

Descriptions on Unidentified Species of Dibranchiate Cephalopods.

II. A Cranchiidae Squid of the Genus *Taonius*.

By

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A good specimen of this deep-sea squid was given to the author through the kindness of the Whale Research Institute.

As would be described later in this paper, a member of characters go to prove definitely that this species belongs to the genus *Taonius* of the family Cranchiidae. Two of the striking characters are its elongated form and the soft gelatinous like nature of the body. Many other characteristics were observed while comparing it with the known species *Taonius pavo*. As the present writer is not aware of any literature of this specimen and its differences and similarities with other known species, he has made an effort to publish here the observations he made on this unidentified species.

The sample was obtained from the stomach contents of the sperm whale caught near Kamchatka in the North Pacific in the summer of 1951.

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General descriptions of the specimen

Mantle and its surface: Mantle texture remarkably characteristic; very soft and gelatinous as in *Chiroteuthis*. The body form of this specimen is much elongated, subfusiform, and its length is about 7 times the maximum breadth, which is perhaps at the anterior portion of the mantle. From this region the mantle gradually tapers behind near up to the beginning of the fin and then becomes narrower rapidly, to continue as the filiform end-process (figs. 1 and 2). In this point, the sample almost resembles *Taonius pavo*. The 'Schwanzfaden' as described by PFEFFER on the VERRILL's and JOUBIN's specimens of *T. pavo*, does not exist in this sample.

In table 1 are collected the results of the morphological measurements made on the sample.

Table 1. Morphological measurements of the specimen examined.

Body parts	Length	
Mantle; ventral length	428 mm	
breadth at the anterior margin	63	
Fin; length	164	
maximum breadth	76	
Head; length	47	
breadth except the eyes	27	
height	33	
	left	right
Arms; length of the first	94	*76
the second	124	120
the third	120	123
the fourth	114	113
Eyes; diameter	37	
Fin length/Mantle length	39%	
Fin length/Fin length	218%	

* the tip broken

It is a very striking fact that on the surface of the mantle are densely scattered white hemispherical crystalline tubercles of about 5 to 7 mm. dia. and many black large and small pigment spots of less than 5 mm. quite differing from the chromatophores in the general squids (fig. 3). They are about the same in arrangement and number at both dorsal and ventral surfaces of the mantle except at the attaching portion of the fin, and on the whole they become more abundant, distinct and larger as the anterior mantle margin is approached. However, no tubercles are recognized on the surface of the fin and the mantle region situated along the fin. On the other hand, black-coloured pigments do not at all exist on the ventral side of the fin and the distribution on the dorsal surface is limited only to the gladius region. It is of great importance to note that there is not a single line of chitinous tubercle on either side of the ventral aspect of the mantle.

As in general Cranchiids, the anterior margin of the mantle is firmly fused with the head by the cartilaginous articulations, indirectly at both the funnel bases and directly at the nuckal region. At these points, the mantle is faintly convex with a dune crescentwise angle.

Fin: As regards the combined outline of the fin, it is a little

elongated and gold-coin shaped with a projected extremity; its length is decidedly more than twice the maximum breadth. Since there is no appearance of the anterior insertion, lateral angles and auriculating lobes are not distinctly recognized.

Head: The head proper excluding the projecting eyes is rather narrow and triangular shaped when looked from the ventral side; on all its surface, no kinds of tubercles or folds are found. There is a clear demarcating constriction between the head and arm regions. The dorsal surface is roundish and smooth. The ventral side is almost totally occupied by the expansion of the funnel. The eyes are enormously large, and projected from the lateral surface of the head by means of a short but thick peduncle; the diameter of the eye reaches about 35 mm. and it is about 30 mm. in height. In SASAKI's text-fig. 145, the eyes are not so much protruded as in this specimen.

At the posterior margin of the eyes, olfactory tubercles are situated in *T. pavo*, while in this specimen a gelatinous substance surrounded by a yellow-coloured band in formalin fixing solution is found near the same place. The author is not certain whether this is the same as the olfactory tubercles of *T. pavo*.

