брались пробы, интенсивность промысла и состав уловов. Был произведен подробный анализ этих данных, и для некоторых видов были вычислены минимальные размеры ячеи. Рекомендуется рассмотреть вопрос о введении этих размеров ячеи для коммерческого промысла в Статистическом районе 48.

Resumen

Selectividad de arrastre para varias especies de peces Antárticos fue evaluada tomando en consideración los datos adicionales obtenidos por Polonia, España y la URSS durante los experimentos de selectividad realizados en el Area Estadística 48 en las temporadas 1978/79, 1981/82 y 1986/87. Esta información comprende diferentes características de los copos de malla experimentales, distribución talla-frecuencia de las poblaciones muestradas, composición y tasas de capturas. Detalles de estos datos fueron analizados y se calculó la luz mínima de malla para varias especies. Se recomienda que la implementación de estas luces de malla deben ser consideradas para la pesca comercial en el Area Estadística 48.

1. INTRODUCTION

Available data on the selectivity of various trawl codends on Antarctic fish were evaluated in the light of additional information presented to the CCAMLR Scientific Committee. This included: parameters of the codends and netting used, the length distribution of fish in the stock sampled, catch rates and catch composition. All these factors may influence the selectivity and should, therefore, be taken into consideration, when selection parameters are calculated. They were, however, not analyzed by authors of the background documents submitted to the Scientific Committee of CCAMLR (Balguerias, 1988; Efanov et al., 1989; Zaucha, 1986 and 1988).

2. COMMENTS ON METHODS

Some differences were noted in methods and equipment used in selectivity experiments. Some of them, such as number of panels in the codend (2 or 4), inside or outside position of fine-meshed liner in relation to bottom panel, were considered to have little or no influence on fish selection. Other attributes such as twine size and haul duration (which affects the amount of fish in codend) and length of fish caught has in some cases a significant effect on selectivity parameters.

In the first Polish experiment (1978/79), the single-layer codend of mesh size 124 mm was made of 7 mm twine. In the second experiment (1986/87), the size of twine in the codend was 4.2 mm. The Soviet (1981/82) and the Spanish (1986/87) selectivity experiments were conducted with 3.1 and 3.0 mm twine respectively. The relationship between the twine diameter and selection factors (SF) for *Champsocephalus gunnari* gives the range of likely change of some selectivity parameters when different twine is used in the codends (Figure 1). It should be noted, that the selection curve for 7 mm twine is not well defined and SF point in Figure 1 is only a rough estimate.

The effect of catch rates on fish selection cannot be properly evaluated on the basis of available data. Polish hauls of 2 to 3 hours resulted in some cases in large catches of 2 to 5 tonnes and thus affected the selectivity of the major species caught (*C. gunnari*). The significant decline of SF and the 50% selection length (L_{50}) was observed (Figure 2). Some data points in Figure 2 were estimated from selection ogives which were not well defined, therefore the presented relationship should be taken with care. Thirty minute hauls in the Spanish experiment gave average catches of 290 to 580 kg and resulted in better conditions for fish selectivity. However, some single hauls with high catches did not result in the reduction of selection parameters of fish sampled (Figure 3; see also Table 1.1 of the Appendix). Similarly, no clear relationship was observed between SF and catch per tow for *Notothenia gibberifrons* in the Polish experiment (Figure 4; see also Table 9.2 of the Appendix). In this case the selection was probably influenced by a large by-catch of benthos (sponges).

An accurate evaluation of another factor, the length distribution of fish caught, was also difficult. Analysis of its effect on selectivity was limited to hauls with comparable catch rates. In general, observations of this relationship were not consistent for *C. gunnari* in both Spanish and Polish data sets. This relationship was, however, noted for *N. gibberifrons* in the Polish records, where gradual decrease of L_{50}, ranging from 33.5 to 23.4 cm, may clearly be related to an increasing amount of small specimens of this species (Figures 5 and 6; see also Table 9.2 of the Appendix).

3. EVALUATION OF THE RESULTS FOR SOME SELECTED, COMMERCIALLY EXPLOITED SPECIES

3.1 Champsocephalus gunnari

3.1.1 South Georgia (Subarea 48.3)

Polish, Spanish and Soviet mesh selectivity experiments in 1981/82 and 1986/87 were carried out in comparable conditions. Fish length distributions and catch rates were similar, an amount of C. gunnari in catches from 42 to 100%. The length distribution of that species in the South Georgia area in 1978/79 during the first Polish trawl selectivity studies was also close to that observed in 1986/87.

Information about CPUE and catch composition from the first Polish experiment is not available. Hauls of three hours or more in the second experiment resulted in the mean total catch of 2.9 tonnes and catch rate for C. gunnari of 0.52 tonnes per hour fished (tonnes/hf). Haul-by-haul information from the Soviet experiment is not available. Tows of 30 to 60 minutes yielded total catches of 0.6 to 1.0 tonnes. Mean catch rate for C. gunnari was 0.75 tonnes/hf. In the Spanish experiment 30 minute hauls produced total catches of about 0.3 to 0.6 tonnes on the average. However, several hauls over 1.5 tonnes per tow were also noted (Table 1.1 of the Appendix). Mean catch rates for C. gunnari were 0.45 and 0.49 tonnes/hf, similar to those in the Polish experiment.

The catch rates during selectivity experiments resemble those of the commercial fishery. The mean CPUE range observed from 1984 to 1988 for C. gunnari was 0.1 to 0.5 tonnes per hour in a mixed fishery and 1.0 to 1.5 tonnes per hour in the fishery targetted at this species. A less than expected increase was observed in L_{50} as a result of enlarging the mesh size from 68 through 88 to 124 mm. The 50% selection length for 88 mm mesh in the Polish experiment was decreased due to a large quantity of fish and benthos in the codend. The 50% selection length for codends having 124 mm and 125 mm meshes and the chafer having 220 mm meshes was estimated from the selection ogives. In the first case, a low L_{50} resulted from using 7 mm polyamide twine which was approximately twice the thickness of that used in the 68 and 88 mm netting. The number of fish sampled from the 125 mm mesh codend was small, so the selection ogives give two values of the 50% selection lengths, 21 and 29 cm. The low L_{50} values for this codend resulted most probably from the 220 mm mesh chafer used to protect the 3.5 mm codend netting.

3.1.2 South Orkney Islands (Subarea 48.2)

The Spanish study was carried out in favourable conditions for fish selection (low catch rate). This resulted in a relatively high SF of 3.11. Because of the low catch rate, however, the experiment does not represent fishery conditions, where CPUE for C. gunnari was within the range of 0.3 to 0.9 tonnes per hour fished. Also, the number of fish measured seems to be insufficient: despite the small mesh size, the number of fish retained by a codend is more or less the same as the number of fish in the fine-meshed cover.

Information on CPUE in the Polish experiment is not available, and fish length distribution is different from that in the Spanish studies. Moreover, the Polish codend was protected by the 220 mm mesh chafer. Those differences made interpretation of SF and L_{50} estimates from the Polish selectivity studies difficult.

3.1.3 Elephant Island and South Shetland Islands (Subarea 48.1), Table 3

Fish length distribution in the Elephant Island area did not show any significant changes throughout the whole period of selectivity experiments. Selection factors were relatively high (mean SF=3.05) for all meshes tested. The 50% selection length increased gradually as mesh-size increased.

The low estimate of selectivity parameters for the South Shetland Islands area are most probably related to the availability of juvenile fish in the area.

Selectivity parameters obtained in Subarea 48.1 are, however, not representative of commercial fishing, especially for *C. gunnari*. Catch rates in the Spanish experiment were lower than observed in the commercial mixed fishery (0.1 to 2.0 tonnes/hf) in the area, in 1979 to 1983. Total CPUE in the Polish experiment more closely resembled the CPUE in the mixed fishery, but the percentage of *C. gunnari* was very small (2.5 to 6.5%). Corresponding catch rates for this species were 6 and 24 kg/hf, therefore, they cannot represent selectivity conditions of the commercial fishery.

3.2 *Chaenocephalus aceratus*, Tables 4, 5 and 6

The 50% selection length did not increase significantly over the range of mesh sizes from 68 to 125 mm. Selection factors differed considerably (1.4 to 2.63) and were generally low. All values of L_{50} were much lower than the length at 50% maturity for the South Georgia area of 46 cm for males and 47.4 cm for females (Kock, 1981). The morphology of this species, especially its large and spiny head, as well as its behaviour (stretching opercles in case of danger) seem to be mainly responsible for absence of any meaningful trend in selection characteristics.

3.3 *Pseudochaenichthys georgianus*, Tables 7 and 8

Selectivity data available for this species are insufficient to justify any mesh regulation. It is obvious from the Spanish data (Tables 7 and 8) that 68 mm mesh is far too small. Also 88 mm mesh seems not to be adequate to ensure protection of undersized fish (Zaucha, 1988). As in the case of *C. aceratus*, the morphology and behaviour of this fish seems to be responsible for the low selectivity parameters in both experiments.

3.4 *Notothenia gibberifrons*, Tables 9, 10 and 11

Fish length distribution was different in 1978/79 and 1986/87, and also in the five areas studied. Selection factors varied from 2.02 to 3.04 (mean SF=2.62) for various meshes and codends tested, so it was not possible to reach a clear conclusion about selection of this species. One conclusion emerges, however, from information shown in Tables 9, 10 and 11. All values of L_{50} for South Georgia are well below the length at 50% maturity of 31.7 cm (Boronin and Altman, 1979) or 34 cm (Hoffman, 1982). L_{50} values calculated for South Orkney Islands, Elephant Island and South Shetland Islands were 28.8 cm, 30.0 cm and 30.9 cm respectively (Balguerias et al. 1987). Only in one haul taken in the South Shetland area with a mesh of 110 mm (Table 11, data set (1)), the L_{50} of 31.2 cm was above the length at maturity. However, for the same mesh size in the Elephant Island area (Table 11, data set (3)), when the mean CPUE increased from 241 kg to 993 kg/hf, the L_{50} decreased to 23.6 cm. L_{50} values of 30 cm for mesh size 124 mm (Table 9) and of 29.4 cm for mesh 110 mm (Table 11) are difficult to interpret (rough estimate in the first case and a very low CPUE in the second).

