NOTES ON FISHES FROM THE STOMACHS OF WHALES TAKEN IN THE ANTARCTIC

I. *XENOCYTTUS NEMOTOI*, A NEW GENUS AND NEW SPECIES OF ZEOMORPH FISH OF THE SUBFAMILY *OREOSOMINAE* GOODE AND BEAN, 1895

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Since April, 1948, some fishes from the stomachs of whales taken by the Japanese whaling fleets in the Antarctic have been brought back and passed on to the writer for study. The collections include large specimens presenting difficulties in preserving, and this, coupled with other pressing duties, has deferred the preparation of the report of the study. The writer takes pleasure in presenting here the first of a series of papers dealing with these antarctic fishes, and in expressing his sincere thanks to Dr. H. OMURA (Director, Whales Research Institute, Tokyo), Dr. M. NISHIWAKI, Mr. K. FUJINO, Mr. T. NEMOTO (all of the same institute), Mr. T. KAWAKAMI and the other biologists at the Research Division, Fisheries Agency, Mr. K. ŌTSURU (Nihon Suisan Co.) and several other biologists at the whaling companies in Japan for their courtesy and the trouble they have taken. The writer has to thank Miss Y. TAKASHIMA (Tokai Regional Fisheries Research Laboratory) for her help in preparing this paper.

Xenocyttus, New Genus**

Generic type.—*Xenocyttus nemotoi*, new species, described below.

Diagnosis.—The body is deep and compressed, and the caudal peduncle is slender (resembling some of the so-called zeomorph fishes of the genera *Allocyttus*, *Pseudocyttus*, *Cyttosoma*, *Xenodermichhtys*, *Grammicolepis*, *etc.*, on the one hand, and some caproid fishes on the other). Despite pronounced differences in general appearance, the present new genus is, as will be seen below, very closely related to *Oreosoma*, and it is highly probable that the former will prove to be not distinct from the latter, which was introduced by CUVIER in 1829 with *atlanticum* as type. The single specimen upon which he based his discription was only 16 lines (=*ca.* 33 mm***) long. In view of the remarkable changes

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** ξένος=strange; κυττος=an unknown fish (*vide* GÜNTHER, 1860, p. 396, foot-note).

*** According to VAILLANT, 36 mm.

in body shape, and more especially in armature, with advancing age in certain fishes, the writer wishes to give the diagnosis paying special attention to the other characters.

The total number of vertebrae (examined by radiograph) is a little more than 40 (*ca.* 43). The fin-formula of the ventral is I 5 (=4+i, or, all branched); the spine is long, and soft*. The ventral origin is behind the pectoral base; the distance from the former to the anal origin is equal to the length of head and very slightly less than the distance from the ventral origin to the anterior end of the scaled part of the breast. The ventral fins are widely separated from one another, and each fitted in a shallow depression. The lateral line is rather gently curved anteriorly. The belly is very weakly keeled along the mid-ventral line just in advance of the vent for a short distance, but in front of the ventral origins, the ventral surface of the body is almost flat, forming an ill-defined, high isosceles triangle. There are no spiny bucklers on each side of the dorsal and anal bases; they are covered on each side by a low skinny fold which bears very small scales. The dorsal and anal spines are not widely separated from the soft rays of the fins.

The shape and arrangement of scales are very characteristic. They are firmly adherent and spiny excepting for those on the belly. At first sight the shape of scales varies greatly in different parts of the body, but there are gradations between the peculiar scales on the belly and those on the other parts of the body. The former scales are low pyramidal plates of moderate size, each with contour-line-like, concentrically arranged rings on the central part, and each separated from neighboring scales by narrow naked area of varying width (thus forming a mosaic as in the specimen of *Oreosoma atlanticum* described and figured by WAITE, 1912, p. 198, pl. 11). The contour of these scales is either nearly quadrilineal, or nearly pentagonal (or further, nearly circular), and the outskirts of the central elevation is flattened. There is usually a short spine near the posterior margin of each of these scales. The scales on the back and the other parts of the body and head, excepting for the belly, are rough to the touch; they bear one to three distinct spines behind the central elevation and near the posterior margin. Some scales lack these spines, and may be called circular.

