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A New Lichomolgid Copepod Associated with the Simple Ascidian *Halocynthia roretzi*

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Synopsis

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A new cyclopoid copepod, *Lichomolgus nakaii*, was found in the branchial cavity and the intestines of the edible simple ascidian *Halocynthia roretzi* collected from the Pacific coast of northern Honshu, Japan.

The new species is the fourth with four claws on the second antenna and the first associated with ascidian. It can be clearly distinguished from congeners by the possession of the shortest caudal rami, the form of genital segment, and the presence of one outer denticulate projection on the second segment of the fourth endopod.

Eighteen species of *Lichomolgus* copepods were listed by HUMES and STOCK (1973), and six species, *L. eganae* GOTTO, 1975, *L. hippopi* HUMES, 1976, *L. uncus* JONES, 1976, *L. sepiae* IZAWA, 1976, *L. sadoensis* Ho, 1980 and *L. bidentipes* Ho, 1980 were added since then.

In 1983, Ho suggested that *L. sepiae* should be transferred to *Metaxymolgus* (Ho, 1983). In the same year, however, HUMES and STOCK redefined the genus *Doridicola*, placing *Metaxymolgus* in its synonymy (HUMES and STOCK, 1983). They thus transferred *L. sepiae* and *L. longicauda* to *Doridicola*.

Among these 22 species of *Lichomolgus*, there are only three with four terminal claws on the second antenna. All of these are associated with the Mollusca, either bivalves or cuttlefish. This paper adds the fourth species having four claws on the second antenna, associated with the simple edible ascidian *Halocynthia roretzi* from the Pacific coast of northern Honshu, Japan.

Genus *Lichomolgus* THORELL, 1859

Lichomolgus nakaii sp. nov.

(Figs. 1–6)

Female. The body shape is cyclopoid (Figs. 1a, 3a). The average length of 10 specimens is 1.23 mm (1.13–1.28 mm) from the anterior end to the end of the caudal ramus. To this the caudal setae add about

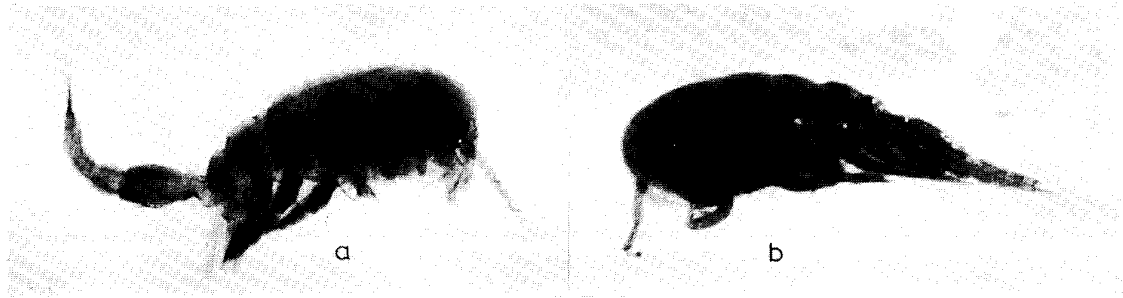


Fig. 1. *Lichomolgus nakaii* sp. nov., a, female; b, male.

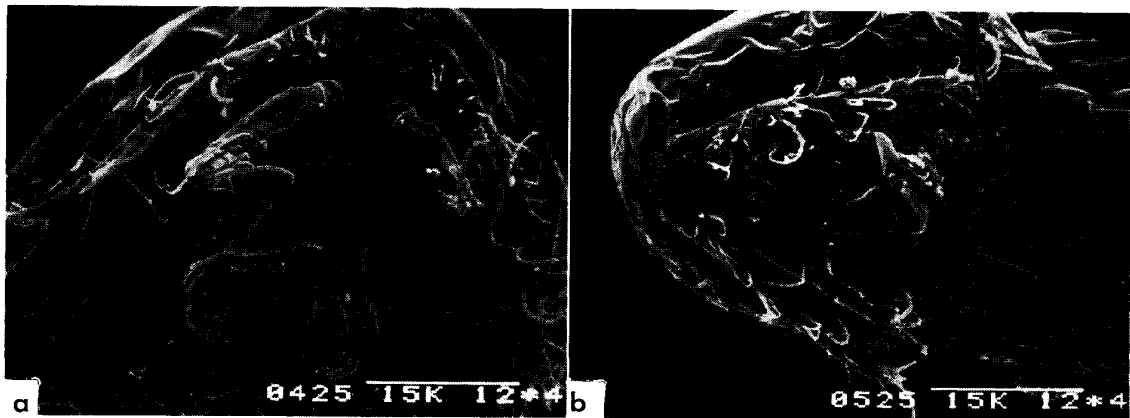


Fig. 2. *Lichomolgus nakaii* sp. nov., a, mouthparts of female; b, mouthparts of male, 2nd antenna are partly broken.

