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Length Distribution and Sex Ratio of Commercially Caught Redfish
(Sebastes) from the ICNAF Area Based on Sampling Yearbook,
Vol. 1-4.

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Redfish are fished commercially through the whole of the Convention Area except in the most northern Division, 1A. The catch in 1 B and 2 G is only insignificant, for most years no catch is reported. In 1 C the catch is only small. In all the other divisions redfish constitute a substantial part of the landings, as appears from Fig. 1 which shows redfish landings in weight and as percentages of total landings for the individual divisions.

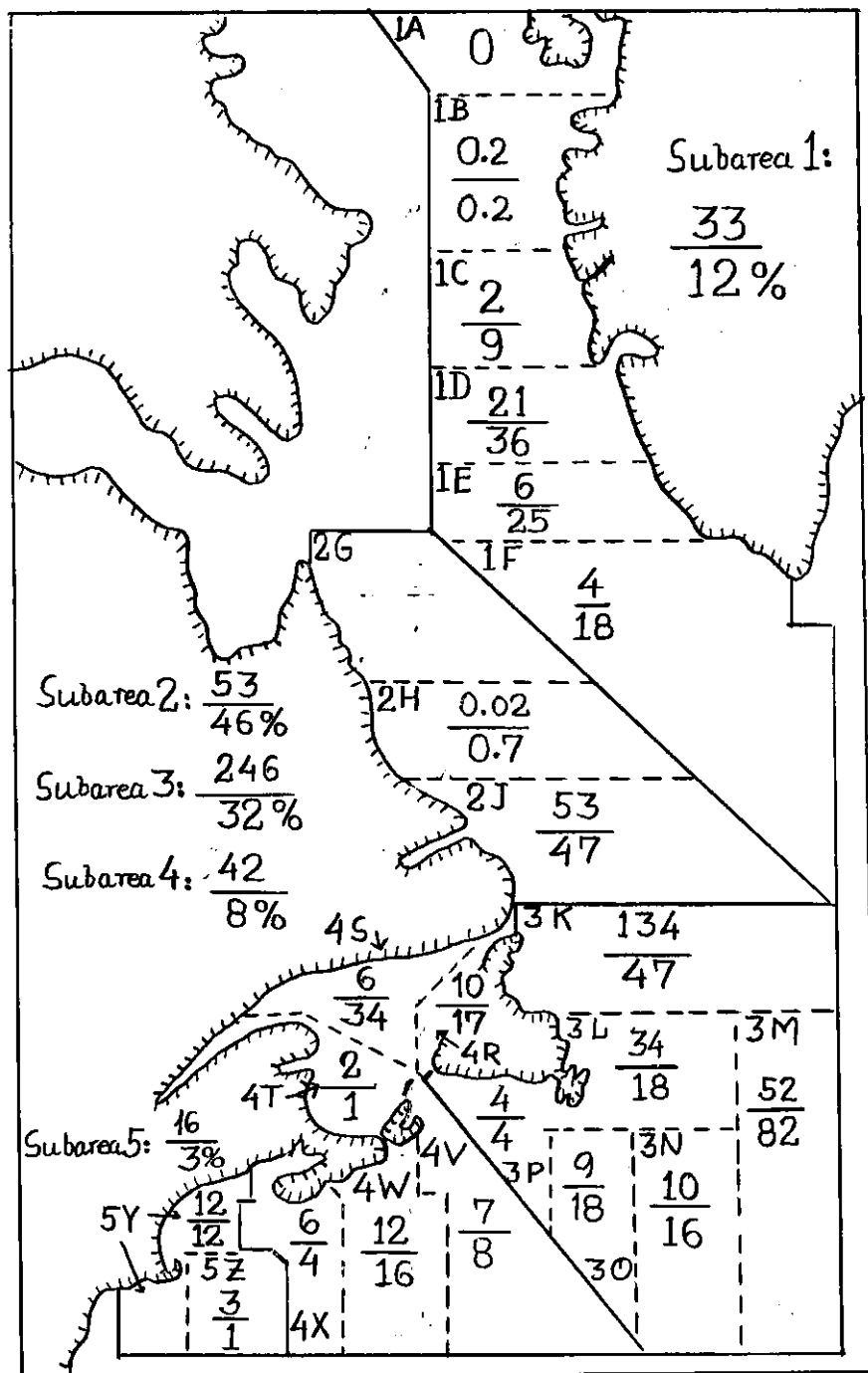


Fig. 1. Redfish landings (all countries) in 1959; above the line - '000 tons, below the line - percentage of total landings (all species).

Measurements of redfish are for years since 1955 reported by a number of countries and published in the ICNAF Sampling Yearbooks, Vol.1-4. The data used in the following are from these Yearbooks (a few data from Vol.5 - 1960, still under preparation, have been included).

In spite of the ICNAF recommendation that the fork length be measured and to the nearest cm, some countries continue to measure total length either to nearest cm or to nearest cm below. For the comparisons made on the following pages the differences caused by the varying methods of measurements can be regarded as insignificant. Canadian and U. S. measurements are made at shore - after discard; the USSR measurements are made on board - before discard; and this is probably also the case with German and Icelandic catches, which are reported as measured on board.

Distribution of Species

In the reporting of landings for the Statistical Bulletin, no attempt is made to distinguish between species; all is reported as redfish, sebastes sp. In the reporting for the Sampling Yearbook, most countries distinguish between S. marinus and S. mentella.