Catch rates for this species in the experiments are more or less the same as those reported in the mixed commercial fishing in the Scotia Sea area from 1979 to 1983 (average CPUE of 0.01 to 0.4 tonnes/hf). It is, therefore, likely that selectivity on the exploited fishing grounds is similar.

3.5 *Patagonotothen brevicauda guntheri*, Table 12

The fish length distribution and catch rates of the Spanish selectivity experiment were similar to those reported for the commercial fishery in this area. The bulk of the Soviet catches consisted of 14 to 17 cm long fish (Shust and Borodin, 1988). Reported CPUE for the 1984 to 1987 seasons were 0.3, 0.4 and 1.6 tonnes/hf (bottom trawl) and 2.1 tonnes/hf (midwater trawl). The average amount of fish in the codend during selectivity experiments was about 580 kg. For this reason the selection factor obtained may be taken as applicable for commercial fishing by bottom trawls. This estimatation is, however, preliminary and further selectivity studies with the mesh size and codends currently in commercial use, should be undertaken. High catch rates by midwater trawls is likely to result in substantially lower selectivity.

4. SUMMARY AND CONCLUSIONS

4.1 *Champsocephalus gunnari*

The selection factor (SF) of 2.95, obtained in the South Georgia area for mesh sizes of 68 and 88 mm, seems applicable for calculations of mesh size in the commercial trawl fishery for *C. gunnari*.

When referred to a nominal mesh of 80 mm, adopted by CCAMLR in 1984 as the minimum mesh size for *C. gunnari*, this value of SF gives L_{50} of 23.6 cm. This length is only slightly above the mean length at 50% maturity for the South Georgia area of 23.1 cm (Kock, Duhamel and Hureau, 1985), and well below the length of first spawning of 27 cm (Kock, 1989). The application of SF=2.95 corresponds in this case to the minimum mesh size of 92 mm. A mesh size of 108 mm would in turn correspond to the age at first capture of 4 years (i.e. around 32 cm), which was proposed as the optimum under conditions of high fishing mortality (Anonymous, 1988).

By using the mean SF from the South Georgia area in calculation of minimum mesh sizes for *C. gunnari* for the South Orkney and South Shetland areas, and applying the length at first spawning of 35 cm (Kock, 1989), the minimum mesh size of 119 mm was obtained.

4.2 *Notothenia gibberifrons*

By assuming the mean SF of 2.62 for *N. gibberifrons* for the entire Statistical Area 48, and using mean lengths at 50% maturity for this species in South Georgia (32.9 cm) as well as South Orkney, Elephant and South Shetland Is (29.9 cm), we obtain mesh sizes of 126 and 114 mm respectively. It should be recalled, however, that SFs for *N. gibberifrons* vary considerably between the areas studied and there is no clear relationship between mesh size increase and L_{50}. For these reasons the above mesh sizes should to be taken as provisional.

4.3 *Patagonotothen brevicauda guntheri*

SF of 3.21 when referred to 16 cm, which is the 50% length at maturity of *P.b. guntheri* (Balguerias and Quintero, 1989; Shlibanov, 1989), gives minimum mesh of 50 mm for this species.

4.4 *Chaenocephalus aceratus* and *Pseudochaenichthys georgianus*

Selection parameters for *C. aceratus* differ considerably for various meshes and codends tested. In general, they are rough estimates resultant from insufficiently defined selectivity ogives. Selectivity data available for *P. georgianus* are inadequate for designation of a minimum mesh size.

4.5 Mesh Regulation

Assuming that the actual size of twine mesh in commercially used codends is on the average 10% greater than the nominal mesh size (Zaucha, 1988), the introduction of the following mesh sizes in the commercial fishery in the Statistical Area 48 should be considered:

(a) Subarea 48.3

   (i) Fishery targeted at *C. gunnari*
   80 mm, to protect immature fish, or
   90 mm, to protect first spawners, or
   100 mm, to give an age at first capture of 4 years;

   (ii) Fishery target at *P. guntheri*
   50 mm, to protect immature fish;

   (iii) Mixed fishery (not targeted at *C. gunnari* or *P.b. guntheri*)
   120 mm, to include *N. gibberifrons, C. aceratus* and *P. georgianus* in addition to *N. rossii* and *D. eleginoides*, which have been covered by this mesh regulation since 1984 - Conservation Measure 2/III), to ensure better protection of immature fish;

(a) Subareas 48.1 and 48.2

   110 mm, to ensure protection of first spawners of *C. gunnari* and immature *N. gibberifrons*.

In addition to the above, the provision that topside chafers will not be used and codends will be made not thicker than 4.5 mm should also be included.

4.6 Further Selectivity Experiments

Further research on mesh selectivity is recommended in order to improve the applicability of available selection factors. It is important that such studies reflect selectivity in the commercial fishery and therfore be undertaken using commercial fishing gear and techniques independently from biomass surveys.

It is worthy to note that the mean SF of 3.5 for *C. gunnari* and *N. gibberifrons*, obtained in the first Polish experiment using tape netting of 60 and 100 mm mesh, is considerably higher than that for twine netting currently in use in commercial trawls. One

of the properties of the tape netting is constant rectangular shape of meshes (Zaucha, 1986). Satisfactory parameters of fish selection, obtained for this kind of net, should encourage further experiments with the 'open mesh' netting.

There is no information available to evaluate whether or not the mortality of fish passed through nets is a significant problem for Antarctic fish. It is recommended that such studies be undertaken in future selectivity experiments.

REFERENCES

BALGUERIAS, E. 1988. Selectivity parameters for *Notothenia gibberifrons* Lönnberg, 1905 and *Champsocephalus gunnari* Lönnberg, 1905 obtained during "Antartida 8611" expedition. SC-CAMLR-VII/BG/43.

BALGUERIAS, E. and M.E. QUINTERO. 1987. Informe de resultados Antartida 8611. Pescas cientificas, Instituto Español de Oceanografia. p. 63.

BALGUERIAS, E. and M.E. QUINTERO. 1989. Algunos datos sobre la distribución, abundancia y biologia de *Patagonotothen brevicauda guntheri* (Norman, 1937) en Shag Rocks. SC-CAMLR-VIII/BG/27.

BORONIN, A.V. and Y. ALTMAN. 1979. Growth and natural mortality of green notothenia. *Trudy, Atlant. Nanchno-issled. Ryb. Khoz. Okeanogr. 81:* 66-71. (In Russian).

CCAMLR. 1988. Report of the Working Group on Fish Stock Assessment. *SC-CAMLR-VII, Annex 5.*

EFANOV, S.F., G.E. BIDENKO and V.A. BORONIN. 1989. Selectivity of trawls with reference to icefish (*Champsocephalus gunnari* L.). WG-FSA-89/14.

HOFFMAN, U. 1982. *Zur Alterbestimmuug und zum Wachstum von Notothenia gibberifrons Lönnberg bei South Georgia. Fisch - Forsch., 20* (2): 49-53.

KOCK, K.-H. 1981. Fischereibiologishe Uutersuchungen an drei antarktischen Fischarten: *Champsocephalus gunnari* Lönnberg, 1905, *Chaenocephalus aceratus* (Lönnberg, 1906) and *Pseudochaenichthys georgianus* Norman, 1937. (*Notothenioidei, Channichthyidae*). *Mitt. Just. Seefisch. 32:*1-226.

KOCK, K.-H. 1989. Reproduction in the Mackerel Icefish *Champsocephalus gunnari* and its implications for Fisheries Management in the Atlantic Sector of the Southern Ocean. SC-CAMLR-VIII/BG/16.

KOCK, K.-H., G. DUHAMEL and J.-C. HUREAU. 1985. Biology and status of exploited Antarctic fish stocks: a review. *Biomass Scientific Series No. 6.*

SHLIBANOV, V.I. 1989. 1989/90 Stock Status and TAC Assessment for *Patagonotothen guntheri* in South Georgia Subarea (48.3). WG-FSA-89/21.

SHUST, K. and R. BORODIN. 1988. *Notothenia (p.) guntheri* Stock Staus and TAC Estimation in the Area of Shag Rocks (Subarea 48.3). WG-FSA-88/33.

ZAUCHA, J. 1986. Preliminary appraisal of Antarctic fish selection by the 32/36 bottom trawl combined with various codends. SC-CAMLR-V/BG/29.

ZAUCHA, J. 1988. Selectivity of standard Polish commercial trawl codends on Antarctic fishing grounds. SC-CAMLR-VII/BG/11.