0.12 mm. The maximum width is 0.47–0.52 mm and 0.48 mm on average. The head is separated from the first thoracic segment. The second segment is equal in width to the first segment, and the following segments gradually diminish in width. The urosome is shorter than half the body. The genital segment is fairly inflated. The areas of attachment of the egg sacs are situated dorsolaterally and bear two very small naked setae (Fig. 4f), representing sixth leg. The caudal rami are very short with six naked setae. A small rostrum is linguiform and articulated (Fig. 2a).

The first antenna (Fig. 3b) is seven-segmented, the second segment being the longest as in the other species of *Lichomolgus*.

The second antenna (Fig. 3c) is four-segmented, the second is the longest, and the third segment is the shortest and is furnished with three setae. The fourth segment has four strong curved claws with one shorter and one longer setae.

The labrum has two broad lobes (Fig. 2a).

The mandible (Fig. 3d) is of the usual lichomolgid simple type, with a slender base merging gradually into a long, tapering lappet

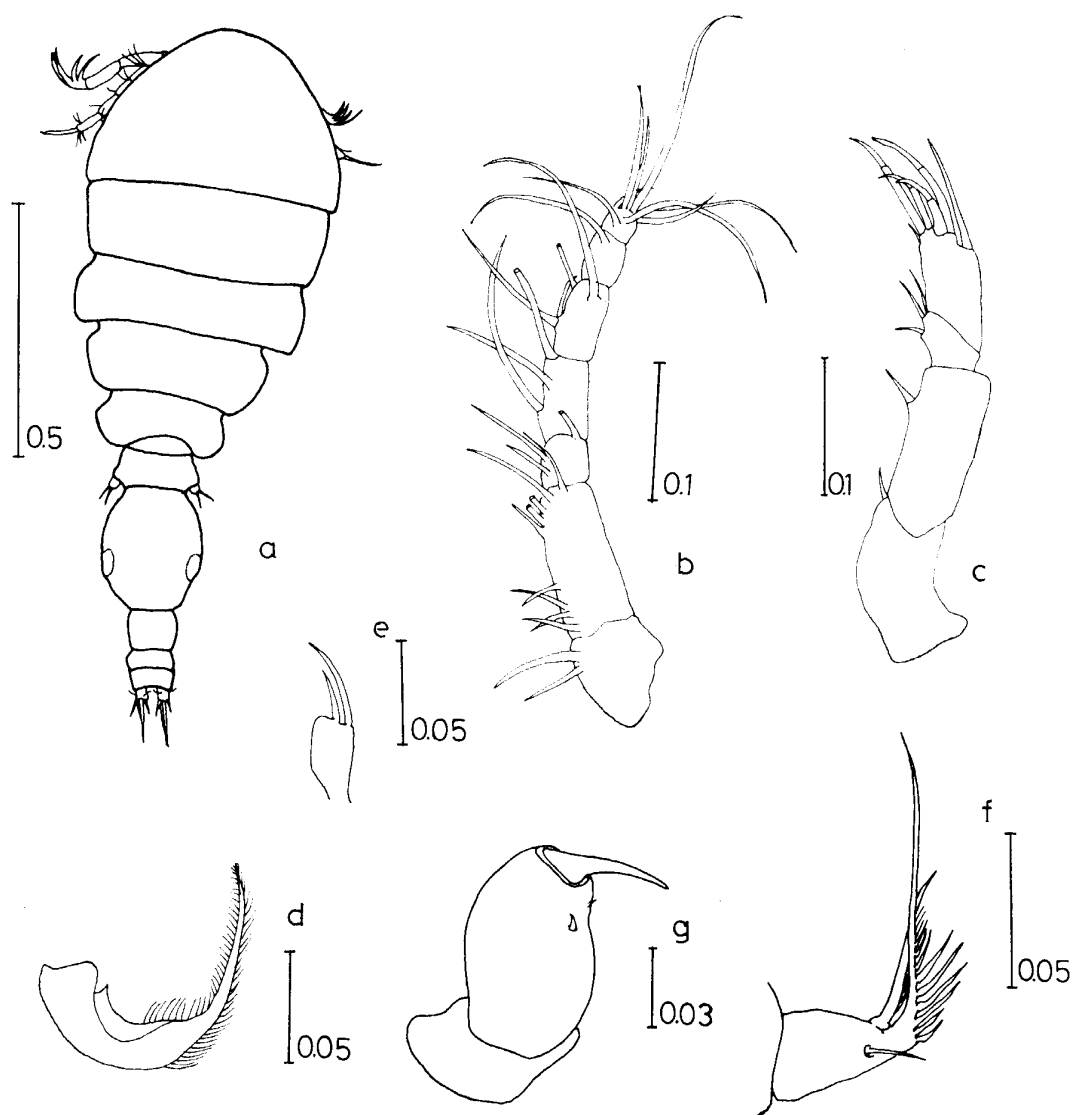


Fig. 3. *Lichomolgus nakaii* sp. nov., female. a, dorsal view; b, 1st antenna; c, 2nd antenna; d, mandible; e, maxillule; f, maxilla; g, maxilliped, drawn from SEM photograph. Scales in mm.

which is finely spinose on either edge. Paragnaths could not be identified with certainty.

The maxillule (Fig. 3e) is small and palp-like, with two rather stout terminal setae of different length.

The maxilla (Fig. 3f) is two-segmented, and provided with the usual number of elements in *Lichomolgus*, one long dense pectinate lash, and an auxiliary lash with one seta.

The maxilliped (Fig. 3g) is three-segmented, the first segment is stout and unarmed, the second segment with two minute setae, the

third-segment largely represented by a strong claw.

In the first to fourth legs (Fig. 4a-d) both of the exopods and endopods are three-segmented, except for the endopod of the fourth leg, which has only two segments, as usual in *Lichomolgus*.

The spine and setal formula is as follows, with Roman numerals indicating spines and Arabic numerals, setae:

P1. coxa	0-1	basis	1-0	exp	I-0; I-1; III, I, 4
				end	0-1; 0-1; I, 5
P2. coxa	0-1	basis	1-0	exp	I-0; I-1; III, I, 5
				end	0-1; 0-2; II, I, 3
P3. coxa	0-1	basis	1-0	exp	I-0; I-1; III, I, 5
				end	0-1; 0-2; I, II, 2
P4. coxa	0-1	basis	1-0	exp	I-0; I-1; II, I, 5
				end	0-1; II

The second segment of fourth endopod bears one denticulate projection on the outer surface (Fig. 4d).

