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COLOURLESS BLOOD FISHES

FOUND WHILE FISHING NORTH OF SOUTH GEORGIA ISLAND IN APRIL 1978

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ABSTRACT:

This paper presents the ice fishes found while fishing with a pelagic trawl north of South Georgia Island in April 1978. Length and weight composition of the captured specimens is also presented.

The Chaenichthyidae, or the so called ice-fish, represent a world-unique family by the fact that, unlike all the red blood marine vertebrates, it has colourless blood, owing to the absence of erythrocites, hence, of the respiratory red pigment-hemoglobin (5, 7).

In contradistinction to the majority of the species belonging to this family, generally living at great depths (2oo - 7oo m), those of South Georgia Island appear, too, in the warmer and shallower water near the coast. The biology of most of the species of this family is less studied, but it is known that they perform vertical migrations for krill - the favourite food of the Antarctic fish (2).

Blood histological analyses of these species showed the presence of a reduced quantity of erythrocites, which cannot play

any role in the organism - environment gas exchange. It was noticed that the blood assures the organism oxygenation through the superficial capilary system on the whole body surface and the plasma. Consequently, the principal role in respiration is not played by the gills, but by the whole surface of the body and fins. In this way, the total surface of the capillary network exceeds 3 times the respiratory surface of the gills. It may be shown, as an example, that in the colourless fish in the zone of Kerguelen Islands the capillary system is so thick that reaches a length of 45 mm on 1 mm^2 of tegument of the pectoral fins (1).

Figuratively, we could consider the whole body as a gill lamella where oxygen is taken up and CO_2 is eliminated.

MATERIAL

By the end of April, 1978, the trawler "Sinoe" carried out prospective fishing north of South Georgia Island with a view

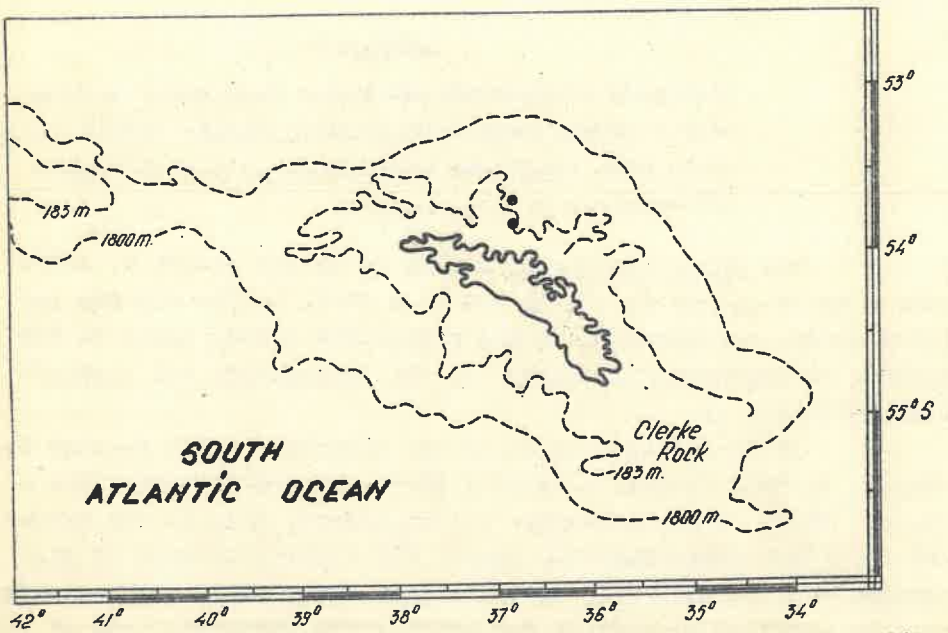

Fig.1 - Location of trawlings in the northern zone of South Georgia Island

to species identification of the captures and to settle the conditions in which industrial fishery could be fulfilled within the zone (Fig.1).

Trawlings were carried out with a pelagic trawl, in the area between 53°45' - 53°42' lat.S and 36°49'-36°57' long.W, at depths of 180-220 m, at 95-140 m level and in close vicinity of the bottom, at a speed of 3.6 kn.

The captures were poor, but exceptionally valuable in what concerns the component species, consisting mainly of Chaenichthyidae, Nototheniidae, Myctophidae, Trichiuridae, Euphansidae and Octopidae.

In the witness trawlings, the Chaenichthyidae occured every time, having been represented by 3 species:

- Champsocephalus gunnari LÖNNB.
- Pseudochaenichthys georgianus NORM.
- Chaenocephalus aceratus (LÖNNB.)

RESULTS AND CONCLUSIONS

Of the 3 species of Chaenichthyidae, C.gunnari represented on the average 68% of the total capture. The total lengths of the captured specimens varied between 16 and 37 cm and the weights, between 35 and 150 g; mean length and weight were 22.1 cm and 115 g, respectively. The species is distinct from the other two ones by short pectoral and ventral fins, a more prolonged body and uniform light grey colour.

