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A New Species of an Oceanic Squid, *Moroteuthis pacifica* from the North Pacific (Cephalopoda: Onychoteuthidae)

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An Oegopsida genus *Moroteuthis* VERRILL, 1881 contains gigantic members of the oceanic squids, such as:

Moroteuthis robusta (VERRILL, 1876) from Subarctic Pacific,

M. ingens (SMITH, 1881) from the Southern Ocean, and

M. robsoni ADAM, 1962 also from the Southern Ocean.

The medium-sized members of this genus are:

M. lönnbergi ISHIKAWA & WAKIYA, 1914 from Sagami Bay, Japan,

M. aequitorialis THIELE, 1921 from tropical Atlantic, and

M. knipovitchi FILIPPOVA, 1972 from the Southern Ocean.

A sole small species hitherto described may be:

M. japonica (TAKI, 1964) from Tosa Bay, Japan.

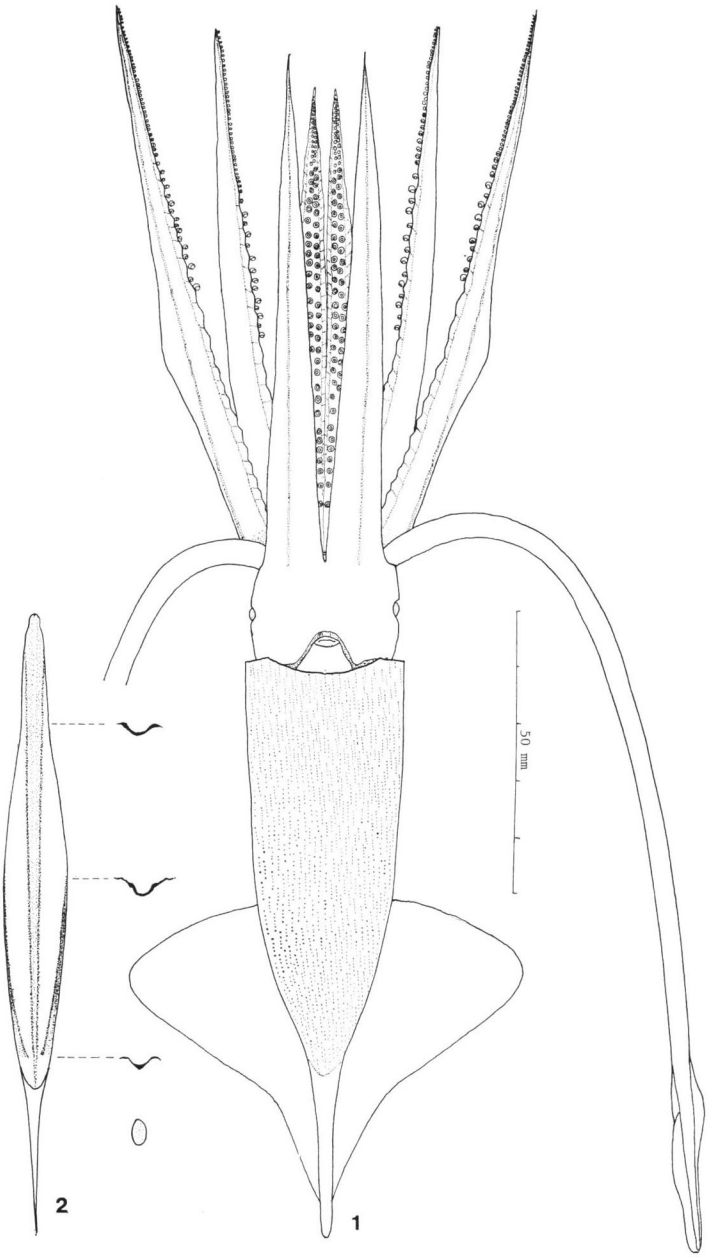
During the cephalopod faunal study of the North Pacific Ocean including the Japanese waters, four specimens of the genus *Moroteuthis* of rather small size were recognized to be new to science.