The pockets receiving scales are arranged fairly regularlly on the posterior part of the body, but the number of scales below the dorsal

* Probably because of the strong preservative? The writer can not be certain of the rigidity of the spine. In *Zen* the ventral fins lack spine. In the present genus, it is difficult to see whether the outermost fin-ray (which is here regarded as a spine) is divided or not, because only one specimen (which has been in strong formalin) is available. But there seem to be no segments in this ray, and its thickness is much greater than the inner fin-rays.

origin is difficult to count because of the irregular arrangement. Approximatly the number of scales in an oblique row passing the dorsal origin down and backward to the scale just above the lateral line is 1/2 (just in front of the anterior end of the base of the 1st dorsal spine) +2 (smaller than those below)+19–25 (left), and 1/2+2+20–23 (right). The number of scales in the lateral line is *ca.* 110 (to the end of the vertebral column)+*ca.* 6 (left), and *ca.* 107+*ca.* 6 (right). The number of the scale rows from the left orbital rim to the right is *ca.* 17.

Taking into consideration the dissapearance of certain armature in the adult of certain fishes, the presence of three low outgrowths on the belly above the ventral fin on each side of the present specimen should be specifically mentioned here. They are each formed of a few slightly modified scales with a higher projecting part. The hindmost outgrowth is the largest, and fairly widely apart from the middle one, which is also more conspicuous than the anteriormost. On the right side, the anterior two projections are less pronounced than on the left side of the body. The sclaes are the smallest on the interorbital area, in front of the nearly vertical ridge of the operculum, on the pectoral base, and on the folds along the dorsal and anal bases; they are the largest on the belly (excepting for the abdominal projections which are composed of more elevated scales).

The eyes are not so large as in large specimens of the members of *Allocyttus* and *Neocyttus*. The eye-diameter is about 1/3 of the length of head, and almost equal to the interorbital breadth (above eye-centers).

The mouth is not so small as in *Grammicolepidae*, oblique, and protractile. The hind end of the maxillary nearly reaches the vertical through the anterior margin of the eye.

The interorbital area is broad, medially scaled, separated by an extremely fine naked line from the posterior part of the head which is covered by much larger scales. The lateral parts of the interorbital area, namely, the parts just above the eyes, are dark brown, with irregular depressions and with bristle-like projections along the orbital rim. The median broad scaled part just mentioned, like the ground color of the body, is bluish gray. There are few, low spines along the ventral margin of the orbit. The preorbital has shallow concavites, and anteriorly provided with one or two small spines which are directed downwards. The ventral side of the head, snout and jaws are naked. The cheek and postocular parts of the head are scaled, only the hind margin and two diverging long ridges of the operculum, exposed branchiostegal membrane*

* The general appearance of the breast and postero-ventral part of the head resemble that of the figure of *Oreosoma atlaticum* given in CUVIER and VALENCIENNES' 'Histoire naturelle des poissons', pl. 99 (the figures are designated *O. coniferum*).

and neighboring parts of the opercular bones being naked. There is a small knob at the symphysis of the lower jaw. It has three spines directed downward. The posterior end of the lower jaw is angular, and separated from the gular thickening and branchiostegal membrane by a fairly wide concavity. The branchiostegal membrane on each side is ventrally connected with its partner, and free from the isthmus posteriorly.

The gills are three and a half in number, and there is no slit behind the last gill. The pseudobranchiae are well developed. The number of the branchiostegals is seven on each side. The gill-rakers on the first gill-arch are rather soft, and the length of the longest gill-rakers are about one-third of the horizontal eye-diameter. The number of the gill-rakers just mentioned is 5+1+19 (left) and 5+1+18 (right).

Teeth are present on the lower jaw only. They are small, simple, well separted from one another, few in number, and arranged in a single or two (anteriorly only) rows. The vomer, palatines, tongue and inner side of upper jaw bear close-set, tooth-like, slender projections. They are probably papillae.

The upper lip is broad, and inflected inward as a thin skinny flap covering entirely the edge of the premaxillaries. When seen from the ventral side, this skinny fold (which may be called a curtain) narrows at the mid-dorsal point of the upper jaw. The greatest width of the inner portion of this kinny flap is almost equal to the greatest breadth of the skinny membrane just inside of the edge of the premaxillaries (which is commonly met with in *Decapterus*, *Cypselurus*, *etc.*). The tongue is short, slightly concave dorsally, and bears prominent papillae (see above). The nostrils are paired on each side of the head. The posterior nostril is slit-like, stretched nearly vertically, and situated near the anterior margin of the orbit. The anterior nostril is just in front of the posterior one, oblong or kidney-shaped, and its vertical length is smaller than in the latter. A bony roof protrudes between the posterior and anterior nostrils.

Xenocyttus nemotoi, New Species*

'Tsubu-matōdai' (new Japanese name**)
Plates 1 & 2

Material examined. — Holotype (Cat. No. 49756, Zoological Institute,

* The writer takes pleasure in naming this new species after Mr. T. NEMOTO who collected the type specimen.