According to this separation the samples from Subarea 1 include only S. marinus, the samples from Subarea 2 include both species, and so do the samples from 3K and 3M. From 3L, 3N, 3O, 4R and 4S only S. mentella or "redfish" are reported (for very few of the samples it is noted that an, only small, number of marinus are included). For the remaining divisions of 4 and for Subarea 5 only "redfish" are reported. From the strong decrease in abundance of marinus through subareas 2 and 3 it is assumed that marinus does not appear - at any rate not as stocks which could be sampled - in these southwestern divisions. The samples from these divisions are therefore in the following recorded as mentella, without thereby indicating that the inclusion of these redfish into the species S. mentella Travin is incontestable.

For the divisions from which both species are recorded the following numbers of samples of either species are reported:

	Division	2H	2J	3K	3M
<u>S. marinus</u>		27	36	30	5
<u>S. mentella</u>		1	16	19	32

Thus the abundance of marinus diminishes from north to south; but it is still the prevailing species in 3K, it is only in 3M that mentella becomes predominant. For a few Canadian samples from 3N and 3O single individuals of marinus are noted.

This summary gives the impression of a much greater abundance of marinus in proportion to mentella than that actually observed by Canadian fishing experiments in the same areas: The Canadian Research Report for 1959 (ICNAF Annual Proceedings, Vol. 10) says based on experimental hauls off Labrador and on the northeastern Newfoundland shelf "the marinus type redfish were far outnumbered by the mentella type". The disagreement of the samples with the experimental fishing may be caused by different seasons or zones fished. This may also be the cause of the striking difference as to species between samples recorded by Iceland and by USSR for the same subareas:

	Numbers of samples		Divisions	
	Subarea 2		3K	M
	Iceland	USSR	Iceland	USSR
<u>marinus</u>	62	0	35	0
<u>mentella</u>	2	8	26	25

However, one cannot quite disregard the possibility that the differences might be caused by individual observers not using quite the same criteria when distinguishing between the two species.

Depth Distribution of Samples by Species

Canada and Iceland are the only countries which have reported depth ranges for the samples.

When comparing the depth ranges for the regions where both mentella and marinus occur the following distribution results:

Depth zones and mean depths in m for

		<u>marinus</u>	<u>mentella</u>
2 H J	Canada	125-200: 138	125-200: 138
	Iceland	150-285: 218	220-240: 230
	"	180-285: 225	
	"	160-200: 180	
	Mean	190	184
3 K M	Canada		154-220: 187
	Iceland	150-195: 173	170-225: 198
	"	170-200: 185	165-230: 198
	"	150-180: 165	150-250: 200
	Mean	183	174

When proceeding southwards into the divisions from where only mentella is reported the Canadian samples, noted partly as mentella and partly as redfish, give the following means for depth of fishing; numbers of samples in ():

- 3 L - 168 m (1)
- 3 N - 153 (12)
- 3 O - 118 (4)
- 3 P - 125 (10)
- 4 R - 146 (10)
- 4 S - 141 (11)
- 4 T - 155 (1)

A comparison of these figures does not confirm the generally accepted assumption that marinus occur in shallower water than mentella; it just shows the fact that redfish are fished in shallower water in Subarea 4 and in the western part of Subarea 3 than in the northeastern part of Subarea 3 and in Subarea 2. Unfortunately, depth ranges are reported neither from samples from Subarea 1 nor from those from Divisions 4 V W.X and 5 YZ.

Distribution of Mean Lengths by Species

The mean lengths of redfish caught vary considerably within the Convention Area, from 44.7 cm and 1 C to 23.8 cm in 4 W.

The mean lengths by divisions are shown on the map in Figure 2 for all samples, all countries and both sexes, but separately for the two species; for Subarea 3 all samples not termed as "marinus" are considered as "mentella"; for Subarea 4 and 5 all samples (noted either as "mentella" or as "redfish") are considered as "mentella". The divisions 4V-5Z only include U.S.A. samples; as these are only separated by the individual divisions since 1959 samples for 1960 are also included.