Before describing this new species, I wish to extend my sincere thanks to Mr. W. ICHIKAWA and Mr. T. YASUI, Japan Marine Resources Research Center (JAMARC), for their generous offering of three specimens under study. My hearty thanks are also due to the crew of the fishing boat *Kyowa-Maru* for their warm cooperation in collecting one of the specimen used in this study when I was on board that ship in December 1978. The measurements and part of illustrations were made with cooperations of Mr. S. TSUKADA and Mr. K. YANAGISAWA whom I owe thanks.

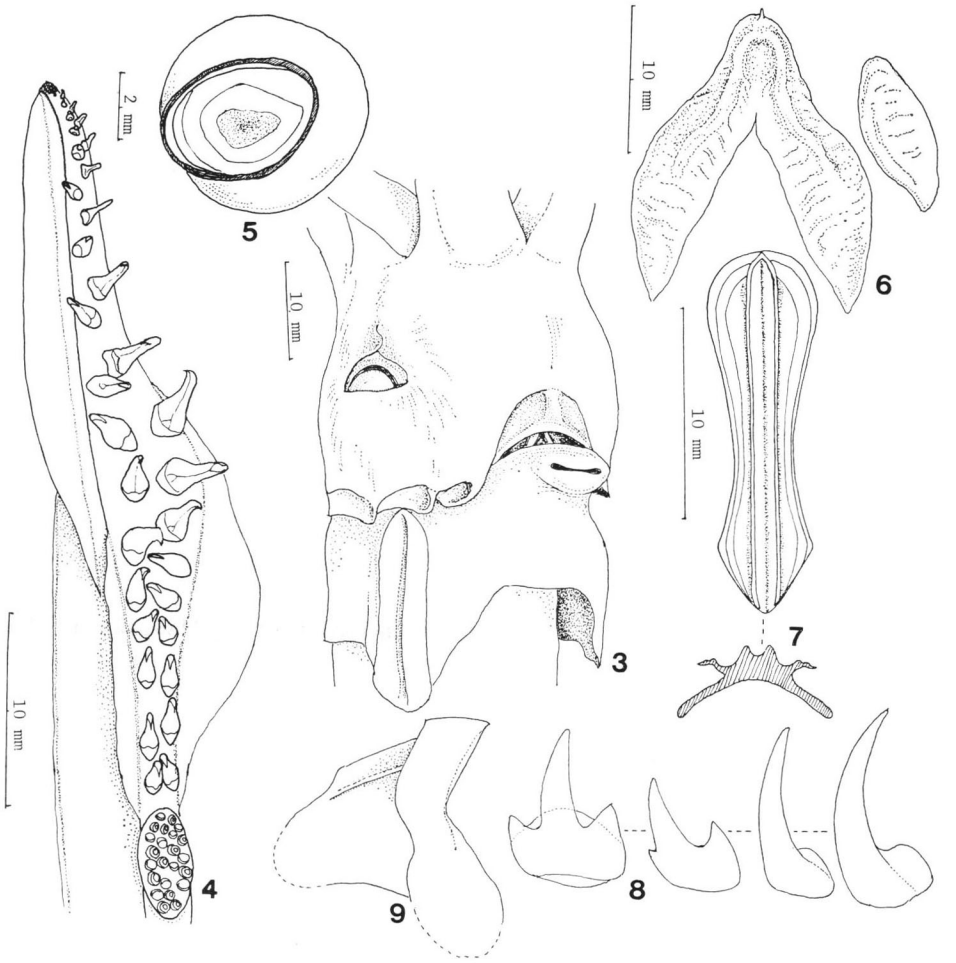
Family Onychoteuthidae GRAY, 1849
Genus ***Moroteuthis*** VERRILL, 1881
Moroteuthis pacifica n. sp.

(Figs. 1–9; Plate 1)

Materials examined (*Type series*): Holotype specimen (NSMT Mo-61210): Male, 159.5 mm in dorsal mantle length, lat. 40°51′N, long. 148°07′W, Northeast Pacific Ocean, collected by the *No. 1 Ryôun-Maru* (JAMARC) on July 10, 1979; Paratype No. 1 (NSMT Mo-61211): Female, 106.4 mm in dorsal mantle length, lat. 35°59′N, long. 170°03′E, Northwest Pacific Ocean, collected by the *No. 1 Ryôun-Maru* (JAMARC)



Figs. 1–2. *Moroteuthis pacifica* n. sp. —— 1. Ventral view of the paratype #1 —— 2. Galdius with its sections.