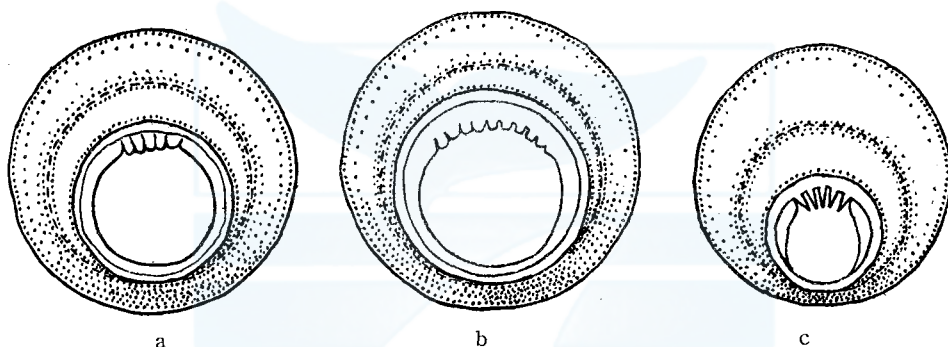
The funnel covers almost the whole ventral region of the head and is between two linear elevations of the cephalic cartilage running along both the ventral margins, and is especially expanded at the base in longitudinal directions. The figure of this is shown in fig. 5; the distal part, free from the head, is much longer, when compared with common squids and its orifice is vertically opened. The funnel groove is not well differentiated. The olfactory crest is also not distinct.

Arms: Arms not equal in length and are rather short. The length is about one-fourth the length of the mantle; their order of length being $2 \div 3 \div 4 > 1$. The thickness of the arms are more or less alike, and are round in cross-section. The arm tapers gradually from the base towards the tip, and its distal end is blunt.

The keel nor the web are developed in any one arm. However, protective membranes are well developed and extend from the proximal base to the distal extremity along the two sides. The dorsal membrane is much smaller than the ventral one. The width of the ventral membrane reaches about 10 mm on each arm. SASAKI, however, in his description has said that the proximal half of the third arm is slightly keeled and the dorsal outer surface of the fourth arm is webbed. The trabeculae are thickened.

Arm suckers: Arm suckers are globular and relatively large. They are arranged in 2 rows throughout. They begin from the basal end and are distribute at some intervals at the proximal region, but are

crowded at the distal portion (fig. 6). The suckers are almost the same in size and structure at similar regions in each arm. The suckers are smallest on the ventral arms. Choosing the lateral third arm for the description of suckers, there are about 50 pairs of suckers arranged in 2 distinct rows. The suckers of the 9th or 10th series are the largest and those following are similar in size. Again the suckers of the 17th or 18th series are remarkably large and those that follow become gradually smaller in size. However, when the size of the distal suckers compared with those of other common squids are comparatively larger. A similar feature is observed in all the other three arms (fig. 4). SASAKI's specimen had 20 pairs or more of suckers.



Text-fig. 1. The structure of 3 kinds of horny rings on the suckers of the left third arm. (a) The proximal one; 1st series. $\times 20$. (b) The central one; 13th series. $\times 20$. (c) The distal one; 25th series. $\times 20$.

Generally, the structure of horny ring is related in its proportion to the size of its bearing sucker. Namely, three kinds of teeth were seen (text-fig. 1). The proximal horny ring is provided with 3 to 5 square-cut teeth produced from the higher wall of the horny ring. The teeth of the other horny rings are also produced from the same higher wall region. The teeth of the proximal horny ring are closely set by each other with deep crests.

The central horny ring which is the largest has about 7 to 12 teeth, much broader and shorter than the former, so much so that they are easily over-looked if carelessly observed. It was also observed that some erosion into the wall usually occurred near the marginal teeth and sometimes an irregular bridge at the opposite side of the teeth region was seen.

In SASAKI's specimen, teeth was produced on the whole margin of the horny ring and it numbered about 20 to 30. But according to VERRILL's and JOUBIN's descriptions, teeth were present only at the

higher wall as in this specimen.

On the distal horny ring, situated after the 20th series of suckers, the number of teeth is considerably decreased to 4~6 and its form becomes conspicuously sharp and triangular in shape. Besides these, a few anomalous plate-like teeth were also seen at both lateral sides of the horny ring.

Tentacles: PFEFFER described that tentacles are easily broken. To my regret they were completely lost in this specimen.

