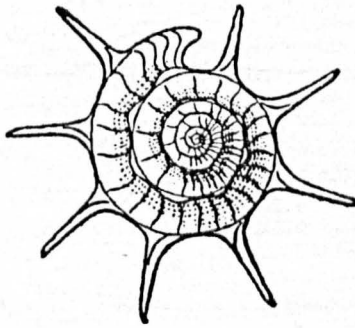


# 貝類学雑誌

## VENUS

### THE JAPANESE JOURNAL OF MALACOLOGY

第43卷      Vol. 43



日本貝類学会

Published by

THE MALACOLOGICAL SOCIETY OF JAPAN

1984

東京 Tokyo

Zm 9284

チリー沖から *Nototodarus* 属の新発見  
(頭足綱: アカイカ科) (予報)

奥谷 喬 司・黒岩 道 徳  
(東京水産大学) (海洋水産資源開発センター)

The First Occurrence of *Nototodarus* (Cephalopoda:  
Ommastrephidae) from off Chile,  
Southeast Pacific (Preliminary Report)

Takashi OKUTANI

(Tokyo University of Fisheries, 4-5-7, Konan, Minato-ku, Tokyo 108)

and

Michinori KUROIWA

(Japan Marine Resources Research Center, 3-27, Kioi-cho,  
Chiyoda-ku, Tokyo 102)

During an exploratory fishing on the so-called 167 Seamount located east of Isla San Felix and Isla San Ambrosio, Chile, eight specimens of "unusual" squids were fished in 1983. Six specimens among them were subjected to a routine biological inspection on board the research ship, but two were brought home for identification.

The results of close examination revealed that this squid belongs to the genus *Nototodarus* Pfeffer, 1912, which has never been known from the East Pacific. The observations on these two specimens are worth reporting. After a search for literatures and comparisons with *Nototodarus* specimens in hand, we inclined to consider that these specimens are referable to *N. hawaiiensis* (Berry, 1913) by the reason discussed in this report.

#### Material

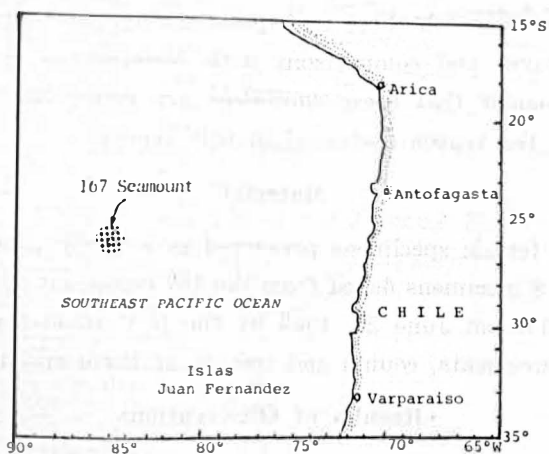
A male and a female specimens preserved in a fairly good condition. They are sampled from 8 specimens fished from the 167 Seamount at 25°39'S, 85°31'W, at a depth of 243 m, on June 25, 1983 by the R/V *Ibuki-Maru* (Fig. 1). See Table 1 for measurements, counts and indices of these specimens.

#### Results of Observations

The general appearance of these specimens is common with those described

**Table 1.** Measurements and indices on two preserved specimens  
測定値及び比率

	Male	Female
Dorsal mantle length (mm)	221	309
Mantle width index	28.0	26.5
Fin length index	39.3	38.1
Fin width index	63.3	57.6
Fin angle (both lobes)	102°	100°
head width index	24.4	22.9
Right Arm I index	50.2 <sup>+</sup>	42.3
Arm II index	53.8	49.1
Arm III index	60.6	38.8 <sup>+</sup>
Arm IV index	52.0	43.6
Left Arm I index	53.3	45.3
Arm II index	49.7	51.4
Arm III index	65.1	42.4
Arm IV index	54.7	42.0
Right Arm I sucker counts	30 <sup>+</sup>	39 <sup>+</sup>
Arm II sucker counts	21 <sup>+</sup>	41
Arm III sucker counts	32 <sup>+</sup>	21
Arm IV sucker counts	3	46
Left Arm I sucker counts	43 <sup>+</sup>	37 <sup>+</sup>
Arm II sucker counts	36 <sup>+</sup>	47
Arm III sucker counts	39	29
Arm IV sucker counts	36	54
Maximum arm sucker index	3.2	2.1
Right tentacle length index	111.3	73.1
Left tentacle length index	104.0	85.4
Right club length index	76.9	45.3 <sup>+</sup>
Left club length index	74.6	60.1
Maximum tentacular sucker index	3.1	2.8

