INSHORE FISHES FROM THE SOUTH ORKNEY AND SOUTH SHETLAND ISLANDS, THE ANTARCTIC PENINSULA AND SOUTH GEORGIA

By INIGO EVERSON

THE collections described in this paper consist of over 2,000 specimens representing 15 species of nototheniiform fish. The fish were caught during the period 1964–67 by the following methods: hand lines; long lines; baited traps; a beam trawl; Agassiz trawl towed behind a boat or hauled beneath fast ice; by hand, on the shore or whilst diving. These methods are intended to catch demersal fish rather than pelagic fish, although the latter certainly occur in this region.

Larval stages of certain of the species present in the collection have been described in a separate paper (Everson, 1968). The order of presentation of the fish families in this paper follows that of Norman (1938) in a revision of the Antarctic Nototheniiformes which has become the standard work for the region.

Although the fish in this collection have been described before, proportional measurements are given in Table I for each species to allow systematic regional comparisons to be made. The details of material and capture are listed together with notes which were not suitable for inclusion in Table I.

SYSTEMATICS

Proportional measurements used in this paper are as follows: The *standard length* (*SL*) is the distance from the tip of the snout to the end of the caudal peduncle in a straight line. The *head length* (*HL*) is the distance from the tip of the snout to the posterior margin of the operculum, opercular spine or the opercular membrane, whichever is the greatest. The *eye diameter* (*ED*) is the horizontal antero-posterior diameter of the eye itself and not of the orbit. The *snout length* (*Sn*) is the distance from the tip of the upper jaw to the anterior margin of the eye. The *interorbital width* (*IOW*) is the minimum distance between the bony orbital margins. The *body depth* (*BD*) is the vertical diameter of the fish at the anterior end of the soft dorsal fin. The *pectoral fin length* (LOP_1) is the distance from the extreme base of the uppermost ray to the farthest tip of the fin.

NOTOTHENIIDAE

Notothenia larseni Lönnberg

Four specimens, 5·37–5·88 cm. standard length, caught in an Agassiz trawl on the bottom in 20 m. in Borge Bay, Signy Island, on 30 August 1965.

Notothenia gibberifrons Lönnberg

121 specimens, 19·8–36·7 cm. standard length, caught at Signy Island in all months of the year except November at depths ranging from 34 to 60 m. using hand lines and long lines. Six specimens, 27·0–29·5 cm. standard length, caught by hand line in 45–60 m. in Whalers Bay, Deception Island, on 9 February 1967. One specimen, 28·1 cm. standard length, caught by hand line at Port Lockroy on 11 February 1967. Seven specimens, 21·4–29·6 cm. standard length, caught on a long line in 24 m. between Neny and Stonington Islands on 17 February 1967.

Notothenia nudifrons Lönnberg

11 specimens, 3·85–9·12 cm. standard length, caught in an Agassiz trawl at 40 m. depth in Borge Bay, Signy Island, on 24 January 1966. Three specimens, 4·38–5·76 cm. standard length, caught in an Agassiz trawl at 27 m. depth in Borge Bay, Signy Island, on 30 August 1965. Three specimens, 4·48–7·12 cm. standard length, caught in an Agassiz trawl at 40 m. depth in Borge Bay, Signy Island, on 4 January 1967. 15 specimens, 8·3–17·2 cm. standard length, caught on a long line between Neny and Stonington Islands on 17 February 1967.