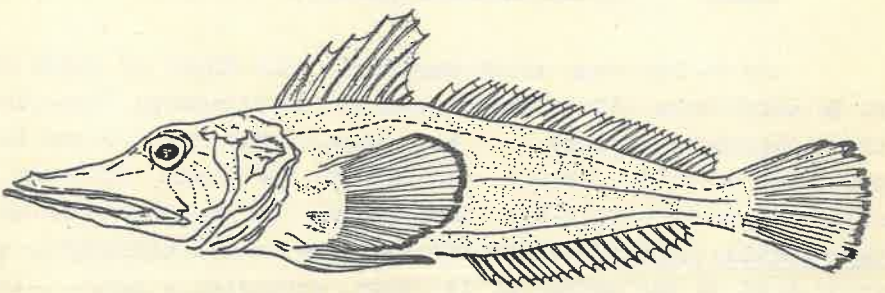

Fig.2 - Pseudochaenichthys georgianus NORM.

In contradistinction to the former, P.georgianus (Fig.2)

has longer and broader pectoral fins and a dark grey-brown colour which makes its identification much easier among the mix of species in the trawl purse. In our captures small sized specimens prevailed, the length and weight which varied from 19 to 26 cm and from 75 to 2oo g, respectively. Mean length and weight were 21.8 cm and 1o2 g, respectively.

The third species, C.aceratus (Fig.3) much resembles C.gunnari, from which it differs, however, by much prolonged ventral fins and dirty white to light grey colour, as well as the 5-6 transversal brown coloured strips. It is characteristic that when lifeless, its mouth is wide open. The caught specimens were 9 to 37 cm long, their weights varying between 18 and 125 g; the means were 17.5 cm and 41 g, respectively.

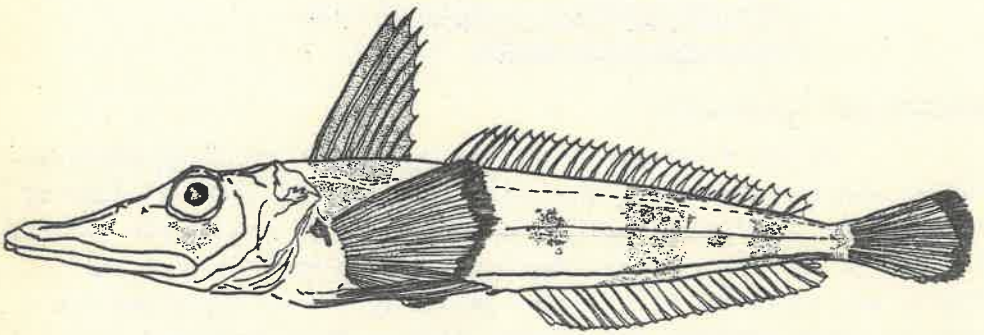

Fig.3 - Chaenocephalus aceratus (LÖNNB)

As it has been above mentioned, the blood of these species is colourless. Given the absence of erythrocites, hemoglobin - the respiratory pigment - is also absent. But its absence is compensated by a high circulation rate of the blood, which is intensely pumped by a well-developed hearth. Our measurements on Chaenocephalus aceratus indicated that the hearth represents on an average 6.3% of the weight of its body, supplying a great volume of circulated blood.

It is known that these species live in cold water with much dissolved oxygen. The abundance of oxygen gives high pressure on the whole body surface, which facilitates its rapid dissolva-

tion in the colourless blood that then carries it at high speed through all tissues.

In connection with this oxygen abundance, but especially with the low temperature of the medium, a reduction of the general metabolism, appears natural (3, 6). Finally, the direct effect of this reduction of metabolism is a reduction of the nutritional necessity.

Well now, to this reduction of the nutritional needs one may add the food abundance - that is the krill, for finding of which the species does not make any important effort.

These would be the main conditions in which the occurence of colourless blood was possible, as well as its taking over the gas exchange, followed by the present adaptations in the circulatory system.

The colourless blood fish are quite sparse, even in the museums, however these species may form object of industrial fishing as an important number of them occur in the waters of South Georgia Islands (4). Our results were not among the most spectacular in late April, but we consider that good fishing can be developed here during the austral summer, that is in the period from December to March.

BIBLIOGRAPHY:

1. ANDIASEV A.P. - 1971 - Subordinul Notothenoidea. In: RASS, T.S. Jizni jivotnih, 4. Rîbî. Moskva: 503-504.

2. CHLAPOWSKI K., KRZEPTOWSKI M. - 1978 - On the presence of fishes in Antarctic krill catches, Acta Ichthyologica et Piscatoria, 8, 1: 3-8.

3. HARVEY W. - 1958 - Cercetare anatomică despre mişcarea inimii şi a sîngelui la animale. Ed. ştiinţifică, Bucureşti: 164.

4. NODZYNSKI J. - 1976 - Oceana technologiczna szczekacza (Chaenocephalus aceratus) polawianego w rejonie wod Georgii poludnioweg. Bull. MIR, Gdynia, 6/38: 18-22.

5. PARIN N.V. - 1978 - Ihtiofauna okeanskoi epipelaghiali, Akad. Nauka SSSR, Izd. Nauka, Moskva: 63.

6. RUCH T., FULTON J. - 1963 - Fiziologie medicală şi biofizică. Ed. a 18-a a Manualului de Fiziologie a lui HOWELL, Ed. Medicală Bucureşti: 15-37.

7. RUUD J.T. - 1965 - The ice fish. Readings from Scientific American Oceanography, with Introductions by J.R.Moore; W.H.Freeman et Cp., San Francisco, 1971: 300-305.

8. x x x - 1974 - The Antarctic Pilot. Hydrographer of the Navy, 4-th edition: 19-35.

9. x x x - 1977 - Biological Investigations of Marine Antarctic Systems and Stocks, 1, Research Proposals: 79.