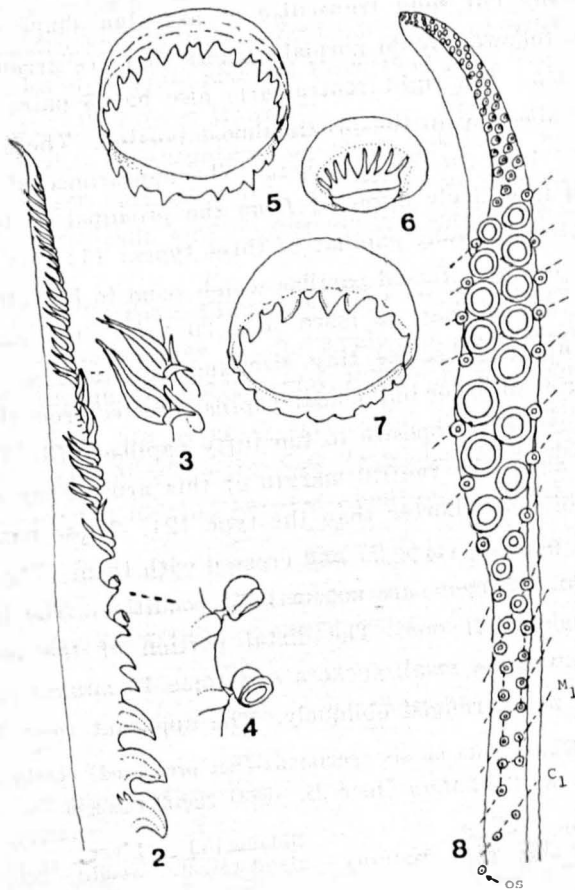


**Fig. 1** The locality (167 Seamount off Chile) for the present specimens. 採集地点

by Pfeffer (1912), Berry (1913, 1918), Dell (1952), Voss (1962), Wormuth (1976) among others. Only the morphological characters that are compared with other species will be extracted in the following lines.

The skins in the mantle and head are rather rough like those described for *Nototodarus "nipponicus"* by Okutani and Uemura (1973). The roughness seems to attribute to a mucoid covering over epidermis and not to a real sculptures on the skin.

Nuchal crests and the ridge bordering the head and neck are very pronounced. The thick funnel retractor creates a pit between its dorsal edge and the adjacent



**Figs. 2-8** *Nototodarus* sp. cf. *hawaiiensis* from 167 Seamount off Chil.

2. Lateral view of hectocotylus; 3. Enlarged two sets of papillae; 4. Two suckers on the hectocotylus;
5. Chitinous ring of left tentacular club ( $\delta$ );
6. Chitinous ring of dactylus; 7. Chitinous ring of the 10th sucker of the right Arm III; 8. Sucker arrangement of tentacle club.

2. 交接腕側面圖; 3. 肉質突起擴大; 4. 交接腕吸盤;
5. 左腕大吸盤角質環; 6. 腕先端吸盤角質環; 7. 右第3腕第10吸盤角質環; 8. 腕吸盤配列。

crest. The characters of funnel-mantle locking apparatus and surroundings are common to those of other members of the genus.

Arms are all strong. The second arm has strong keel and flattened like the Arm III. The swimming membranes are not developed except fleshy trabeculae connecting with sucker pedicels. The largest arm sucker rings have 5-6 strong canine teeth among which the central one is the strongest. The proximal margin has 10 or more blunt teeth or semilunar projections (Fig. 7). The horny rings of distal arm have several strong, conical, long teeth distally and a semilunar, protruded proximal margin.