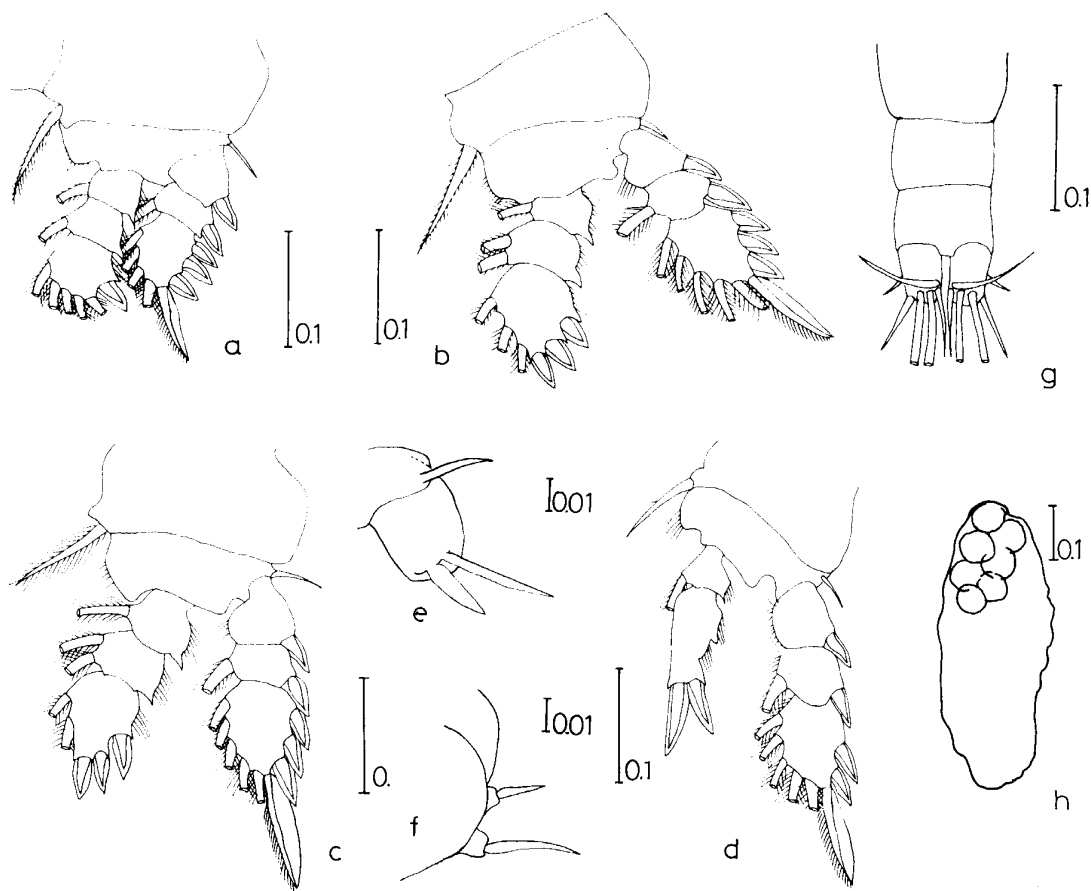


Fig. 4. *Lichomolgus nakaii* sp. nov., female. a, 1st leg; b, 2nd leg; c, 3rd leg; d, 4th leg; e, 5th leg; f, 6th leg; g, caudal rami; h, egg sac. Scales in mm.