Figs. 3–9. *Moroteuthis pacifica* n. sp. —— 3. Head part of the holotype showing the funnel cartilage of the mantle-funnel connective, nuchal crests, Y-shaped fleshy ridge in the funnel groove and folded lobes of the eye-lid sinus. —— 4. Right tentacular club of the paratype #1. Note two off-set crests on dorsal side and a broad ventral crest. —— 5. The 15th sucker of the right 3rd arm showing the smooth chitinous ring (Paratype #1). —— 6. Dorsal and a ventral elements of the funnel organ (Holotype). —— 7. Nuchal cartilage and its sagittal section (Paratype #1). —— 8. A half row of the radula. —— 9. An outline of the lower jaw plate.

on June 13, 1979; Paratype No. 2 (NSMT Mo-61212): Male, 89.7 mm in dorsal mantle length, lat. 35°54′N, long. 175°39′E, Northwest Pacific Ocean, collected by the *No. 1 Kôei-Maru* (JAMARC) on June 26, 1978; Paratype No. 3 (NSMT Mo-61213), 90.3 mm in dorsal mantle length, lat. 35°38′N, long. 142°30′E, Northwest Pacific Ocean, collected by the *Kyôwa-Maru* (T. OKUTANI) on December 20, 1978.

Description: The body is muscular throughout but rather soft to touch. The mantle is cylindrical in anterior protion but becomes conical from the position immediately ahead the fin base. The posterior portion is tapering forming a long and slender tail behind ending in a rather blunt tip. The dorsal anterior end is a blunt angle, while the ventral anterior margin is shallowly emarginated leaving blunt angles at the positions of both mantle-funnel connectives. The dorsal side is more densely distributed with chromatophores presenting a feeble dark mid-dorsal band. The ventral side of the mantle is paler in colos and ornamented with wrinkles or warts characterstic for the genus.

The fin is muscular and nearly sagittate in outline. The bases of the fin at the anterior end are separated in a considerable distance. The anterior margin of both lobes are convex with a gentle curve down to the widest point located at about anterior one-third of the fin length. The posterior margin of the fin is slightly concave uniting with the posterior portion of the mantle at a certain distance ahead the posterior tip of the mantle (tail) (Fig. 1).

The head is as wide as the mantle opening. It is almost cylindrical but slightly compressed dorso-ventrally. The lateral surface of the head is occupied by medium-sized eye. The naterior sinus of the eye-lid is rather deep, dorsal lobe partially overlays the ventral lobe (Fig. 3).

The funnel element of the mantle-funnel connective is simply leaf-shaped. There may be a slight concavity laterally at the middle. The groove widens posteriorly. Mantle element of the funnel-mantle connective is a slender, long ridge starting from the tip of the angle at the end of ventral emargination.

The funnel groove is rather small but sharply demarcated off. There is an arching ridge of muscle across the funnel groove and another short mucular connective runs between the top of that arch and the anterior edge of the funnel groove. Thus, they form approximate Y-shape (Fig. 3).

The dorsal element of the funnel organ is thick Y-shaped, with a tiny anterior papilla, blunt ridges on both rami and a shallow hollow on the stem of the Y. The ventral an element is oval pad (Fig. 6).

The posterior end of the funnel groove forms a crest. There are two more crests on the neck, one just posterior of the eye and the other between this and the crest on the posterior edge of the funnel groove.

The nuchal cartilage is spatulate, widened towards both ends. There is a central longitudinal groove margined by very sharp ridges on both sides and another sharp and shelved ridge outside thereof (Fig. 7).

The arms are muscular, strong and very long in proportion to the mantle. The arm armatures are biserial suckers and none of hook presents on brachial arms. The arm formula is I, IV, II=III.