Table 1: Species: *Champsocephalus gunnari*
Area: South Georgia and Shag Rocks [R] (Subarea 48.3)
Month/Year: November to December 1986[1], September 1981[2], December 1978 to March 1979[3]

Mesh Size (mm) Measured (Nominal)	Selection Factor	50% Selection Length (cm)	Modal Length		Number of Fish Measured		Mean Total Catch Per Hour (kg)	Mean % of *C. gunnari* in Total Catch	Mean Catch of *C. gunnari* Per Hour (kg)
			cm	Range	Codend	Cover			
68 (70)[1]	2.94	20.0	26	13 - 37	92770	19854	583	76.9	448
67 (70)[1]R	3.48	23.5	26	17 - 41	8055	4551	1162	41.9	487
88 (80)[1]	2.56	23.0	26	11 - 41	56342	29851	970	56.4	547
88 (80)[2]	2.81	24.8	25	12 - 37	5340*		600-1000*	90-100*	750
124 (120)[3]	(1.77)e	(21-23)e	25	18 - 49	2864	2274	na	na	na
125 (120)c[3]	(1.68;2.32)e	(21-29)e	25	18 - 49	430	421	na	na	na

na Data not available
e Estimated value
c Codend with the 220 mm mesh chafer
* Codend and cover combined

Table 2: Species: *Champsocephalus gunnari*
Area: South Orkney (Subarea 48.2)
Month/Year: December 1986[1], December 1978 to March 1979[2]

Mesh Size (mm) Measured (Nominal)	Selection Factor	50% Selection Length (cm)	Modal Length		Number of Fish Measured		Mean Total Catch Per Hour (kg)	Mean % of *C. gunnari* in Total Catch	Mean Catch of *C. gunnari* Per Hour (kg)
			cm	Range	Codend	Cover			
68 (70)[1]	3.11	21.3	22; 33	10 - 51	379	329	87	4.6	4
125 (120)c[2]	(2.56)e	(32)e	38	31 - 47	2272	1905	na	na	na

na Data not available
e Estimated value
c Codend with the 220 mm mesh chafer

Table 3: Species: *Champsocephalus gunnari*
Area: Elephant I. and South Shetland Is (Subarea 48.1)
Month/Year: December 1986 to January 1987[1], January to February 1987[2], November to December 1986[3], November 1986 to February 1987[4]

Mesh Size (mm) Measured (Nominal)	Selection Factor	50% Selection Length (cm)	Modal Length		Number of Fish Measured		Mean Total Catch Per Hour (kg)	Mean % of *C. gunnari* in Total Catch	Mean Catch of *C. gunnari* Per Hour (kg)
			cm	Range	Codend	Cover			
68 (70)[1]	3.11	21.3	22;32	19 - 39	4394	1751	121	38.7	47
68 (70)[2]s	2.89	19.7	14;23	9 - 36	2666	2730	70	12.8	9
88 (80)[3]	3.22	28.0	22;32	15 - 52	2330	1841	241	2.5	6
110 (100)[4]	2.82	31.1	22-23;32-34	15 - 52	604	1035	369	6.5	24

s   S. Shetland Islands

Table 4: Species: *Chaenocephalus aceratus*
Area: South Georgia (Subarea 48.3)
Month/Year: November to December 1986[1], December 1978 to March 1979[2]

Mesh Size (mm) Measured (Nominal)	Selection Factor	50% Selection Length (cm)	Modal Length		Number of Fish Measured		Mean Total Catch Per Hour (kg)	Mean % of *C. aceratus* in Total Catch	Mean Catch of *C. aceratus* Per Hour (kg)
			cm	Range	Codend	Cover			
68 (70)[1]	(2.63)e	(17.9)e	15;25;32	13-67	639	301	615	1.3	8
88 (80)[1]	2.29	20.6	15;25;34;51	13-69	2954	133	966	11.9	115
124 (120)[2]	(1.41)e	(17.5)e	24	12-68	3490	1161	na	na	na
125 (120)c[2]	(1.75)e	(21.0)e	24	12-68	1008	325	na	na	na

na   Data not available
e   Estimated value
c   Codend with the 220 mm mesh chafer used

Table 5: Species: *Chaenocephalus aceratus*
          Area: South Orkney Is (Subarea 48.2)
          Month/Year: December 1986[1], December 1978 to March 1979[2]

Mesh Size (mm) Measured (Nominal)	Selection Factor	50% Selection Length (cm)	Modal Length		Number of Fish Measured		Mean Total Catch Per Hour (kg)	Mean % of *C. aceratus* in Total Catch	Mean Catch of *C. aceratus* Per Hour (kg)
			cm	Range	Codend	Cover			
68 (70)[1]	(2.22)e	(15.2)e	13,20,28,42	11-62	1058	1609	82	14.7	12
125 (120)c[2]	(1.68)e	(21.0)e	57	23-70	164	36	na	na	na

na   Data not available
e   Estimated value
c   Codend with the 220 mm mesh chafer

Table 6: Species: *Chaenocephalus aceratus*
          Area: Elephant I. and South Shetland Is (Subarea 48.1)
          Month/Year: October to November 1986 and February 1987[1], December 1978 to March 1979[2]

Mesh Size (mm) Measured (Nominal)	Selection Factor	50% Selection Length (cm)	Modal Length		Number of Fish Measured		Mean Total Catch Per Hour (kg)	Mean % of *C. aceratus* in Total Catch	Mean Catch of *C. aceratus* Per Hour (kg)
			cm	Range	Codend	Cover			
88 (80)[1]	2.48	21.5	46	12 - 68	1801	44	241	14.2	34
110 (100)[1]	2.09	23.0	46	12 - 68	1691	125	434	14.4	62
124 (120)[2]	(1.61;2.1)e	(20;26)e	na		827	106	na	na	na

na   Data not available
e   Estimated value

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Table 7: Species: *Pseudochaenichthys georgianus*
          Area: South Georgia (Subarea 48.3)
          Month/Year: November to December 1986

Mesh Size (mm) Measured (Nominal)	Selection Factor	50% Selection Length (cm)	Modal Length		Number of Fish Measured		Mean Total Catch Per Hour (kg)	Mean % of *P. georgianus* in Total Catch	Mean Catch of *P. georgianus* Per Hour (kg)
			cm	Range	Codend	Cover			
68 (70)	2.00	13.8	19;34;48	13-56	382	58	583	1.0	6

Table 8: Species: *Pseudochaenichthys georgianus*
          Area: South Orkney (Subarea 48.2)
          Month/Year: December 1986 to January 1987

Mesh Size (mm) Measured (Nominal)	Selection Factor	50% Selection Length (cm)	Modal Length		Number of Fish Measured		Mean Total Catch Per Hour (kg)	Mean % of *P. georgianus* in Total Catch	Mean Catch of *P. georgianus* Per Hour (kg)
			cm	Range	Codend	Cover			
68 (70)	2.25	15.4	14;27;39;50	12-52	14	230	80	1.7	1

Table 9: Species: *Notothenia gibberifrons*
Area: South Georgia (Subarea 48.3)
Month/Year: November to December 1986[1], December 1978 to March 1979[2]

Mesh Size (mm) Measured (Nominal)	Selection Factor	50% Selection Length (cm)	Modal Length cm	Range	Number of Fish Measured Codend	Cover	Mean Total Catch Per Hour (kg)	Mean % of N. gibberifrons in Total Catch	Mean Catch of N. gibberifrons Per Hour (kg)
68 (70)[1]	2.87	19.5	16;38	5 - 49	347	646	556	1.8	10
88 (80)[1]	2.02	18.2	16;40	5 - 51	6814	2198	971	24.1	234
124 (120)[2]	(2.42)e	(30.0)e	25;40	9 - 51	1663	1093	na	na	na
125 (120)c[2]	*	*	25;40	9 - 51	1898	979	na	na	na

na   Data not available
e   Estimated value
c   Codend with the 220 mm mesh chafer used
*   All selection estimates were over 50% level

Table 10: Species: *Notothenia gibberifrons*
Area: South Orkney Is. (Subarea 48.2)
Month/Year: December 1986[1], December 1978 to March 1979[2]

Mesh Size (mm) Measured (Nominal)	Selection Factor	50% Selection Length (cm)	Modal Length cm	Range	Number of Fish Measured Codend	Cover	Mean Total Catch Per Hour (kg)	Mean % of N. gibberifrons in Total Catch	Mean Catch of N. gibberifrons Per Hour (kg)
68 (70)[1]	3.04	20.8	19	9 - 43	6247	4047	81	36.1	29
125 (120)c[2]	*	*	na	na	6562	2288	na	na	na

na   Data not available
c   Codend with the 220 mm mesh chafer used
*   All selection estimates were over 50% level

Table 11: Species: *Notothenia gibberifrons*
          Area: Elephant I., Joinville I. and South Shetland Is (Subarea 48.1)
          Month/Year: October to November 1986[1], December 1986 to March 1987[2], January to February 1987[3], December 1978 to March 1979[4]

Mesh Size (mm) Measured (Nominal)	Selection Factor	50% Selection Length (cm)	Modal Length		Number of Fish Measured		Mean Total Catch Per Hour (kg)	Mean % of *N. gibberifrons* in Total Catch	Mean Catch of *N. gibberifrons* Per Hour (kg)
			cm	Range	Codend	Cover			
68 (70)[2]	2.86	19.6	31	17-46	566	42	121	28.6	35
68 (70)[3]s	2.70	18.4	21;32;38	12-49	329	89	69	20.0	14
88 (80)[1]	2.28	19.8	30	11-46	20701	2826	241	71.8	173
88 (80)[1]s	2.88	25.0	30	11-47	3217	420	750	74.3	557
110 (100)[1]	2.84	31.2	30	11-47	7053	8526	241	71.8	173
110 (100)[3]	2.10	23.6	29	18-48	3090	1328	993	76.9	764
110 (100)[1]j	2.64	29.4	30	11-47	835	761	8	25.8	2
124 (120)[4]s	(1.3;1.6)e	(16;20)e	na		10609	4253	na	na	na

na   Data not available
e   Estimated value
j   Joinville Is
s   S. Shetland Is

Table 12: Species: *Patagonotothen brevicauda guntheri*
          Area: Shag Rocks (Subarea 48.3)
          Month/Year: November 1986