Buccal membrane: The buccal membrane is rather thick, broad and supported with 8 ribs, of which the dorsal and ventral ones are united at the base and are *T*-shaped. They are further fastened to the dorsal side of the second arm and to the ventral side of the third arms. The outer lip is well developed.

Gladius: The gladius is dark amber-coloured and clearly perceptible from the back of the mantle. It extends over the whole length of it. The basemental structure of the gladius resembles well with that of *T. pavo*. The anterior half of its gladius is followed behind in equal width, and while leaving the middle region, it spreads by degrees posteriorly and then from the origin of the fin, it rapidly tapers, forming a filiform end-cone at the distal end.

Conclusion

In M. SASAKI's monograph on the Dibranchiate Cephalopods, single species belonging to the genus *Taonius*, in the sea-around Japan was represented. In foreign countries, several species were described since STEENSTRUP's introduction of this genus in 1861. Later, it was clarified that they belong respectively to other new genera, expecting the species which is quite similar to *T. pavo*. As far as the author is aware of, there are no other species of the genus *T. pavo* anywhere. The author believes that the specimen described here is the only species of this genus ever found, in view of the following reasons:

- (1) Is most elongated.
- (2) Length of mantle, fin, head and arms is proportionately similar to that of *T. pavo*.
- (3) Galert-like consistency of body constitution.
- (4) Non-stalked large eyes.
- (5) Structure of lanceolate gladius.

On the other hand, remarkable difference with *T. pavo* were also seen as shown by following characters.

- (1) Existence of white tubercles and many kinds of pigment spots on the surface of the mantle.

- (2) Situation of teeth on the horny ring of each sucker and its number,
- (3) Absence of olfactory tubercles.
- (4) The curious tongue-like shape of the funnel and its vertical opening.

Among these, it is the most notable fact that the specimen has Calcium hyaline tubercles which are not found in other *Taoninae* squids and appearance of them suggests the close phylogenical relationship to the *Cranchiinae* squids.

Many important questions remain unanswered and due to the lack in number of the samples, it seem almost impossible to establish a new species now. However the author hopes that the work on this unidentified species would be continued by others interested, and definite conclusions come to later with the establishment of the new species.

References

- HOYLE, W. E.: On *Loligopsis* and some other Genera. Proc. Roy. Soc. Edinburgh **8**, 313-333 (1885).
- : Report on the Cephalopoda collected by H. M. S. CHALLENGER during the Years 1873-1876. Edinburgh 1-246 (1886).
- JOUBIN, L.: Cephalopodes provenant des campagnes de la PRINCESSE-ALICE (1891-1897). Result. Camp. Scient. Albert I de Monaco. Fasc. **17**, 1-135 (1900).
- LESUEUR, C. A.: Descriptions of several new Species of Cuttle-fish. Jour. Acad. Nat. Sci. Philadelphia **2**, 86-101 (1821). (not seen original)
- PFEFFER, G.: Die Cephalopoden der Plankton Expedition. Ergeb. Plank. Exp. Humboldt-Stiftung., **2**, Fa, 1-815 (1912).
- SASAKI, M.: A Monograph of the Dibranchiate Cephalopods of the Japanese and adjacent Waters. Jour. Coll. Agric. Hokkaido Imp. Univ., **20**, Suppl. No. 1-357 (1929).
- VERRILL, A. E.: The Cephalopods of the North-eastern Coast of America. Transact. Connecticut Acad. **5**, 177-446 (1881).

Plate I.



Fig. 1. Ventral view of the specimen. $\times 1/4$.



Fig. 2. The same, dorsal view. $\times 1/4$.

Plate II.

