

<https://doi.org/10.17895/ices.pub.9380>

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to



REPORT OF THE WORKING GROUP ON ASSESSMENT OF HAKE STOCKS

Copenhagen, 12-17 May 1980

Page 2: Eliminate "may" in the last line.

Page 17: Table 1.4. Heading of 2nd column should read "IVa + VIa"

Page 19: New Table 1.6 (attached)

Page 20: New Table 1.7 (attached)

Page 23: Change symbols ♀ for "♂" and ♂ for "♀"

Page 24: New Table 1.11 (attached)

Page 27: Table 2.2. "Reversed" should read "Revised" in the heading.

Page 30: Table 2.5. Heading should read "Length composition of the catches ($N \times 10^3$)"

Page 31: Table 2.6. Heading should read "Number (thousands)"

Page 33: Footnote 2. "r/u" should read "R/V"

Page 34: Table 2.9. Change symbols ♀ for "♂" and ♂ for "♀"

Page 36: Table 2.11. Line "1981". Eliminate "(80)" and " $80^{(2)}$ " in mesh columns and eliminate footnote (2).

Page 41: Mean "0" should read "0 to 3"
age 1
3

Page 44: "Males" should read "Females"

Page 45: "Females" should read "Males"

Page 46: Figure 1.9. On the y-axis "yield" should read "biomass".
Value for K of ♂.143 should read ".148".

Page 49: Figure 2.3. "Males" should read "Females".

Page 50: Figure 2.3 continued. "Females" should read "Males".

Page 51: Figure 2.4. On the y-axis "yield" should read "biomass".
Value for K of ♂.143 should read ".148".

Table 1.6. Length compositions (thousands of fish) for Hake landings from ICES Divisions IVa + VIa and Sub-area VII by country and vessel class for 1979.

Length class (cm)	Divisions IVa + VIa					Length class (cm)	Division VII					
	England + Wales (trawl)	Scotland	France Hauturiers (trawl)	Spain (trawl)	Total		England + Wales (trawl)	France		Spain		Total
								Hauturiers (trawl)	Artisans (trawl)	Trawl	Longline	
5 -						5						
10 -						10						
15 -						15						
20 -						20						
25 -						25	4.0	13	877	9		903
30 -	.3		3		3	30	64.4	124	2 091	279		2 558
35 -	1.2		45		46	35	63.8	237	684	1 334		2 319
40 -	4.2		65	7	76	40	32.4	359	80	2 284		2 755
45 -	7.2		75	46	128	45	16.3	387	54	1 802		2 259
50 -	9.9		133	163	306	50	11.6	566	47	1 353	29	2 007
55 -	8.4		137	351	496	55	13.9	738	49	886	108	1 795
60 -	7.6		176	431	615	60	27.6	594	23	637	282	1 564
65 -	4.6		80	282	367	65	10.4	442	48	444	140	1 084
70 -	3.4		107	47	157	70	5.0	273	42	338	122	780
75 -	2.9		145	46	194	75	2.4	85	12	177	38	314
80 -	2.2		60	20	82	80	2.8	123	13	59	56	254
85 -	1.6		40	11	53	85	2.3	39	7	32	16	96
90 -	.8		12	3	16	90	1.4	42	1	24	13	81
95 -	.5		25		26	95	.7	16	-	16	6	39
100 -	.4		11		11	100	.6	8	-	-	6	15
105+	.5				1	105+	.2	8	-	-	-	8
Total	55.7		1 114	1 407	2 577	Total	260	4 054	4 028	9 675	817	18 834
Obs. tonnes	106	(1 400)	2 499	2 436	5 041	Obs. tonnes	215	5 691	1 417	9 770	1 872	18 965
Calc. tonnes	102		2 408	2 436	4 946	Calc. tonnes	228	6 249	1 422	9 720	1 870	19 489

Table 1.7. Length composition (thousands of fish) for Hake landings from ICES Divisions VIIIa and b, by country and vessel class for 1979.

Length class (cm)	France					Spain				Total
	Hauturiers (trawl)	Artisans		Gillnet and Longlines	Côtiers (trawl)	Bakas		Bous (trawl)	Parejas- trios (p. trawl)	
		(Pelagic trawl)	(Bottom trawl) (1)			(trawl) (A)	(trawl) (B)			
5 -	-	-	19 503	-	-	-	-	-	-	19 503
10 -	-	-	33 282	-	-	-	105	-	-	33 293
15 -	-	-	35 027	-	384	161	7 086	36	203	42 897
20 -	-	32	16 062	-	5 801	126	5 558	142	556	28 277
25 -	5	359	5 307	1	8 463	1 714	7 615	505	1 538	25 507
30 -	22	679	4 390	11	3 056	2 083	745	787	2 451	14 224
35 -	82	1 057	1 832	7	322	1 268	318	894	1 359	7 139
40 -	149	721	1 198	11	19	614	435	596	551	4 294
45 -	277	215	417	7		566	89	650	249	2 470
50 -	140	115	157	16		420	118	716	280	1 962
55 -	170	55	364	67		173	84	602	232	1 747
60 -	40	69	128	101		120	65	364	151	1 038
65 -	73	29	80	144		60	47	245	103	781
70 -	30	18	7	245		38	2	116	63	519
75 -	12	8	2	76		12	3	25	27	165
80 -	8	5	1	37		0		6	1	58
85 -	4	5	1	28		1		2	4	45
90 -		1		4		1		0	1	7
95 -				1				0	1	2
100 -										
105+										
Total	1 012	3 368	117 758	756	18 045	7 370	28 554	5 687	7 770	190 680
Obs. tonnes	1 115	1 524	7 465	1 587	2 493	3 042	4 548	4 446	3 126	29 346
Calc. tonnes	1 075	1 602	7 048	1 821	2 427	3 048	4 536	4 448	3 126	29 131

(1) Includes discards

(A) Calculated from Port of Pasajes

(B) Calculated from Port of Ondarroa

Table 1.11 Immediate losses in percentages and tonnes by area, country and gear type calculated under different selectivity factors, for 80 mm mesh change.

Sub-area/ Division	1979 Mesh Size	Immediate Loss (percent)		1979 (3) Official Nominal Catch of Hake (t)	Immediate Loss (tonnes)		Percent of Hake in Total landing
		SF=3.6	SF=4.1		SF=3.6	SF=4.1	
IV + VI France Hauturiers	70	0.3	0.2	2 459	7	5	<5
England and Wales	80	0.0	0.0	106	0	0	<5
Scotland	70	-	-	1 400	≈0	≈0	<5
Spain	70	0.2	0.0	2 436	5	0	20
Total		0.2	0.1	6 401	12	5	
VII France Hauturiers	70	0.6	0.6	3 200	19	19	10-40
France Semi-Industrials ¹	50	13.0	19.0	2 490	324	468	5-15
France Artisans	50	18.0	28.0	1 417	255	391	<5
England and Wales	75	1.7		215	4		<1
Spain Longlines	-	-	-	1 872	0	0	
Spain Trawlers	70	1.5	1.8	99 704	150	180	25
Total		3.9	5.5	19 164	752	1 058	
VIIIa,b France Hauturiers	60	1.6	2.0	1 115	18	22	≈50
France Pelagic Trawls	60	9.2	15.0	1 524	140	229	15-35
France Artisans	40	24.0	35.0	4 543	1 090	1 590	10-20
France Côtiers	40	51.0	71.0	2 493	1 271	1 770	15-20
France Gillnets + Longlines	-	-	-	1 587	0	0	60-80
Spain Trawlers	60	15.0	22.0 ²	15 162	2 274	3 336	44
Total		19.0	28.0	26 424	4 793	6 947	
Total		10.7	15.4	51 989	5 557	8 010	

¹ Mesh size and catch composition of 1978 used (no data available for 1979).

² 25% of mesh size assumed 40mm.

³ Official Spanish data multiplied by 2

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International Council for the
Exploration of the Sea

C.M 1980/G:13
Demersal Fish Committee

REPORT OF THE WORKING GROUP ON ASSESSMENT OF HAKE STOCKS

Copenhagen, 12-17 May 1980

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REPORT OF THE WORKING GROUP ON ASSESSMENT OF STOCKS OF HAKE

0. INTRODUCTION

0.1 Participants

The ICES Working Group on Assessment of Hake Stocks met at ICES headquarters in Copenhagen from 12 to 17 May 1980. The following persons participated:

J Bridger	United Kingdom
E Cadima (Chairman)	Portugal
S Clark (Rapporteur)	USA
J Dardignac	France
A Fernandez	Spain
J Y Le Gall	France
J Pereiro	Spain
R Robles	Spain
C de Verdelhan	France

0.2 Terms of Reference

At the ICES 1979 Statutory Meeting it was decided (C.Res.1979/2:39) that the Working Group on the Assessment of Stocks of Hake should meet at ICES headquarters from 10-15 March 1980

- "(1) to assess TACs for hake,
- (2) in view of ACFM's recommendation that an 80 mm mesh should be introduced for the hake fishery, to estimate the effects of the EEC Commission's proposals regarding mesh regulations for both Recommendation 1 and Nephrops fisheries in NEAFC Region 3".

As complete catch and effort data for 1979 were not available in March, the meeting was postponed until May.

A number of proposed EEC regulations (COM (79) 709 final, Brussels, 27 November 1979) appear pertinent. As regards the directed fishery for hake, the relevant proposal is Article 10 of the above report, which reads as follows:

"No vessel fishing for hake shall use any trawl any part of which has a mesh size smaller than 80 mm.

However, the use of existing mesh sizes of at least 70 mm in single twine and 75 mm in double twine in Region 2 and of 60 mm in single twine and 65 mm in double twine in Region 3 shall be authorised for two months following the entry into force of this Regulation".

It has been noted by the Chairman of ACFM that as there is no acceptable definition for a directed hake fishery at present this regulation may prove difficult to enforce.

The minimum landing size for hake is 30 cm in all areas (Annex VI).

Minimum mesh sizes proposed in the above document (Article 2 and Annex I) are as follows:

North Sea (Sub-area IV) - 90 mm
Remainder of NEAFC Region 2 except ICES Division VIIa, Skagerrak and the Kattegat - 80 mm
ICES Division VIIa - 75 mm
NEAFC Region 3 - 65 mm

Minimum mesh sizes for Nephrops (Article 8 and Annex VII) are as follows:

NEAFC Region 2 - 70 mm (60 mm outside the North Sea and West of Scotland until 31.12.1982)

NEAFC Region 3 - 60 mm (50 mm until 31.12.1982)

0.3 Nominal Landing Trends

Nominal hake catches for NEAFC Regions 2 and 3 (including the stock areas considered in this report) for 1936-79 appear in Table 0.1. Nominal catches averaged 52 000 tonnes during the late 1930s, declined to 0 with the cessation of fishing during World War II, and then rose sharply to 194 000 tonnes in 1946. Landings subsequently declined more or less continually to an average of 111 000 tonnes during 1956-60 and then increased to an average of 129 000 tonnes from 1961-65. Since that year nominal catches were relatively constant from 1966-76 (averaging 101 000 tonnes); an average of 57 000 tonnes has been reported for 1977-79. The latter figure is believed to reflect both declining abundance and EEC restrictions on Spanish effort.

It should be noted that the data in Table 0.1 are subject to many sources of error (such as unreported landings or misreporting by area) particularly in the case of data for earlier years, and consequently only generalised interpretations are possible. Nevertheless, nominal catches have declined considerably since the early post-war years. The 1974-76 average (97.6 thousand tonnes) is only 55% of the 1946-48 average (177.8 thousand tonnes), while the 1977-79 average (57 000 tonnes) is only 32% of the 1946-48 figure. Related evidence relative to trends in catch per unit effort supports the hypothesis of a pronounced decline in abundance and accordingly the Group accepted these data as indicative of the general condition of the resource relative to earlier years.

Nominal catches of hake as reported to ICES by country and area from 1961-79 are given in Table 0.2. Again, a general downward trend is evident, although national trends differ somewhat. Nominal catches for France declined from an average of 36 000 tonnes for 1961-63 to an average of 23 000 tonnes from 1969-76. French landings for 1977-79 averaged 18 000 tonnes, down 50% from the 1961-63 average. Declines in French landings in Sub-areas VIII and IX in recent years were offset by increases in Sub-area VII. Nominal catches for Portugal since 1961 have fluctuated without a noticeable trend; those for Spain declined gradually from an average of 73 000 tonnes in 1961-63 to an average of 61 000 tonnes in 1974-76 and then dropped sharply to an average of 30 000 tonnes under EEC restrictions, down 59% from 1961-63. Nominal catches for the United Kingdom declined by over 85% during the same period; catches for other nations have fluctuated without a clear trend.

0.4 Stock Separation

In the preceding Working Group report (Anon., 1979), two stocks were recognised within NEAFC Regions 2 and 3, i.e., a "northern stock" (ICES Divisions IVa and VIa, Sub-area VII, and Division VIIIA+b), and a "southern stock" in ICES Divisions VIIIC and IXa. This arrangement has been based primarily on the distribution of nursery grounds and apparent differences in recruitment trends between the two areas. In addition, the narrow continental shelf along the northern coast of Spain and the Cape Breton depression (where depths increase sharply to 500 m 4 miles from the coast and to 1 000 m 20 miles from the coast) also serve as a geographical barrier, resulting in limited movement may

between the Bay of Biscay and the Cantabrian Sea. There is no biological basis for further sub-divisions. Indeed, data from British larval surveys suggest a relatively continuous distribution from the Cape Breton depression northward (Figures 1.1-1.4).

In the absence of more definitive data, the Group has continued to recognise a "northern" and a "southern" stock in this report, noting that different arrangements may be more appropriate when additional data become available.

0.5 Assessment Data Base

The lack of adequate catch and length and age composition data, and uncertainty in biological parameter estimates, have greatly hindered assessment of these stocks. Nominal landings data reported to ICES are obviously erroneous in many cases; information relative to amounts discarded (even for the Nephrops fishery, which has been shown to take large amounts of small hake) is very limited, and length composition data are unavailable for many major components of the fishery prior to 1976. No age composition data are available for commercial landings of either stock. Information relative to biological parameters is also limited. Decamps and Labastie (1978) have realised some success in aging hake otoliths, but due to the limited sample size available their conclusions should probably be regarded as tentative. No reliable estimates of M are available for either stock at the present time. Consequently, detailed assessments have not been attempted during the meeting; work on both stocks was primarily confined to yield per recruit studies and related analyses.

1.0 NORTHERN STOCK (ICES Divisions IVa and VIa, Sub-area VII, and Divisions VIIa and b)

1.1 Nominal Landing Trends

Nominal catches for the Northern Stock (as reported to ICES for 1961-79 by country and area) appear in Table 1.1; Table 1.2 is similar but contains revised values, based on updated landings data. Revised figures are available for France for 1961-78 and for Spain for 1973-79; remaining data have not been changed. Preliminary estimates calculated by the Group for 1979 based upon reports by French inspectors of licensing violations suggest that Spanish effort in EEC waters was approximately double expected levels based on issuance of licenses by the EEC, and accordingly reported Spanish landings were increased by a factor of 2 so as to provide an estimate of the actual Spanish catch.

Revised nominal catches for France declined more or less continually from 42 000 tonnes (all areas) in 1961 to 17 000 tonnes in 1977-78; preliminary data for 1979 suggest an increase to 21 000 tonnes. Trends in all areas were generally similar during this period, with 47% of the French landings being taken in Sub-area VII (Table 1.2). Nominal catch data for Spain for 1961-72 do not appear to be reliable, although subsequent values declined gradually from 49 000 tonnes in 1973 to 27 000 tonnes in 1978; preliminary data for 1979 indicate landings of 29 000 tonnes (Table 1.2). Since 1973, 55% of the Spanish catch has been taken in Divisions VIIa and b. As noted above, nominal catches for the United Kingdom have declined by over 85% during the last two decades, while catches for other nations have fluctuated without a clear trend.

Total nominal catch for this stock declined from 96 000 tonnes in 1961 to 51 000 tonnes in 1971, rose to 80 000 tonnes in 1973, and then declined to an average of 51 000 tonnes in 1977-79. The increase observed in the early 1970s primarily reflects adjustments to Spanish data. An overall

decline of 45% is indicated for the last two decades (i.e., from 89 000 tonnes in 1961-63 to 51 000 tonnes in 1977-79), although it may be noted that data for earlier years are less reliable and thus the actual extent of the decline could very well have been greater.