The Arm I is trapezoid in cross-section, with very low protective membrane on both sides of sucker-bearing surface. There are more than 50 pairs of suckers down to the extremely tapering tip. The Arm II is also trapezoid in cross-section and also with a

low protective membrane, but has a keel along the ventral side lowering and finally diminishing distally. There are some 60 pairs of suckers down to the extremely slender distal tip. The Arm III is rather compressed with distinct but low protective membrane on both sides of sucker-bearing surface and a rather high aboral keel originated at about a quarter proximally. The suckers of this arm are also some 60 pairs down to the extremely tapering tip. The Arm IV has a very broad keel along the entire length of the dorsal margin. There are some 60 pairs of suckers down to the slenderly tapering tip. The chitinous rings of arm suckers are all small. They do not have teeth but occasionally small and blunt knobs (Fig. 5).

The tentacle is very strong, with the stem being as thick as brachial arms, and about one and half times longer than the dorsal mantle length. The club is not conspicuously expanded but slenderly lanceolate. The armature is consisted of fixing appratus, manus hooks and 14 microscopic dactylus suckers. The fixing apparatus is well demarcated off as an oval disc bearing 11–12 small suckers and 12–13 fleshy pads. The manus is equipped with 15–17 pairs of hooks which are enwrapped with fleshy hood basally. Hooks at 8th to 13th of the ventral row are larger than counterparts of the dorsal row, but those of other pairs are almost similar in size. There is a smilunar fleshy crest at about the middle on the ventral rim of the club. There are also two offset crests on the dorsal side, proximal one being small and is still offset from the low aboral keel running from the stem down to the distal tip of the club (Fig. 4).

The buccal connectives are connected to dorsal sides of the Arms I and II and ventral sides of the Arms III and IV (DDVV-type). No pigmentation exists around the buccal region.

The gladius is elongate leaf-shaped. The central rhachis is broad and the vane is margined by brownish thickening posteriorly. The endocone is long, occupying about a quarter of the entire length, translucent and ovoidal in cross section (Fig. 2).

The radular teeth are seven per row. The rhachidian is tricuspid. The central cusp is far stronger than mariginal cusps. The lateral tooth is bicuspid but has a small denticle inside. Both inner and outer marginals are unicuspid having a rather broad base (Fig. 8).

The lower jaw plate has a sharply defined, and straight cutting edge. The rostral tip is barely projected. The jaw angle is obtuse and is visible from side. The hood is situated usual on crest which is considerably curved down and carries a ridge. The hood notch is shallow and wings are widely spread with lateral wall close together (Fig. 9).

Measurements: See Table 1.

Type locality: Northeast Pacific Ocean at lat. 40°51′N, long. 148°07′W, surface (surface water temperature 16°C).

Distribution: Northwest to Northeast Pacific Ocean, near surface (Fig. 10).

Comparative remarks: The large-sized members of the genus *Moroteuthis* live in cold water areas of both northern and southern hemispheres. But, small to medium-sized species occur in temperate to tropical oceans. The present species was collected

Table 1. Measurements and indices of *Moroteuthis pacifica* n. sp.

		Holotype	Paratype #1	Paratype #2	Paratype #3
Sex		Male	Female	Male	—
Dorsal mantle length (mm)		159.5	106.4	89.7	90.3
MWI		24.5	25.5	24.6	20.9
FLI		64.5	61.7	57.1	58.7
FWI		55.7	57.8	59.8	60.9
HWI		21.8	23.7	23.6	21.4
I	R	74.4	77.0	63.1*	56.8
	L	73.0	76.4	84.2	57.0
II	R	88.1	95.2	98.9	72.6
	L	90.8	97.2	105.6	65.7*
III	R	88.1	87.0	93.9	83.7
	L	83.8	99.4	80.2*	52.0*
IV	R	90.1	90.3	93.0	86.2
	L	90.4	91.9	107.4	86.4
TLI	R	163.6	128.7	127.0	155.7
	L	150.5	141.7	123.7	149.7
TCI	R	44.6	43.5	41.2	37.4
	L	41.9	44.0	46.6	39.9