TABLE I

Species	*Range of size* (cm.)	*HL/SL* (per cent)	*ED/HL* (per cent)	*Sn/HL* (per cent)	*IOW/HL* (per cent)	*BD/SL* (per cent)	*LOP*$_1$*/HL* (per cent)	D_1	D_2	A	P_1	*Body scales*	*Lateral-line tubular scales*	
													Upper	*Lower*
Notothenia larseni	5·37– 5·88	30–32	33–41	26–32	7·7–9·2	18–19	75–81	V–VI	36–39	36–38	25–26	ct.	49	0
N. gibberifrons	19·8 –36·7	26–33	20–24	25–29	6–9	15–21	75–91	VI–VII	31–33	31–34	21–23	ct.	41–48	31–38
N. nudifrons	3·85–17·2	28–32	28–33	22–28	5·5–6·5	19–22	71–87	IV–V	36–40	35–36	22–23	ct.	36–39	0
N. neglecta	4–44	29–34	16–26	27–33	20–33	19–27	60–95	II–VII	35–41	27–32	16–19	cyc.	38–51	8–18
N. rossii marmorata	17–37	25–29	15–19	27–30	26–30	23–27	74–83	IV–VI	32–36	36–38	20–23	cyc.	47–53	12–16
Trematomus newnesi	5·6 –12·5	28–32	25–29	25–29	21–24	15–21	83–93	VI–VII	33–36	32–36	24–25	ct.	43–51	4–12
T. nicolai	7·02	34	25	25	12·5	20	79	III	37	32	29	ct.	39	0
T. borchgrevinki	4·75	30	33	23	22·4	19	88	V	34	31	23	ct.	0	0
T. bernacchii	14·3 –25·3	29–34	22–30	26–35	11–18	23–30	62–74	IV–V	32–34	32–34	23–24	ct.	0	0
T. hansoni	22·8	29	21	28	18	22	90	V	37	34	27	ct.	44	0
Harpagifer bispinis	5·3 – 8·7	38–43	20–24	22	18–22	23–30	66–73	III–VI	22–25	17–19	16–17	—	—	—
Parachaenichthys georgianus	43·3 –47·4	38–40	12·5–13·5	43–45	7·0–8·5	11–14	43		43–44	30–31	22	—	—	—
P. charcoti	42·0 –42·4	35·5–36·5	13–14	42–45	7·5–8·0	11–14	49–51		42–44	30–31	21–23	—	—	—
Champsocephalus gunnari	8·18	32	24	36	16	12	72	IX	38	36	27	—	—	—
Chaenocephalus aceratus	46·7 –55·8	37–40	17–20	47–49	19–22	20	41–54	VI–VIII	38–40	37–39	25–26	—	—	—

HL Head length.
SL Standard length.
ED Eye diameter.
Sn Snout length.

IOW Interorbital width.
BD Body depth.
LOP$_1$ Pectoral fin length.

D_1 Rays in spinous dorsal fin.
D_2 Rays in soft dorsal fin.
A Rays in anal fin.
P_1 Rays in pectoral fin.

ct. Ctenoid.
cyc. Cycloid.

Notothenia neglecta Nybelin

1,404 specimens ranging in size from 4 to 44 cm. standard length, caught in Borge Bay, Signy Island, from low water of spring tides down to 60 m. between December 1964 and February 1967, by all of the methods described above. 17 specimens, 29·2–46·1 cm. standard length, caught on hand lines in 50 m. in Whalers Bay, Deception Island, on 9 February 1967. Nine specimens, 19·2–24·7 cm. standard length, from 2 m. depth caught on hand lines at the Argentine Islands on 13 February 1967. Five specimens, 28·0–30·4 cm. standard length, caught on a long line in 30 m. at Adelaide Island on 15 February 1967. Seven specimens, 16·9–29·7 cm. standard length, caught in 25 m. on a long line at the Argentine Islands on 16 March 1967. Six specimens, 26·4–38·5 cm. standard length, caught on hand lines at Whalers Bay, Deception Island, on 24 March 1967. Three specimens, 31·2–35·8 cm. standard length, caught on hand lines from the jetty at King Edward Point, South Georgia, on 1 April 1967. One specimen, 27·2 cm. standard length, caught in a trap from the jetty at King Edward Point, South Georgia, on 3 April 1967. Six specimens, 30·2–38·0 cm. standard length, caught on hand lines from the jetty at King Edward Point, South Georgia, on 4 April 1967.

The fin-ray frequencies for *Notothenia neglecta* from Borge Bay, Signy Island, are shown in Fig. 1.