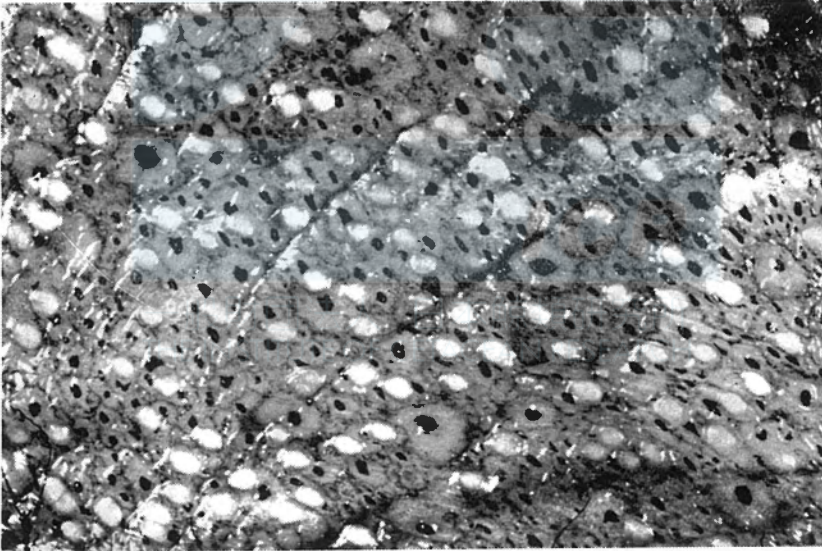


Fig. 3. Mantle, surface view. $\times 4$.

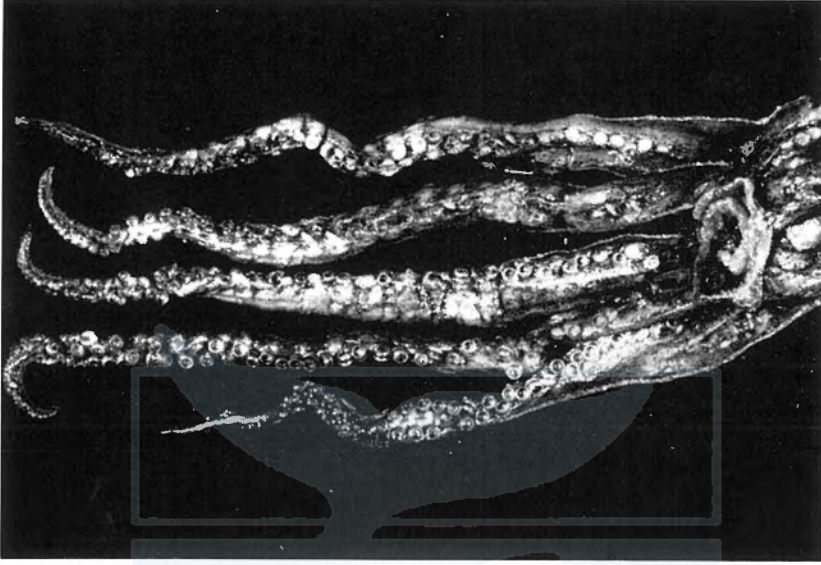


Fig. 4. Right arms, inner view. $\times 1$.

Plate III.



Fig. 5. Head, ventral view. $\times 3/4$.

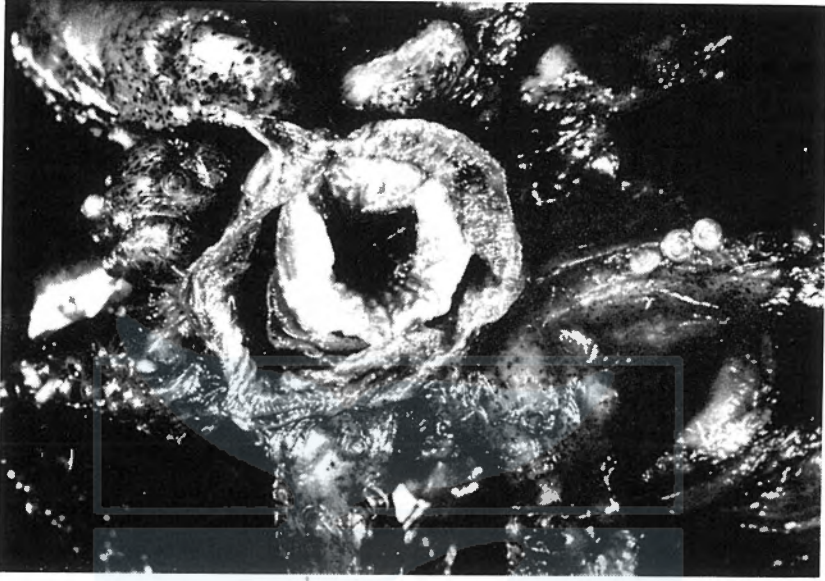


Fig. 6. Mouth part. $\times 3$.