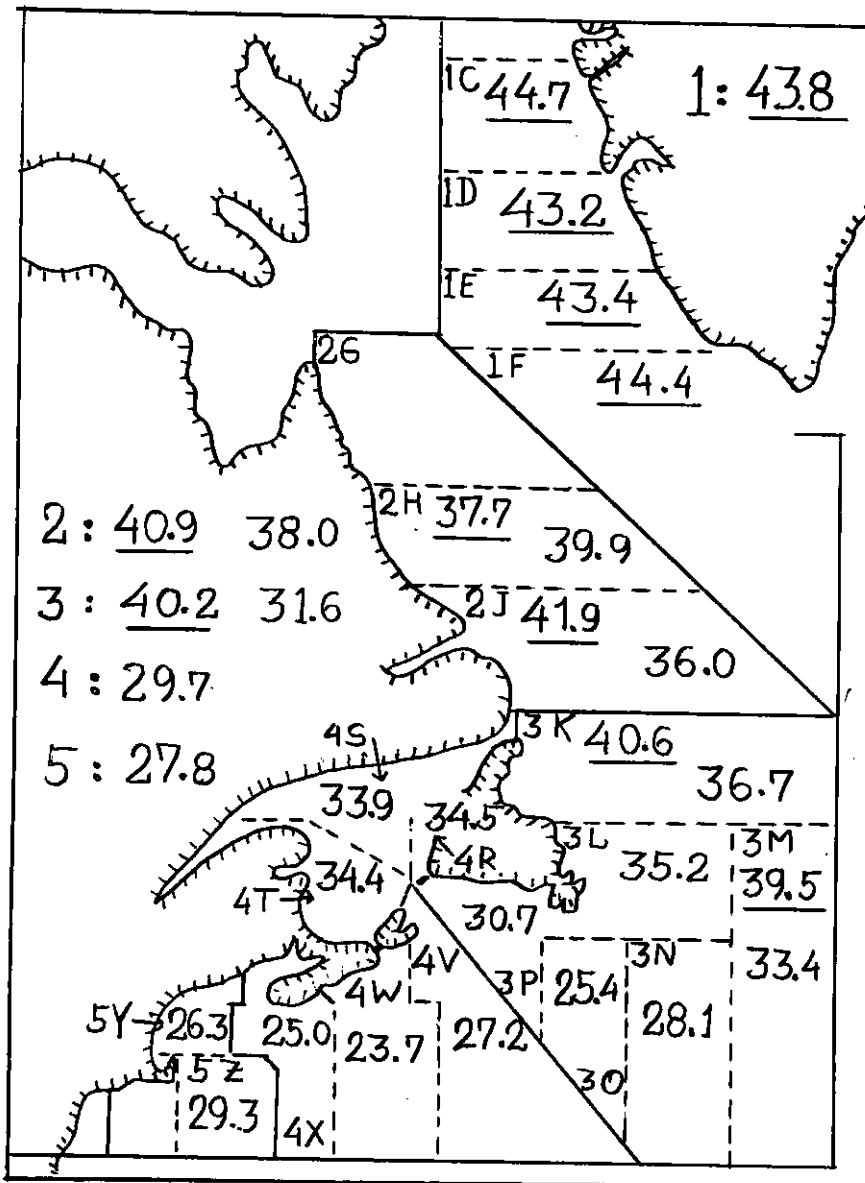


Fig. 2. Mean length, both sexes, S. marinus (underlined) and S. mentella (no underlining), all countries all samples, 1955-59.

The largest redfish are caught in Subarea 1, where the mean size is 43.8, ranging in Divisions 1 C - 1 F between 43.2 and 44.7 cm. A considerable decrease in size is observed when passing into Subarea 2, where the marinus samples show a mean size of 40.9 cm (range 37.7 to 41.9), and mentella (not sampled in Subarea 1) has a mean size of 38.0 cm (range 36.0 - 39.9 cm). Only little smaller are the redfish in 3 K: marinus - 40.6 and mentella 36.7 cm. The marinus in 3 M measures 39.5 cm. For mentella the mean lengths decrease from 3 K both to the south and to the west; on the northern and eastern part of the Grand Bank (3 L and 3 M) the mean length is 35.2 and 33.4 cm and on southern part still lower: 3 N - 28.1 cm and 30 - 25.4 cm. Going westwards from 3 K into the Gulf of St. Lawrence the following mean lengths are observed: 4 R - 34.5 cm, 4 S - 33.9 and 4 T - 34.4 cm. Going further south to the Nova Scotian and New England area the mean lengths decrease further to the minimum of 23.8 cm in 4 W.

For marinus the samples thus show a considerable decrease, about 4-5 cm, in size from Subarea 1 and into 2 and 3. The large size of marinus in 1 compared to 2 and 3 cannot be due to the fishery there being a more recent one exploiting a virgin stock. In fact, as the following figures of total landings show the fishery for redfish in Subarea 1 is older than in 2, although both are fairly recent:

Redfish total catch tons	Subarea 1	Subarea 2
1960	23,036	78,341
59	32,540	52,772
58	17,945	77,556
57	28,137	0
56	14,008	0
55	32,249	0
54	15,520	0
53	13,465	6
52	159	1

As the samples from Subarea 2 are from 1958-59, they are in fact samples of a virgin stock of which exploitation has just started. The smaller size of the marinus in Subarea 2 (and in the northeastern part of Subarea 3) must therefore either be a character inherent to that stock or be caused by the samples representing to some degree a mixture of marinus and mentella due either to interbreeding or to an incomplete separation of the two species in the material sampled.

Considering secondly mentella, the largest sizes are observed in 2 H, 2 J and 3 K, 36.0 - 39.9 cm; in the areas to the west and south of these divisions lower figures 33-35 cm, are found; in the southern part of Subarea 4 the mean sizes are as low as 24-25 cm. In Subarea 5, however, the mean lengths again increase, to 26 and 29 cm.

The increase in length passing from 4 W X north and east may well be in conformity with the development of the fishery - more virgin stocks to the northeast and in the southwest stocks which have been heavily fished for a number of years. The especially high mean sizes for Divisions 2 H, 2 J and 3 K may possibly have to be explained similarly to the explanation offered for the small sizes of marinus in this region.

The increase in size from 4 W X to 5 Y Z can neither be explained by a different degree of exploitation nor by a mixture with larger-sized redfish. The figures shown on the map only refer to 1959 and 1960 the two years when the divisions were considered individually. For the earlier years the samples were combined for several divisions; these years are included in the following summary of mean lengths in cm:

	1956	1957	1958	1959	1960
4 V W X	24.1	24.9	24.3	24.5	25.7
5 Y Z	25.6	26.6	26.6	27.8	27.9

For all the years the mean length is thus higher in 5 Y Z than in 4 V W X. In 5 Y Z there is a gradual increase in size from 1956 to 1960 amounting to 2.3 cm; is it a rich year-class growing through the years?

For 1959 and '60 when the individual divisions are reported, we have the following mean lengths in cm:

	4 V	4 W	4 X	5 Y	5 Z
1959	26.1	23.7	24.3	25.6	29.9
1960	28.2	23.8	25.6	26.2	28.7

Also these figures present a noticeable increase in size from 4 V X to 5 Y and again from 5 Y to 5 Z.

As the females are larger than the males one could expect the size difference between the divisions to be caused by a differing distribution of males and females (from the NE-Atlantic it is known that the two sexes of mentella at certain seasons appear separated from one another). The following summary shows the percentage abundance of females in USA samples.