Morphometric variation

The collection of *Notothenia neglecta* from Signy Island includes specimens ranging in length from 4 to 44 cm.; the latter must be near to the maximum size for the region. Although the young stage of *Notothenia neglecta* is almost certainly pelagic, a demersal phase begins early in life; thereafter the rate of overall growth of the head is greater than that of the body. However, relative head length remains constant, i.e. head length $= (0{\cdot}32 \pm 0{\cdot}026) \times$ standard length. The width of the head becomes relatively much greater during the demersal phase, but this feature is unsatisfactory for comparison between individuals due to varying expansion of the gill chamber and opening of the mouth. The interorbital width is easily measured and it may be considered representative of head width. The relationship between interorbital width and head length was plotted against the standard length of the fish and the following regression line fitted by the method of least squares:

$$\frac{\text{head length}}{\text{interorbital width}} = 4{\cdot}01 - 0{\cdot}0367\ (\text{standard length} - 21{\cdot}47).$$

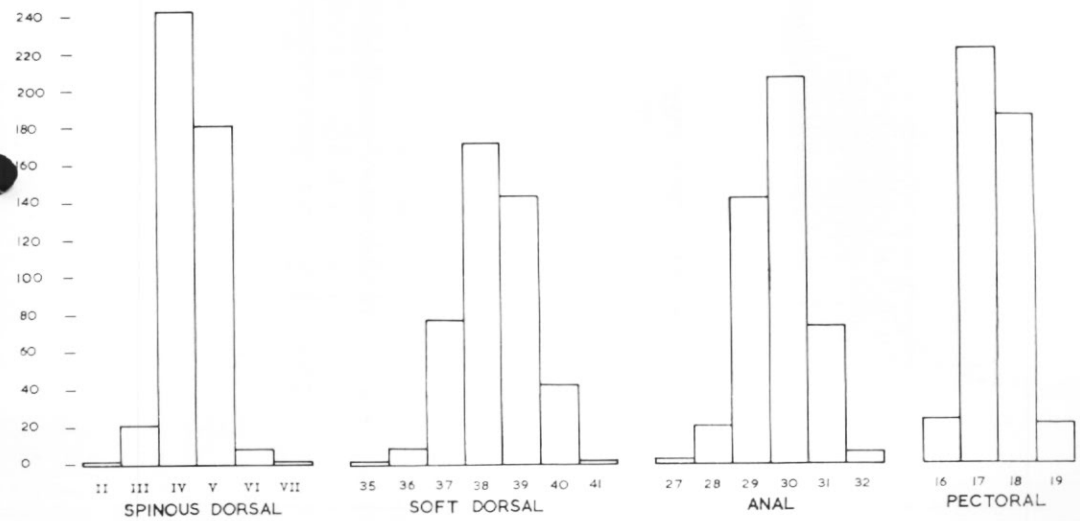

Fig. 1. Fin-ray frequencies for *Notothenia neglecta*, Borge Bay, Signy Island.

The coefficient 0·0367 for the sample of 120 fish examined has a standard deviation of 0·0167 and is significant at the 5 per cent level. The results are illustrated in Fig. 2 with comparable data from various other sources (Norman, 1938; Nybelin, 1951; Hureau, 1962; Bellisio, 1964).

This feature is very important to Nybelin's description of *Notothenia neglecta* but the size range and number of individuals which he measured were too small to show significant variation with length. Nybelin also used the ratio of interorbital width to orbital diameter (the maximum diameter of the fleshy orbital rim) but, since the interorbital width varies with the standard length, the second ratio will almost certainly vary as well. The orbital diameter has therefore been related to the head length:

$$\frac{\text{orbital diameter}}{\text{head length}} = 3 \cdot 75(\pm 0 \cdot 106) + 0 \cdot 171 \text{ (head length)}.$$

These results are from a large sample of fish (120) from one region (Signy Island). The relationships described agree well with those given by Norman (1938) but less well with the work of Nybelin (1951), who, applying narrower limits to the variations, described *Notothenia neglecta* (from Deception Island) and *N. coriiceps* (from Archipel de Kerguelen).

Although Nybelin considered that the extent of squamation in *N. neglecta* differed from that in *N. coriiceps*, the present specimens of *N. neglecta* appear to be similar to specimens of *N. coriiceps* in the British Museum (Nat. Hist.) in this respect. It seems likely, therefore, that there are several geographical races of *N. coriiceps* in Antarctica; larger collections from many different regions are, however, needed before adequate systematic comparisons can be made.