Mesh Size (mm) Measured (Nominal)	Selection Factor	50% Selection Length (cm)	Modal Length		Number of Fish Measured		Mean Total Catch Per Hour (kg)	Mean % of *P.b. guntheri* in Total Catch	Mean Catch of *P.b. guntheri* Per Hour (kg)
			cm	Range	Codend	Cover			
67 (70)	3.27e	21.5e	12	10 - 22	451	634	1163	57	663

na   Data not available
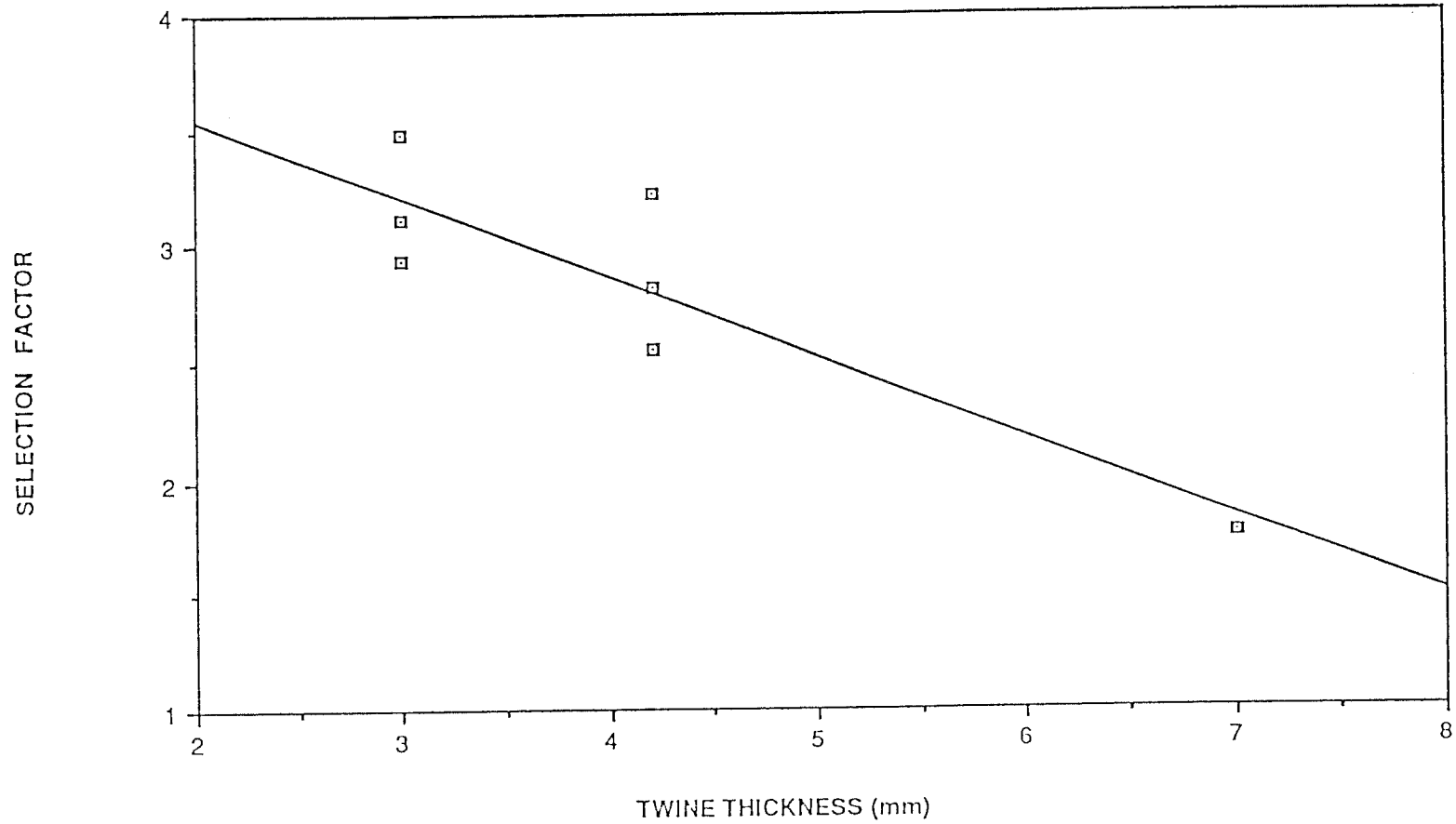e   Estimated value

Champsocephalus gunnari

Figure 1: Relationship between the diameter of twine (mm) codends used in the selectivity experiments and the selection factor for *Champsocephalus gunnari*.
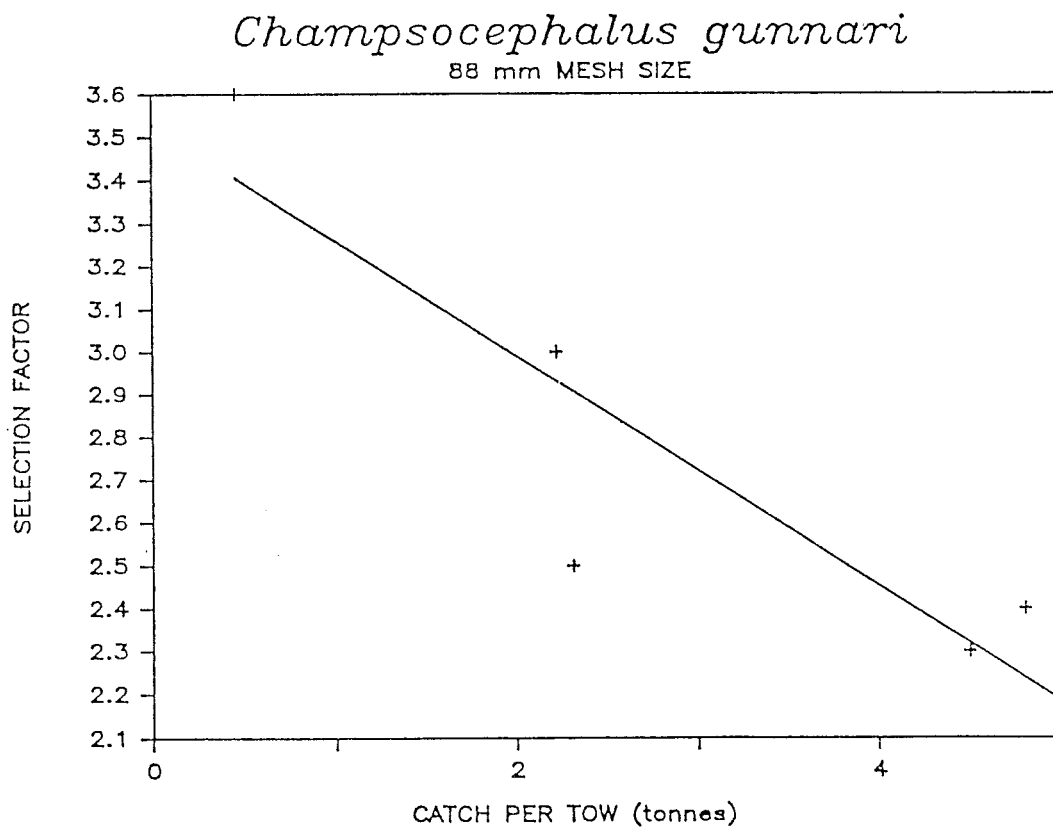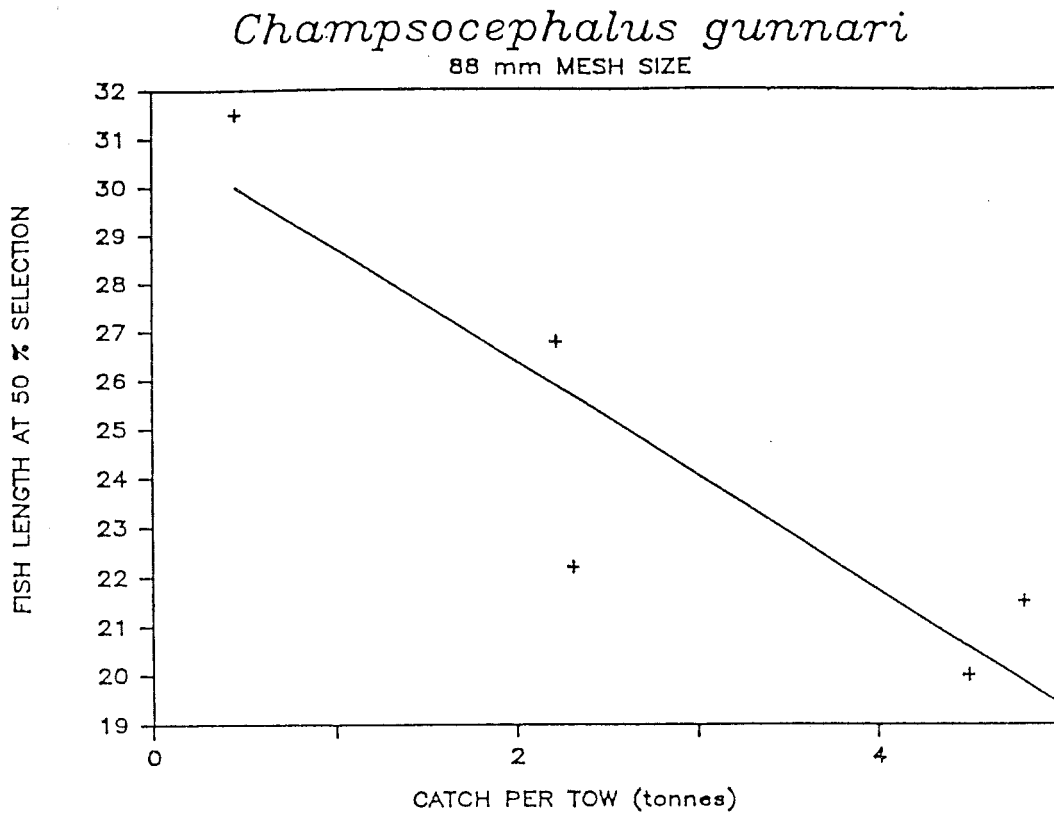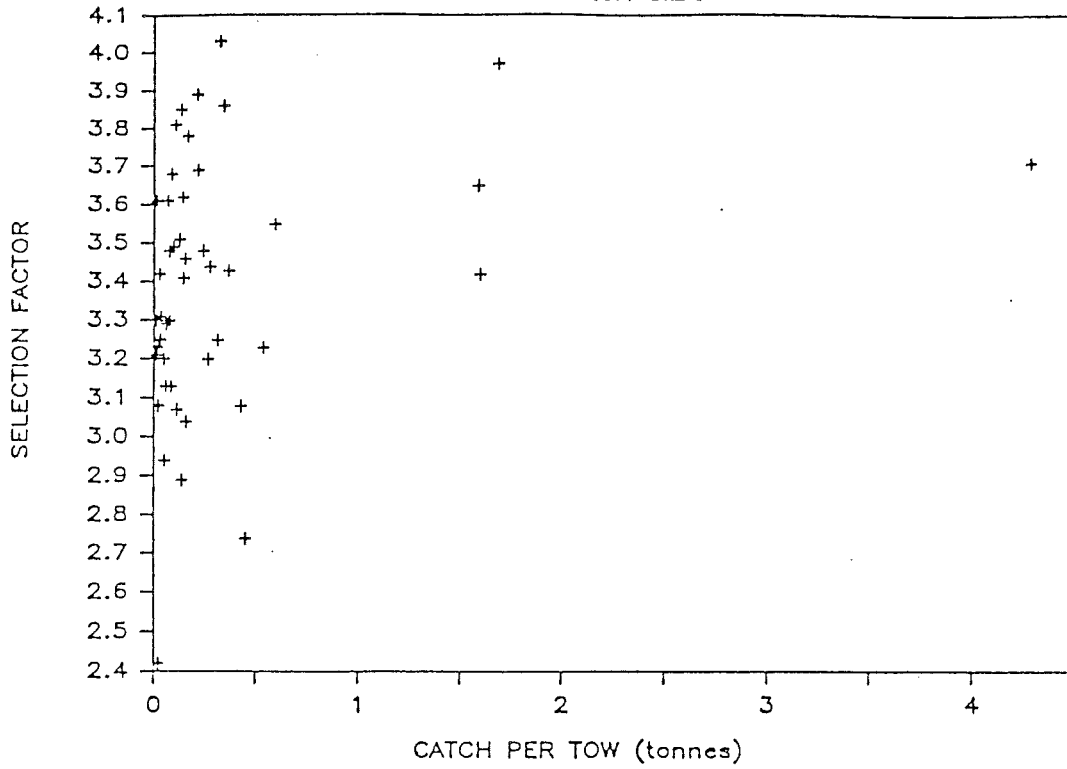
Figure 2: Relationship between the total catch-per-tow and selectivity parameters for *Champsocephalus gunnari* in the Polish experiment.