	4 V	4 W	4 X	5 Y	5 Z
1959	58	52	54	49	54
1960	51	53	55	49	52
Mean	55	53	55	49	53
Mean l.					
1959-60	27.2	23.8	25.0	26.3	29.3

It is true that the larger sized females are more abundant in 5 Z than in 5 Y, but as the difference in abundance is only about 4 % and the difference in size between the two sexes is only 2.4 cm, this can in no way explain the size difference of 3.0 cm between the two divisions. Furthermore, in 4 W and 4 X with a lower mean size, the female abundance is as high as or higher than in 5 Z.

It thus appears that for explaining the difference in mean size between these divisions we are left with the possibility of assuming either a different growth rate in the various divisions (and separate populations) or movements between the divisions with older and larger fish being more abundant in one division than in another.

Mean Lengths by Sexes

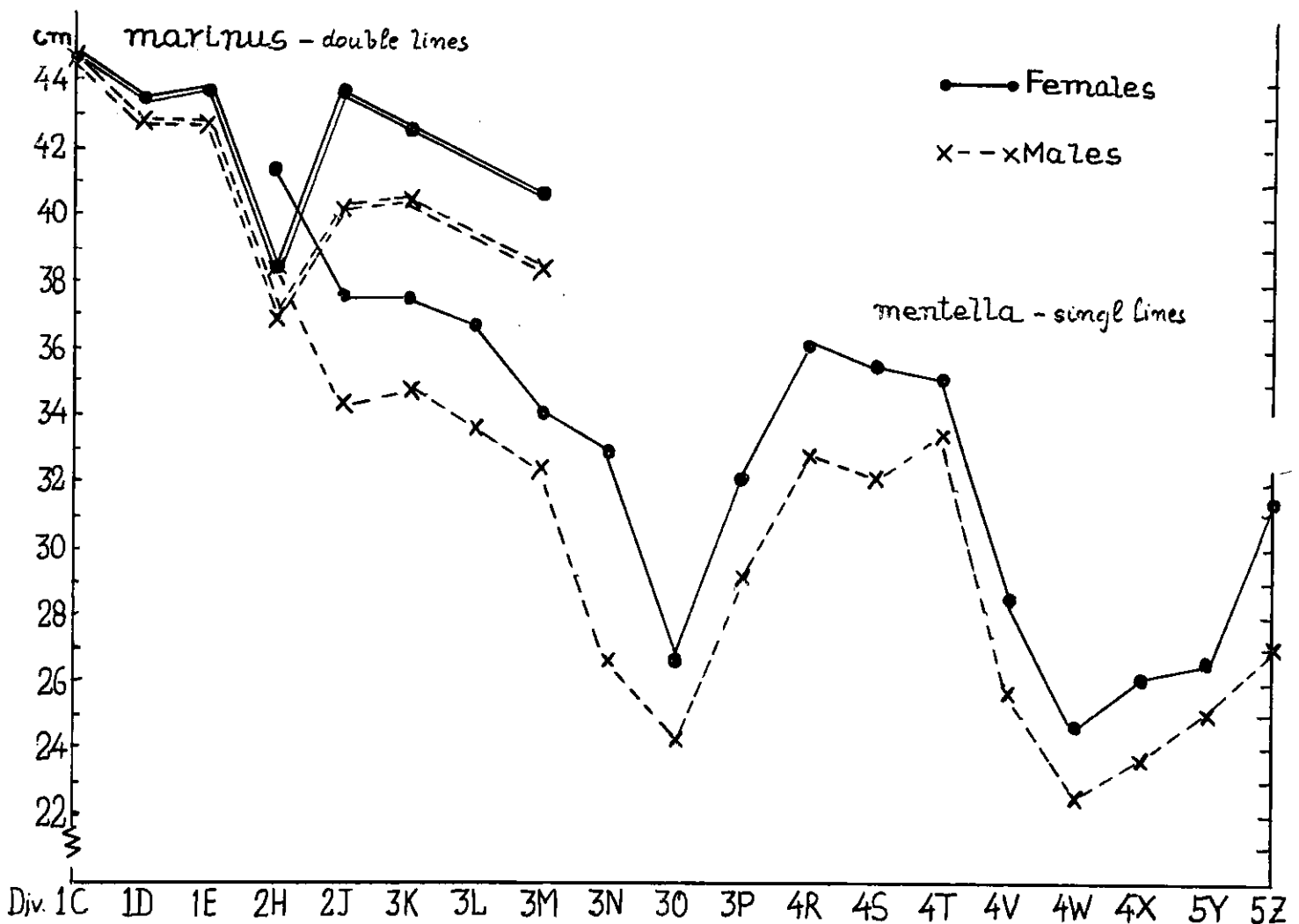


Fig. 3. Mean lengths in cm of males and females of *S. marinus* (double lines) and *S. mentella* (single lines) by divisions.