* Tip incomplete

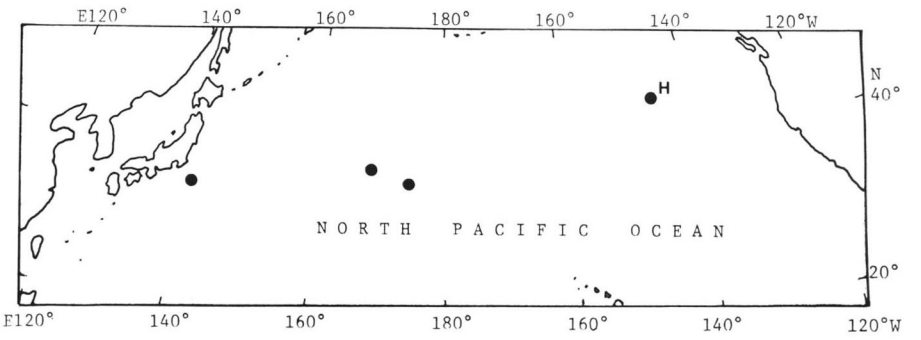


Fig. 10. Distribution of *Moroteuthis pacifica* n. sp.
H indicates the station where the holotype was collected (Type locality), otherwise localities for paratypes.

from the surface layers of the warm Kuroshio waters or its extension. The comparison will be made with small- to medium-sized members.

Moroteuthis lönnbergi ISHIKAWA and WAKIYA, 1914 was based on five specimens from Sagami Bay, middle Honshu. I have examined more than ten specimens collected from Suruga Bay and off Mie Prefecture, both on the Pacific coast of middle Honshu. The present new species shares with *M. lönnbergi* in possession of Y-shaped fleshy ridge in the funnel groove. However, *M. lönnbergi* differs from the present new species in the following characters:

(1) Arm suckers are mostly between 40 to 50 and never exceed 56 pairs.
(2) Tentacular hooks are less than 13 pairs.
(3) Fixing apparatus consists of only 7–8 suckers and pads.

The maximum size of the present species has never been known, but it is likely smaller than *M. lönnbergi* which grows to 275 mm in mantle length (SASAKI, 1929).

Moroteuthis japonica (TAKI, 1964) was originally allocated in the genus *Onykia*, but it was proved to be a member of *Moroteuthis* because of a complete lack of marginal suckers on the tentacular club (OKUTANI, 1981). TAKI's species differs from the present new species in having only 8 carpal suckers, different arm formula (4,2,3,1 versus 1,4,2=3 in the new species) and different shapes of funnel and nuchal cartilages. NESIS (1974) assumed that *M. japonica* is conspecific with *M. aequitorialis* THIELE, 1921, but critical comparison of both species has never been made.

M. aequitorialis THIELE, 1921 was described from the tropical Atlantic at lat. 0°16′N long. 18°W and has never been recaptured since the original description. According to the original description, the mantle of this species is "glatt, ohne Warzen" (as in *Kondakovia*?) and FWI is 70 and FLI, 38–40. These characters never agree with those in the present new species.

It is hardly assumed that the present specimens are juveniles of large-sized species of the Subarctic and Antarctic origin. Only brief comparisons will be made.

M. robusta (VERRILL, 1881) has a long sagittate fins, of which FWI is less than 50. The tentacular club is very slender bearing 10–11 carpal suckers and pads and 18 pairs of hooks on the manus. The endocone of *M. robusta* is long, solid and cartilaginous.

M. robsoni ADAM, 1962 is very similar to *M. robusta* in general appearance. The tentacular club has only 8–9 suckers and pads in the fixing appratus and 12 pairs of hooks.

M. ingens (SMITH, 1881) is characterized with rather broad fins less attenuate than those in the former two species. *M. ingens* has 10–11 carpal suckers and pads and 14 pairs of hooks of which ventral row is far stronger than the dorsal one. The warts of mantle of this species may be the most prominent among the genus.

M. knipovitchi FILIPPOVA, 1972 is characterized in having 9 carpal suckers and pads, 13 pairs of manus hooks and 16 dactylus suckers. The fleshy base of the manus hooks is trilobed, this character is unique and does not share with any other species including the present new species.