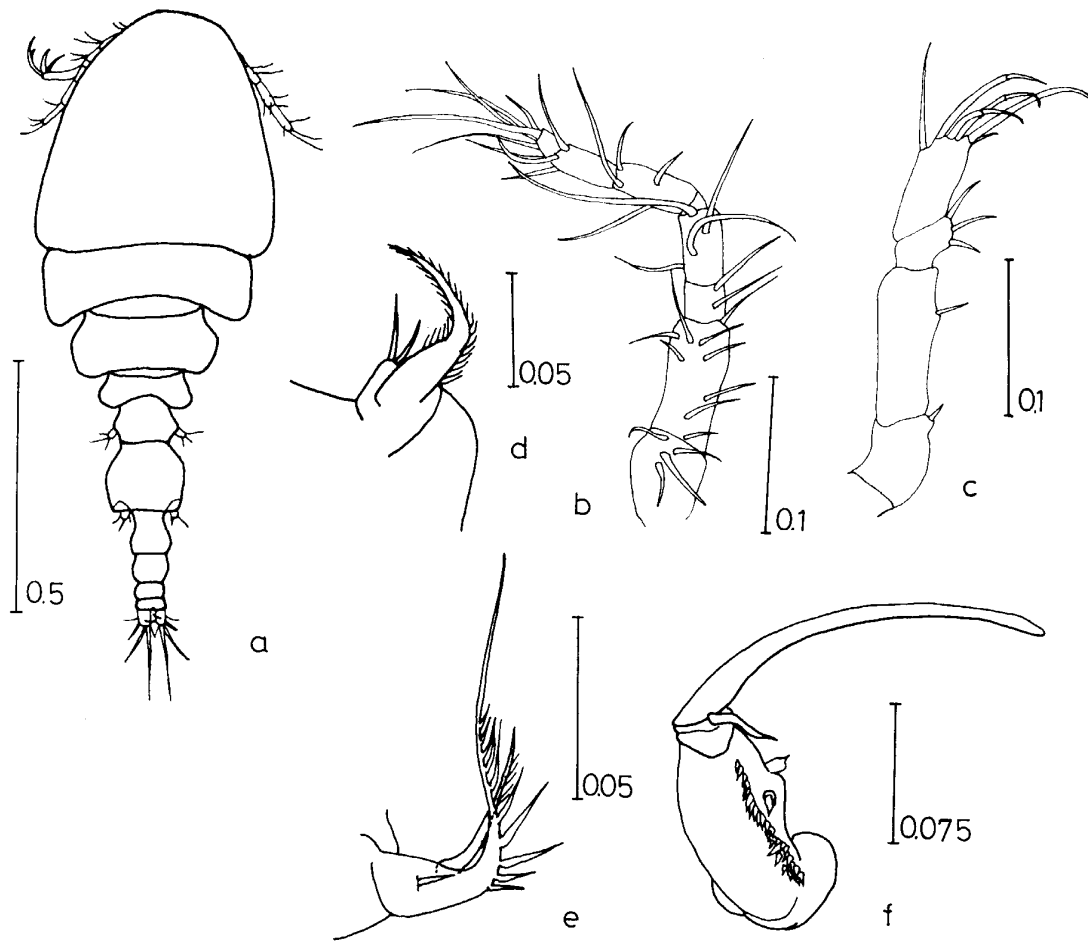


Fig. 5. *Lichomolgus nakaii* sp. nov., male. a, dorsal view; b, 1st antenna; c, 2nd antenna; d, mandible and maxillule; e, maxilla; f, maxilliped, drawn from SEM photograph. Scales in mm.

The fifth leg (Fig. 4e) is very short and rod-shaped, armed with a spine and a naked seta. Adjacent naked seta on the body.

The caudal rami (Fig. 4g) are very short, slightly longer than wide, and provided with six setae, two of them appreciably longer than the others.

The egg sac (Fig. 4h) is elongated, 0.54×0.21 mm in the specimen drawn. The sac contains many eggs of about 0.06 mm in diameter.

Male. The average length of 10 specimens is 1.09 mm (0.97–1.22 mm), and with the caudal setae added about 0.14 mm (0.12–0.16 mm). The maximum width is 0.39 mm (0.31–0.41 mm). The general body form is typically cyclopid (Figs. 1b, 5a). The head is fused with the first thoracic segment. The second segment is slightly narrower than the first fused segment, and the following segments diminish in width. The urosome is different from the female in the