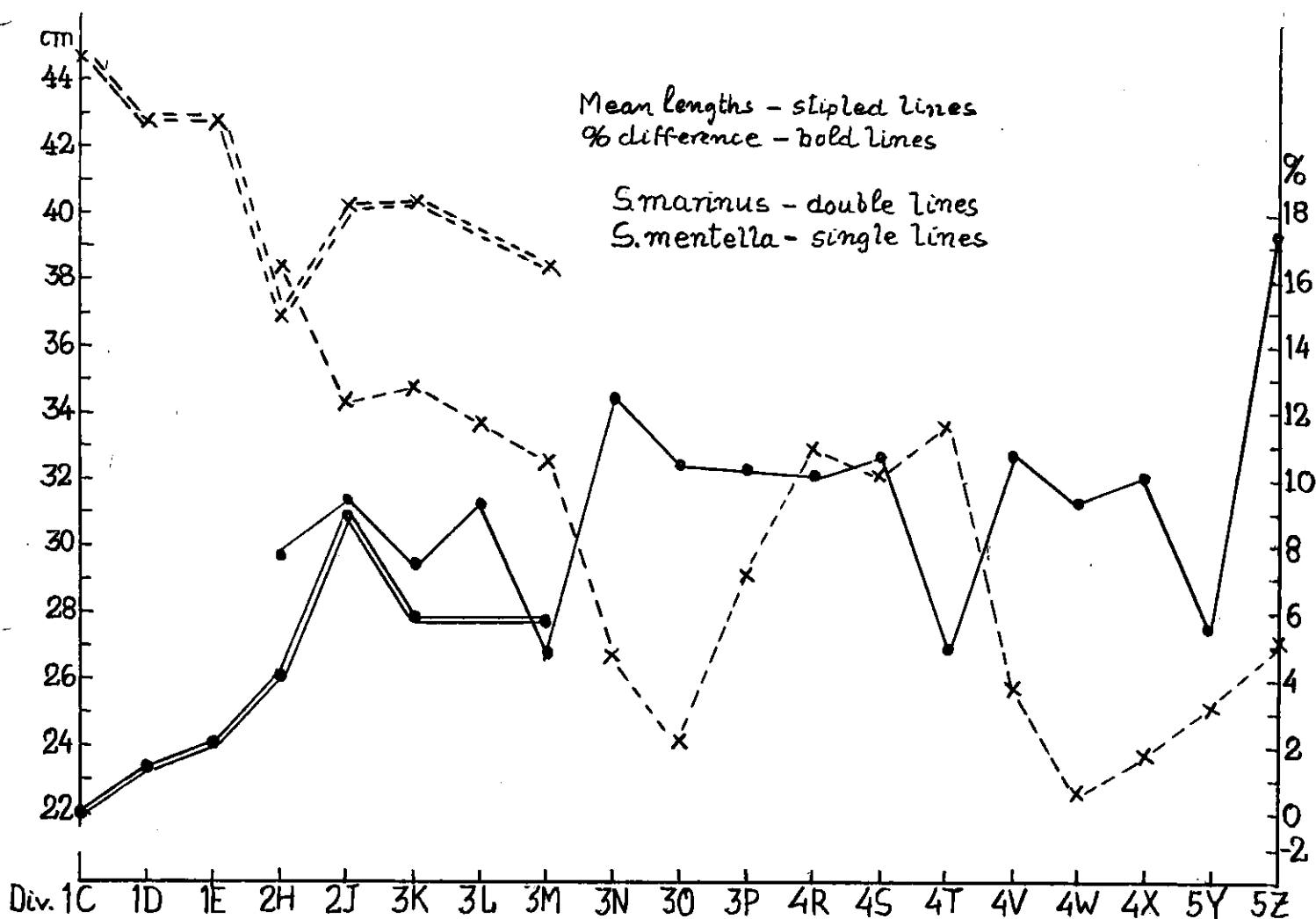


Fig. 4. Mean lengths in cm of males and percentage difference in lengths between males and females.

The measurements from the samples - as far as these are separated by sexes - confirm the established fact that in redfish the females are larger than the males; but they also show that the difference in length between the sexes is larger for mentella than for marinus.

	<u>S. marinus</u>	<u>S. mentella</u>
Length of females, cm	42.5	32.6
Length of males, cm	40.9	29.8
Difference in cm	1.6	2.8
Difference in % of male l.	3.9	9.4

Calculated as % of the male length the difference is thus more than twice as large for mentella as for marinus.

The difference between the mean lengths of males and females varies considerably within the distribution area for the species as appears from Figure 3 and Figure 4 and from the following tables:

S. marinus:

Division	1C	1D	1E	2H	2J	3K	3M	Mean ICDE	Mean 2HJ&3M
l. females	44.7	43.5	43.7	38.4	43.7	42.7	40.6	44.0	41.4
l. males	44.7	42.9	42.8	36.9	40.1	40.3	38.4	43.5	38.9
diff. cm.	0	0.6	0.9	1.5	3.6	2.4	2.2	0.5	2.4
diff. %	0	1.4	2.1	4.1	8.9	5.9	5.7	1.2	6.2
no. of samples ¹⁾	10	6	3	1	3	2	1		

S. mentella

Division	2H	2J	3K	3L	3M	3N	3O	3P	4R
l. female	41.4	37.6	37.6	36.8	34.1	30.0	26.7	32.2	36.2
l. males	38.4	34.4	34.8	33.7	32.6	26.7	24.2	29.2	32.9
diff. cm	3.0	3.2	2.8	3.1	1.5	3.3	2.5	3.0	3.3
diff. %	7.8	9.3	7.4	9.2	4.6	12.4	10.4	10.3	10.1
no. of sampl. ¹⁾	1	13	13	15	16	16	13	9	13

S. mentella (cont'd)

Division	4 S	4 T	4 V	4 W	4 X	5 Y	5 Z
l. females	35.6	35.2	28.6	24.8	26.2	27.4	31.6
l. males	32.2	33.6	25.8	22.7	23.8	25.2	27.2
diff. cm	3.4	1.6	2.8	2.1	2.4	2.2	4.4
diff. %	10.6	4.8	10.8	9.3	10.1	8.7	16.2
no. of sampl. ¹⁾	10	1	13	21	18	24	10

	Mean	2H J & 3 K M	3L & 3 N-5Z
l. females		37.7	30.9
l. males		35.1	28.1
diff. cm		2.6	2.9
diff. %		7.3	10.3

For marinus there is as considerable increase in the difference of length of the two sexes when passing from Subarea 1 - with 1.2 % difference - into Subareas 2 and 3 - with 6.2 % difference. This means that in the area where both species occur together and where the mean lengths of marinus approach those of mentella, there is also an approach in the amount of difference in lengths between sexes.