Table 1.3 provides percentages of total nominal catch in weight by species for ICES Divisions IVa and VIa and Sub-areas VII and VIII for 1947, 1962 and 1978. (These years were chosen as representative of the immediate post-war period, intermediate years and the most recent situation.) For Divisions IVa and VIa, the percentage by weight of hake in reported catches declined from 10% in 1947 to 1% in 1978, while in Sub-area VII this percentage declined from 28% in 1947 to 5% in 1978. Corresponding figures for Sub-area VIII were 35% and 9%, respectively (Table 1.3). (French percentages for 1979 ranged from 3 - 52%, depending upon port and vessel class, but averaged only 7%.) Thus, available data point to pronounced decline both in total landings and in relative importance of this species. The directed hake fishery of former years has been largely replaced by a number of different mixed fisheries. The Group was unable to reach a consensus relative to criteria which could serve to determine a directed fishery.

1.2 Length Composition

Prior to 1979, only England and Wales were able to provide adequate annual length composition data by area and port of landing. However, sampling has improved and data are available by area and vessel type for some major fisheries exploiting the Northern Stock. While additional length composition data for hake rejected at sea are needed, tentative estimates of numbers landed at length by vessel class appear possible for 1977-78 (Tables 1.4 -1.5). Data for 1979 are similar but include estimates of discards for French artisans in Divisions VIIa and b (Table 1.7). As a rule, estimates were obtained by applying sample data collected at certain ports to corresponding landings data by country and vessel class on a monthly or quarterly basis and raising resulting distributions to total landings to obtain the final distributions.

Data for all years reflect the relative importance of fisheries in Sub-area VII and Divisions VIIa and b, as opposed to more northerly areas. English trawlers, French hauturiers, and larger Spanish trawlers tend to harvest larger fish, reflecting use of larger mesh sizes and/or more offshore distribution of effort. French artisans and other Spanish trawlers tend to take smaller hake. Estimates of numbers rejected are unavailable in most cases, although the potential magnitude of the problem is evident from French data for artisans (Table 1.7); here, inclusion of estimated rejects in the sample data resulted in a total catch of 88 million fish below 20 cm in length - 75% of the total number taken.

Age/length keys are unavailable for this stock, although preliminary information on age composition by area has been derived from available growth parameter estimates and length composition data. Mean ages were calculated for a series of vessel classes/gear types for the 1969-79 period, both for total landings (Table 1.8) and for younger and older age groups (0-3 and 4+, Figure 1.5), using the von Bertalanffy growth equation for both sexes derived in the previous Working Group meeting (Anon., 1979). Midpoint lengths for each interval were converted to age and weighted estimates generated from appropriate age composition data.

Mean ages of the total catch (Table 1.8) for the cases examined tend to fluctuate without a definite trend from 1969-79, although a pronounced shift in size distribution (towards smaller hake) occurs in more southerly Sub-areas (VII and VIII). This trend is also clearly endorsed by French and Spanish data for ages 0-3 (Figure 1.5). Numbers of ages 0-3 hake landed annually by France and Spain in Sub-area VIII

normally exceed numbers landed in the remaining areas and for years in which estimates of numbers rejected can be made, total annual estimates were as high as 339 million fish (Figure 1.5). The magnitude of the resulting loss in yield can be put in perspective by considering that in 1946 England and Wales took 45 million fish weighing a total of 63 000 tonnes, while in 1969-74 the estimated number of young hake taken annually in Divisions VIIIA and b exceeded 450 million fish with a total weight of 13 500 tonnes (Figure 1.5).

1.3 Trends in Catch per Unit Effort

Catch-effort data by area, country and vessel class appear in Table 1.9. Data for all areas (excluding Spain, for which catch-effort data are not available prior to 1967) indicate declines in abundance in the last two decades ranging from 30% (French hauturiers in Divisions VIIIA and b for 1961-75) to 98% (United Kingdom trawlers in Divisions IVa and VIa for 1961-79). Catch per unit effort in Divisions IVa and VIa has declined more or less continually for both France and the United Kingdom throughout the available time series, although for the remaining indices values have been relatively constant since the late 1960s. Evidence relative to recruitment trends is somewhat conflicting; since the mid-1960s catch per effort of < 35 cm hake for trawlers from the ports of Lesconil and La Rochelle (used as an index of recruitment at age 2) has fluctuated without a definite trend in Division VIIIA but has declined somewhat in Division VIIIB (Figure 1.6).

1.4 Weight at Length

Table 1.10 provides weight at length values by length interval, the weight/length relationship used to derive these values, and von Bertalanffy growth parameter estimates for males and females. The weight/length relationship is the same as used in the La Rochelle (1978) and Charlottenlund (1979) assessments (Anon., 1978, 1979); growth parameter estimates are those derived by Decamps and Labastie (1978). Weight at length values were calculated at the mid-point of each length interval and differ slightly from those used in preceding assessments.

1.5 Selectivity

A number of experiments have been performed on gear selectivity for this species (Monteiro, 1966; Brabant and Guillou, 1976; Dardignac and de Verdelhan, 1978). Selectivity of 40 mm and 80 mm trawl gear is of particular interest in the present situation due to current gear usage and current or proposed regulations, and accordingly selection curves for 40 mm and 80 mm trawls have been obtained from previous assessments or calculated directly (Figure 1.7). The selection curve for 40 mm trawls obtained in the 1979 Working Group meeting (Anon., 1979) by fitting the logistic equation to data of Brabant and Guillou (1976) has been used in this assessment; also, a curve for 80 mm trawls was calculated from selectivity data for 61 mm trawls obtained by Working Group members in August 1979.

1.6 Yield per Recruit

Yield per recruit analyses were performed for males and females by means of the Beverton-Holt model, assuming $M = 0.2$ and using the growth parameter estimates of Decamps and Labastie (1978) presented in Table 1.10. For each sex, calculations were performed for t_c values corresponding to 40 mm, 60 mm and 80 mm mesh sizes (t_c values of 0.9, 1.9 and 2.9 years, respectively); no changes in t_c occurred by sex as the von Bertalanffy growth curves for males and females are identical for fish of up to 3 years of age.

For males, F values providing maximum yield per recruit (F_{max}) were 0.14, 0.17, and 0.21, respectively; corresponding figures for females were 0.16, 0.21, and 0.28 (Figure 1.8). While current levels of F are unknown, the Group considered that present levels of F are substantially higher than 0.2, and are certainly in excess of F_{max} , particularly on smaller fish.

Curves of virgin biomass per recruit were calculated for males and females from the growth parameters of Decamps and Labastie (1978) and the weight-length equation in Table 1.10 (Figure 1.9). Maxima in these curves occur at ages of 7.6 years for males and 8.9 years for females, substantially higher than current ages at entry for mesh sizes of up to 80 mm. Taken together, results of yield per recruit modelling suggest that current age at entry is too low, and current levels of F are too high, to achieve maximum yield per recruit.

In previous meetings, assessments of long-term effects of changes in effort and mesh size have been calculated using the method of Jones (1961, 1974). However, non-equilibrium situations now appear to exist in fisheries on both the northern and southern stocks (due to changing fishing patterns in the northern stock and sharply declining recruitment in the southern stock). Accordingly, members of the Group expressed serious doubts about the applicability of Jones' method in this situation (for example, simulations were performed which indicated that the F-vector derived from cohort analysis of length composition data was more dependent upon earlier events in the fishery than on data for the last few years). Therefore, the Group chose not to apply Jones' method in the present meeting.

1.7 Catch Predictions

The Group calculated immediate losses (in terms of percentages and actual weight based on 1979 nominal catch data) for various components of the fishery assuming an increase in mesh size to 80 mm (see Appendix I for details of calculations). Calculations were performed based on the 1979 length composition data and mesh sizes in force during that year with the exception of French semi-industrial trawlers in ICES Sub-area VII, for which only 1978 data were available. Results appear in Table 1.11.

As might be expected, such losses were negligible for larger mesh components of the fishery employing gears in Divisions IVa and VIa (where nominal catches are relatively insignificant). For smaller mesh sizes in Sub-areas VII and VIII, however, immediate losses become appreciable. For French semi-industrials* and artisans* using 50 mm trawls in Sub-area VII, losses range from 13% to 28% or from 300 - 500 tonnes, depending upon the selectivity data used. Immediate losses are also quite significant for French artisans and côtiers using 40 mm trawls in Sub-area VIII (24 - 71% or from 1 100 - 1 800 tonnes depending upon the selectivity data used). For all cases examined, average immediate losses range from 12-17%. It is thus evident that an increase in mesh size to 80 mm, while of unquestionable value to hake, would entail substantial economic hardship in certain cases. Obviously, severe and possibly unacceptable immediate losses could also occur in small mesh fisheries directed towards other species, for example, Nephrops and sole. The Group identified five additional species (gurnard, whiting, blue whiting, Norway lobster and octopus) for which a mesh size increase to 80 mm could result in long-term losses.

1.8 Management Options

The Group considered the implications of an increase in mesh size to 80 mm keeping effort at current levels. The potential for substantial long-term gains was noted based on yield per recruit calculations out-

* These vessels have been using 70 mm trawl as of 1979.

lined in Section 1.6; for example, at a constant F of 0.4 yield per recruit increases by 70% or more with a mesh size increase of from 40 to 80 mm (Figure 1.8). Additional benefits accruing from such an increase (assuming that total effort remains constant) would include increases in total and spawning stock biomass, reduced mortality of smaller hake, and increased economic returns promoted by increases in efficiency due to increases in catch and reduced handling of discards. It was noted that in some cases, immediate losses associated with the imposition of an 80 mm mesh size might be considerable (Table 1.11) and thus the above potential benefits would have to be carefully weighed in view of current socio-economic conditions.

The Group noted the desirability of a precautionary TAC (total allowable catch) to maintain 1981 effort at current levels. The 1980 TAC set by EEC (40 000 tonnes) was taken as the catch for 1980; adjusting this figure by the calculated average immediate loss over the entire fishery (15%, Table 1.11) associated with an increase to 80 mm mesh, provides a TAC of 34 000 tonnes.

Although assessments of long-term effects of effort changes were not made in the assessment, indications are that a reduction in effort would be beneficial, and accordingly the direction taken in calculation of this recommended TAC, i.e. towards an assumed lower level of effort appears to be appropriate. Accordingly, the Group recommended a TAC of 34 000 tonnes for the Northern Stock for 1981.

A summary of the TACs recommended, adopted, and the subsequent estimated catches, together with the mesh sizes recommended and in use are given in Table 1.12.

2.0 SOUTHERN STOCK (ICES Divisions VIIIc and IXa)

2.1 Nominal Landing Trends

Nominal catches for the Southern Stock (as reported to ICES for 1961-79 by country and area) appear in Table 2.1; Table 2.2 is similar but contains revised values based on updated landing data only for the divisions of the Southern Stock.

Total catches decreased from around 30 000 tonnes for the period 1972-75 to 15 000 tonnes in 1977-79. Portuguese and Spanish catches appear to follow similar trends in reduction during the last 6 or 7 years from 20 000 tonnes to 10 000 tonnes for Spain and from 15 000 to 7 000 tonnes for Portugal. France has occasionally fished in the area, the catches remaining below 100 tonnes.

2.2 Length Composition

While additional length composition data for hake rejected at sea are needed, tentative estimates in number at length by gears appear possible for the average of the period 1974-77 (Table 2.3) and for 1978 and 1979 (Table 2.4-Table 2.5).

Estimates were obtained from samples collected at certain ports (Galician and Portuguese ports) by country and gear categories and raising the resulting distributions to total landings.

For the period 1974-77, it was only possible to obtain an average composition.

Data from trawlers of both countries show large quantities of small hake (less than 30 cm long), as opposed to the other "artisanal gears" (longline and gillnets), which catch mainly older fish except in the "Beta" fishery (i.e. small mesh gillnet).

Estimates of rejected numbers are not available for the Portuguese fleet, nor for the Spanish fleet in 1979. Rejected fish in these fisheries correspond to illegal or non-registered catches of hake less than 25 cm.

By using the von Bertalanffy growth equation the mean size of each 5 cm length group was calculated, and the total number and mean age for each component of the catch were estimated, splitting the whole population in two groups: less or equal to and older than 3 years. The results of this analysis are given in Table 2.9 and Figure 2.1.

The ratio in numbers of young fish caught in the years before 1978 to those caught in 1978 is about 8 to 1. This sharp decline may result from a possible failure in the recruitment process. The 1979 data are not comparable as they do not include discards. However, for 1977-79 Spanish research vessel surveys on the abundance of young hake confirm the decline of recruitment as shown by the length composition.

2.3 Trends in Catch per Unit Effort

No additional data have been provided from 1979 on effort or catch per unit effort for Spain or Portugal. Table 2.7 provides this information for Portugal, Spain and France for the period 1971-78. In 1977-78 Portuguese trawlers' catch per unit effort shows a decline as compared with previous years. However, fishing effort remains stable.

2.4 Weight at Length

Table 2.8 provides weight at length values by length classes, weight/length relationship used to derive these values and von Bertalanffy growth parameters for males and females.

The weight/length relationship used comes from the demersal cruise of the Portuguese research vessel "Noruega" during March 1980; growth parameter estimates are those obtained by Decamps and Labastie (1978). Weight at length values were calculated at mid-point classes and are slightly higher (around 10%) than the one used in the preceding assessment.

2.5 Selectivity

Selectivity of 40 and 80 mm trawl gear is of particular interest in the present situation due to current gears used and proposed regulations. Selection curve for 40 mm was obtained in the 1979 Working Group meeting (Anon., 1979) by fitting the logistic equation to the data of Brabant and Guillou (1976). Selectivity curve for 80 mm was derived from the selection curve for 60 mm (Figure 2.2) obtained by Spanish scientists in August 1979 ("Cigala" 1979 survey), taking a selection factor of 4.8 and a constant selection range.

2.6 Yield per Recruit

Yield per recruit analyses for males and females assuming $M = 0.2$ and using growth parameter estimates provided in Table 2.9 were performed (Figure 2.3). For males F providing maximum yield per recruit (F_{max}) was .14 for a mesh size of 40 mm and .21 for a mesh size of 80 mm. Corresponding values for females were .16 and .28. While current levels of F are not known, the Group considered that the present level of F is well above the F_{max} , particularly on small fish.

As the von Bertalanffy growth curve is identical for fish during the first 3 years for both sexes, for assessment purposes t_c will be the same and so a combined yield curve was used for both sexes.

Curves of virgin biomass per recruit were calculated separately for male and female (Figure 2.4), using the von Bertalanffy equation and weight/length relationship in Table 2.9. In these curves the maximum occurs at the age of 7.6 years for males and 8.9 years for females, substantially higher than current ages at entries for mesh sizes up to 80 mm.

Taken together, the results of the yield by recruit modelling suggest that current age at entry (for 40 mm mesh size) is too low and current levels of F are too high to achieve maximum yield by recruit.

2.7 Catch Predictions

The Group calculated immediate losses (in terms of percentage and actual weight, based on 1979 nominal catches) for various components of the fishery and the whole fishery assuming an increase in mesh size to 80 mm. Results appearing in Table 2.10 indicate that substantial losses occur for trawlers while artisanal fisheries are not affected. The resulting total immediate loss was estimated to 16% of the 1979 catches.

The potential for substantial long-term gains was noted based on yield per recruit calculations, as outlined in Section 2.6. For example, at a constant $F = .40$ the difference between yield for recruit at mesh size of 40 mm or 80 mm is 70% or more. Additional benefits accruing from such an increase in mesh size would result in an increase in the total spawning biomass, in a reduction in juvenile mortality etc.

2.8 Management Options

The Group considered the implications of an increase in the mesh size to 80 mm, keeping effort at current levels. Substantial long-term gains were noted, based on Y/R calculations outlined in Section 2.6. For example, at a constant F of 0.4, the difference of Y/R for mesh size 40 mm and 80 mm is around 70%.

The Group noted the desirability of a precautionary TAC to maintain 1979 effort at current levels. The 1980 TAC (10 000 tonnes) was taken as the catch for 1980; adjusting this figure by the estimated immediate loss (16%, Table 2.10) associated with an increase to 80 mm mesh size provides a TAC of 8 400 tonnes. Accordingly the Group recommended a TAC of 8 400 tonnes for the Southern Stock for 1981.

A summary of the TACs, recommended, adopted, and the subsequent estimated catches, together with the mesh sizes recommended and in use, are given in Table 2.11.

APPENDIX I

Immediate losses for each gear have been calculated in this report by the relation

$$I.L (\%) = 100 \left(1 - \frac{\sum_{i=1}^n C_i L_i^b \frac{P_{2i}}{P_{1i}}}{\sum_{i=1}^n C_i L_i^b} \right)$$

where

n = number of length intervals of size classes;

C_i = number caught in the i th size class;

L_i = size class mid-point;

b = exponent of the weight/length relationship;

and P_{1i} and P_{2i} are retention ratios for the old and new mesh sizes at the i th size class.