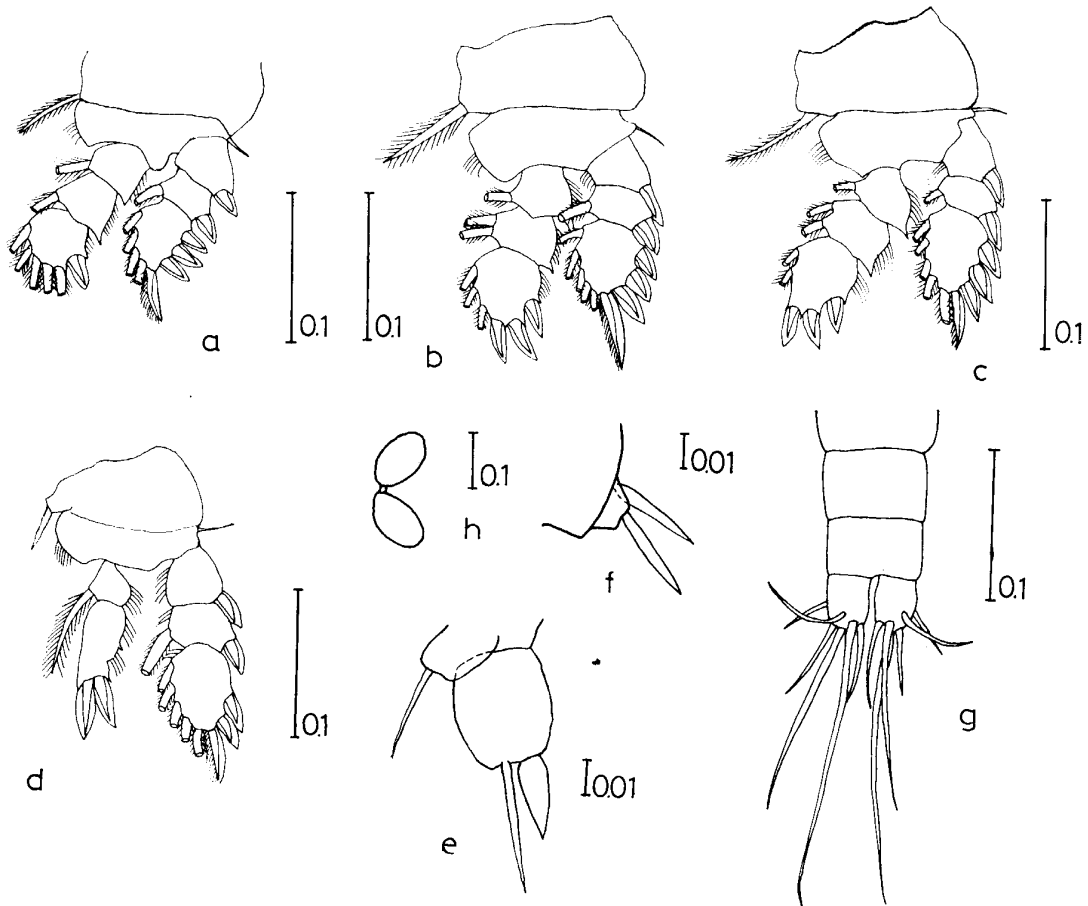


Fig. 6. *Lichomolgus nakaii* sp. nov., male. a, 1st leg; b, 2nd leg; c, 3rd leg; d, 4th leg; e, 5th leg; f, 6th leg; g, caudal rami; h, spent spermatophores. Scales in mm.

form of the genital segment, and the addition of abdominal segment. The genital segment is bell-shaped and carries on each side of the posteroventral margin two small setae which represent the sixth leg (Fig. 6f). The caudal rami are relatively longer than in the female (Fig. 6g). The rostrum is similar to that of female.

The first and second antennae, labrum, mandible, maxillule, and maxilla are similar to those of the female (Fig. 5b-e).

The maxilliped (Fig. 5f) is stout and four-segmented, transformed into a strong grasping organ. The first and third segments are unarmed, but the second segment is armed with a row of spines and with two small setae. The fourth segment forming the terminal claw is armed with one long spine.

Leg 1-4 (Fig. 6a-d) are almost identical with those of the female. The fifth leg (Fig. 6e) is similar to that of the female.

Other features are substantially as in the female. Two spent

spermatophores (Fig. 6h) attached to the female are 0.12 mm long, excluding the neck.

Material examined. Twelve females and 6 males were obtained from the branchial cavities and 42 copepodids were also found in the intestines of edible ascidian, *Halocynthia roretzi*, taken from Motoyoshi County, Miyagi Prefecture, August 10, 1985. In addition, 51 fully developed females and 25 males were collected from the branchial cavities of host ascidians taken at the same place on May 18, 1986.

The holotype (female), the allotype (male) and 10 paratypes (5♀♀, 5♂♂) are deposited at the National Science Museum (Nat. Hist.), Tokyo.