** Japanese names for antarctic fishes are necessary in order to expedite collecting of additional specimens and gathering information about the habits of these fishes. 'Tsubu' means tubercles; 'matōdai' means John Dory, member of *Zeus*.

Faculty of Science, University of Tokyo=Cat. No. '55-111, ABE), collected by Mr. NEMOTO from the stomach of a fin whale along with numerous euphausids. The whale was killed on January 15, 1955, in 64°32′ S and 115°25′ E. So far, only the holotype has been available for study.

Description of the holotype.—Total length 162 mm, standard length 140 mm. The belly is swollen because of the stomach contents (contrary to expectation consisting of numerous copepods; this specimen was found along with numerous euphausids as stated above). The general appearance of the specimen is mentioned in the description of the generic characters given above. The following measurements are given in hundredths of the standard length: Greatest depth of body (near dorsal origin) 74.3, greatest breadth of body (belly, above ventral fins; belly is well swollen) 22.1, breadth of body at upper edges of pectoral bases 18.6, breadth of body at anterior ends of lateral lines 15.4, least depth of caudal peduncle 7.1, length of head 35.0, horizontal diameter of eye 12.0 (left) and 11.4 (right), vertical diameter of eye 11.1 (left and right), length of snout 10.0 (left) and 9.6 (right), interorbital breadth (above eye-centers) 11.6, greatest depth of preorbital at the antero-dorsal corner of scaled part of cheek 2.9 (left) and 3.2 (right), length of longest (1st) dorsal spine 12.9, length of longest (*ca.* 15th–20th) dorsal fin-rays *ca.* 11.1, length of longest (1st) anal spine 6.4, length of longest (*ca.* 15th–20th) anal fin-rays *ca.* 11.4, length of ventral spine 18.6 (left) and 19.1 (right), length of longest (outermost) ventral fin-ray 16.6 (left) and 18.6 (right), length of longest (8th from top) pectoral fin-ray 13.6 (left) and 13.2 (right), length of longest (4th–6th from the raker just below the one at the joint of the upper and lower limbs) gill-rakers 3.9 (left) and 4.3 (right), greatest diameter of scales on postero-dorsal part of body *ca.* 1.2, greatest diameter of exposed part of larger scales on belly *ca.* 1.4.

D. VI 35 (all fin-rays unbranched and segmented; hindmost 2 rays close together). A. II 33 (all fin-rays unbranched and segmented; hindmost 2 rays close together). P. 21 (all fin-rays unbranched and segmented) on both sides. V. I 5 (outer 4 soft rays branched; innermost ray unbranched or branched) on both sides. Caudal fin dorsally injured; below the end of lateral line are 7 principal rays, of which upper 6 rays are branched.

The body-wall is thick; the muscles there are white and fairly hard (resembling boiled squid meat) although they are seemingly oily. On the right side of the belly, embedded in these muscles, and just above the posterior margin of the vent, lies a posteriorly curved spine-like bone of a size nearly equal to the longest anal spine. The bone is

pointed at the ventral end. The left side of the belly has not been dissected. The peritoneum is blackish. The air-bladder seems to be absent. The pyloric caeca are numerous. The gonads are still very small, but the present example is believed to be a male.

The color in formalin is bluish or pinkish gray, with many rounded, dark blue markings of varying size; some of them are slightly larger than the pupil, and some are much smaller than the latter. The membranes of the ventral fins are blackish. The dorsal and anal spines, and the exposed parts of the bones of the head are brownish orange. Color prior to preservation, according to Mr. NEMOTO, who collected the specimen, was light orange, with blue markings.

Relationships.—Though resembling caproid fishes, *Lampris*, *Leiognathus*, *etc.*, at first sight, the present new genus and species is undoubtedly closely related to some zeomorph fishes, and more especially, to *Allocyttus verrucosus* (GILCHRIST) and *Oreosoma atlanticum* CUVIER. In the total number of vertebrae*, *Xenocyttus nemotoi* resembles *Grammicolepis* and *Neocyttus*, and considerably differs from *Zeus*, *Cyttus* and *Caproidae*. As the change with advancing age in the shape of body, armature, relative size of eyes, relative size and number of fin-rays in the ventrals, coloration, *etc.*, are very remarkable in certain fishes, and as there have been some discrepancies in the diagnostic descriptions of the genera of the so-called *Zeidae*, *Grammicolepidae* and *Caproidae*, no pretence is made here to introduction of a new family for *Xenocyttus*, *Oreosoma*, *Allocyttus* and allies. The difference in the number of ventral fin-rays between *Oreosoma atlanticum* described by CUVIER** and the specimen described under the same name as above by WAITE (1912) (which was later named *O. waitei* by WHITLEY) on the one hand, and *Xenocyttus nemotoi* on the other, and the presence of the orifice behind the last gill in WAITE's specimen perplexes the present writer. Furthermore, GILCHRIST's account (1922, p. 71) of the change with advancing age of the coloration, relative depth of body and the development of the enlarged scales (namely, the so-called tubercles) is in the reverse direction if *Oreosoma atlanticum* is presumed to be the young of