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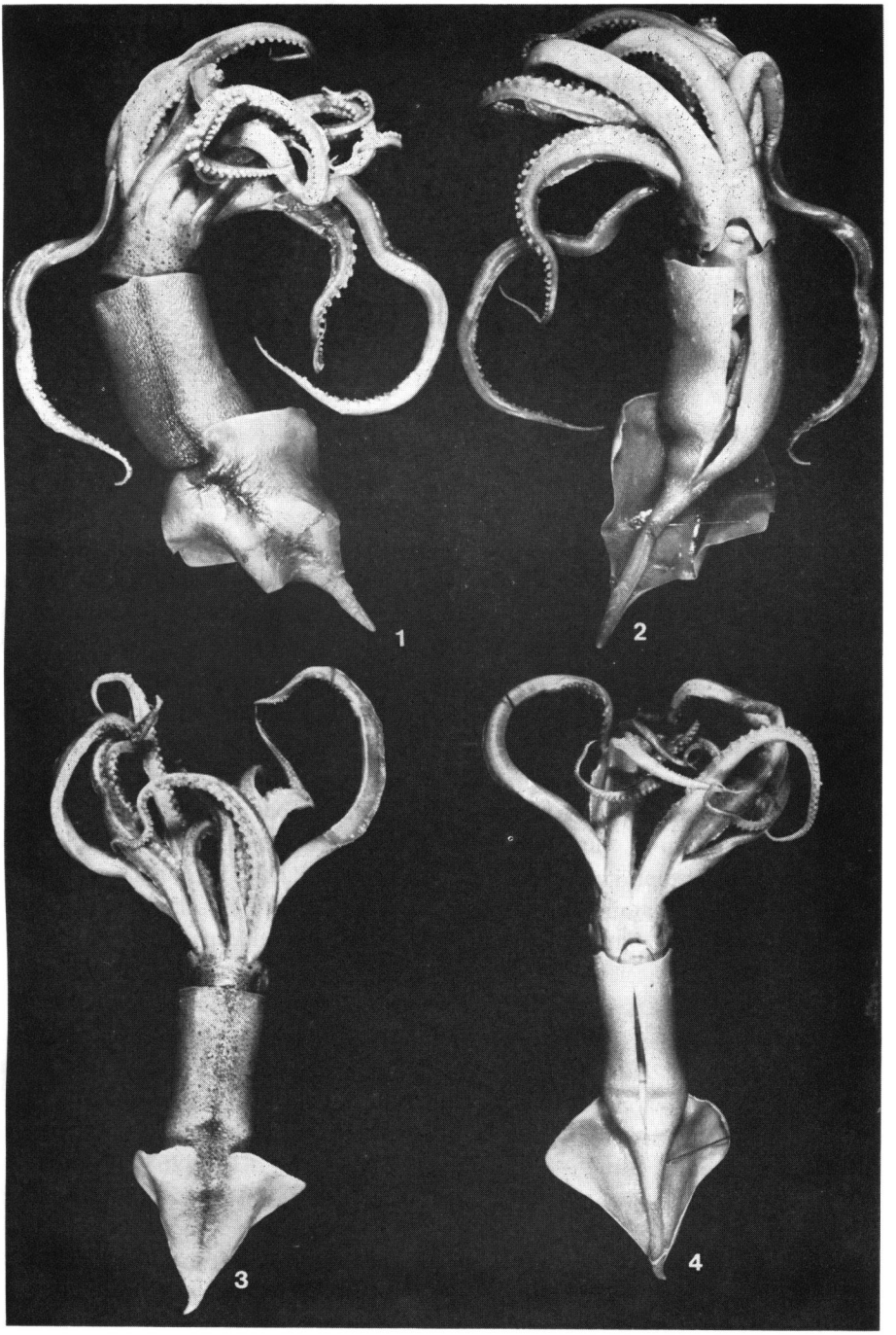
Explanation of the Plate 1

1–2. *Moroteuthis pacifica* n. sp. Holotype specimen (NSMT Mo 61210); 159.5 mm DML.
3–4. *Moroteuthis pacifica* n. sp. Paratype #1 (NSMT Mo 61211); 106.4 mm DML.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