Both Arm IV in male are modified into hectocotylus. The left ventral arm has 5 pairs of fleshy but solid trabeculae of axe-edge shape on the proximal portion. They are followed by 36 normal suckers that are arranged in a double row to the distal tip. The right ventral arm also has 5 pairs of fleshy, solid, axe-edge shaped trabeculae in the proximalmost portion. They are followed by triangular pedicels that carries 3 suckers. The appearance of the distal two-thirds of this arm is entirely different from the proximal portion. The distal portion is ornamented by fleshy papillae of three types: (1) The ventral margin of this arm carries crowded fusoid papillae which seem to be gathered three (or two) into "tufts". There may be more than 20 tufts (the exact counts are almost impossible as they become tiny size and indistinct at the distalmost portion). (2) The row of lower but solider papillae erected from the base of each "tuft". They are curved in opposite to the tufty papillae. (3) There is a row of solitary papillae along the ventral margin of this arm. They are not longer than the type (1) but not shorter than the type (2). These papillae underlay the above-mentioned papillae (type 2) and crossed with them (Figs. 2-4).

Tentacles in male specimens are not in good condition. The best preserved tentacle is the female's left one. The distal portion of the tentacular club (dactylus) has 11 rows of 4 small suckers and some 10 minute suckers on the trip. Manus suckers are arranged obliquely. The apparant rows (s-L-L-s) are

**Table 2.** Biological data on six specimens (not preserved) obtained on board the *Ibuki-Maru* (June 25, 1983) 残余標本測定値

No.	Sex	DML (mm)	Body weight (g)	Gonad weight (g)	Maturity	Nidamental gland weight (g)	Liver weight (g)	Stomach contents
1	♂	216	375	4	+++		9	Empty
2	♂	200	395	4	+++		9	Half (squid)
3	♀	260	680	65	+++ (copulated)	37	38	Full (squid)
4	♀	280	900	75	+++ (copulated)	35	50	Full (squid)
5	♀	116	—	—	+++ (copulated)	—	—	—
6	♀	294	—	—	+	—	—	—

nine from distal to proximal. The interpretation on the more proximal suckers will be arbitrary. There are 3 sets of 4 small suckers in a zigzag arrangement followed by a pair of carpal suckers and an odd suckers (3 in total). A tentative trace of their arrangement is shown in Fig. 8.

The measurements and observations of 6 additional specimens that were not brought home are shown in Table 2.

### Discussion

Identity of *Nototodarus* species has not always been well established. Smith et al. (1981) and Kawakami and Okutani (1981) used the morphology of distal papillae of hectocotylized arm and sucker counts to distinguish two closely-related and partially sympatric species in New Zealand waters. Taking this view, we examined mature males of *N. philippinensis* Voss, 1962 from Tosa Bay, Japan\*, and *N. hawaiiensis* Berry, 1912 from Hawaii\*\*.

It is axiomatic that investigations on more specimens are needed to make a statistical comparison among species. But, either of species are still so scarce in museum collections that only representative specimens were subjected to comparison.

The sucker counts of these three specimens are slightly different from each other (Table 3). However, they are far smaller in number than either of New Zealand species (Kawakami and Okutani 1981). It may safe to say that the difference among them are never so spectacular in comparison to that occurs between *N. gouldi* and *N. sloani* in New Zealand waters (Kawakami and Okutani 1981). However, somewhat shredded condition of distal portion of arms in

**Table 3.** Comparison of sucker counts and PPI\* among three males of present specimen, *N. philippinensis*, and *N. hawaiiensis*  
3種の第1腕吸盤数と交接腕変形部比率比較

Specimen Locality	Present specimen Off Chile	<i>N. philippinensis</i> Tosa Bay, Japan	<i>N. hawaiiensis</i> Off Hawaii
Arm I	Right	30 <sup>+</sup> (39 <sup>+</sup> ) <sup>2)</sup>	54
	Left	43 <sup>+</sup> (37 <sup>+</sup> ) <sup>2)</sup>	52
Arm IV	Right	3	6
	Left	36	40
PPI <sup>1)</sup>	59.7	66.6	61.9

<sup>1)</sup> PPI: Percentage of distal papillate portion to the total length of hectocotylized arm (Right Arm IV).

<sup>2)</sup> Female

\* It was formerly identified to be *N. nipponicus* Okutani & Uemura, 1973 but M. Roeleveld (pers. comm.) considers it being conspecific with *N. philippinensis*. The examined specimen was collected by Masahiro Toriyama, from off Mimase, Tosa Bay, Shikoku (300 m) on March 18, 1980.