* It is regretted that the total number of vertebrae (N) in *Oreosoma* and *Allocyttus* is not known to the writer. This number in *Zeus* and *Cyttus* (31 or 32), *Grammicolepis* (46), *Neocyttus* (40) is cited from REGAN, 1910; that of *Capros aper* (10/12-13) from GÜNTHER, 1860; that of *Antigonia rubescens* (9+11+1) from STARKS, 1902. The present writer has examined the skeleton of *Zeus japonicus* and *Antigonia capros*; N is 31 (=13+18) for the former, and 22 (=10+12) for the latter. There is a slit behind the 4th gill in *A. capros*, whereas it is absent in *Z. japonicus*. V. I 5 (all branched) in *capros*; I 7 (all branched) in *japonicus*.

** VAILLANT, 1893, re-examined the type and another specimens of the species, and corrected the number of ventral fin-rays erroneously given by CUVIER. According to VAILLANT, this number is I 7.

Xenocyttus nemotoi. The adoption of the name *Oreosominae* for *Oreosoma*, *Xenocyttus*, *Allocyttus* and allies (if any) is only for convenience' sake. MYERS' statement (1937, pp. 146 and 147) that he was inclined to think 'there may be more than one family type among them' (the word 'them' refers to the genera usually referred to *Zeidae*) fits for expressing the opinion of the present writer.

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EXPLANATION OF PLATES 1 & 2

PLATE 1

Fig. 1. *Xenocyttus nemotoi*, new genus, new species. Type. Cat. No. 49756, Zoological Institute, Faculty of Science, University of Tokyo.
Fig. 2. Left side of the belly of the same specimen as above, showing three low outgrowths.

PLATE 2

Fig. 1. Dorsal view of the head of the same specimen as above.
Fig. 2. Ventral view of the belly of the same specimen as above.