If we assume that (1) the selection factor ($SF = \frac{L_{50}}{m}$) is constant, (2) the selection range is proportional to L_{50} ($L_{75} - L_{25}$) = $B L_{50}$, and (3) the selection curve is logistic in form,

P_{1i} and P_{2i} may be computed by the relation

$$P_{ij} = \frac{e^{x_{ij}}}{1 + e^{x_{ij}}}$$

$$\text{where } x_{ij} = \frac{2 \ln 3}{B} \left(\frac{L_i}{SF \times m_j} - 1 \right)$$

using $m = m_1$ to compute P_{1i} and $m = m_2$ for P_{2i} (m_1 = old mesh;
 m_2 = new mesh)

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Table 0.1 Nominal Hake catches (thousands of tonnes) for NEAFC Regions 2 and 3, 1936-1979, as reported to ICES.

YEARS	CATCH
1936 ¹	43.2
1937 ¹	52.5
1938 ¹	59.9
1939	-
1940	-
1941	-
1942	-
1943	-
1944	-
1945	-
1946	194.3
1947	179.7
1948	158.0
1949	130.6
1950	114.9
1951	128.1
1952	119.7
1953	109.8
1954	105.9
1955	143.0
1956	101.5
1957	113.3
1958	112.6
1959	110.9
1960	114.2
1961	133.8
1962	128.9
1963	133.2
1964	130.2
1965	120.6
1966	107.2
1967	107.0
1968	107.4
1969	100.6
1970	117.0
1971	62.4 ²
1972	110.0 ²
1973	109.4
1974	98.3
1975	102.9
1976	91.7
1977	66.7
1978 ³	49.6
1979 ³	54.9

Mean 1936-38 = 51.8

Mean 1946-48 = 177.8

Mean 1974-76 = 97.6 (Before 200 miles jurisdiction)

Mean 1977-79 = 57.1

¹Spanish catch assumed nil.

²Includes 17.6 thousand tonnes for Spain which were not reported by area but is assumed to have been taken in Regions 2 and 3.

³Preliminary; not reported to ICES.

Table 0.2 Nominal Hake catches (thousands of tonnes) as reported to ICES by country and area, 1961-1979.

YEARS	TOTAL	FRANCE					PORTUGAL	SPAIN					U.K.			OTHERS		
		TOTAL	IV+VI	VII	VIII	IX	IX	TOTAL	IV+VI	VII	VIII	IX	TOTAL	IV+VI	VII	TOTAL	IV+VI	VII
1961	(133.4) ¹	35.0 ²	1.5	18.0	12.3	3.1	13.0	(72.4) ¹	.	.	40.6	31.8 ³	11.8	10.5	1.3	1.2	1.0	0.2
1962	(128.3)	39.5 ²	0.7	19.4	14.8	3.1	6.4	(67.8)	.	.	32.0	35.8 ³	13.7	12.3	1.4	0.9	0.6	0.3
1963	(132.5)	33.4 ²	1.5	14.9	12.4	3.2	6.9	(79.1)	.	.	39.3	39.8 ³	11.9	10.7	1.2	1.2	1.0	0.2
1964	(129.7)	30.7 ²	3.2	11.3	13.0	2.9	9.0	(79.8)	.	.	34.0	45.8 ³	9.2	8.7	0.5	1.0	0.8	0.2
1965	(120.0)	26.2 ²	3.7	11.7	10.7	-	10.4	(74.7)	.	21.0	7.1	46.6 ³	7.7	7.3	0.4	1.0	0.8	0.2
1966	(106.6)	18.1	3.0	7.6	5.5	2.0	8.3	(73.2)	.	.	27.5	45.7 ³	5.9	5.3	0.6	1.1	0.9	0.2
1967	(116.5)	25.9	2.9	9.6	11.0	2.4	7.6	(76.7)	.	.	31.6	45.1 ³	4.9	4.1	0.8	1.4	0.9	0.5
1968	(106.4)	22.5	2.5	7.8	10.2	2.0	7.2	(69.7)	.	.	32.2	37.5 ³	5.4	4.5	0.9	1.6	1.3	0.3
1969	(99.6)	21.3	2.9	7.9	8.8	1.7	6.6	(65.7)	.	.	27.1	38.6 ³	4.3	3.9	0.4	1.7	0.5	1.2
1970	(116.4)	25.7	1.5	9.8	12.8	1.5	9.3	(76.1)	.	.	34.3	41.8 ³	3.2	2.7	0.5	2.1	1.9	0.2
1971	(61.6)	23.6	0.8	9.1	13.1	0.6	8.0	(24.8)	0.9	7.8	14.0	2.1 ³	2.6	2.2	0.4	2.6	2.1	0.5
1972	108.8 ⁴	21.8	0.4	8.8	12.6	-	8.7	73.2 ⁴	1.1	4.8	32.4	17.3	2.9	2.4	0.5	2.2	2.2	-
1973	108.6	24.2	2.2	10.7	11.3	-	15.3	63.0	0.5	4.7	37.0	20.8	2.8	2.2	0.6	3.3	2.9	0.4
1974	96.5	21.7	2.5	11.8	7.3	0.1	7.8	61.7	7.1	21.9	18.5	14.1	2.7	2.1	0.6	2.6	2.3	0.3
1975	101.4	22.2	3.2	11.0	7.9	0.1	9.4	63.9	6.4	20.5	18.0	19.0	2.6	2.3	0.3	3.3	2.4	0.9
1976	90.7	19.1	3.8	10.4	4.8	0.1	7.9	58.8	4.1	20.8	20.2	13.7	2.3	1.7	0.6	2.6	1.8	0.8
1977	64.9	15.3	2.6	6.1	6.6	-	5.5	41.0	1.6	5.3	16.6	17.5	1.9	1.6	0.3	1.2	0.8	0.3
1978	49.6	18.4	2.2	7.3	8.8	-	4.4	21.7	1.3	5.0	6.6	8.8	2.0	1.6	0.3	3.1	.	.
1979 ⁵	54.9	20.5	2.5	7.1	10.9	-	6.8	25.9	1.2	5.8	9.4	9.5	1.7	1.5	0.2	.	.	.

¹Numbers in brackets include unknown African catches for Spain (see footnote 3)

²Includes small amounts unreported by area.

³Data refer to port of landing, not area of capture (includes African catches).

⁴Includes 17.6 thousand tonnes for Spain which were not reported by area

⁵Preliminary; not reported to ICES.

Table 1.1 Nominal catches (thousands of tonnes) for the Northern Hake stock (ICES Divisions IVa and VIa, Sub-area VII, and Divisions VIII a and b), as reported to ICES by country and areas, 1961-1979.

YEARS	TOTAL	FRANCE				SPAIN				U.K.			OTHERS		
		TOTAL	IVa+VIa	VII	VIII ¹	TOTAL	IVa+VIa	VII	VIII ¹	TOTAL	IVa+VIa	VII	TOTAL	IVa+VIa	VII
1961	85.4	31.8	1.5	18.0	12.3	40.6	.	.	40.6	11.8	10.5	1.3	1.2	1.0	0.2
1962	81.5	34.9	0.7	19.4	14.8	32.0	.	.	32.0	13.7	12.3	1.4	0.9	0.6	0.3
1963	81.2	28.8	1.5	14.9	12.4	39.3	.	.	39.3	11.9	10.7	1.2	1.2	1.0	0.2
1964	71.7	27.5	3.2	11.3	13.0	34.0	.	.	34.0	9.2	8.7	0.5	1.0	0.8	0.2
1965	62.9	26.1	3.7	11.7	10.7	28.1	.	21.0	7.1	7.7	7.3	0.4	1.0	0.8	0.2
1966	50.6	16.1	3.0	7.6	5.5	27.5	.	.	27.5	5.9	5.3	0.6	1.1	0.9	0.2
1967	61.4	23.5	2.9	9.6	11.0	31.6	.	.	31.6	4.9	4.1	0.8	1.4	0.9	0.5
1968	59.7	20.5	2.5	7.8	10.2	32.2	.	.	32.2	5.4	4.5	0.9	1.6	1.3	0.3
1969	52.7	19.6	2.9	7.9	8.8	27.1	.	.	27.1	4.3	3.9	0.4	1.7	0.5	1.2
1970	63.7	24.1	1.5	9.8	12.8	34.3	.	.	34.3	3.2	2.7	0.5	2.1	1.9	0.2
1971	50.9	23.0	0.8	9.1	13.1	22.7	0.9	7.8	14.0	2.6	2.2	0.4	2.6	2.1	0.5
1972	65.2	21.8	0.4	8.8	12.6	38.3	1.1	4.8	32.4	2.9	2.4	0.5	2.2	2.2	.
1973	72.5	24.2	2.2	10.7	11.3	42.2	0.5	4.7	37.0	2.8	2.2	0.6	3.3	2.9	0.4
1974	74.3	21.5	2.5	11.8	7.2	47.5	7.1	21.9	18.5	2.7	2.1	0.6	2.6	2.3	0.3
1975	72.9	22.1	3.2	11.0	7.9	44.9	6.4	20.5	18.0	2.6	2.3	0.3	3.3	2.4	0.9
1976	69.0	19.0	3.8	10.4	4.8	45.1	4.1	20.8	20.2	2.3	1.7	0.6	2.6	1.8	0.8
1977	41.8	15.3	2.6	6.1	6.6	23.5	1.6	5.3	16.6	1.9	1.6	0.3	1.1	0.8	0.3
1978	36.4	18.4	2.2	7.3	8.8	12.9	1.3	5.0	6.6	2.0	1.6	0.3	3.1	.	.
1979	38.6	20.5	2.5	7.1	10.9	16.4	1.2	5.8	9.4	1.7	1.5	0.2	.	.	.

¹Includes Divisions VIIIa,b and c.

Table 1.2 Revised catches (thousands of tonnes) for the Northern Hake stock (ICES Divisions IVa and VIa, Sub-area VII and Divisions VIII a and b) by country and area determined by the Hake Working Group, 1961-1979.

YEARS	TOTAL	FRANCE				SPAIN				U.K.			OTHERS		
		TOTAL	IVa+VIa	VII	VIIIa,b	TOTAL	IVa+VIa	VII	VIIIa,b	TOTAL	IVa+VIa	VII	TOTAL	IVa+VIa	VII
1961	95.6	42.0	5.3	20.7	16.0	40.6	.	.	40.6	11.8	10.5	1.3	1.2	1.0	0.2
1962	86.3	39.7	4.9	19.3	15.5	32.0	.	.	32.0	13.7	12.3	1.4	0.9	0.6	0.3
1963	86.2	33.8	4.0	16.2	13.6	39.3	.	.	39.3	11.9	10.7	1.2	1.2	1.0	0.2
1964	76.8	32.6	4.6	15.2	12.8	34.0	.	.	34.0	9.2	8.7	0.5	1.0	0.8	0.2
1965	64.7	27.9	3.3	13.0	11.6	28.1	.	21.0	7.1	7.7	7.3	0.4	1.0	0.8	0.2
1966	60.9	26.4	3.2	13.0	10.2	27.5	.	.	27.5	5.9	5.3	0.6	1.1	0.9	0.2
1967	62.1	24.2	3.2	9.9	11.1	31.6	.	.	31.6	4.9	4.1	0.8	1.4	0.9	0.5
1968	62.0	22.8	2.5	9.2	11.1	32.2	.	.	32.2	5.4	4.5	0.9	1.6	1.3	0.3
1969	54.9	21.8	3.5	10.9	7.4	27.1	.	.	27.1	4.3	3.9	0.4	1.7	0.5	1.2
1970	64.9	25.3	4.3	11.5	9.5	34.3	.	.	34.3	3.2	2.7	0.5	2.1	1.9	0.2
1971	51.3	23.4	3.3	10.7	9.4	22.7	0.9	7.8	14.0	2.6	2.2	0.4	2.6	2.1	0.5
1972	65.5	22.1	3.7	9.6	8.8	38.3	1.1	4.8	32.4	2.9	2.4	0.5	2.2	2.2	.
1973	79.5	24.0	3.2	12.3	8.5	49.4	2.4	17.9	29.1	2.8	2.2	0.6	3.3	2.9	0.4
1974	74.2	21.3	2.8	11.9	6.6	47.6	3.6	16.1	27.9	2.7	2.1	0.6	2.6	2.3	0.3
1975	74.5	22.2	3.3	12.1	6.8	46.4	4.9	15.8	25.7	2.6	2.3	0.3	3.3	2.4	0.9
1976	67.3	18.3	3.8	10.3	4.2	44.1	4.2	15.6	24.3	2.3	1.7	0.6	2.6	1.8	0.8
1977	51.2	17.2	2.8	7.6	6.8	31.0	1.6	13.0	16.4	1.9	1.6	0.3	1.1	0.8	0.3
1978	49.9	17.4	2.2	7.3	7.9	27.4	1.4	12.4	13.6	2.0	1.6	0.3	3.1	.	.
1979 ²	51.4	20.5	2.5	7.1	10.9	29.2	2.4	11.6	15.2	1.7	1.5	0.2	.	.	.

¹Data for 1961-1972 and 1979 not revised; revised figures for Sub-area VIII for 1973-1978 include data for VIII a+b only.

²Preliminary

Table 1.3 Percentage of total nominal catch by weight of demersal species as reported to ICES for Divisions IVa+VIa and Sub-areas VII and VIII in 1947, 1962 and 1978.

SPECIES	IVa+VIa			VII			VIII		
	1947	1962	1978	1947	1962	1978	1947	1962	1978
Hake	10.0	7.0	1.0	28.0	15.0	5.0 (10)*	35.0	24.0	9.0 (10)*
Horse Mackerel		1.0	0.2	0.0	0.0	12.0	20.0	25.0	35.0
Sea Bream	0.1	0.3	0.3	1.0	2.0	3.0	0.4	8.0	5.0
Cod	15.0	19.0	10.0	6.0	3.0	10.0	0.0	1.0	
Haddock	38.0	20.0	14.0	1.0	3.0	1.0	0.0	0.0	
Gurnard	0.4	0.3	0.1	1.0	1.0		1.0		
Ling	6.0	3.0	5.0	1.0	2.0	3.0		0.6	2.0
Megrim	0.7	0.7	0.6	0.7	4.0	2.0		3.0	5.0
Monk	0.8	1.0	1.0	0.5	0.4	6.0	1.0	3.0	8.0
Plaice	1.0	2.0	1.0	3.0	4.0	4.0	1.0	0.3	0.1
Pollack	0.6	1.0	0.3	0.7	0.7	3.0	0.8	0.5	0.9
Saithe	5.0	14.0	28.0	1.0	2.0	2.0		0.6	
Skates/Rays	3.0	3.0	0.9	14.0	16.0	2.0	5.0	4.0	
Sole	0.0	0.0	0.0	1.0	2.0	2.0	0.7	1.0	1.0
Turbot	0.7	0.1	0.0	0.6	0.3		0.2	0.1	
Whiting	16.0	21.0	11.0	19.0	19.0	14.0	11.0	1.0	0.9
Conger	0.3	0.2	0.1	3.0	4.0	1.0	2.0	2.0	2.0
Blue Whiting			21.0			1.0			4.0
Norway Lobster		0.1	2.0			7.0			4.0
Cephalopods			0.1			1.0			3.0
Others	2.0	6.0	4.0	17.0	22.0	18.0	24.0	27.0	19.0
TOTAL (tonnes)	192 661	191 965	544 641	144 869	137 244	208 200	249 236	190 843	193 600

* WG data.

Table 1.4 Length compositions (thousands of fish) for Hake landings from the Northern stock (ICES Divisions IVa and VIIa, Sub-area VII and Divisions VIII a and b) by area, country and vessel class for 1977.