(a) L_{50};   (b) Selection Factor

Champsocephalus gunnari

68 mm MESH SIZE

CATCH PER TOW (tonnes)

Notothenia gibberifrons

68 mm MESH SIZE
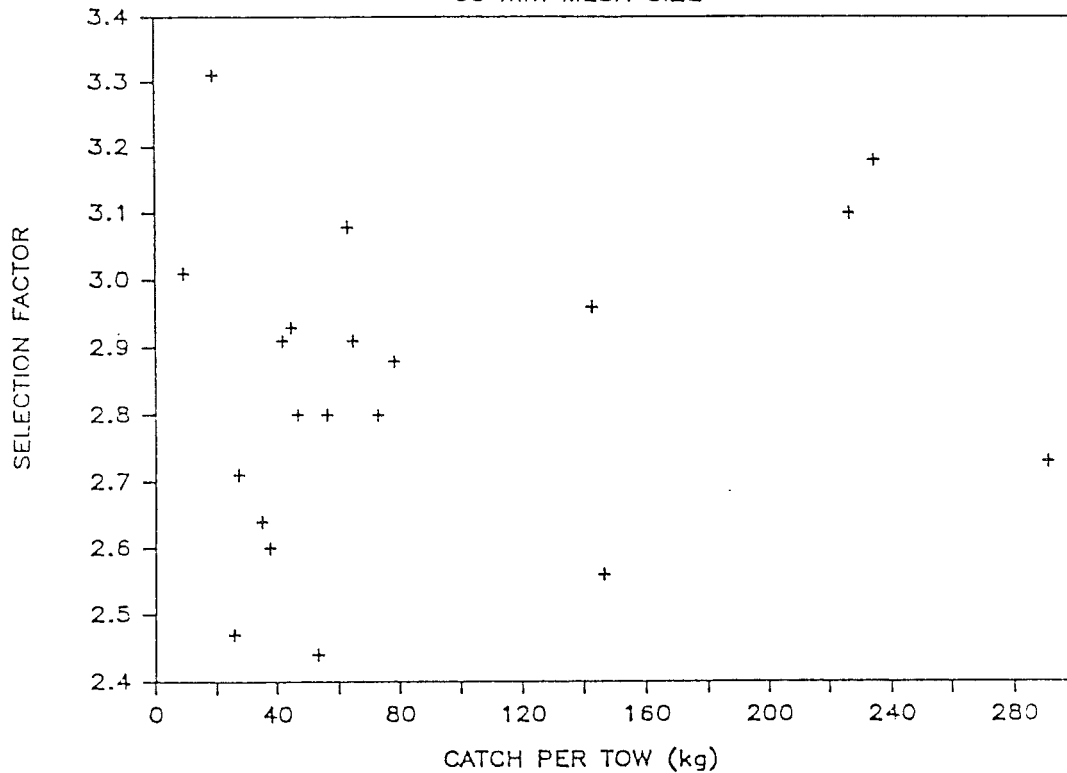
CATCH PER TOW (kg)

Figure 3: Relationship between catch-per-tow and the selection factors for (a) *Champsocephalus gunnari* and (b) *Notothenia gibberifrons* in the Spanish experiment.