A similar condition is found for mentella. In Divisions 2 H J and 3 K M where this species occurs together with marinus, and where its mean length comes close to that of marinus, the difference in length between the sexes is rather low, only 7.3 % compared to 10.3 % in more western and southern regions, thus approaching the increased difference for marinus in 2 H - 3 M, 6.2 %.

1). with samples are here understood reported length distributions; in most cases each of these includes a number of individual samples

This infers that when comparing marinus from Subarea 1 with mentella from Subarea 4 the mean sizes and the differences in length between the sexes are wide apart. When we however compare marinus and mentella from Subarea 2 and the northern part of 3, these differences are much smaller. The question remains whether the two species as to these characters approach one another in Subareas 2 and 3 or interbreed, producing redfish intermediary between marinus and mentella, or finally whether the two species are only incompletely separated when sampled. If we can dispense with the last possibility we are faced with the problem of the specific validity of marinus and mentella.

When considering the redfish from the most southern divisions, not only a pronounced increase in the mean lengths of the two sexes is found when passing from 5 Y into 5 Z, but also an increase of the difference in size between the two sexes. In 5 Y the females are only 8.7% larger than the males, whereas in 5 Z this difference is 16.2% , an exceptionally high figure; in no other division is a figure higher than 12.4% observed.

This considerable difference in size between males and females is also apparent for most of the separate samples as reported by months for 1959 and 1960, the two years in which 5 Y and 5 Z are dealt with separately:

Subarea 5. Difference in size between males and females (♀ minus ♂)

in % of male length:

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1959 { 5Y	8.6	8.3	11.1	8.3	7.1	8.0	7.1	7.7	7.4	3.2	7.8	13.9	8.2
5Z	17.8		23.7		22.5	14.6	17.6	11.1	26.7				19.0
1960 { 5Y	11.0	9.2	5.9	6.2	7.3	10.2	12.4	10.9	6.8	9.4	12.5	10.6	9.7
5Z			4.0		13.0	23.8							13.7

The great difference in length between the two sexes in 5 Z is observed as well in winter as in summer.

Sex Ratio

Most of the data reported for the Sampling Yearbook (especially those for the more recent years) are given separately for males and females. Thus the material renders it possible to investigate differences in sex ratio.

The following table gives the sex ratio expressed as numbers of females in pro mille of total numbers by species and divisions:

S. marinus

Year	1C	1D	1 E	2H	2J	3K	3M	Total
1958-59	59	59	58	58	58	59	59	
fem. o/oo	448	456				486	373	
fem. o/oo	452	459	471	427	452	430	459	450
no. of sampl.	10	6	3	1	3	2	1	26

S. mentella

	2H	2J		3K		3M		Total
Year	1958	58	59	58	59	58	59	
o/oo								
females		505	565	538	569	561	506	
o/oo								
females	378	535		554		534		500
no. of								
samples	1	13		13		15		42

S. mentella

	3L		3N				3O			3P		3NOP			Total		
Year	1958	59	55	56	57	58	59	58	59	55	56	57	58	56	57	58	
o/oo																	
females	606	570	479	425	504	505	546	441	495	506	424	404	515	469	531	503	Total
o/oo																	
females	588				492			468				462			501		
No. of																	
samples	15				15			13				11			23		77

S. mentella

	4 R					4 S					4RS	4T	4 RST			
Year	55	56	57	58	59	55	56	57	58	59	59	56	56	57	58	
o/oo																
females	494	510	564	441	457	483	554	491	568	442			574	556	539	
o/oo																
females		493						507		576	352		556			
No. of																
samples		13						10		5	1		19			

S. mentella

	4 V		4 W		4 X		4 V W X			Total
Year	59	60	59	60	59	60	56	57	58	
o/oo										
females	580	509	523	526	535	550	547	560	544	
o/oo										
females	545		525		543		550			537
No. of										
samples	13		21		18		36			135

S. mentella

S. mentella

	5 Y		5 Z		5 Y Z			Total	Total
Year	59	60	59	60	56	57	58		
o/oo									
females	484	494	535	523	518	536	539		
o/oo									
females	489		529		531			516	518
No. of									
samples	24		10		34			68	

These figures reveal another difference between the marinus in 1C-3M and mentella in 2H-5Z, viz. a difference in the sex ratio: marinus only 450 o/oo females against 518 o/oo for mentella. The pro. mille figures for marinus only vary little from division to division: from 427 to 471. The figures for mentella show greater variations from 462 (disregarding the single sample from 4 T) to 588.