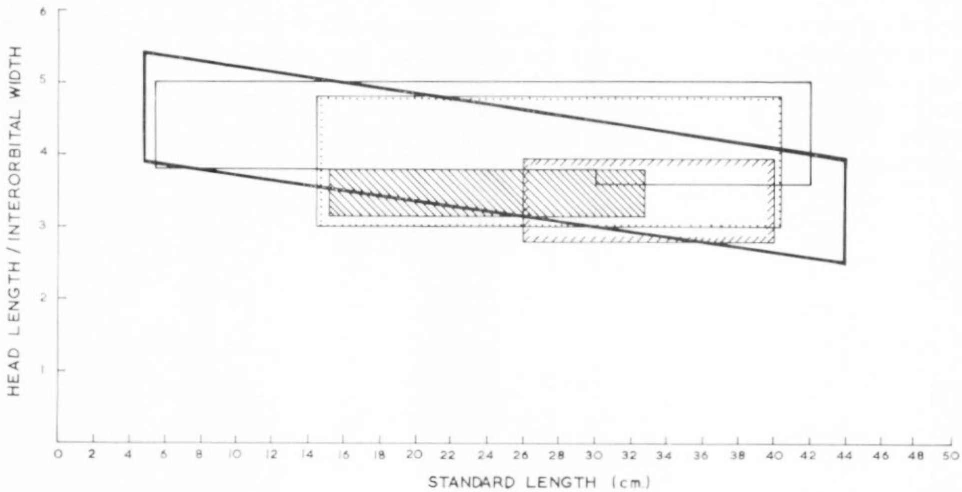

Fig. 2. A comparison between the results of various authors describing, for *Notothenia neglecta*, the ratio of head length/interorbital width related to standard length.

Norman (1938) ———— Bellisio (1964) ////////

Nybelin (1951) \\\\\\\\ Everson (present paper) ————

Hureau (1962) ....

Notothenia rossii marmorata Fischer

At Signy Island, specimens were taken in nearly every month of the year. During the summer they occurred most commonly close inshore (less than 20 m. depth) and in the winter more frequently in depths greater than 40 m., in all cases very close to the bottom.

134 specimens, 17·5–33·1 cm. standard length, caught on hand lines from the jetty at King Edward Point, South Georgia, between 28 March and 4 April 1967. 25 specimens of "fry",

5·13–6·08 cm. standard length, caught along the shore of King Edward Point, South Georgia, at high water by hand on 29 and 30 March 1967.

The fin-ray frequencies for 57 specimens from Signy Island and 80 from South Georgia are shown in Figs. 3 and 4, respectively.

There seem to be two major colour forms of this species: a commoner red-brown form with lighter spots and stripes, and irridescent blue spots on the flanks, and an olive-green form in which the spots are less well marked.

The "fry" which were caught at South Georgia has been cast up on the shore at night; all were silvery in colour and had obviously reached the pelagic phase. They had the following relative measurements: the head length if 26–30 per cent of the standard length and the eye diameter is 26–31 per cent of the head length. The interorbital width is 25–30 per cent of the head length. The pectoral fins are 84–92 per cent of the head length and the body depth is 20–23 per cent of the standard length.

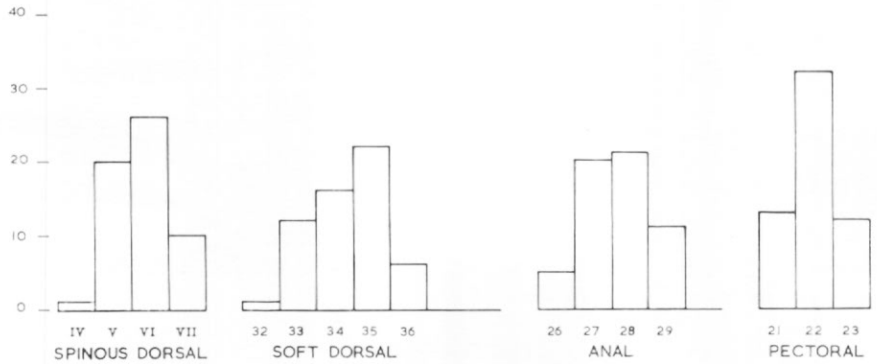

Fig. 3. Fin-ray frequencies for *Notothenia rossii marmorata*, Borge Bay, Signy Island.