Notothenia gibberifrons

110 mm MESH SIZE
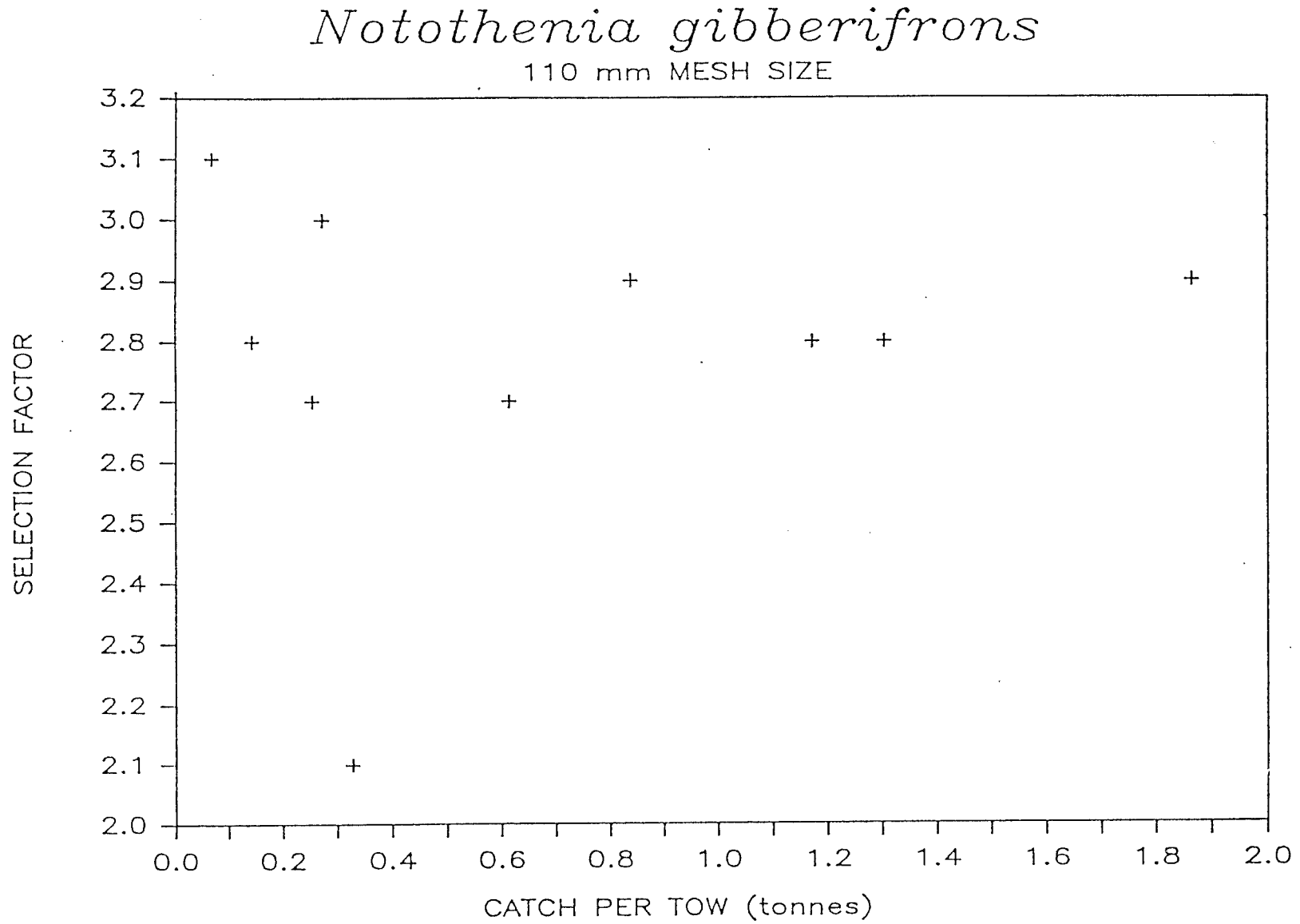
Figure 4: Relationship between catch-per-tow and the selection factors for Notothenia gibberifrons in the Polish experiment.
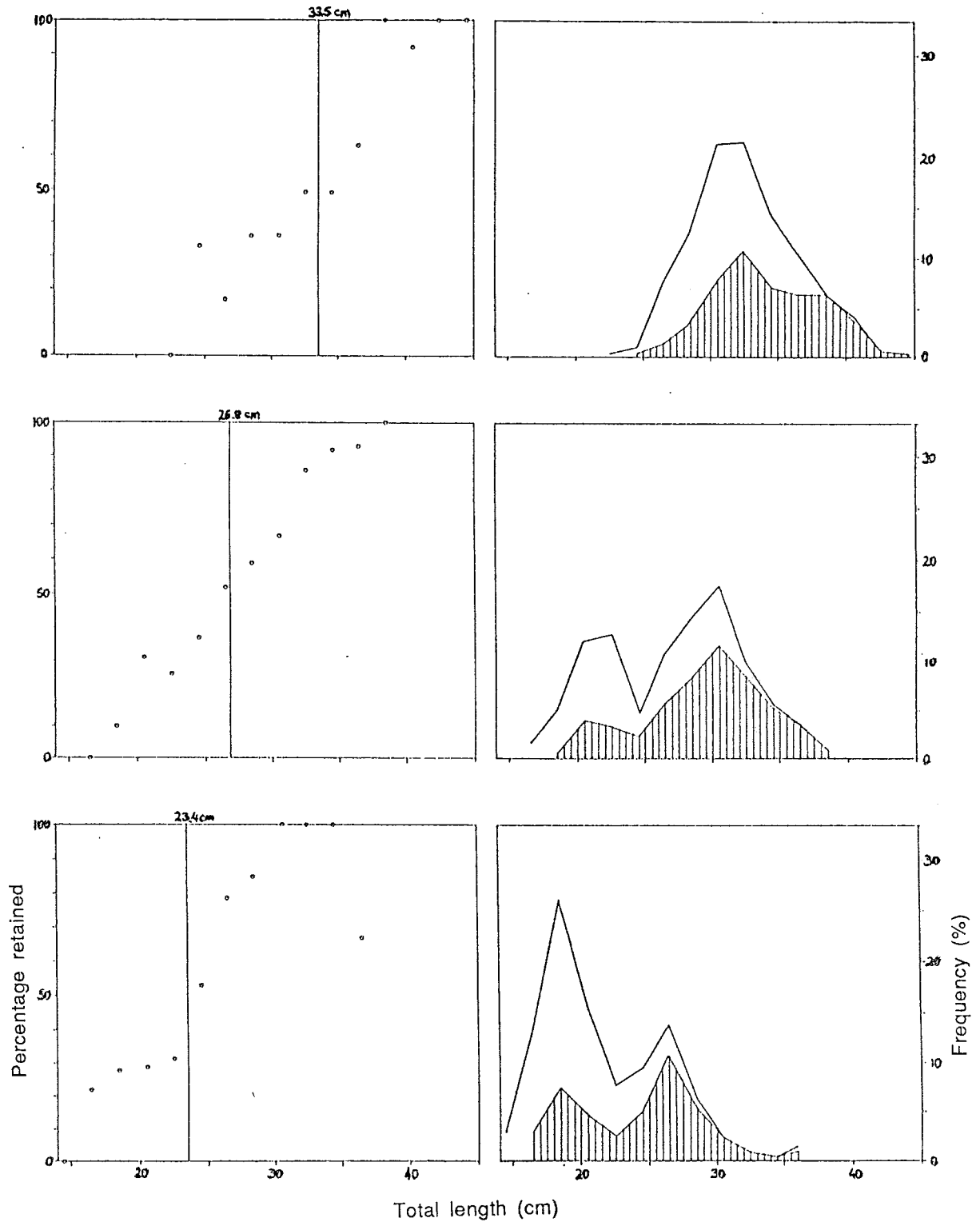
Figure 5: Effect of the length structure of the stock sampled on the 50% selection length of fish in experiments with 110 mm mesh size. Shaded area represents fish retained by the trawl codend. Dots on the left are percentage of fish retained in particular length classes. Vertical lines are L_{50}.
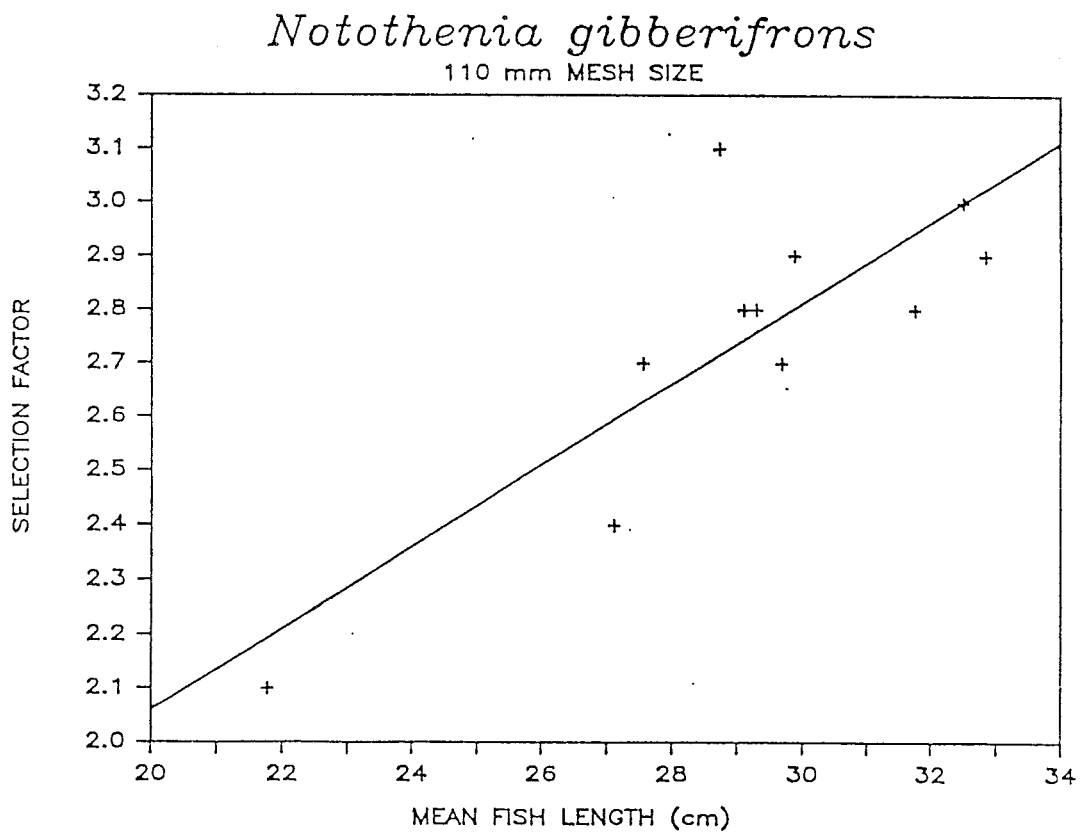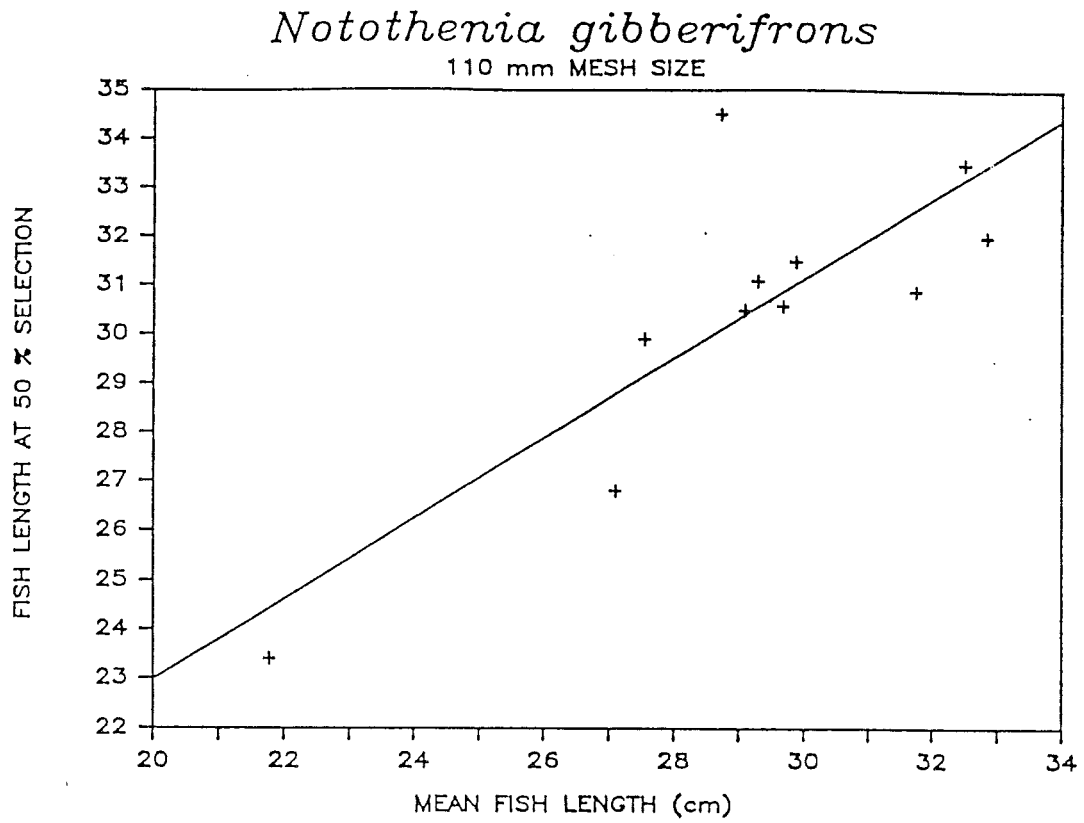
Notothenia gibberifrons
110 mm MESH SIZE

Notothenia gibberifrons
110 mm MESH SIZE

Figure 6: Relationship between mean fish length in the stock sampled and selectivity parameters: the 50% selection length and the selection factor.