LENGTH CLASSES (cm)	IVa + VIIa		VII						VIII a,b			
	FRANCE	ENGLAND	FRANCE			U.K.	SPAIN		FRANCE			SPAIN
	HAUTU- RIERS	AND WALES	HAUTU- RIERS	SEMI- INDUS- TRIALS	ARTI- SANS		GILL- NETS + LONG- LINES	TRAW- LERS	HAUTU- RIERS	ARTI- SANS	FILETS MAILLANTS, PALANGRES	BAKAS, BOUS AND PAREJAS
5-9												
10-14												
15-19								4				
20-24			1	16	39			313	8	1 600	0	1 243
25-29	4	1	21	458	799	2		273	145	8 132	3	3 875
30-34	27	2	84	1 507	1 423	18		1 854	100	6 339	4	3 612
35-39	77	3	129	1 321	793	33		3 785	120	2 898	9	2 174
40-49	108	3	271	459	294	28	444	3 485	140	854	5	2 413
45-49	141	7	383	215	131	11	383	2 534	160	225	4	2 990
50-54	153	17	429	190	38	8	295	1 086	154	81	2	1 952
55-59	126	23	418	125	20	6	89	744	125	62	4	1 743
60-64	144	24	263	78	12	11	75	486	92	90	16	1 301
65-69	116	20	94	61	22	12	48	294	43	67	37	827
70-74	101	13	95	61	26	12	40	228	9	27	28	394
75-79	104	6	68	46	19	9	39	220	2	16	23	206
80-84	55	3	38	20	6	5	26	87	3	5	15	140
85-89	45	2	34	27	3	3	25	44	2	4	4	55
90-94	44	1	14	11	3	3	15	19	6	2	13	3
95-99	25	1	14	7	4	2	9	13	2	2	26	0
100-104	16	1	9	3	2	-	6	13	1			4
105-109	6	1	1	3	1							
110-115	3	-	1	4								
TOTAL	1 295	128	2 367	4 612	3 635	165	1 494	15 482	1 112	20 404	193	22 932

Table 1.5 Length compositions (thousands of fish) for Hake landings from the Northern stock (ICES Divisions IVa and VIa, Sub-area VII and Divisions VIII a and b) by area, country and vessel class for 1978.

LENGTH CLASSES (cm)	IVa + VIa			VII						VIIIa,b			
	FRANCE	ENGLAND	SCOTLAND	FRANCE			U.K.	SPAIN		FRANCE			SPAIN
	HAUTU- RIERS	AND WALES		HAUTU- RIERS	SEMI- INDUS- TRIALS	ARTI- SANS		GILL- NETS + LONG- LINES	TRAW- LERS	HAUTU- RIERS	ARTI- SANS	GILL- NETS + LONG- LINES	BAKAS, BOUS AND PAREJAS
5-9													
10-14													
15-19													4 075
20-24					16	27				3	1 328	0	4 800
25-29	1		158	17	467	331			123	33	7 448	5	8 507
30-34	10	1	1 292	65	1 706	572	24		626	25	7 020	5	6 277
35-39	54	5	966	101	2 124	537	29		1 337	77	2 785	7	4 565
40-44	72	6	228	289	687	244	71	352	2 348	189	1 515	6	2 256
45-49	79	4	84	532	181	83	69	308	2 326	190	438	5	2 389
50-54	65	5	86	528	64	52	45	236	1 804	186	330	3	2 237
55-59	49	8	61	426	38	28	18	70	1 015	101	178	7	1 032
60-64	88	10	74	320	44	8	9	60	594	67	118	21	443
65-69	82	11	26	158	37	17	9	36	346	28	67	40	272
70-74	92	12	19	81	43	17	5	30	307	22	47	50	220
75-79	110	7	66	48	34	14	5	28	171	9	29	53	89
80-84	59	7		39	15	10	6	22	95	4	12	30	23
85-89	45	3		30	19	9	3	18	45	2	7	14	14
90-94	38	2		15	6	5	2	12	48	1	2	1	12
95-99	17	2		9	4	3	2	6	30	1	3	1	0
100-104	11	1		5	2	1	2	4	17			-	5
105-109	4	2		1	2				4				
110-114	2			1	1								
TOTAL	878	86	3 060	2 665	5 490	1 958	299	1 182	11 236	938	21 327	248	37 216

Table 1.6 Length compositions (thousands of fish) for Hake landings from ICES Divisions IVa + VIa and Sub-area VII by country and vessel class for 1979.

LENGTH CLASSES (cm)	IVa + VIa				VII					TOTAL
	ENGLAND	FRANCE	SPAIN		ENGLAND	FRANCE		SPAIN		
	AND WALES (TRAWL)	HAUTURIERS (TRAWL)	TRAWL	LONG- LINES	AND WALES (TRAWL)	HAUTURIERS (TRAWL)	ARTISANS (TRAWL)	TRAWL	LONG- LINES	
5-9	-									
10-14	-									
15-19	-									
20-24	-									
25-29	-	-	-		4.0	13	877	4.4	-	898.4
30-34	0.3	3	-	3.3	64.4	124	2 091	139.7	-	2 419.1
35-39	1.2	45	-	46.2	63.8	237	684	667.2	-	1 652.0
40-44	4.2	65	3.3	72.5	32.4	359	80	1 142.0	-	1 613.4
45-49	7.2	75	22.8	105.0	16.3	387	54	901.2	-	1 358.5
50-54	9.9	133	81.5	224.4	11.6	566	47	676.5	14.7	1 315.8
55-59	8.4	137	175.4	320.8	13.9	738	49	443.2	54.0	1 298.1
60-64	7.6	176	215.6	399.2	27.6	594	23	318.5	141.1	1 104.2
65-69	4.6	80	141.0	225.6	10.4	442	48	222.2	70.0	792.6
70-74	3.4	107	23.5	133.9	5.0	273	42	169.0	61.0	550.0
75-79	2.9	145	23.1	171.0	2.4	85	12	88.4	19.1	206.9
80-84	2.2	60	10.2	72.4	2.8	123	13	29.3	28.1	196.2
85-89	1.6	40	5.5	47.1	2.3	39	7	16.0	8.0	72.3
90-94	0.8	12	1.6	14.4	1.4	42	1	12.0	6.3	62.7
95-99	0.5	25		25.5	0.7	16	-	8.0	3.1	27.8
100-104	0.4	11		11.4	0.6	8	-	-	3.1	11.7
105+	0.5			0.5	0.2	8	-	-	-	8.2
TOTAL	55.7	1 114	703.5	1 873.2	259.8	4 054	4 028	4 837.6	408.5	13 587.9
OBS TONNES	106	2 499	1 218	3 823	215	5 691	1 417	4 885	936	13 144
CALC. TONNES	102	2 408	1 218	3 728	228	6 249	1 422	4 860	935	13 694

Table 1.7 Length compositions (thousands of fish) for Hake landings from ICES Divisions VIII a and b by country and vessel class for 1979.

LENGTH CLASSES (cm)	FRANCE					SPAIN				TOTAL
	HAUTURIERS (TRAWL)	ARTISANS		GILLNET AND LONGLINES	COTIERS (TRAWL)	BAKAS ¹		BOUS (TRAWL)	PAREJAS- TRIOS (TRAWL)	
		(PELAGIC TRAWL)	(BOTTOM TRAWL) ²			TRAWL (A)	TRAWL (B)			
5-9	-	-	19 503	-	-	-	-	-	-	19 503.0
10-14	-	-	33 282	-	-	-	52.3	-	-	33 334.3
15-19	-	-	35 027	-	384	85.7	3 543.1	18.0	101.7	39 159.5
20-24	-	32	16 062	-	5 801	63.0	2 779.2	71.0	277.9	25 086.1
25-29	5	359	5 307	1	8 463	857.2	3 807.8	252.5	769.1	19 821.6
30-34	22	679	4 390	11	3 056	1 041.4	3 135.6	393.4	1 225.3	13 953.7
35-39	82	1 057	1 832	7	322	634.2	377.7	447.0	679.4	5 438.3
40-44	149	721	1 198	11	19	307.0	159.1	298.0	275.5	3 137.6
45-49	277	215	417	7		283.0	217.8	325.0	124.7	1 866.5
50-54	140	115	157	16		210.2	44.3	358.1	140.0	1 180.5
55-59	170	55	364	67		86.6	58.9	301.0	115.8	1 218.3
60-64	40	69	128	101		60.2	42.0	182.0	75.6	697.8
65-69	73	29	80	144		30.2	32.7	122.7	51.5	563.1
70-74	30	18	7	245		19.1	23.8	58.0	31.7	432.6
75-79	12	8	2	76		6.2	1.1	12.4	13.7	131.4
80-84	8	5	1	37		0.2	1.8	3.1	0.3	56.4
85-89	4	5	1	28		0.3		1.1	1.8	41.2
90-94		1		4		0.5		-	0.7	6.2
95-99				1				0.2	0.4	1.6
100-104										
105+										
TOTAL	1 012	3 368	117 758	756	18 045	3 685.2	14 277.2	2 843.3	3 885.1	165 629.7
TONNES RF.	1 115	1 524	7 465	1 587	2 493	1 521	2 274	2 223	1 563	
CALC. TONNES	1 075	1 602	7 048	1 821	2 427	1 524	2 268	2 224	1 563	

¹ Data sets (A) and (B) calculated for sample data from the ports of Pasajes and Ondarra, respectively.

² Includes discard estimates.

Table 1.8 Numbers (millions) and mean age of Hake caught from 1969-1979 by area and gear type.

AREA		IVa + VIa				VII						VIIIa,b							
NATION		E + W	F R A	S P N	S C O T	E + W	FRANCE			SPAIN		FRANCE					SPAIN		
VESSEL OR GEAR TYPE		T R A W L	H A U T.	T R A W L	T R A W L	T R A W L	H A U T.	S E M I.	A R T.	T R A W L	G I L L + L N L E	H A U T.	A R T.	G I L L	P E L.	C O T.	B O U S	B A K A	P A R A.
YEAR																			
69 - 74	NO.	1.9	2.2	10.2	0.6	0.3	10.6	?	?	31.3	?	?	118 ¹	?	?	?		339 ¹	
	AGE	9.3	7.3	4.0	4.3	6.8	5.4	?	?	3.4	?	?	1.2	?	?	?		1.3	
77	NO.	0.1	1.3	?	?	0.1	2.4	4.6	3.6	15.5	1.5	1.1	20.4	0.2	?	?		22.9	
	AGE	8.5	8.2	?	?	7.0	6.8	4.1	3.4	3.3	6.4	5.2	2.4	11.8	?	?		4.6	
78	NO.	0.1	0.9	?	3.1	0.2	2.7	5.5	1.9	11.2	1.2	0.9	21.3	0.2	?	?		37.2	
	AGE	9.9	9.9	?	3.8	5.7	6.7	3.7	3.8	5.7	6.4	5.6	3.0	10.7	?	?		3.2	
79	NO.	0.1	1.1	0.7	?	0.3	4.0	?	4.0	4.8	0.4	1.0	118 ¹	0.7	3.4	18.0	2.8	18.0	3.9
	AGE	8.2	9.2	8.1	?	5.2	7.4	?	3.3	5.8	9.7	6.0	1.2	10.0	3.9	2.2	4.9	2.5	3.4
MEAN 77-79	NO.	0.1	1.1	0.7	3.1	0.2	3.0	5.0	3.2	10.5	1.0	1.0		0.4	3.2	18.0			
	AGE	8.9	9.1	8.1	3.8	6.0	7.0	3.9	3.5	4.9	7.5	5.6	2.2	10.8	3.9	2.2		2.9	

¹Includes estimate of numbers rejected.

Table 1.9 Trends in catch per unit effort for trawl fisheries in ICES Divisions IVa and VIa, Sub-area VII and Divisions VIII a and b by area, country and vessel class, 1961-1979.

YEAR	IVa + VIa		VII				VIIIa,b	
	FRANCE ¹	U.K. ²	FRANCE ¹		U.K. ²	SPAIN ¹	FRANCE ¹	
			HAUTURIERS	ARTISANS			HAUTURIERS	ARTISANS
1961	155	151	142.2	41.9	88.9	.	174.4	37.3
1962	124	162	110.8	36.7	105.3	.	159.0	31.2
1963	101	150	83.3	29.5	74.8	.	136.2	25.4
1964	74	128	65.5	25.5	33.9	.	124.8	20.6
1965	89	104	43.0	26.6	15.0	.	106.5	19.7
1966	37	61	53.2	21.9	20.0	.	75.1	20.9
1967	54	48	39.4	16.9	20.0	47.3	77.8	22.6
1968	50	41	40.7	11.7	73.7	57.4	75.1	21.6
1969	43	44	52.8	13.9	35.1	55.8	69.9	23.6
1970	48	45	60.2	17.0	25.9	76.0	78.4	40.6
1971	42	17	57.2	16.6	23.5	98.9	95.2	25.6
1972	42	9	47.0	19.5	24.7	54.0	90.6	21.1
1973	33	6	51.1	20.7	21.1	55.8	83.5	25.7
1974	26	6	57.2	19.4	34.3	51.9	82.4	18.0
1975	27	5	56.6	21.5	33.5	45.1	62.5	22.0
1976	29	4	43.1	.	29.0	53.1	63.3	.
1977	23	4	34.5	.	22.0	56.2	53.7	.
1978	17	3	41.3	.	24.6	59.4	74.7	.
1979	.	2	.	.	21.6	.	.	.
\bar{x}_{61-63}	126.7	154.3	112.1	36.0	89.7	-	156.5	31.3
$\bar{x}_{\text{last 3 yrs. in series}}$	23.0	3.0	39.6	20.5	22.7	56.2	63.9	21.9
% change	-82	-98	-65	-43	-75	-	-59	-30

¹Catch in kg per ten horsepower days.

²Catch in tonnes per million tonne hours.

Table 1.10 Growth parameter estimates, weight-length relationship and average weights at length used for assessment of the Northern Stock.

Source: Descamps et Labastie, C.M. 1978/G:41

LENGTH CLASSES (cm)	\bar{W} (mid-point class) Kg	GROWTH PARAMETER ESTIMATES																
5-9	0.002	<table><tr><td></td><th>♀</th><th>♂</th></tr><tr><td>L_{∞}</td><td>83.0</td><td>116.0</td></tr><tr><td>K</td><td>0.148</td><td>0.098</td></tr><tr><td>t_0</td><td>-0.42</td><td>-0.51</td></tr><tr><td>W_{∞}</td><td>4.068</td><td>11.383</td></tr></table>			♀	♂	L_{∞}	83.0	116.0	K	0.148	0.098	t_0	-0.42	-0.51	W_{∞}	4.068	11.383
	♀			♂														
L_{∞}	83.0			116.0														
K	0.148			0.098														
t_0	-0.42			-0.51														
W_{∞}	4.068			11.383														
10-14	0.012																	
15-19	0.034																	
20-24	0.074																	
25-29	0.136																	
30-34	0.228																	
35-39	0.354																	
40-44	0.520																	
45-49	0.732																	
50-54	0.995																	
55-59	1.316																	
60-64	1.701																	
65-69	2.155																	
70-74	2.684																	
75-79	3.295																	
80-84	3.993																	
85-89	4.785																	
90-94	5.676																	
95-100	6.673																	

Weight-length relationship $W_{(Kg)} = 0.00513 L_{(cm)}^{3.074}$

Table 1.11 Immediate losses in percentages and tonnes by area, country and gear type calculated under different selectivity options.

Sub-area/ Division	1979 Mesh Size	Immediate Loss (percent)		1979 Official Nominal Catch of Hake (t)	Immediate Loss (tonnes)		Percent of Hake in Total landing
		SF=3.6	SF=4.1		SF=3.6	SF=4.1	
IV + VI France Hauturiers	70	0.3	0.2	2 459	7	5	<5
England and Wales	80	0.0	0.0	106	0	0	<5
Scotland	70	-	-	1 400	≈0	≈0	<5
Spain	70	0.2	0.0	1 218	2	0	20
Total		0.2	0.1	5 183	9	5	
VII France Hauturiers	70	0.6	0.6	3 200	19	19	10-40
France Semi-Industrials ¹	50	13.0	19.0	2 490	324	468	5-15
France Artisans	50	18.0	28.0	1 417	255	391	<5
England and Wales	75	1.7		215	4		<1
Spain Longlines	-	-	-	936	0	0	
Spain Trawlers	70	1.5	1.8	4 985	75	90	25
Total		5.0	7.0	13 243	677	968	
VIIIa,b France Hauturiers	60	1.6	2.0	1 115	18	22	≈50
France Pelagic Trawls	60	9.2	15.0	1 524	140	229	15-35
France Artisans ¹	40	24.0	35.0	4 543	1 090	1 590	10-20
France Côtiers	40	51.0	71.0	2 493	1 271	1 770	15-20
France Gillnets + Longlines	-	-	-	1 587	0	0	60-80
Spain Trawlers	60	15.0	22.0 ²	15 162	2 274	3 336	44
Total		19.0	28.0	26 424	4 793	6 947	
Total		12.0	17.0	44 850	5 479	7 920	

¹ Mesh size and catch composition of 1978 used (no data available for 1979).

² 25% of mesh size assumed 40mm.

Table 1.12 Estimated catches, TAC's recommended and adopted and mesh size recommended and in use after 1975 in the Northern stock.

