

Redescription of Mysid *Archaeomysis vulgaris* (Nakazawa, 1910) Comb. Nov. (Crustacea: Mysidacea: Gastrosaccinae)

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일본산 곤쟁이 1종 *Archaeomysis vulgaris*의 재기재

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적 요

본 연구는 일본 연안에서 채집된 *Gastrosaccus vulgaris*의 표본을 상세히 관찰하여 이 종이 *Archaeomysis*속에 속한다는 것을 밝히고, 신모식을 선정, 재기재하고 근사종 *Archaeomysis kokuboi*와 비교하여 외부형태적 차이를 명백히 서술하였다. 이와 함께 이 종의 동종이명관계, 지리적 분포 및 생태에 관해서도 보고하였다.

Key words: Crustacea, Mysidacea, *Archaeomysis vulgaris* comb. nov., Redescription.

INTRODUCTION

Since the establishment of *Gastrosaccus vulgaris* by Nakazawa (1910) severe confusion has remained unsolved about the taxonomic position of the species due to brief and insufficient original description and figures. When Ii (1964) described *Archaeomysis kokuboi* as a new species, he fully discussed that the Nakazawa's species would be placed in *Archaeomysis* but not in *Gastrosaccus*,

and that *A. kokuboi* may be a junior synonym of *G. vulgaris*. However, he could not come to a final conclusion on the last point because more materials, especially from Nakazawa's collection localities, were needed for careful study. In order to clarify the taxonomic position of *G. vulgaris*, we examined in detail a number of males and females collected from various places of Japan including original type localities of *G. vulgaris*. Consequently, this study revealed that the Nakazawa's species is apparently distinct from *A. kokuboi*, and it should be placed in the genus *Archaeomysis* by the existence of small exopods on the second to fifth pleopods of female.

***Archaeomysis vulgaris* (Nakazawa, 1910) comb. nov.** (Figs. 1-5)

Gastrosaccus vulgaris Nakazawa, 1910 (p. 253, figs. 6, 23, 24, 29, 35); Tattersall, 1921 (p. 407); Li, 1964 (p. 262).

Archaeomysis kokuboi: Wang and Liu, 1987 (p. 206, fig. 1); Shen *et al.*, 1989 (p. 194, fig. 2).

Type series. Neotype (NSMT-Cr 11318): Adult male (8.7 mm); allotype (NSMT-Cr 11319): adult ovigerous female (10.0 mm); paratypes (NSMT-Cr 11320): 4 adult males (8.6-8.7 mm), 13 immature males (2.7-6.8 mm), 4 ovigerous females (10.0 mm), 3 immature females (2.7-6.1 mm). From sandy beach in Ohara, Chiba Pref., Pacific coast of central Japan, 17 November 1990, collected by S. G. Jo. All types are deposited in the National Science Museum, Tokyo (NSMT).

Other materials. Japan Sea coast of Japan: One male (6.8 mm), 8 females (6.8-11.3 mm), 34 ovig. females (9.3-11.6 mm); sandy beach in Kakehashi, Ishikawa Pref., 30 Apr. 1986, dip net, coll. S. Ishimaru. Five ovig. females (7.1-7.7 mm); sandy beach in Igarashi, Niigata Pref., 16 July 1986, dip net, coll. Y. Hirota. One adult male (8.8 mm); sandy beach in Igarashi, Niigata Pref., 16 Apr. 1987, collected together with *Archaeomysis kokuboi*, dip net. Five adult males (9.0-11.6 mm), 19 ovig. females (9.5-12.5 mm), 7 immature females (8.0-9.0 mm); sandy beach in Shirao, Ishikawa Pref., 22 Apr. 1989, dip net. Eighteen males (5.9-8.1 mm), 64 females (5.2-9.5 mm), 8 ovig. females (8.3-9.3 mm); sandy beach in Hane, eastern coast of Noto Pen., Ishikawa Pref., 10 Feb. 1991, dip net. Many males (5.8-12.8 mm) and females (5.3-13.2 mm); sandy beach in Tomarai, Tottori Pref., 0.3-0.5 m deep, 4 Apr. 1991, dip net, coll. Y. Furuta.