HAUL-BY-HAUL SELECTIVITY DATA OBTAINED
FROM THE POLISH AND SPANISH EXPERIMENTS[*]

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[*] Table 1.1 refers to Table 1of this paper
   Table 2.1 refers to Table 2 and so on.

Table 1.1: Species: *Champsocephalus gunnari*
Area: South Georgia, Shag Rocks (Subarea 48.3)
Month/Year: November to December 1986
Mesh size (mm):
Measured (nominal): 68 (70) and 67 (70)[r]
Twine diameter (mm): 3.0

Station	Haul Time (min)	Total Catch Per Tow (kg)	Total Catch Per Hour (kg)	Species Catch Per Tow kg	Species Catch Per Tow %	Number of Fish Measured Codend	Number of Fish Measured Cover	Modal Length cm	Modal Length Range	Selection Factor	50% Selection Length (cm)
19[r]	30	30.22	60.44	9.92	33	56	124	18;24	16-39	3.42	23.06
28[r]	30	276.75	553.50	54.70	20	103	62	25	18-40	3.44	23.18
29[r]	30	1590.50	3181.00	684.10	43	117	129	25	19-28	3.65	24.60
32[r]	30	213.92	427.84	195.00	91	107	112	25	21-32	3.89	26.27
47	30	1687.72	3375.44	1687.70	100	176	68	26;31	22-39	3.97	26.99
48	30	325.16	650.32	325.00	100	170	246	27	16-37	4.03	27.41
55	30	342.55	685.10	250.50	73	93	110	27	22-35	3.86	26.27
62	30	21.64	43.28	20.35	94	89	125	15	13-30	2.42	16.49
69	30	53.79	107.58	17.12	32	150	19	14;28	13-37	2.94	19.98
70	30	428.16	856.32	23.15	5	280	61	23	20-40	3.08	20.95
71	30	32.22	64.44	8.90	28	78	27	15;24	13-39	3.25	22.14
75	30	80.46	160.92	25.90	32	214	144	23	20-31	3.30	22.40
83	30	1599.06	3198.12	211.01	13	135	234	14;23	13-33	3.42	23.20
84	30	1296.00	2592.00	19.50	2	68	112	13;23	12-35	3.66	24.90
97	30	88.32	176.64	41.25	47	88	74	28	19-36	3.68	25.01
105	30	160.34	320.68	9.18	6	69	62	13;27	13-42	3.04	20.68
111	30	598.06	1196.12	590.00	99	120	141	24	19-30	3.55	24.17
112	30	107.91	215.82	93.50	87	83	125	24	21-40	3.81	25.92
113	30	167.54	335.08	112.00	67	97	132	27	20-35	3.78	25.72
120	30	4288.75	8577.50	4258.00	99	155	126	26	21-36	3.71	25.25
122	30	218.85	437.70	45.10	21	60	47	27	21-31	3.69	25.11
124	30	36.38	72.76	3.53	10	100	39	26	14-30	3.31	22.53
126	30	97.40	194.80	69.35	71	86	42	27	20-34	3.49	23.74
127	30	77.35	154.70	17.80	23	73	19	27	21-34	3.48	23.65
128	30	20.30	40.60	3.25	16	32	14	15;24	13-29	3.23	21.98

Table 1.1 (continued)

Station	Haul Time (min)	Total Catch Per Tow (kg)	Total Catch Per Hour (kg)	Species Catch Per Tow		Number of Fish Measured		Modal Length		Selection Factor	50% Selection Length (cm)
				kg	%	Codend	Cover	cm	Range		
131	30	315.31	630.62	90.60	29	117	154	22	14-29	3.25	22.14
133	30	147.65	295.30	13.20	9	100	58	13;25	13-31	3.41	23.19
147	30	540.79	1081.58	518.00	96	172	159	22	19-29	3.23	21.96
155	30	268.37	536.74	184.00	69	203	116	22	16-36	3.20	21.74
161	30	156.52	313.04	70.00	45	157	109	23	19-36	3.46	23.57
162	30	367.09	734.18	328.00	89	237	123	25	19-38	3.43	23.30
165	30	60.84	121.68	47.00	77	167	92	22	14-35	3.13	21.28
168	30	127.75	255.50	16.10	13	110	164	16;22	14-31	3.51	23.87
169	30	244.83	489.66	22.20	9	162	115	22;25	13-42	3.41	23.70
170	30	113.61	227.22	23.05	20	192	140	15;22	13-50	3.07	20.86
179	30	86.95	173.90	37.30	43	370	88	26	21-34	3.13	21.19
180	30	134.58	269.16	45.40	34	68	70	26	21-31	3.85	26.17
184	30	69.61	139.22	26.50	38	181	69	25;38	15-55	3.61	24.56

r   Shag Rocks

Table 1.2: Species: *Champsocephalus gunnari*
Area: South Georgia (Subarea 48.3)
Month/Year: December 1986
Mesh size (mm):
Measured (nominal): 88 (80)
Twine diameter (mm): 4.2

Station	Haul Time (min)	Total Catch Per Tow (kg)	Total Catch Per Hour (kg)	Species Catch Per Tow		Number of Fish Measured		Modal Length		Selection Factor	50% Selection Length (cm)
				kg	%	Codend	Cover	cm	Range		
123	180	2219.3	739.8	1452.5	65	743	1101	23;26	18-47	3.0	26.8
124	180	452.4	150.8	381.6	84	260	410	26	20-35	3.6e	31.5e
126	180	2306.9	769.0	1249.2	54	352	653	23*;26	19-39	2.5	22.2
127	180	4802.1	1606.3	2053.7	43	298	499	26	18-37	2.4e	21.5e
128	230	4497.8	1173.3	3100.8	69	535	450	27	21-38	2.3e	20.0e

e Estimated value
* Modal length with high frequency (in polymodal length distributions)

Table 2.1: Species: *Champsocephalus gunnari*
Area: South Orkney (Subarea 48.2)
Month/Year: December 1986 to January 1987
Mesh size (mm):
Measured (nominal): 68 (70)
Twine diameter (mm): 3.0

Station	Haul Time (min)	Total Catch (Per Tow) (kg)	Total Catch (Per Hour) (kg)	Species Catch Per Tow		Number of Fish Measured		M<odal Length		Selection Factor	50% Selection Length (cm)
				kg	%	Codend	Cover	cm	Range		
347	30	144.44	288.88	32.50	23	164	111	23;34	20-50	3.62	24.77
350	30	12.08	24.16	7.44	62	44	26	23	12-36	3.21	21.94

Table 3.1: Species: *Champsocephalus gunnari*
Area: Elephant I., South Shetland Is. (Subarea 48.1)
Month/Year: January to February 1987
Mesh size (mm):
Measured (nominal): 68 (70)
Twine diameter (mm): 3.0

Station	Haul Time (min)	Total Catch Per Tow (kg)	Total Catch Per Hour (kg)	Species Catch Per Tow		Number of Fish Measured		Modal Length		Selection Factor	50% Selection Length (cm)
				kg	%	Codend	Cover	cm	Range		
413	30	449.80	899.60	333.00	74	113	162	22;32	19-35	2.74	18.90
434	30	52.33	104.66	27.00	52	57	52	23	21-39	3.20	21.96
448	30	22.05	44.10	18.10	82	147	60	23;26;31	19-38	3.08	21.12
477[s]	30	137.99	275.98	137.60	100	176	180	13;22	12-31	2.89	19.66
479[s]	30	62.23	124.46	62.00	100	162	162	14;19;24	11-27	3.29	22.40
499[s]	30	15.21	30.42	13.80	91	75	141	14;21;25	13-48	3.61	24.59
545[s]	30	15.58	31.16	4.73	30	36	124	14;20;25	12-27	3.30	22.44

[s] S. Shetland Is

Table 3.2: Species: *Champsocephalus gunnari*
Area: Elephant I. (Subarea 48.1)
Month/Year: October to November 1986
Mesh size (mm):
Measured (nominal): 110 (100)
Twine diameter (mm): 4.2

Station	Haul Time (min)	Total Catch Per Tow (kg)	Total Catch Per Hour (kg)	Species Catch Per Tow		Number of Fish Measured		Modal Length		Selection Factor	50% Selection Length (cm)
				kg	%	Codend	Cover	cm	Range		
I/14	120	1303.0	651.0	29.8	2	79	303	20;30	15-35	2.9	32.0
I/16	180	1864.9	621.0	96.2	5	284	343	20;29	17-44	2.7	30.0
I/41	105	613.3	350.0	17.0	3	37	92	20;30	18-44	3.1	33.7