\*\* Collected by R.E. Young, from 23°31' N, 164°22' W (235-270 fms.), on October 15, 1976.

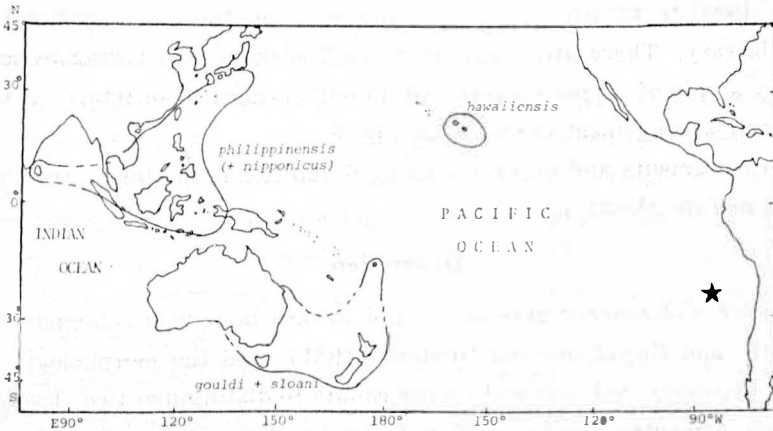


Fig. 9 Known range of *Nototodarus* species. A star indicates the present locality. 従来知られている *Nototodarus* 属の分布。星は本報採集地点。

the present material did not permit us to make more precise comparison. It is not conclusive yet, if the difference in number of suckers on the hectocotylus (3 vs 6) is serious criterion. But, it is more likely an individual variability among specimens judging from the condition of New Zealand *Nototodarus*. Proportion of papillated portion of hectocotylus seems to be also very close to each other.

The conclusive identification of the present specimens is rather difficult based on such a few specimens which are not always in a very ideal condition. However, it is most likely that this will fall the variability range of *N. hawaiiensis*—*philippinensis* complex. In this case, the name *hawaiiensis* has a priority if future study will prove that both species are within a geographical cline of a single species stock that is continuous from West to Central and to Southeastern Pacific.

#### 要 約

これまで、西太平洋及びハワイ付近からしか知られなかった *Nototodarus* 属のイカが、チリー沖の通称 167 海山から 8 個体釣獲された。このうち雄 1 個体 (外套長 221 mm)、雌 1 個体 (外套長 309 mm) につき調査の結果、ハワイスルメイカ *N. hawaiiensis* (Berry, 1913) に最も近似していると結論された。同属の南東太平洋における出現は初めてであるので、比較研究材料が乏しいので、いく分不確定要素はあるが、速報した。

#### References

- Berry, S. S. 1913. Some new Hawaiian cephalopods. *Proc. U.S. Nat. Mus.* 45(1996): 563-566.
- Berry, S. S. 1918. Report on the Cephalopoda. *Zool. Res. Fish. Exp. "Endeavour"* 29: 204-298.
- Dell, R. K. 1952. The Recent Cephalopoda of New Zealand. *Bull. Dom. Mus. Wellington* (16): 1-157.
- Kawakami, T. and Okutani, T. 1981. A note on identity of ommastrephid squids of the genus *Nototodarus* exploited in the New Zealand waters. *Bull. Tokai Reg. Fish. Res. Lab.* (105): 17-30.