Years	Estimated catch (x 10 ³ t)	TAC recommended (x 10 ³ t)	TAC adopted (x 10 ³ t)	Mesh size (mm) recommended		Mesh size (mm) in use	
				IVa+VIa VII	VIIIa,b	IVa+VIa VII	VIIIa,b
1975	74.5			70	60	40-80	40-50
1976	67.3			70	60	40-80	40-50
1977	51.2			70	60	60-80	40-60
1978	49.9			70	60	70-80	40-60
1979	51.4	43.0	43.0	70	60	70-80	40-60
1980		30.0	40.0	80	80	70-80	40-60
1981		(34.0)		(80)	(80)		

Table 2.1 Nominal catches (thousands of tonnes) for the Southern Hake stock (ICES Divisions VIIIc and IXa), as reported to ICES by country and area, 1961-1979.

YEARS	TOTAL	FRANCE		PORTUGAL IXa	SPAIN	
		VIII ¹	IXa		VIII ¹	IXa
1961	100.6	12.3	3.1	13.0 ⁴	40.6	31.8 ³
1962	92.2	14.8	3.2	6.4	32.0	35.8 ³
1963	101.7	12.4	3.2	7.0	39.3	39.8 ³
1964	104.7	13.0	2.9	9.0	34.0	45.8 ³
1965	74.8	10.7	-	10.4	7.1	46.6 ³
1966	89.1	5.5	2.1	8.3	27.5	45.7 ³
1967	97.7	11.0	2.4	7.6	31.6	45.1 ³
1968	89.1	10.2	2.0	7.2	32.2	37.5 ³
1969	82.8	8.8	1.7	6.6	27.1	38.6 ³
1970	99.7	12.8	1.5	9.3	34.3	41.8 ³
1971	37.8	13.1	0.6	8.0	14.0	2.1 ³
1972	71.0	12.6	-	8.7	32.4	17.3
1973	84.4	11.3	-	15.3	37.0	20.8
1974	47.8	7.3	0.1	7.8	18.5	14.1
1975	54.4	7.9	0.1	9.4	18.0	19.0
1976	46.7	4.8	0.1	7.9	20.2	13.7
1977	46.2	6.6	-	5.5	16.6	17.5
1978	28.6	8.8	-	4.4	6.6	8.8
1979 ²	36.6	10.9	-	6.8	9.4	9.5

¹Includes Divisions VIIIA,b and VIIIC.

²Preliminary

³Data refer to port of landing, not area of capture (includes African catches).

⁴Include catches from area Xa,b.

Table 2.2 Reversed catches (thousands of tonnes) for the Southern Hake stock (ICES Divisions VIIIc and IXa) by country and area determined by the Hake Working Group, 1961-1979.

YEARS	TOTAL	PORTUGAL (IXa)	SPAIN (VIIIc + IXa)	FRANCE (VIIIc + IXa)
1961	.	7.5	.	.7
1962	.	7.5	.	.7
1963	.	8.1	.	.6
1964	.	10.5	.	.7
1965	.	12.1	.	.8
1966	.	9.6	.	.6
1967	.	7.8	.	.6
1968	.	8.0	.	.4
1969	.	7.1	.	.5
1970	.	9.9	.	.2
1971	.	9.5	.	.1
1972	26.7	9.4	17.3	.0
1973	35.7	14.7	20.8	.2
1974	23.4	9.2	14.1	.1
1975	32.0	11.1	20.8	.1
1976	26.2	9.7	16.4	.1
1977	15.8	6.4	9.2	.2
1978	14.5	5.6	8.6	.1
1979 ¹	18.1	6.8	11.3	.0

¹ Preliminary

Table 2.3 Number of Hake landed ($\times 10^3$) by fishing gear in Divisions VIIIc and IXa (1974 - 1977 average).

Length Classes (cm)	Portugal		Spain				Total
	Artisanal (1)	Trawl	Trawl (2)	Longline	Gillnet	Small Gillnet	
5- 9	-	-	2 497	-	-	-	2 497
10-14	-	10	45 626	-	-	-	45 636
15-19	11	711	62 474	-	-	-	63 196
20-24	18	4 769	21 547	-	-	231	26 565
25-29	104	4 900	7 896	-	-	1 140	14 040
30-34	114	3 117	2 904	-	-	1 865	8 000
35-39	201	1 915	1 079	3	-	680	3 878
40-44	553	626	1 014	32	10	198	2 433
45-49	776	279	614	79	33	101	1 882
50-54	787	97	371	174	100	-	1 529
55-59	810	85	220	411	232	-	1 758
60-64	610	55	188	425	368	-	1 646
65-69	369	27	126	228	370	-	1 120
70-74	212	8	37	102	221	-	580
75-79	106	1	21	31	78	-	237
≥ 80	66	-	26	10	23	-	125
Total	4 737	16 600	146 640	1 495	1 435	4 215	175 122
Nominal Weight (t)	6 287	3 599	9 421	2 585	3 099	1 098	26 089
Current Mesh Size (mm)	-	40	40	-	-	-	-

(1) Longline and Gillnet are included

(2) Includes an estimation of the illegal catch (< 25 cm)

Table 2.4 Length composition of the catches ($N \times 10^3$) by fishing gear in 1978.

Length Classes (cm)	VIIIc and IXa						Total
	Portugal		Spain				
	Trawl	Artisanal	Trawl (1)	Small Gillnet	Gillnet	Longline	
5- 9	4	-	39	-	-	-	43
10-14	510	-	15 490	-	-	-	16 000
15-19	516	7	17 675	7	-	-	18 205
20-24	3 032	13	4 049	39	-	-	7 133
25-29	3 327	12	1 720	240	-	-	5 299
30-34	941	51	1 873	273	-	-	3 138
35-39	409	131	606	28	3	-	1 177
40-44	257	232	569	2	10	67	1 137
45-49	53	316	969	1	25	259	1 623
50-54	33	461	830	-	73	395	1 792
55-59	70	388	692	-	246	427	1 823
60-64	58	244	355	-	285	219	1 141
65-69	14	171	52	-	125	96	458
70-74	6	138	14	-	26	24	208
75-79	1	48	-	-	11	9	69
≥ 80	-	110	1	-	2	2	115
Total	9 231	2 322	44 914	590	806	1 498	59 361
Nominal Weight (t)	1 629	3 550	5 905	118	1 441	2 071	14 714
Current Mesh Size (mm)	40	-	40	-	-	-	-

(1) Includes an estimation of the illegal catches (< 25 cm)

Table 2.5 Length composition of the catches by fishing gears in 1979.

Length Classes (cm)	VIIIc and IXa						
	Portugal		Spain				Total
	Trawl	Artisanal	Trawl (1)	Small Gillnet	Gillnet	Longline	
5- 9	-	-	-	-	-	-	-
10-14	-	-	91	-	-	-	91
15-19	438	10	1 589	12	-	-	2 049
20-24	4 043	57	4 425	234	-	-	8 759
25-29	5 277	238	4 624	851	-	-	10 990
30-34	1 741	208	3 688	373	-	-	6 010
35-39	674	192	2 151	6	-	1	3 024
40-44	138	462	1 415	-	-	39	2 054
45-49	99	463	1 009	-	-	91	1 662
50-54	52	486	839	-	43	374	1 794
55-59	46	454	682	-	263	489	1 934
60-64	42	426	342	-	399	368	1 577
65-69	7	302	71	-	152	66	598
70-74	-	159	18	-	31	7	215
75-79	-	88	5	-	9	1	103
≥ 80	-	53	-	-	4	8	65
Total	12 557	3 598	20 949	1 476	901	1 444	40 925
Nominal Weight (t)	2 168	4 612	7 246	237	1 705	2 147	18 115
Current Mesh Size (mm)	40	-	40	-	-	-	-

(1) Does not included any estimation of the illegal catches (< 25 cm)

Table 2.6 Number (millions) and mean age of Hake caught from 1974-1979 by gear type.

Southern Stock

Portugal			Spain					France
Trawl	Artisan	Gill/Line		Trawl	Betas	Gill	Line	Artisan
1974/75								
13 359/2.7		3 853/5.0	Excl. R 319 204/1.2	6 266/2.9		1 144/8.9	1 003/7.8	?
			Incl. R 428 617/1.1					
1974/78								
15 075/2.5			126 655/1.28					10 594/5.8 ?
Both countries all gears			152 317/1.72					
1974/77								
Both countries all gears			175 122/1.68					
Both countries all gears 1977			59 351/2.08					?
Both countries all gears 1979			61 690/2.34					
1977								
7 430/2.5	3 689/6.7					No Data		192/6.3
1978								
9 231/2.2	2 322/7.0		55 220/1.6	590/2.6		806/7.7	1 498/6.6	3 413/6.1 68/6.04
1979								
12 557/3.0	3 598/4.4		20 949/3.0	1 476/2.3		901/8.0	1 444/6.9	-

Table 2.7 CPUE for trawl fisheries in Divisions IXa and VIIIc by countries, during the period 1961-1978.

Year	C P U E		
	France	Spain	Portugal
1961	174		24.2
62	151		23.5
63	123		31.2
64	102		34.6
65	107		43.4
66	78		31.0
67	63		19.9
68	54		17.5
69	69		12.1
1970	67		22.2
71	87		16.6
72	53		16.0
73	108		21.1
74	102		10.9
75	93	36.0	13.4
76	67	30.3	9.7
77	-	34.3	4.4
78	-	25.2	4.3

CPUE France: $\text{Kg} \times 10^{-2} \times (\text{HP} \times \text{Day})^{-1}$

CPUE Spain: $\text{Kg} \times 10^{-2} \times (\text{HP} \times \text{Day})^{-1}$

CPUE Portugal: Kg/hour

Table 2.8 Length/weight relationship, Hake.

Length Classes (cm)	Average Weight (kg)		
	France (1)	Portugal (2) *	Spain (3)
5- 9	.002	.003	.002
10-14	.012	.012	.011
15-19	.034	.035	.033
20-24	.073	.078	.073
25-29	.136	.146	.138
30-34	.227	.246	.235
35-39	.352	.384	.372
40-44	.517	.569	.554
45-49	.727	.805	.791
50-54	.989	1.101	1.089
55-59	1.309	1.464	1.456
60-64	1.691	1.900	1.900
65-69	2.142	2.417	2.430
70-74	2.668	3.022	3.053
75-79	3.276	3.724	3.778
> 80	5.000	5.000	5.000
r	-	.9986	.995

* Up to 50 cm only 14 individuals were weighted

(1) $W = .00513 L^{3.074}$ Hake Working Group 1979

(2) $W = .00458 L^{3.12819}$ Portuguese r/u "Noruega" in March 1980

(3) $W = .003487 L^{3.194193}$ Cruise ASA-I-Galicia, March 1976

Table 2.9 Growth parameter estimates, weight-length relationship and average weights at length used for assessment of the Southern Stock.

Source: Decamps and Labastie, C.M. 1978/G:41

Length Classes (cm)	\bar{W} (mid-point class) (kg)	Growth Parameter Estimates																	
5- 9	.003	<table><tr><td></td><th>♀</th><th>♂</th></tr><tr><td>L_{∞}</td><td>83.0</td><td>116.0</td></tr><tr><td>K</td><td>0.148</td><td>0.098</td></tr><tr><td>t_0</td><td>-0.42</td><td>-0.51</td></tr><tr><td>W_{∞}</td><td>4.068</td><td>11.383</td></tr></table>		♀	♂	L_{∞}	83.0	116.0	K	0.148	0.098	t_0	-0.42	-0.51	W_{∞}	4.068	11.383		
	♀		♂																
L_{∞}	83.0		116.0																
K	0.148		0.098																
t_0	-0.42		-0.51																
W_{∞}	4.068		11.383																
10-14	.012																		
15-19	.035																		
20-24	.078																		
25-29	.146																		
30-34	.246																		
35-39	.384																		
40-44	.569																		
45-49	.805																		
50-54	1.101																		
55-59	1.464																		
60-64	1.900																		
65-69	2.417																		
70-74	3.022																		
75-79	3.724																		
>80	5.000																		

Weight-length relationship $W_{(Kg)} = 0.00458 L_{(cm)}^{3.12819}$

Table 2.10 Calculation of immediate losses and long-term gains.

Southern Stock

1. Immediate losses (on 1979) to 80 mm

	Y ₁	Y ₀	Immediate losses	
			Tonnes	%
Portugal, trawl	2 168	952	1 216	-56
Portugal, artis.	4 200	4 200	0	0
Spain, trawl*	7 244	5 576	1 668	-23
Spain, artis.	3 840	3 840	0	0
Total	17 452	14 568	2 834	-16

* Does not included illegal landings

2. Long-term gains (on 1974-77 mean)

Y/R Model

F=0.4	New mesh	60	80	100	120
% L.T. (Y/R)		+37	+69	+98	+119

Mesh = 40 mm	F=0.4 x	.25	.40	.75	1.25
% L.T. (Y/R)		+31	+37	+16	-14

Table 2.11 Abstract of the catches, TACs and meshes in use
in the southern stock of hake from 1975-1981.

Year	Catch x1000 t	TAC proposed by ACFM x 1 000 t	TAC adopted	Mesh in use	Mesh recommended
1975	31.9			40	60 NEAFC
1976	26.1			40	60 NEAFC
1977	15.6			40	60 NEAFC
1978	14.2			40	60 NEAFC
1979	18.1(1)	20.0	20	40	60 NEAFC+ICES
1980		10.0	10	40	80 ICES
1981		(8.4)		(80)	80 (2)

(1) Official data for Spain.

(2) Spanish-Portuguese Working Group, Vigo, April 1980.

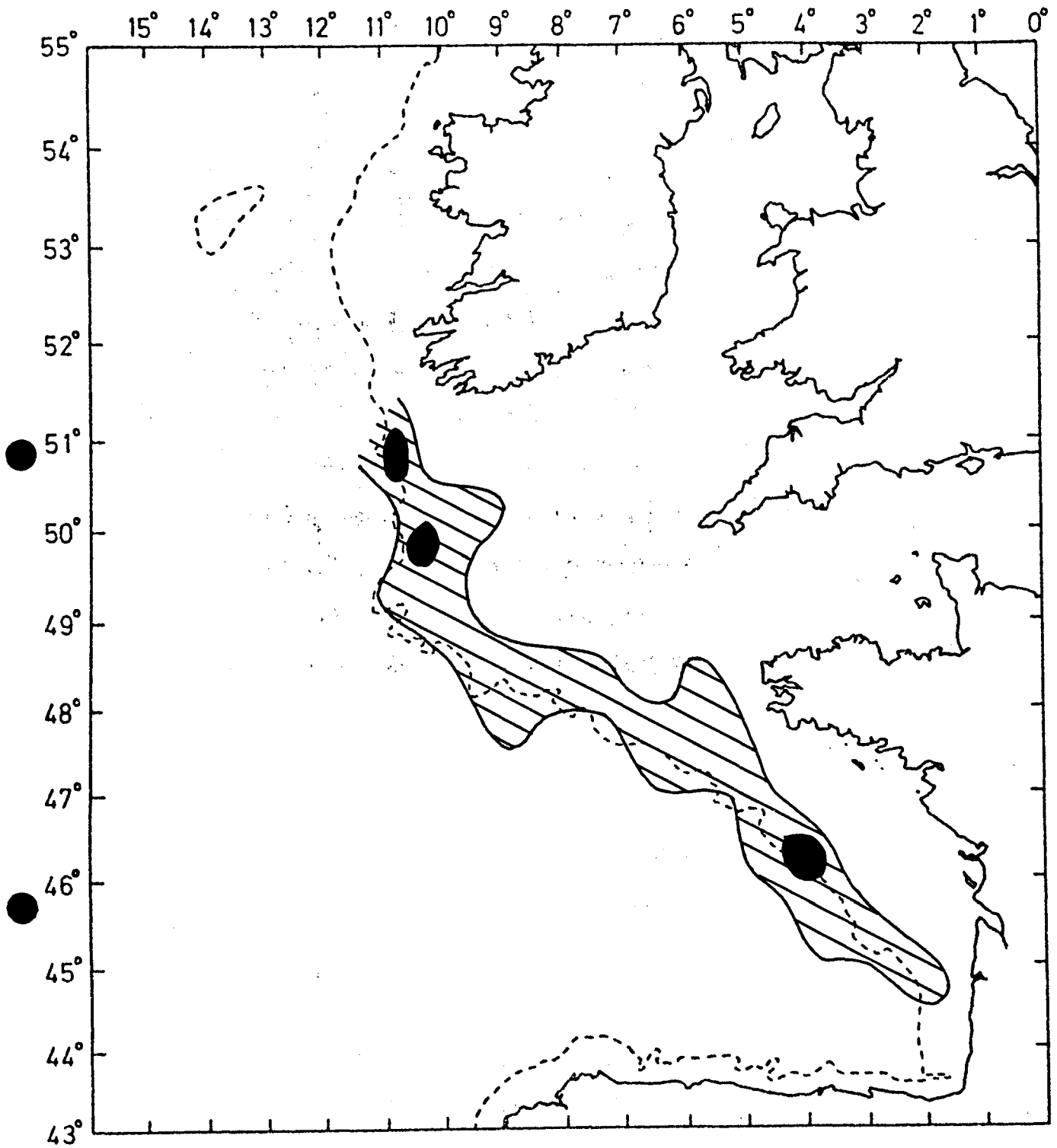


Figure 1.1 Abundance of Hake larvae beneath 1 square metre determined from British Survey Data, 13 - 28 March, 1977