Etymology. The specific name *nakaii* is proposed in honor of the late Dr. Zinjiro NAKAI, Professor Emeritus of Tokai University.

Remarks. This is the fourth species of *Lichomolgus* with four claws on the second antenna. It can be clearly distinguished from other three species, *L. elegantulus*, *L. sadoensis* and *L. bidentipes*, by possession of the shortest caudal rami (Figs. 4g, 6g), form of the genital segment (Figs. 3a, 5a) and one outer denticulate projection on the second segment of the fourth endopod (Figs. 4d, 6d).

Until now, six species of *Lichomolgus* are known to be associated with ascidians: *L. albens*, *L. canui*, *L. diazonae*, *L. forficula*, *L. furcillatus* and *L. marginatus*. All of these commensal species have two claws on the second antenna. On the other hand, three species of *Lichomolgus* having four claws on the second antenna are known; these are associated with the bivalve *Pteria hirundo* (*L. elegantulus* STOCK, 1960), and with the cuttlefish *Septifer virgatus* (*L. sadoensis* and *L. bidentipes* HO, 1980).

Lichomolgus nakaii is the first species associated with the simple ascidian and has four claws on the second antenna. It raises questions on the host-parasite specificity.

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摘 要

松崎加奈恵・小川数也（千代田デイムス・アンド・ムーア株式会社）——マボヤに寄生する橈脚類 *Lichomolgus* 属の1新種。

宮城県本吉郡産の天然マボヤの鰓腔内に寄生する橈脚類キクロプス目 *Lichomolgus* 属の1新種 *L. nakaii*（新称：ナカイヨツツメキクロプス）について記載した。本種は、第2触角先端に4本のかぎ爪を有する種としては4番目のものである。また、このような橈脚類のこれまでの宿主は軟体動物（二枚貝類，イカ類）であったが，ホヤ類は初記録である。既知種とは，叉肢が極めて短いこと，生殖節の形状，第4脚内肢第2節の特徴などの相違によって明らかに識別しうる。

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