* Modal length with high frequency (in polymodal length distributions)

Table 7.2: Species: *Notothenia gibberifrons*
            Area: South Georgia (Subarea 48.3)
            Month/Year: December 1986
            Mesh size (mm):
            Measured (nominal):   88 (80)
            Twine diameter (mm): 4.2

Station	Haul Time (min)	Total Catch Per Tow (kg)	Total Catch Per Hour (kg)	Species Catch Per Tow kg	Species Catch Per Tow %	Number of Fish Measured Codend	Number of Fish Measured Cover	Modal Length cm	Modal Length Range	Selection Factor	50% Selection Length (cm)
123	180	2219.3	739.8	557.2	25	135	56	17*;28;36*-39	9-50	2.6e	23.0e
124	180	452.4	150.8	38.0	8	25	180	17	12-37		* *
126	180	2306.9	769.0	849.2	37	110	37	11;18*;30;38*	10-49		* * *
127	180	4802.1	1606.3	1708.7	36	201	139	9;17*,40*	8-48		* * * *
128	230	4497.8	1173.3	419.0	9	98	70	16*-20*;37-40	9-42	2.2e	19.0e

e   Estimated value
*   Modal length with high frequency (in polymodal length distributions)
* *   All selection estimates were below 50% level
* * *   All selection estimates were over 50% level
* * * * Multiple 50% selection estimates

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Table 9.2:
Species: *Notothenia gibberifrons*

Area: Elephant I., Joinville I., King George I.(Subarea 48.1)

Month/Year: October to November 1986, February 1987[k] 1986

Mesh size (mm):

Measured (nominal): 110 (100) and 88 (80)[k]

Twine diameter (mm): 4.2

Station	Haul Time (min)	Total Catch Per Tow (kg)	Total Catch Per Hour (kg)	Species Catch Per Tow kg	Species Catch Per Tow %	Number of Fish Measured Codend	Number of Fish Measured Cover	Modal Length cm	Modal Length Range	Selection Factor	50% Selection Length (cm)
I/9	125	327.4	157.0	274.0	84	613	169	24;34*	14-46	2.1	23.1
I/10	120	837.9	419.0	691.0	82	438	644	24;36*	13-46	2.9	32.0
I/11	120	253.8	126.0	201.0	79	315	641	26	11-43	2.7	29.9
I/13	260	67.6	16.0	54.0	80	97	334	29-31	13-39	3.1	34.5
I/14	120	1303.0	651.0	1028.0	79	408	568	29	16-42	2.8	31.1
I/16	180	1864.9	621.0	1601.0	86	948	1278	29	13-44	2.9	31.5
I/17	130	1170.9	540.0	866.2	74	494	1980	30	20-41	2.8	30.5
I/41	105	613.3	350.0	437.0	71	224	297	30	19-43	2.7	30.6
I/42	200	85.1	25.0	71.0	83	96	58	31;35	22-48		
I/33[j]	120	80.7	40.0	23.2	29	88	116	19*;26	14-37	2.1	23.4
I/34[j]	115	888.7	464.0	84.6	10	113	200	22;30	17-39	2.4	26.8
I/36[j]	60	272.0	272.0	100.5	37	153	159	30-32	23-44	3.0	33.5
I/37[j]	100	143.4	86.0	77.0	54	119	95	29-31;37*	18-44	2.8	30.9
IV/7[k]	90	599.7	400.0	440.0	73	361	137	27;41	19-47	3.3	29.0

* Modal length with high frequency (polymodal length distributions)

j Joinville I.

k King George I.

Table 10.1: Species: *Notothenia gibberifrons*
           Area: South Orkney (Subarea 48.2)
           Month/Year: December 1986 to January 1987
           Mesh size (mm):
           Measured (nominal):   68   (70)
           Twine diameter (mm):   3.0

Station	Haul Time (min)	Total Catch Per Tow (kg)	Total Catch Per Hour (kg)	Species Catch Per Tow kg	Species Catch Per Tow %	Number of Fish Measured Codend	Number of Fish Measured Cover	Modal Length cm	Modal Length Range	Selection Factor	50% Selection Length (cm)
267	30	64.600	129.20	37.09	57	190	60	19;25;30;37	12-37	2.91	19.91
268	30	234.660	469.32	109.40	47	417	206	12;20;29;32	9-38	3.18	21.76
271	30	62.930	125.86	35.80	57	164	190	17;20;25;28	9-38	3.08	20.95
272	30	56.170	112.34	35.95	64	199	124	19;23;28;35	10-40	2.80	19.05
273	30	77.990	155.98	42.95	55	220	198	11;20;27;35	9-38	2.88	19.57
275	30	226.530	453.06	132.00	58	946	149	20;32	11-36	3.10	21.13
276	30	146.380	292.76	80.00	55	399	301	11;19;27;36	9-43	2.56	17.42
278	30	37.485	74.97	16.05	43	110	42	19;26	15-39	2.60	17.72
281	30	53.355	106.71	18.25	34	116	138	11;16;20;24;28;32	10-39	2.44	16.70
282	30	291.315	582.63	86.90	30	451	402	11;18;24;28;32	9-39	2.73	18.59
322	30	72.620	145.24	35.30	49	175	37	21;26;31;35	15-40	2.80	19.15
323	30	44.675	89.35	30.85	69	120	79	12;21;27;34	10-42	2.93	20.02
327	30	34.880	69.76	16.30	47	78	85	10;14;21;27	8-40	2.64	17.95
328	30	41.795	83.59	9.65	23	62	154	14;20	9-41	2.91	19.78
333	30	18.965	37.93	9.85	52	40	164	10;17	8-39	3.31	22.52
340	30	285.155	570.31	7.28	3	40	12	25;30	19-32	3.21	21.93
345	30	9.285	18.57	6.55	71	30	18	18;23;28;32	16-40	3.01	20.51
378	30	142.785	285.57	74.05	52	341	374	11;19	10-39	2.96	20.23
379	30	25.490	50.98	14.80	58	109	85	10;21;27;30	9-38	2.47	16.78
380	30	46.680	93.36	8.80	19	41	41	10;20;26;30	9-40	2.80	19.16
385	30	27.030	54.06	15.60	58	88	47	11;20;27	9-34	2.71	18.44

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Список таблиц

Таблица 6:	Вид:	*Chaenocephalus aceratus*
	Район:	о. Элефант и Южные Шетландские о-ва (Подрайон 48.1)
	Месяц/год:	октябрь - ноябрь 1986 г. и февраль 1987 г. [1] декабрь 1978 - март 1979 гг. [2]

Таблица 7:	Вид:	*Pseudochaenichthys georgianus*
	Район:	Южная Георгия (Подрайон 48.3)
	Месяц/год:	ноябрь - декабрь 1986 г.

Таблица 8:	Вид:	*Pseudochaenichthys georgianus*
	Район:	Южные Оркнейские острова (Подрайон 48.2)
	Месяц/год:	декабрь 1986 - январь 1987 гг.

Таблица 9:	Вид:	*Notothenia gibberifrons*
	Район:	Южная Георгия (Подрайон 48.3)
	Месяц/год:	ноябрь - декабрь 1986 г. [1], декабрь 1978 - март 1979 гг. [2]

Таблица 10:	Вид:	*Notothenia gibberifrons*
	Район:	Южные Оркнейские о-ва (Подрайон 48.2)
	Месяц/год:	декабрь 1986 г. [1], декабрь 1978 - март 1979 гг. [2]

Таблица 11:	Вид:	*Notothenia gibberifrons*
	Район:	о. Элефант, о. Жуэнвиль и Южные Шетландские о-ва (Подрайон 48.1)
	Месяц/год:	октябрь - ноябрь 1986 г. [1], декабрь 1986 - март 1987 гг. [2], январь - февраль 1987 г. [3], декабрь 1978 - март 1979 гг. [4]

Таблица 12:	Вид:	*Patagonotothen brevicauda guntheri*
	Район:	скалы Шаг (Подрайон 48.3)
	Месяц/год:	ноябрь 1986 г.

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Рисунок 5: Зависимость длины особи, соответствующей 50% удержанию при размере ячеи в 110 мм, от размерного состава облавливаемого запаса. Затемненная часть графика распределения длины изображает количество особей, удержанных кутком трала. Точки слева изображают процентное содержание удержанных особей отдельных размерных классов. Вертикальные линии - L_{50}.

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                Area: Georgia del Sur y Shag Rocks[R] (48.3)
                Mes/año: Noviembre a Diciembre 1986[1], Septiembre 1981[2], Diciembre 1978 a Marzo 1979[3]

Tabla 2:   Especie: *Champsocephalus gunnari*
                Area: Orcadas del Sur (48.2)
                Mes/año: Diciembre 1986[1], Diciembre 1978 a Marzo 1979[2]

Tabla 3:   Especie: *Champsocephalus gunnari*
                Area: I. Elephant, I. Shetland del Sur (48.1)
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                Mes/año: Noviembre a Diciembre 1986[1], Diciembre 1978 a Marzo 1979[2]

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                Area: I.Orcadas del Sur (48.2)
                Mes/año: Diciembre 1986[1], Diciembre 1978 a Marzo 1979[2]

Tabla 6:   Especie: *Chaenocephalus aceratus*
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	Mes/año:	Octubre a Noviembre 1986[1], Diciembre 1986 a Enero 1987[2], Enero a Febrero 1987[3], Diciembre 1978 a Marzo 1979[4]

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