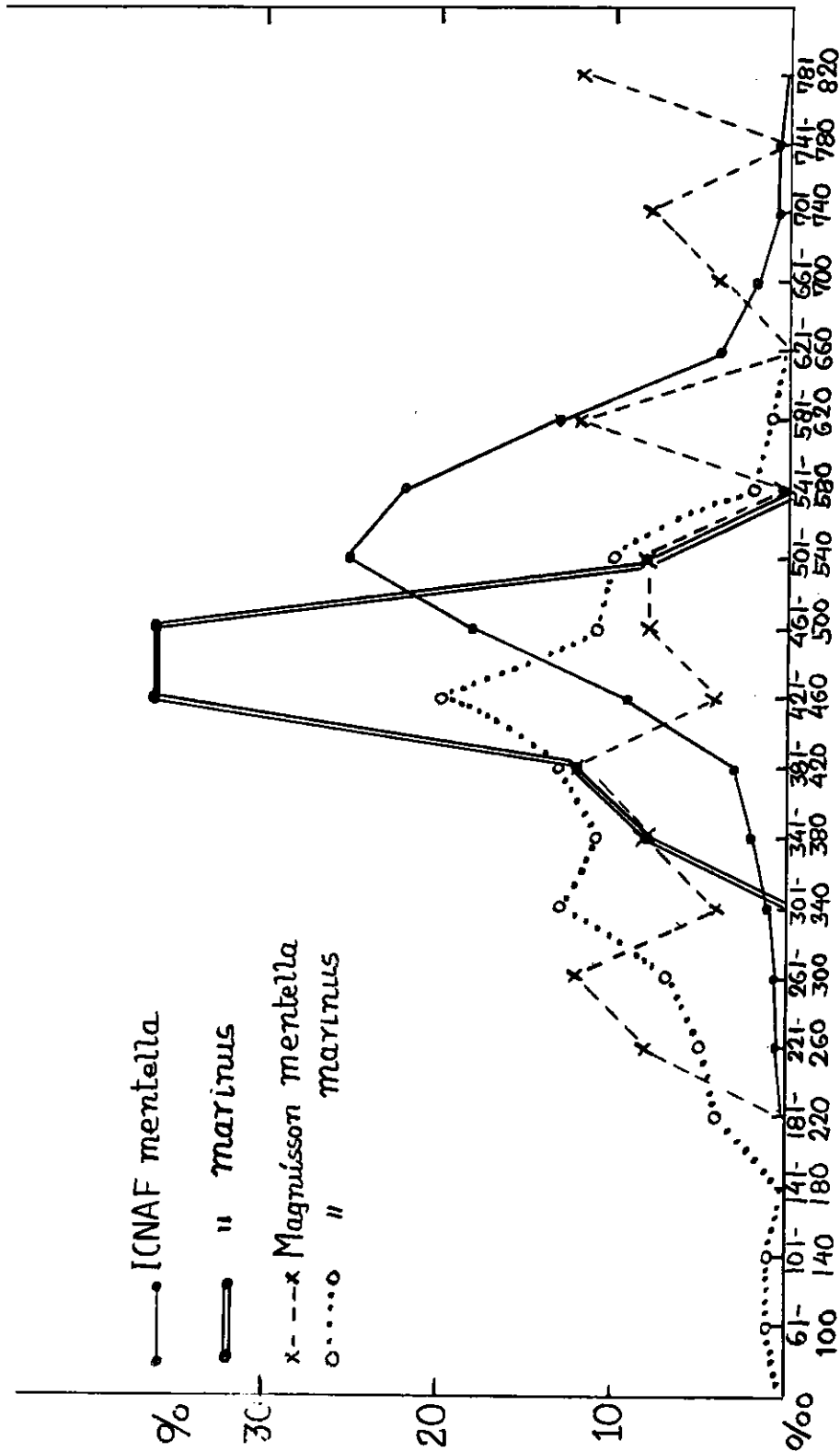


Fig. 5. % frequencies of o/oo abundance of females in samples of redfish.

It is to be noted that the differences in abundance of males and females in the ICNAF area do not rise to such high figures as those indicated for mentella of the NE Atlantic in figure 1 of V. P. Sorokin's paper: Gametogenesis and Migrations of the Sebastes Marinus (L) and S. mentella (Travin) - ICNAF Special Publication No. 3, 1961. From his figure it appears that samples with from 0-20 % of one or other of the sexes are rather common. Also in the area between E-Greenland and Iceland the difference in abundance of the two sexes can be considerable (J. Magnusson: On the Sex Ratio of Redfish in East Greenland and Icelandic Waters in 1957. ICES, Ann. Biol., Vol. 14), although not as high as in the NE Atlantic. This observation is also made in the USSR Research Report for 1960 (ICNAF Annual Proceedings, Vol. 11, p. 87) for mentella in Subarea 2: "The approximately equal distribution of sexes in catches during all seasons indicates the absence of the seasonal separation of male and female schools, so characteristic of the Bear Island-Spitzbergen stock of S. mentella".

The difference in sex ratio between the ICNAF and the Iceland-E-Greenland area appears from Figure 5 presenting the percentage frequencies of samples within 40 o/oo groups of female abundance; in the ICNAF area the samples are grouped in two high peaks, whereas the samples from the Greenland-Iceland area are more widely spread without pronounced peaks. The following summary gives for the two areas and species the percentages of samples with female abundance from 381-580 o/oo, and of those with abundances below 380 and above 581 o/oo:

	ICNAF Area		Iceland-E-Greenland	
	<u>mentella</u>	<u>marinus</u>	<u>mentella</u>	<u>marinus</u>
381-580 o/oo	77	92	32	56
<380 and >581 o/oo	24	8	68	43

Although the two samplings considered are not quite comparable, the ICNAF samples being mainly from commercial fisheries spread over the year, the Icelandic from research cruises with special emphasis on the problem of sex-ratio (May-September), it can hardly be doubted that the results indicate that sexual segregation of redfish is not so pronounced in the Northwest - as in the Northeast Atlantic, and that consequently the migration pattern may be widely different in the two regions.