Plate 1

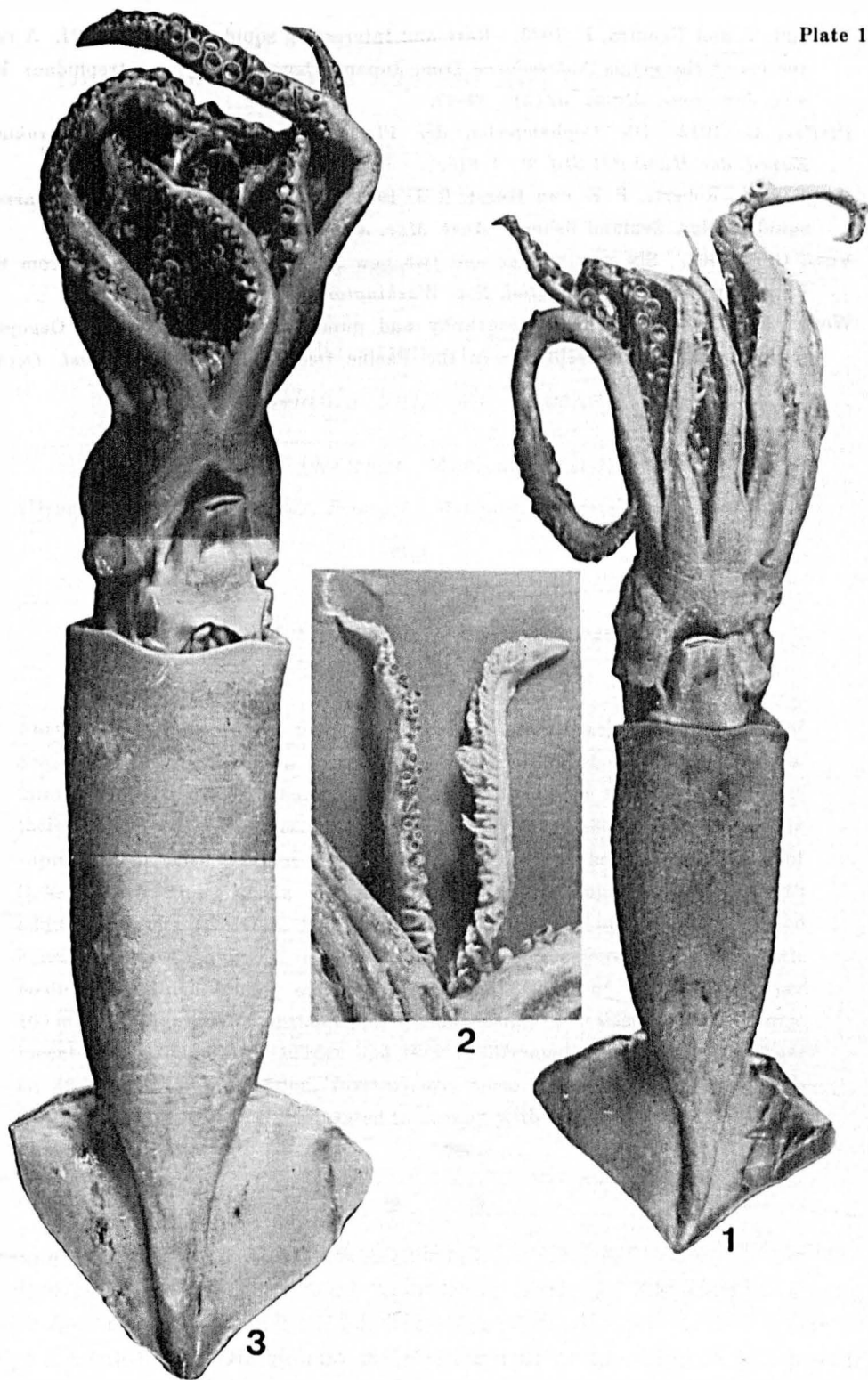


Plate 1. *Nototodarus* sp. cf. *hawaiiensis* from off Chile  
1. Male (221 mm DML); 2. Hectocotylized arm of the same; 3. Female (309 mm DML)



- Okutani, T. and Uemura, K. 1973. Rare and Interesting squid from Japan—II. A new species of the genus *Nototodarus* from Japan (Oegopsida: Ommastrephidae) *Venus, Jap. Jour. Malac.* 32(2): 39-47.
- Pfeffer, G. 1912. Die Cephalopoden der Plankton-Expedition. *Ergebn. Plankton-Exped. der Humboldt-Stif.* 2: 1-815.
- Smith, P. J., Roberts, P. E. and Hurst, R. J. 1981. Evidence for two species of arrow squid in New Zealand fishery. *Aust. Mar. & Freshwater Res.* 15: 247-253.
- Voss, G. L. 1962. Six new species and two new subspecies of cephalopods from the Philippine Islands. *Proc. Biol. Soc. Washington* 75: 169-176.
- Wormuth, J. H. 1976. The biogeography and numerical taxonomy of the Oegopsid squid family Ommastrephidae in the Pacific Ocean. *Bull. Scripps Inst. Ocean.* 23: 1-90.