1.0 - 4.99



5.0+

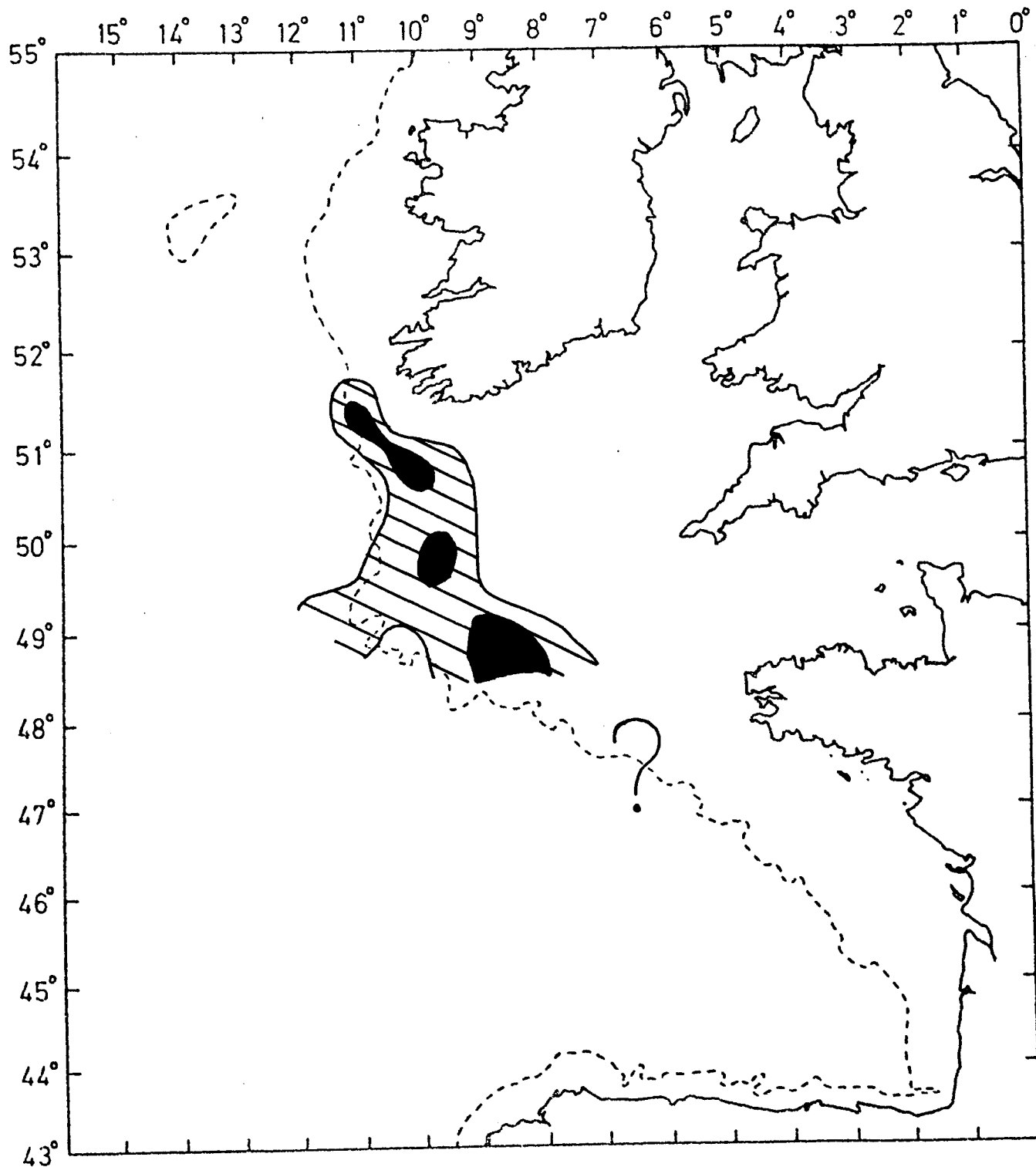
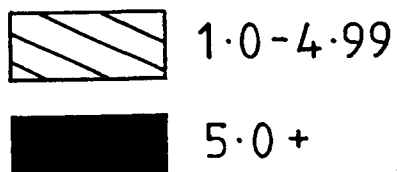


Figure 1.2 Abundance of Hake larvae beneath 1 square metre determined from British Survey Data, 8 - 16 April, 1977



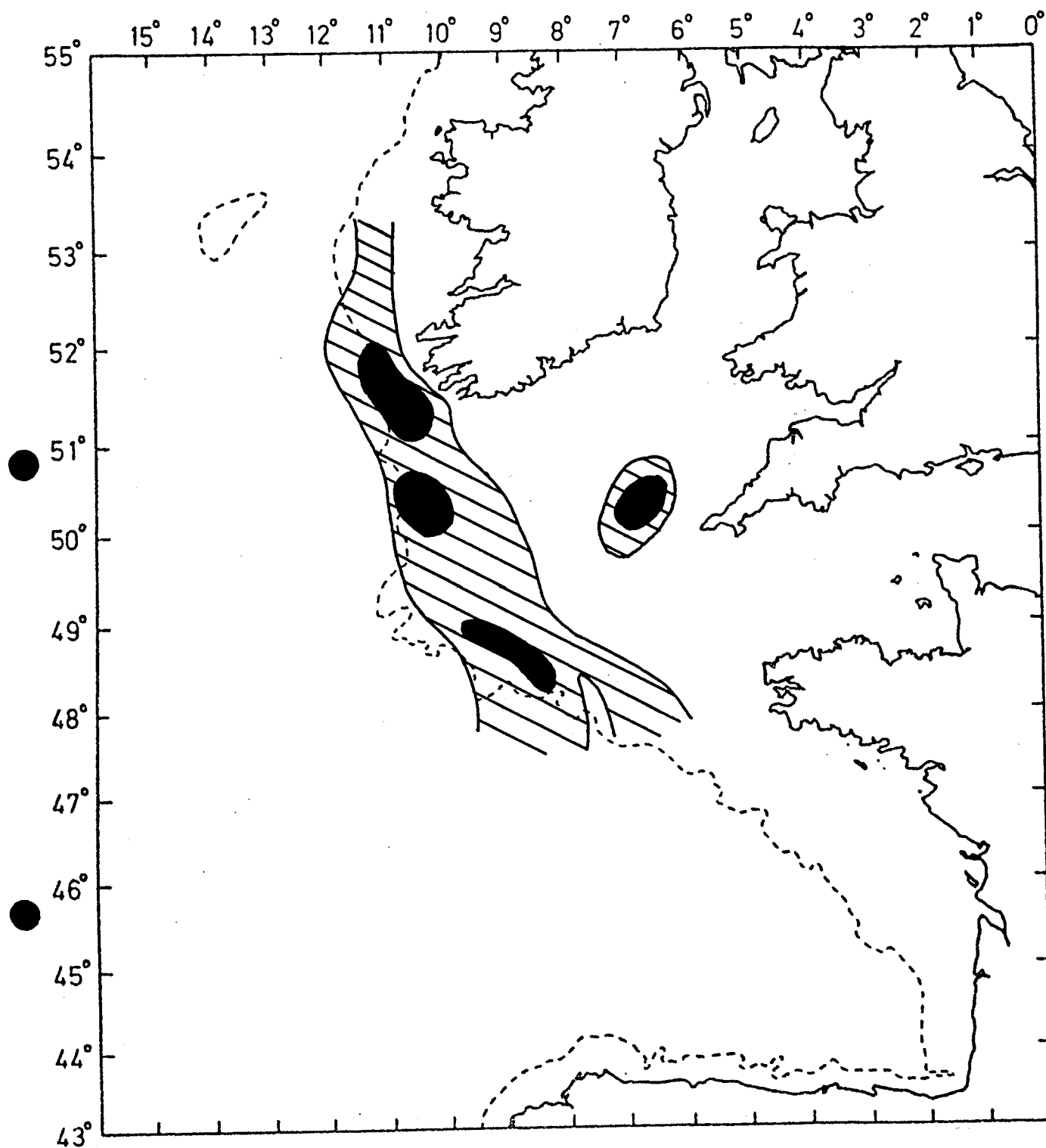
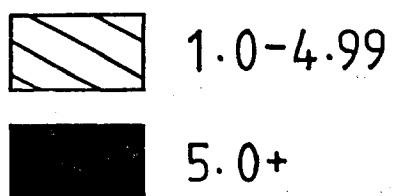


Figure 1.3 Abundance of Hake larvae beneath 1 square metre as determined from British Larval Survey Data 10 - 19 May 1977



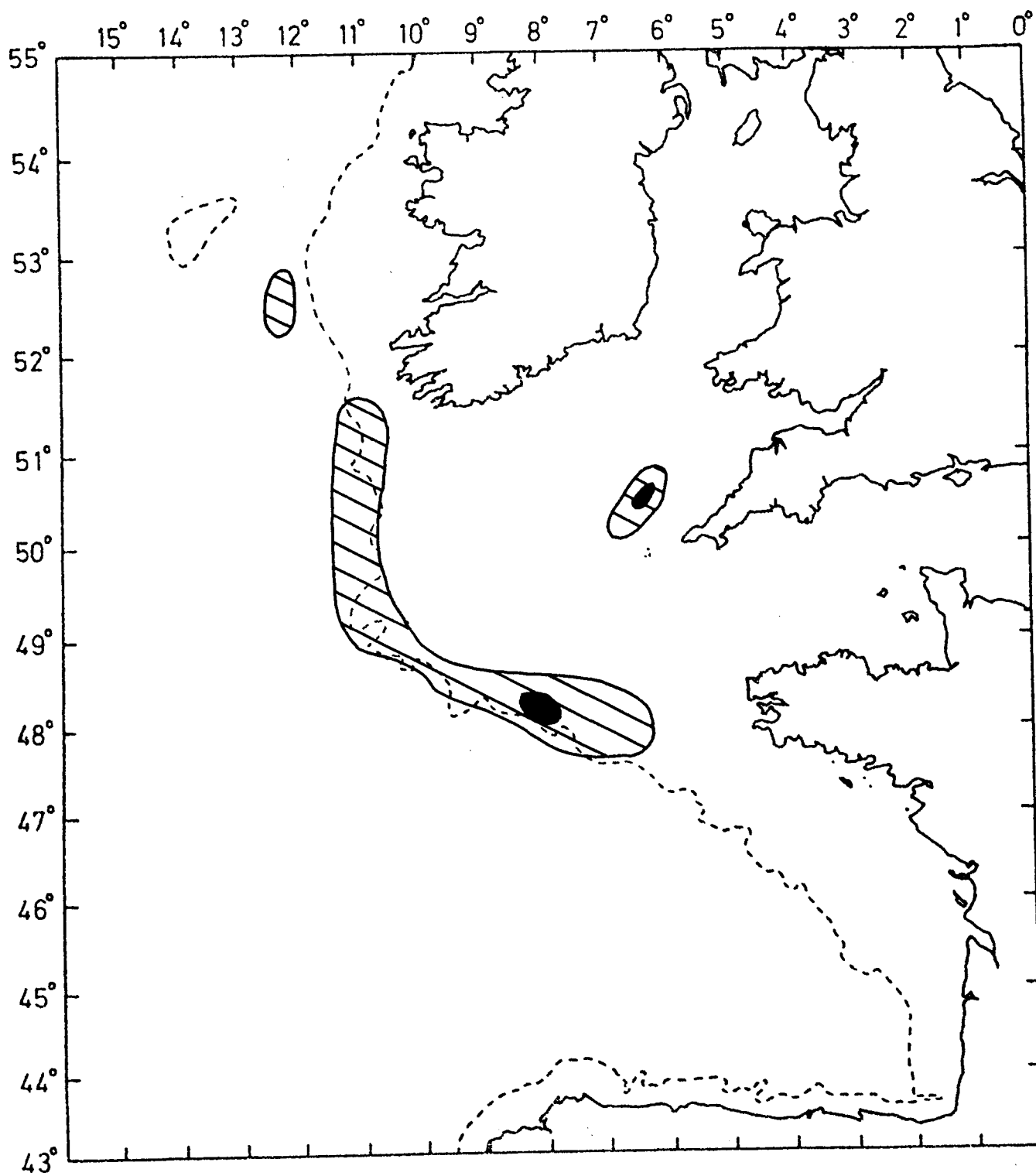
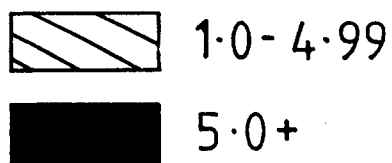


Figure 1.4 Abundance of Hake larvae beneath 1 square metre as determined from British Larval Survey Data, 2 - 12 June 1977



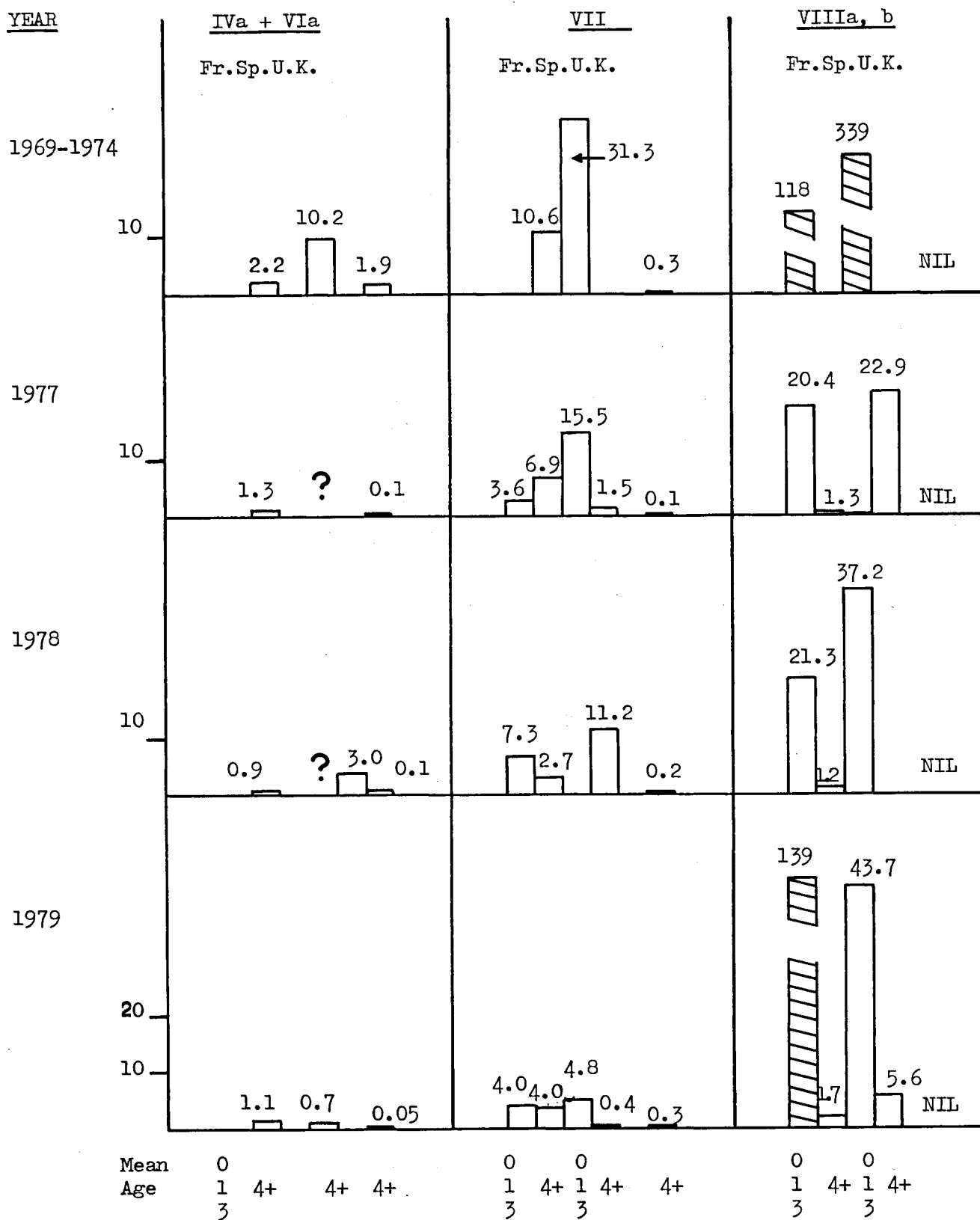


Figure 1.5 Number (millions) of Hake caught in ICES Divisions IVa, VIa, VIIIa, b and Sub-area VII during 1974-1979.