Trematomus newnesi Boulenger

69 specimens, ranging in size from 5·6–12·5 cm. standard length, caught in a beam trawl or Agassiz trawl in depths from 5 to 37 m. in all months of the year.

Trematomus nicolai (Boulenger)

One specimen, 7·02 cm. standard length, caught in an Agassiz trawl in 18 m. in Borge Bay, Signy Island, on 23 December 1965.

The opercular, pre-opercular and cheek regions are scaly but the rest of the head is scaleless. The teeth are relatively short and inconspicuous. The ground colour is brown, the dorsal surface being darker and extending in six dark bands transversely across the body.

In the past *T. nicolai* has only been recorded from east Antarctica and never from the Weddell Sea quadrant. I have examined three examples of *T. nicolai* in the British Museum (Nat. Hist.) described by Boulenger (1902) and Regan (1913) and, although their relative proportions are not quite the same as those for this specimen, the discrepancies are almost certainly due to the difference in size between the fish (those of Boulenger and Regan are 12·6–19·6 cm. in standard length and the Signy Island fish is 7·02 cm. in standard length).

Trematomus borchgrevinki Boulenger

One specimen, 4·75 cm. standard length, found lying moribund in the slush in an ice hole between Neny and Stonington Islands on 22 September 1965.

Trematomus bernacchii Boulenger

One specimen, 23·1 cm. standard length, caught on a hand line in 45 m. in Borge Bay, Signy Island, on 30 September 1966. Four specimens, 14·9–17·5 cm. standard length, caught in a fish trap at Admiralty Bay, King George Island, on 8 February 1967. One specimen,

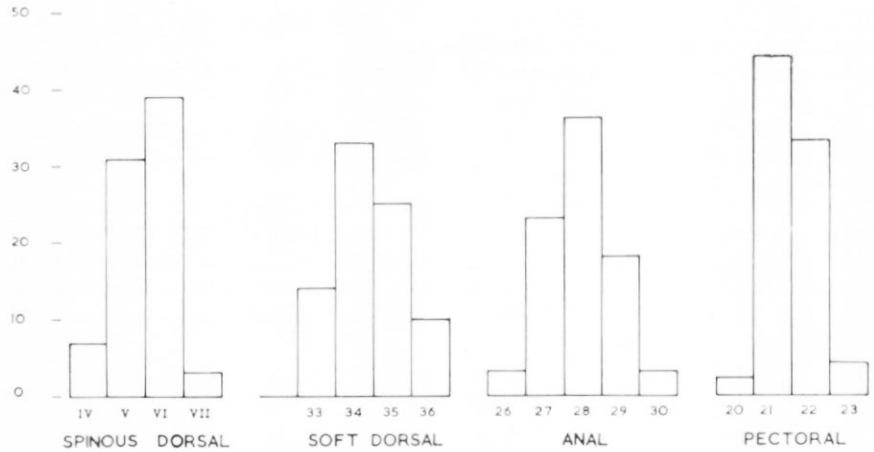

Fig. 4. Fin-ray frequencies for *Notothenia rossii marmorata*, South Georgia.

18·6 cm. standard length, caught on a hand line in 50 m. at Whalers Bay, Deception Island, on 10 February 1967. 22 specimens, 14·3–25·3 cm. standard length, caught on a long line in Meek Channel, Argentine Islands, on 13 March 1967.

Trematomus hansoni Boulenger

One specimen, 22·8 cm. standard length, caught on a line in 24 m. between Neny and Stonington Islands on 17 February 1967.