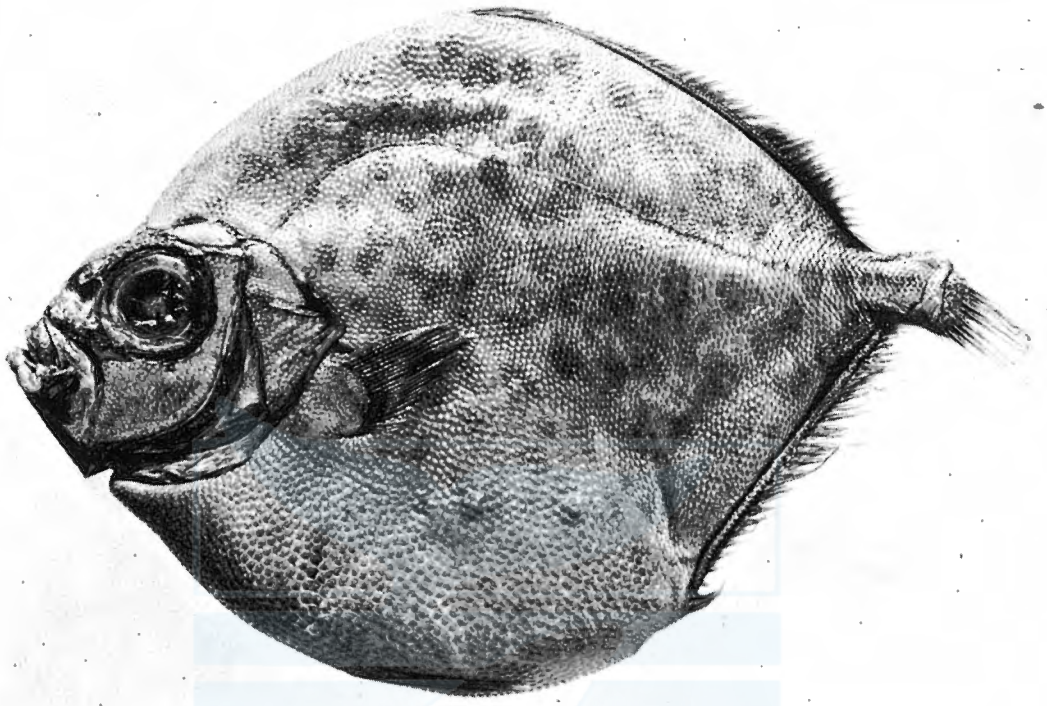

Fig. 1

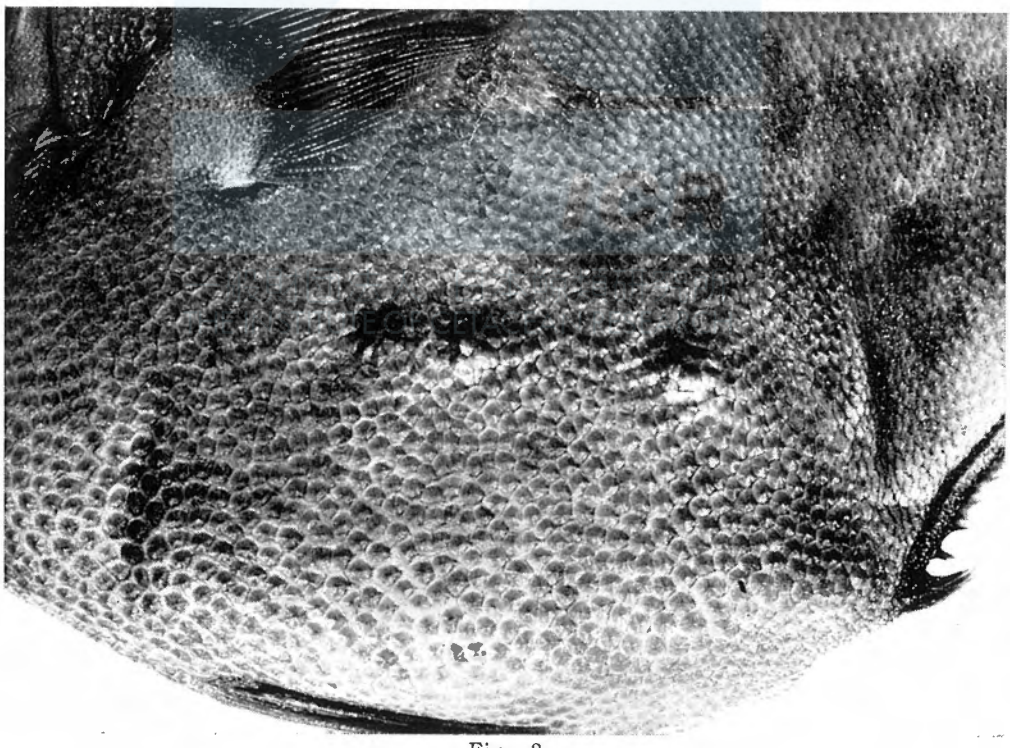

Fig. 2

Fig. 3

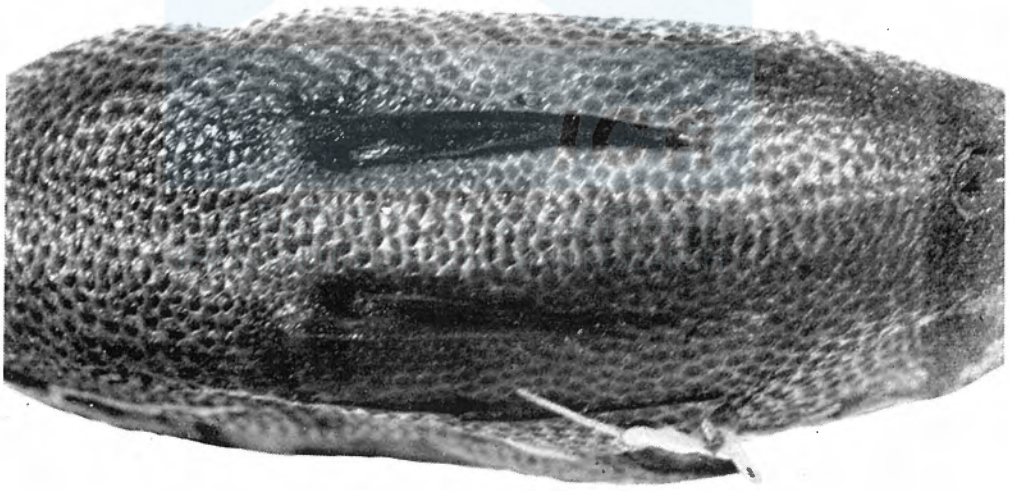

Fig. 4