Includes estimates of numbers rejected

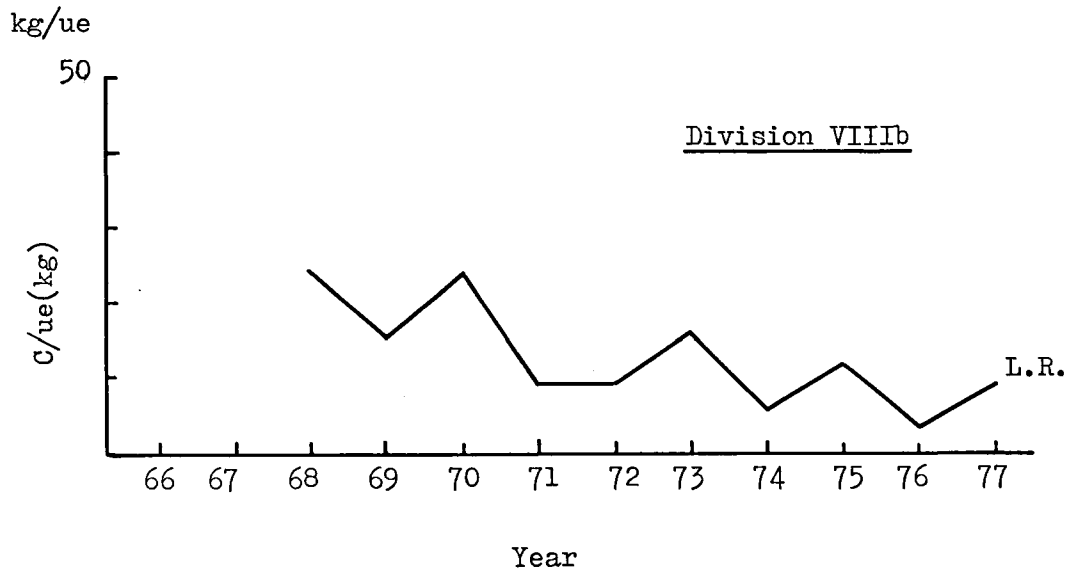
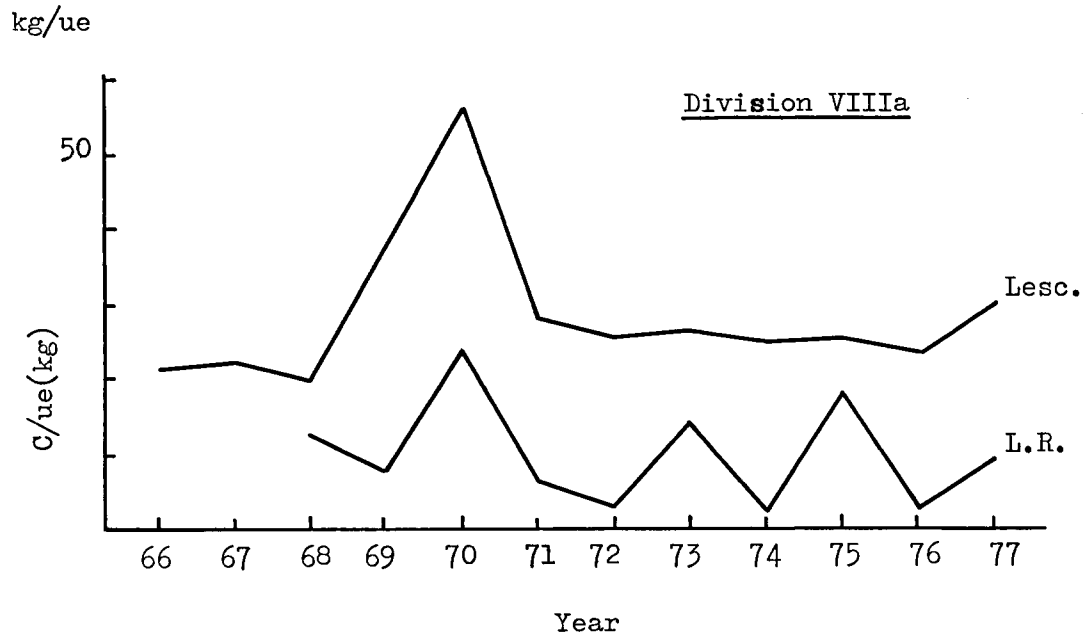


Figure 1.6 Catch per unit effort of <35 cm hake by French trawlers from the ports of Lesconil and La Rochelle from 1966 to 1977

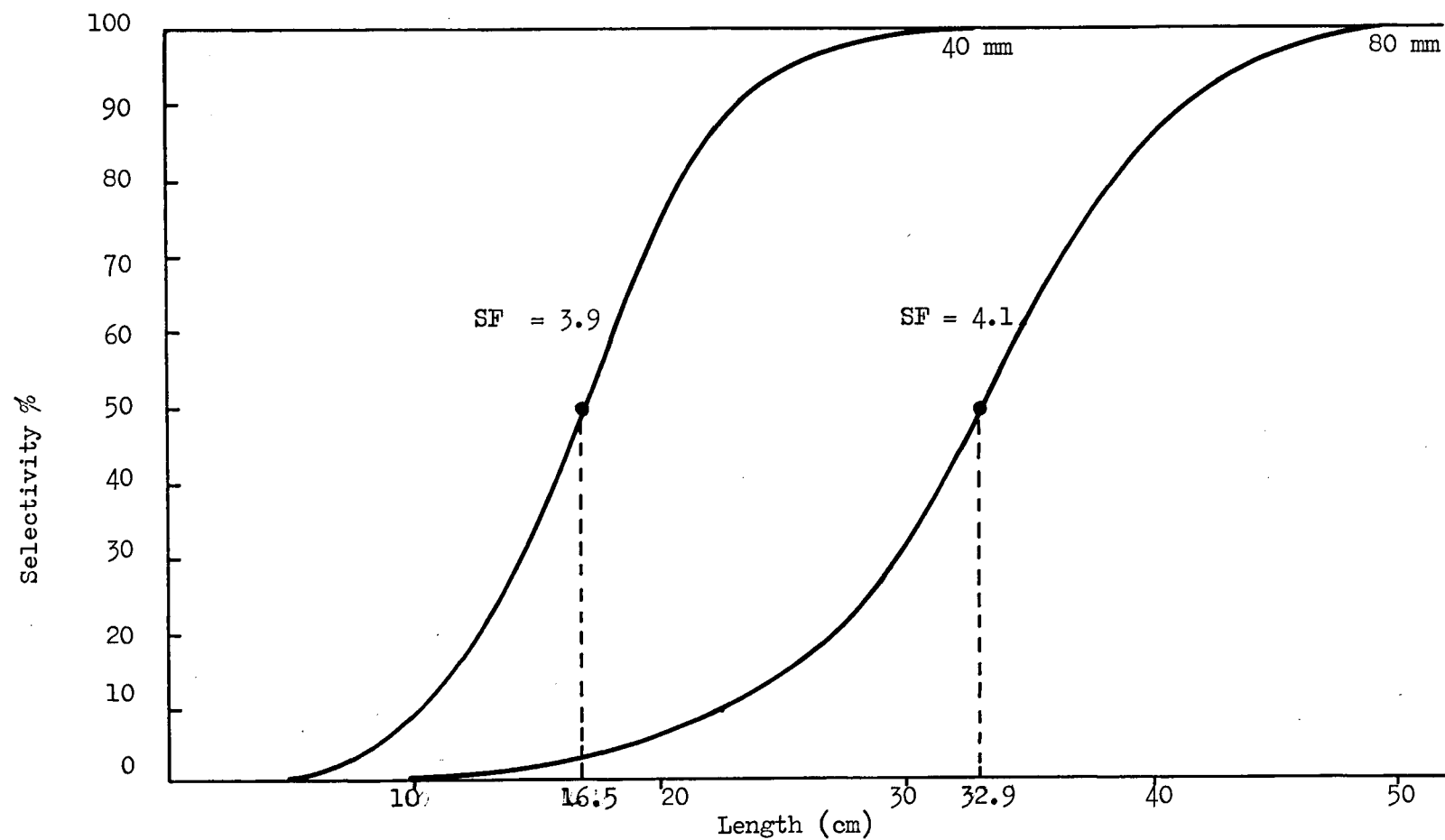


Figure 1.7 Selection curves for 40 mm and 80 mm trawls derived from logistic fits of selectivity data provided by Brabant and Guillou (1976) for 40 mm trawls and by Working Group members for 60 mm trawls.

Figure 1.8 Yield per recruit curves formale and female hake (Northern stock) for 40 mm, 60 mm and 80 mm trawls calculated assuming $M = 0.2$ and utilizing the growth parameter of Decamps and Labastie. (1978).