HARPAGIFERIDAE

Harpagifer bispinis (Schneider)

Five specimens, 5·30–8·62 cm., caught in an Agassiz trawl in 13 m. in Borge Bay, Signy Island, on 15 April 1966. One specimen, 8·23 cm., caught by hand whilst diving in 11 m. in Factory Cove, Signy Island, on 24 April 1966. Two specimens, 7·27 and 8·74 cm., caught in an Agassiz trawl in 35 m. in Borge Bay, Signy Island, on 22 September 1965. 18 specimens, 2·75–7·64 cm., caught in an Agassiz trawl in 16 m. in Borge Bay, Signy Island, on 21 August 1966. One specimen, 7·23 cm., caught in an Agassiz trawl in 40 m. in Borge Bay, Signy Island, on 25 August 1965.

BATHYDRACONIDAE

Parachaenichthys georgianus (Fischer)

Three specimens, 43·3, 46·1 and 47·4 cm. standard length, caught on a hand line from the jetty at King Edward Point, South Georgia, on 2 April 1967.

The colour is either red-brown or slate-grey spotted with darker pigmentation of the same colour as the rest of the fish.

Parachaenichthys charcoti (Vaillant)

One specimen, 42·4 cm. standard length, caught on a hand line in 40 m. in Borge Bay, Signy Island, on 11 June 1966. One specimen, 42·0 cm. standard length, caught on a hand line in Whalers Bay, Deception Island, on 10 February 1967. One specimen, 42·4 cm. standard length, caught as above on 24 March 1967.

CHAENICHTHYIDAE

Champsocephalus gunnari Lönnberg

One specimen, 8·18 cm. standard length, found just alive on the shore at Port Foster, Deception Island, on 25 February 1966.

The preserved specimen is almost white in colour with a few dark spots on the dorsal surface; this was probably the colour when alive but no note was made at the time the fish was found.

Chaenocephalus aceratus (Lönnberg)

27 specimens, 46·7–54·2 cm. standard length, caught on hand lines or long lines in Borge Bay, Signy Island, from March 1965 to February 1967. One specimen 53·1 cm. standard length, caught on a hand line in Whalers Bay, Deception Island, on 3 January 1965. Four specimens, 47·5–55·8 cm. standard length, caught on hand lines at Deception Island on 9 February 1967.

All of the specimens were mature females, and in fresh specimens the ovaries could be seen through the skin as an orange patch just dorsal to the vent.

Discussion

The geographical distributions described by Nybelin (1951) for *Notothenia neglecta* and *N. coriiceps* appear to have been misinterpreted by several authors, resulting in the exclusion of the former species from its type locality. Confusion over the separation of the two species has consequently arisen. (*N. neglecta* occurs in the Victoria Land and Weddell Sea quadrants, the South Shetland and South Orkney Islands and South Georgia, the last-named being the type locality. *N. coriiceps* is only found in the vicinity of Archipel de Kerguelen and Macquarie Island.) The collections described in this paper were made in a restricted area of the Antarctic so that circumpolar comparisons are not possible, and attempts at amalgamation or further sub-division of the two species would be unjustified.

The specimen of *Trematomus nicolai* caught at Signy Island is very interesting as it is the first record for the South Orkney Islands and probably also for the Weddell Sea quadrant. The reason for this is more likely to be the limited effort so far applied to Antarctic fish sampling than an actual rarity of the species. Apart from the obvious difference in overall size between the Signy Island specimen and those with which it was compared in the British Museum (Nat. Hist.), there is a great difference in the size of the teeth. In the Signy Island specimen the teeth are small and inconspicuous, whereas the larger specimens in the British Museum have large prominent teeth. The small specimen probably only used its teeth for holding prey (e.g. amphipods crawling in amongst the weed), whereas the larger specimens, with proportionately much larger teeth, probably bit chunks from their prey (e.g. molluscan siphons protruding from the sand).

The specimen of *Champsocephalus gunnari* was caught at Deception Island, which is some distance from its previously recorded range of South Georgia and Archipel de Kerguelen. However, since the young stages are pelagic (Olsen, 1955), it is possible that this specimen arrived from the South Georgia area despite contrary prevailing currents (Hydrographic Department, 1948, p. 54–56).

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