When considering the tables on p. 9-10 it appears that the female abundance o/oo is higher for the samples of the combined groups of divisions than for the separate divisions within these groups: 3 NOP-501 o/oo; 3N-492, 3 O-468, 3 P-462; and 4 RS-576, 4 RST-556; 4R-493, 4 S-507. The samples grouped together (with high o/oo) are all from the USA fishery. Those not grouped are from other countries (mainly Canada) and US, 1959. It is hardly possible that vessels from another country should, within the same division and the same years and seasons, fish populations with differing sex-ratios. Thus, we are faced with the other possibility: that the criteria by which the sexes are separated are not sufficiently fixed to assure that two sets of observers arrive at the same sex-ratio; or to put it more crudely, that in a considerable number of cases the determination of the sex is faulty. Data at hand for 1958 and 1959 show for the same groups of division the difference in female abundance between Canadian and USA samples; the USA female abundance is between 40 and 140 o/oo higher than the Canadian. This difference is not due to different seasons of the year being sampled by the two countries as the following o/oo by 4 months periods for 3 NOP and 4 RST (1958 and 1959) shows (no. of samples in ()):

	Dec. -March.	April-July	Aug. -Nov.
Canada	368(2)	453 (8)	474(12)
U.S.A.	444(7)	583(10)	555(14)

Although there is a seasonal variation in the relative abundance of the sexes, with low female abundance in Dec. -March, the variation is about the same for the two countries with for all three seasons higher female figures for U.S.A. than for Canada.

The seasonal variation (female abundance o/oo) of the two sexes is shown based on the extensive sampling by USA through the whole of the year from Divisions 3 NOP, 4 VWX and 5 YZ;

	1956	1957	1958	1959	1960	Mean	
3 NOP:							
Dec. -March	420	<u>565</u>	470	413	412	456	highest figure by season underlined
Apr. -July	475	493	511	<u>560</u>	518	511	
Aug. -Nov.	<u>507</u>	530	<u>539</u>	553	<u>569</u>	<u>540</u>	
4 VWX:							
Dec. -March	551	539	538	538	530	539	
Apr. -July	<u>561</u>	<u>576</u>	<u>567</u>	<u>570</u>	529	<u>562</u>	
Aug. -Nov.	538	575	554	501	<u>540</u>	542	
5 YZ:							
Dec. -March	529	496	<u>549</u>	498	453	505	
Apr. -July	<u>553</u>	535	<u>531</u>	<u>505</u>	<u>547</u>	<u>534</u>	
Aug. -Nov.	477	<u>560</u>	548	504	536	525	

The seasonal variation of the sex-ratio is not large, obviously in connection with the already mentioned fact that the tendency for separate shoaling of males and females is only small; but still the figures show a somewhat lower abundance of the females during winter than in the other seasons.

Summary

1. Since 1955 redfish have been sampled by various member countries and the data have been published in the Sampling Yearbooks, Vol. 1-5.
2. Samples of S. marinus are only submitted from Divisions 1B-1F and from 2H, 2J, 3K and 3 M. Samples indicated as S. mentella or just as "redfish" are submitted from divisions 2H to 5 Z.
3. S. marinus is the only species sampled in Subarea 1. In Subarea 2 and the northeastern part of 3 (3K and 3M) both species occur together, the abundance of marinus decreasing, that of mentella increasing from north to south.
4. A considerable disagreement within the same region and season in the proportion of marinus and mentella samples between countries may indicate that the individual observers do not use quite the same criteria when distinguishing between the two species.
5. The depth range of fishing is only reported for a smaller number of samples. The data so far do not support the generally accepted view that marinus occurs in shallower water than mentella.
6. The average length of marinus decreases from a high of 44 cm in Subarea 1 through Subarea 2 to a low of 39 cm in 3 M.

The average length of mentella decreases from a high of 39 cm in 2 through 3 and 4 to a low of 24-25 cm in 4 WX, increasing in 5Y and Z to 26-30 cm.

In the region (2H - 3 M) where both species are fished the difference in length between marinus and mentella is only small - possibly due to interbreeding or incomplete separation of species.

7. Females are larger than males; for marinus the difference is small only 4% the male length, for mentella much greater, over 9%. The difference in length between males and females varies for both species considerably from division to division and in such a manner that in the regions where the two species occur together the figure is so high for marinus (6.2%) and so low for mentella (7.3%) that there in this respect is hardly any difference between the two species. Thus as in item 6 the possibility of interbreeding or incomplete separation of species exists.

In 5 Z the difference observed in length of the two sexes is much higher than in 5 Y (16.2 against 8.7%).

8. The sex-ratio is somewhat different for the two species: females of marinus account for only 450 o/oo (all samples), females of mentella for 518 o/oo.

The differences in abundance of the two sexes is much smaller than in the NE-Atlantic. This indicates that the sexual segregation-and probably also the migrations-are far less pronounced in the ICNAF Area than in the NE-Atlantic.

The sex-ratio observed by different countries in samples from the same division, year and season varies considerably, indicating that the determination of the sex may in cases be faulty.

The seasonal variation of sex-ratio is not large; females are somewhat more scarce in winter than in summer and autumn.

9. When the names marinus and mentella have been used in the preceding pages it is because these names are used by most countries when reporting for the Sampling Yearbook, and not because of a conviction that this is the right specification.

It is doubted whether we know what species occur in the ICNAF Area:

a. Marinus and mentella approach one another in certain characters in the areas where they live together.

b. In the same characters mentella from one area differ from mentella from another area, and the same is true for marinus.

c. Mentella from the ICNAF area differ in some biological aspects from mentella from the NE-Atlantic.

d. There is evidence that in the samples reported the two species are in cases only incompletely separated.

e. This uncertainty as to species is obviously also felt by some of the scientists reporting, vide: the use of terms as "mentella type redfish", of only the name "redfish" or a term as "a group of S. marinus" for the highly interesting shore population revealed by the USA tagging at Eastport, Maine.

Taxonomy is the most pressing study within the redfish. It seems rather futile to study the biology when we do not know which species our researches relate to. It might well be that a number of the now baffling problems (age, growth, sizes, sex-ratio, migrations) with which we are now struggling can be explained and understood better when once we learn with which species our observations shall be classed.