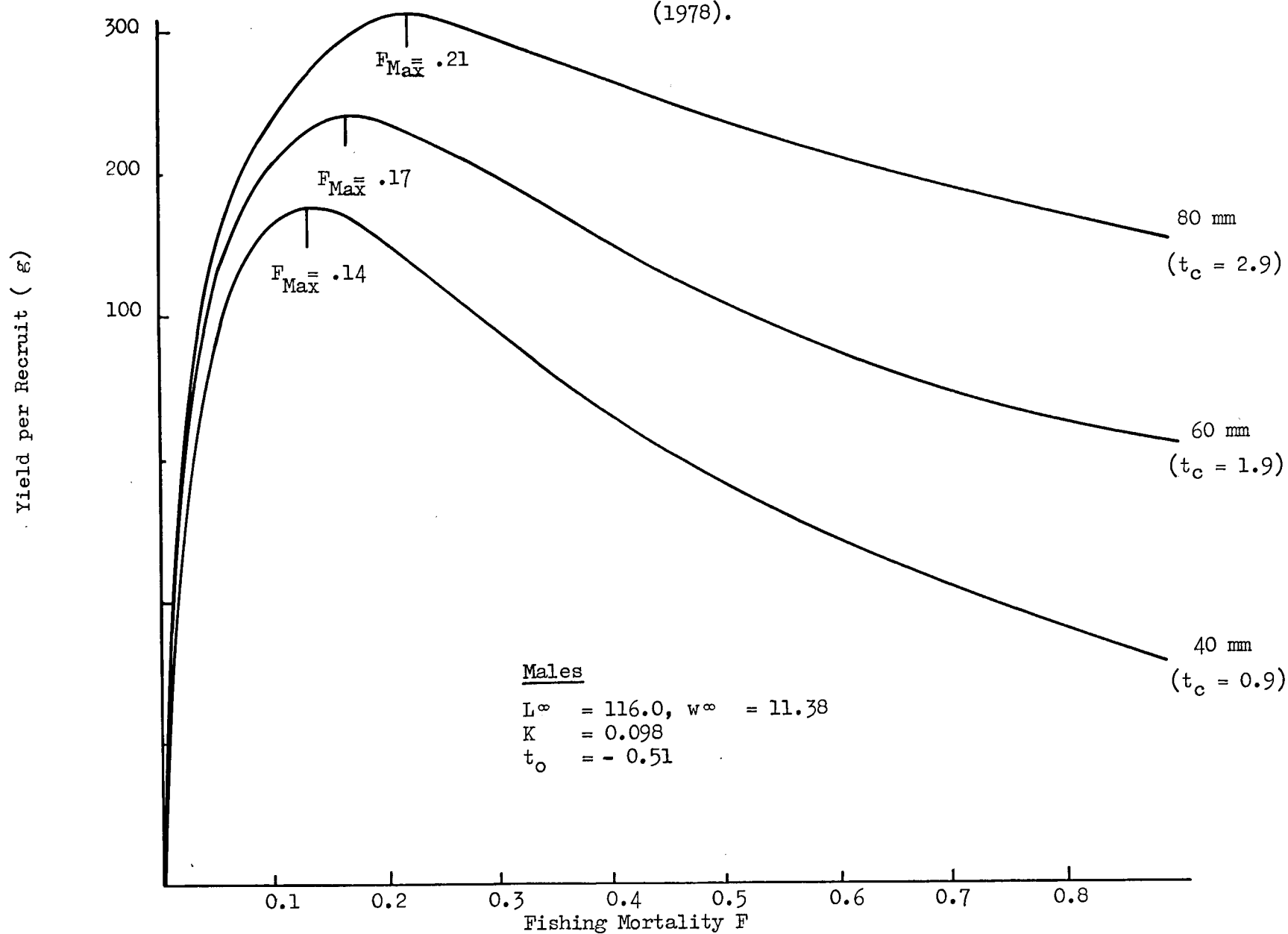


Figure 1.8 continued

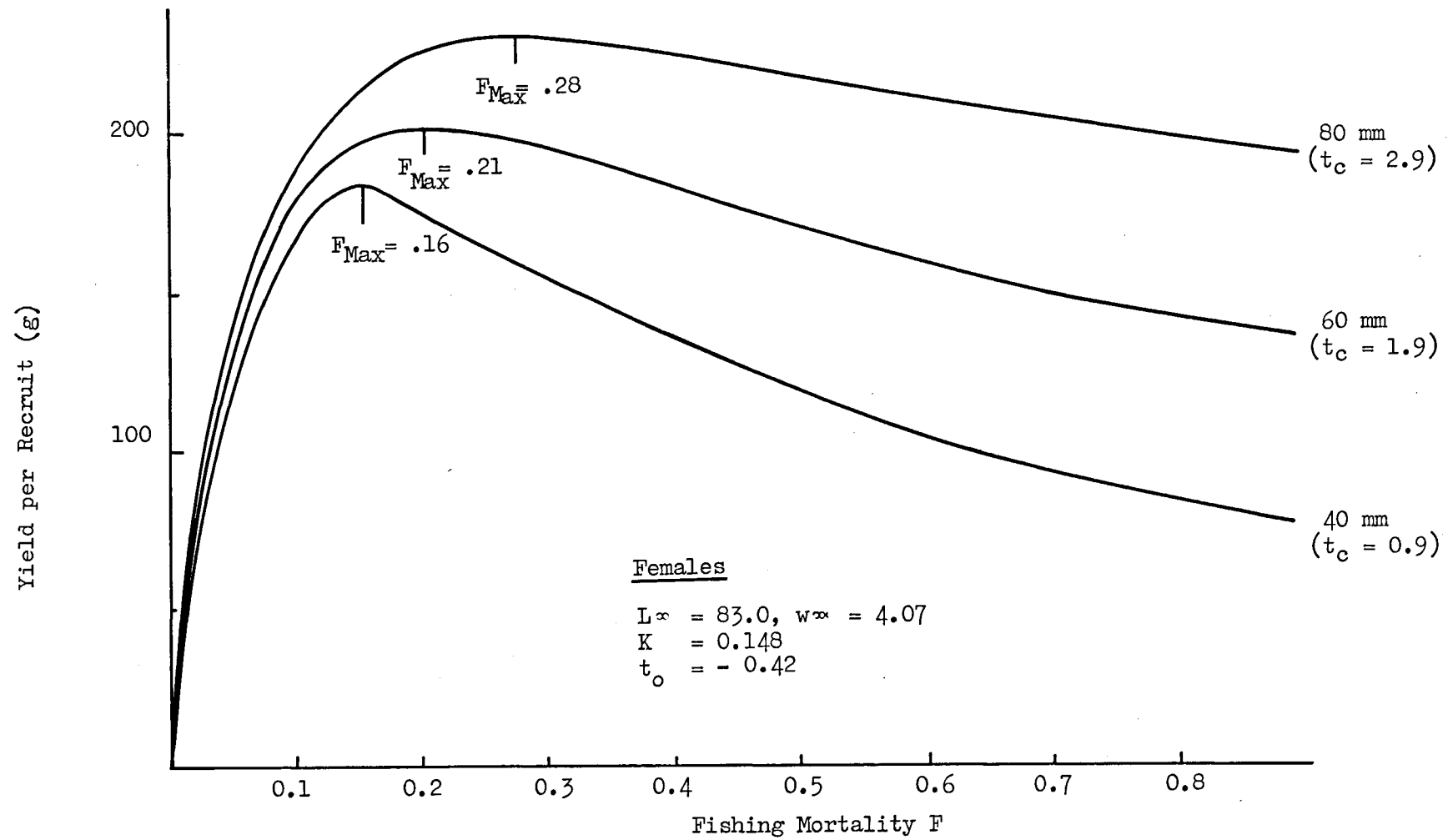
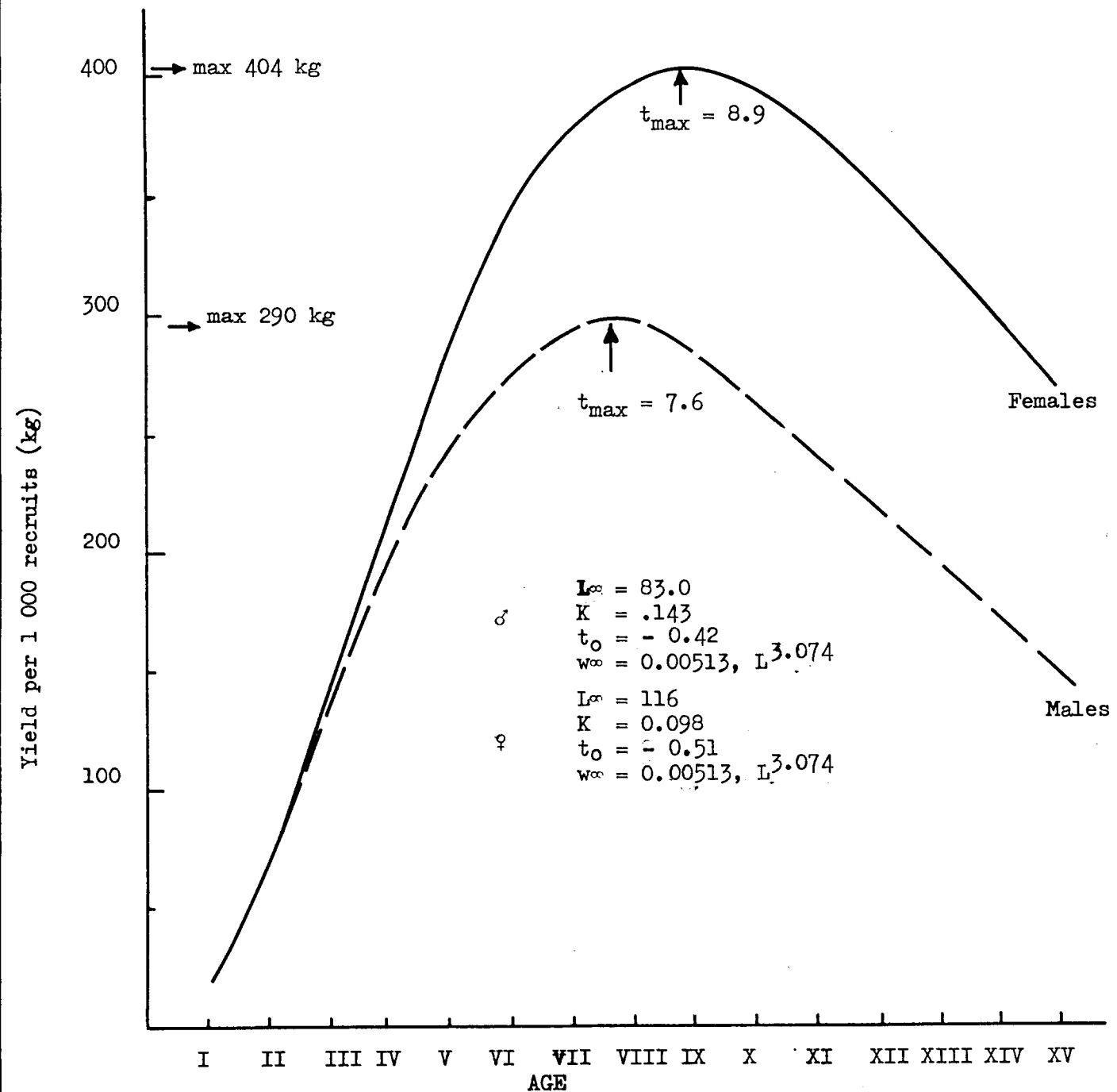


Figure 1.9 Virgin biomass curves for female and male hake (Northern stock) calculated assuming $M = 0.2$ and utilizing the growth parameters of Decamps and Labastie, (1978)



France

Spain

Portugal

YEAR

1974/1975

429

10

?

1974/1978

10

?

127

1977

10

?

NIL

1978

50

40

30

20

10

NIL

1979

10

NIL

NIL

0-3

4+

0-3

3+

Mean Age

Figure 2.1 Number $\times 10^{-6}$ of Hake caught in VIIIA, b and IXa (Southern stock) 1974 - 1979

Figure 2.2 Survey "CIGALA - 79" - Division IXa.
R/V "Cornide de Saavedra" August 1979
Selectivity for 60 mm mesh size

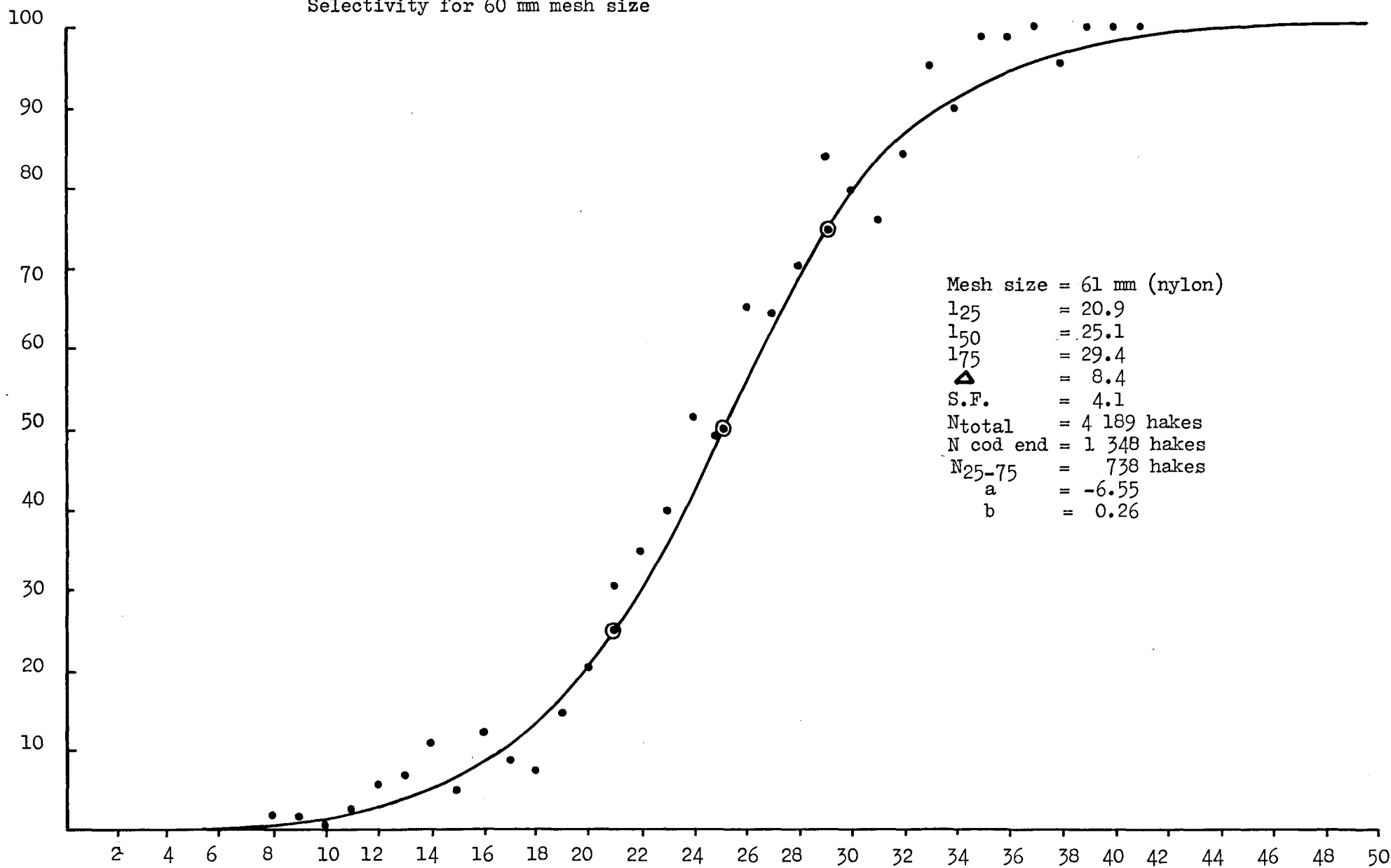
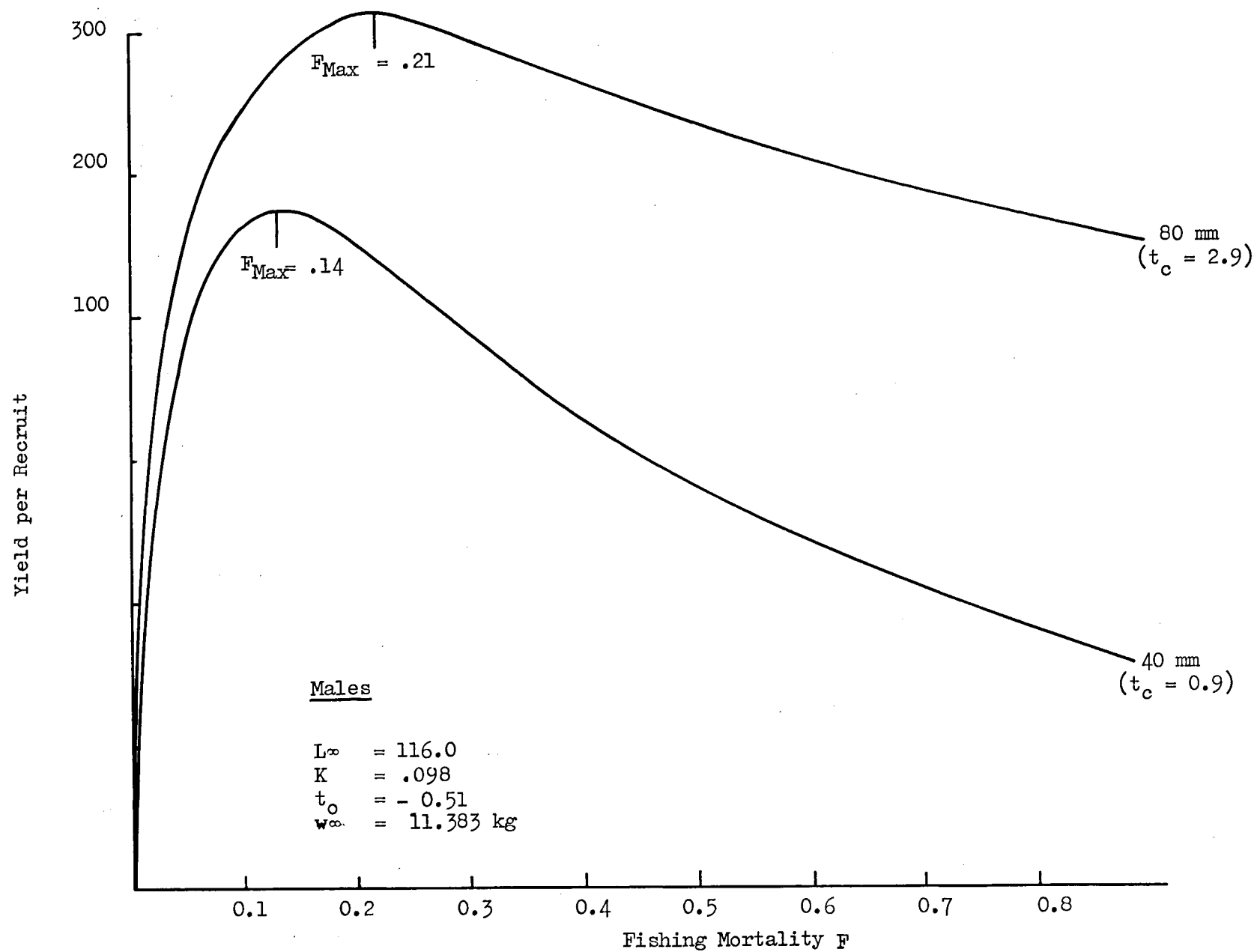


Figure 2.3 Yield per recruit curves by female and male Lake (Southern Stock)
for 40 and 80 mm trawls ($M = 0.2$)



....cont'd

Figure 2.3 continued

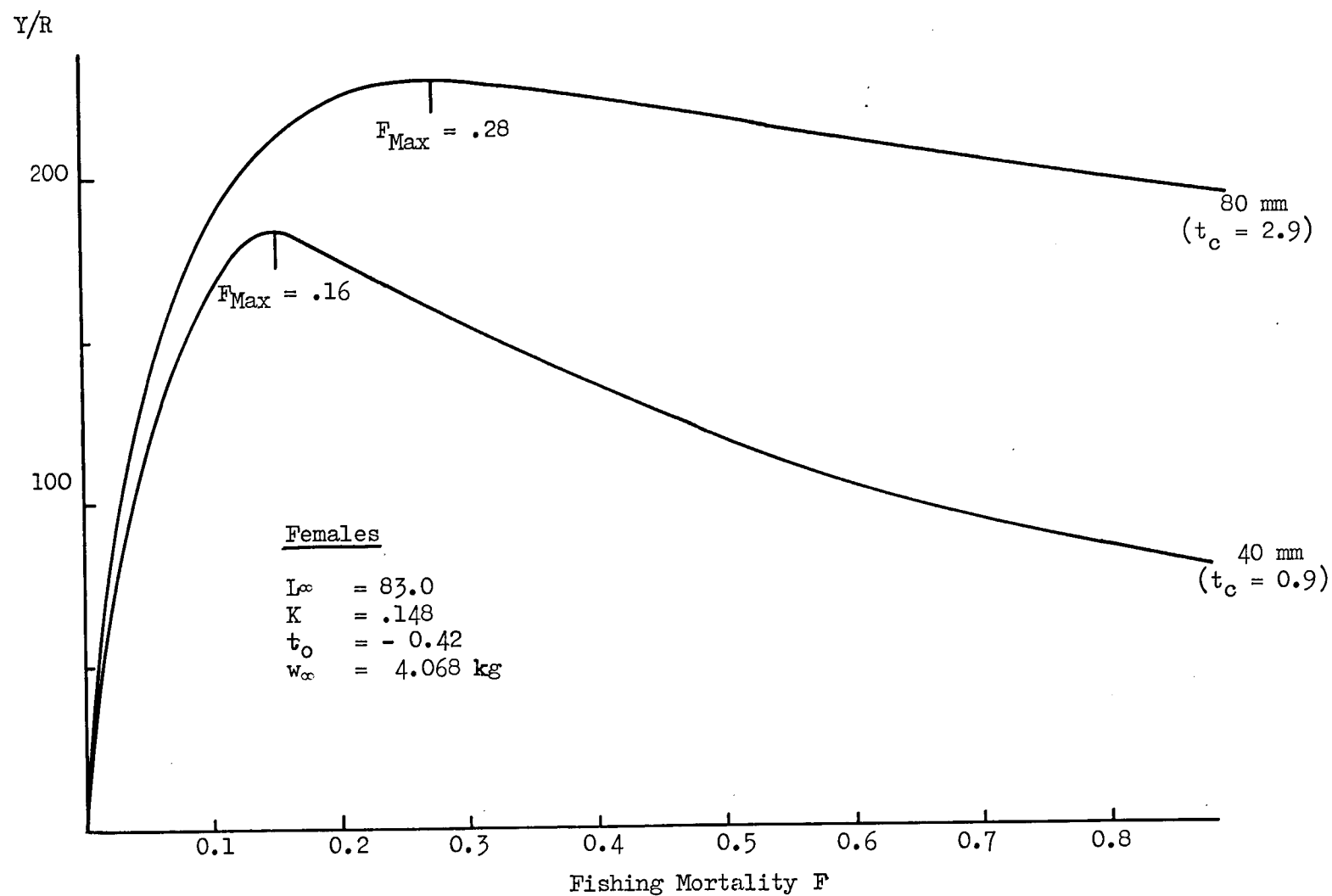


Figure 2.4. Virgin biomass curves for female and male hake (Southern stock) calculated assuming $M = 0.2$ and utilizing the growth parameters of Decamps and Labastie (1978).