Pacific coast of Japan: Thirty-two males (5.6-8.4 mm), 23 females (4.0-8.2 mm), 29 ovig. females (7.5-9.3 mm), 2 immature (3.5 mm); sandy beach in Shinmaiko, Fukushima Pref., 24 Sept. 1990, dip net, coll. N. Ohtake. Thirty-four adult males (7.1-7.6 mm), 17 immature males (4.0-6.0 mm), 3 ovig. females (8.0-8.1 mm), 3 immature females (2.7-6.1 mm); sandy beach in Oarai, Ibaraki Pref., 19 July 1990, dip net. Fourteen males (5.0-8.6 mm), 19 females (4.5-7.6 mm), 16 ovig. females (8.5-10.1 mm), 12 immature (3.6-4.2 mm); sandy beach in Iwata, Onjuku, Chiba Pref., 19 Dec. 1990, dip net, coll. M. Dotsu and S. Tsuchida. One male (6.5 mm), 1 female (9.0 mm), 1 ovig. female (9.7 mm); sandy beach in Inubozaki, Chiba pref., 12 Jan. 1991, dip net, coll. K. Saito. Six males (5.2-7.6 mm), 8 females (4.7-7.0 mm), 1 ovig. female (9.1 mm); sandy beach in Fujisawa, Kanagawa Pref., 5 Apr. 1991, dip net, coll. H. Okada. Eight males (4.5-6.8 mm), 8 females (4.3-5.5 mm), 1 ovig. female (7.8 mm); sandy beach in Fujisawa, Kanagawa Pref., 28 Apr. 1991, dip net, coll. H. Okada. Seven males (5.3-7.3 mm), 5 females (4.3-7.5 mm), 1 ovig. female (8.3 mm), 13 immature (2.8-3.8 mm); sandy beach in Fujisawa, Kanagawa Pref., 4 May 1991, dip net, coll. H. Okada. One ovig. female (10.5 mm); sandy beach in Nagahama, Miura Pen., Kanagawa Pref., 2 May 1991, dip net, coll. T. Sawaguchi. Five males (5.6-7.3 mm), 2 females (6.2, 7.5 mm), 2 immature (2.5, 4.1 mm);

sandy beach in Miura Pen., Kanagawa Pref., 5 May 1991, dip net, coll. T. Sawaguchi. Three males (7.3-9.5 mm), 3 females (8.6-8.8 mm); sandy beach in Arahama, Miyagi Pref., 15 May 1991, dip net, coll. K. Saito. Seven males (up to 7.8 mm), 2 females (both damaged), 2 ovig. females (both damaged); sandy beach in Kushimoto, Wakayama Pref., 5 Jan. 1992, bucket, coll. Y. Hanamura.

East China Sea coast of Japan: One adult male (9.6 mm); sandy beach in Fukiagehama, Kagoshima Pref., Kyushu Island; 30 Apr. 1988; collected together with *A. grebnitzkii*, dip net, coll. T. Noitsu. Seven ovig. females (9.0-12.0 mm), 13 adult females (9.0-12.0 mm); sandy beach in Fukiagehama, Kagoshima Pref., 21 Mar. 1988, dip net, coll. T. Noitsu.

Diagnosis. Posterior margin of carapace deeply emarginate, each side of emargination not split into two separate lobes, but indicative of narrow wrinkle with anterior margin slightly overlapping the posterior. Endopod of third male pleopod unsegmented, outreaching slightly first pseudosegment of exopod. Telson usually with 8 or 9 spines on each lateral margin, cleft shallow, barely reaching level of base of distalmost spine on lateral margin. Endopod of uropod with 4-7 spines on inner margin.

Description. Male. Carapace with anterior margin produced into narrow and rounded rostrum (Fig. 1A); posterior margin deeply emarginate, leaving last two thoracic somites exposed dorsally, without deep slit at dorsolateral portion, but narrow wrinkle present (Fig. 1B, C). Pseudofrontal plate broadly rounded (Fig. 1A).

Eye large; cornea occupying half of whole eye, wider than eyestalk; eyestalk with inner margin slightly concave (Fig. 1A).

Antennular peduncle long and robust, 3-segmented; first segment longest, 3 times as long as second one; second segment shorter than broad, with 2 spines on outer margin; third segment with digitate process on distal margin of dorsal side and one spine and one hairlike seta near outer distal corner; outer flagellum with one lobe fringed with thick setae near base (Fig. 1A).

Antennal scale reaching distal margin of second segment of antennular peduncle, about 3.5 times as long as broad at middle; outer margin naked, terminating in strong spine extending beyond apex of scale; distal suture marking off small apical segment (Fig. 1A, D). Antennal peduncle extending to middle of third segment of antennular peduncle, second segment longest, about 2.8 times longer than third segment, reaching just beyond apex of scale (Fig. 1A, D).

Labrum triangular with strong median frontal process, no spines on each side of median process (Fig. 1E). Mandible well-developed without spine row (Fig. 1F); palp long and slender, second and third segments setose, third segment armed with 2 longitudinal rows of spinose setae on distal part (Fig. 1G, H). Maxillule with outer lobe armed with 12 strong barbed spines and 6 plumose setae; inner lobe with 3 long barbed spines, 5 small naked spines and 1 plumose seta (Fig. 1I). Maxilla with exopod fringed with 13 plumose setae along outer border; terminal segment of endopod oval, armed with 3 different types of spinose setae on apical and inner margins and with hairlike setae on outer margin (Fig. 1J).

First thoracic endopod short, setose along inner margin, basis with developed endite, epipod large and linguiform; exopod distal to basal plate 11-segmented (Fig. 2A, B). Second thoracic endopod similar in general form to first thoracic endopod but without endite on basis; exopod distal to basal plate 12-segmented, basal plate with denticle at outer distal corner (Fig. 2C, D). Third to eighth thoracic endopods similar in structure to each other, carpopropodus divided into 8 to 12 subsegments; third to seventh thoracic exopods with basal plates bearing denticle at outer distal

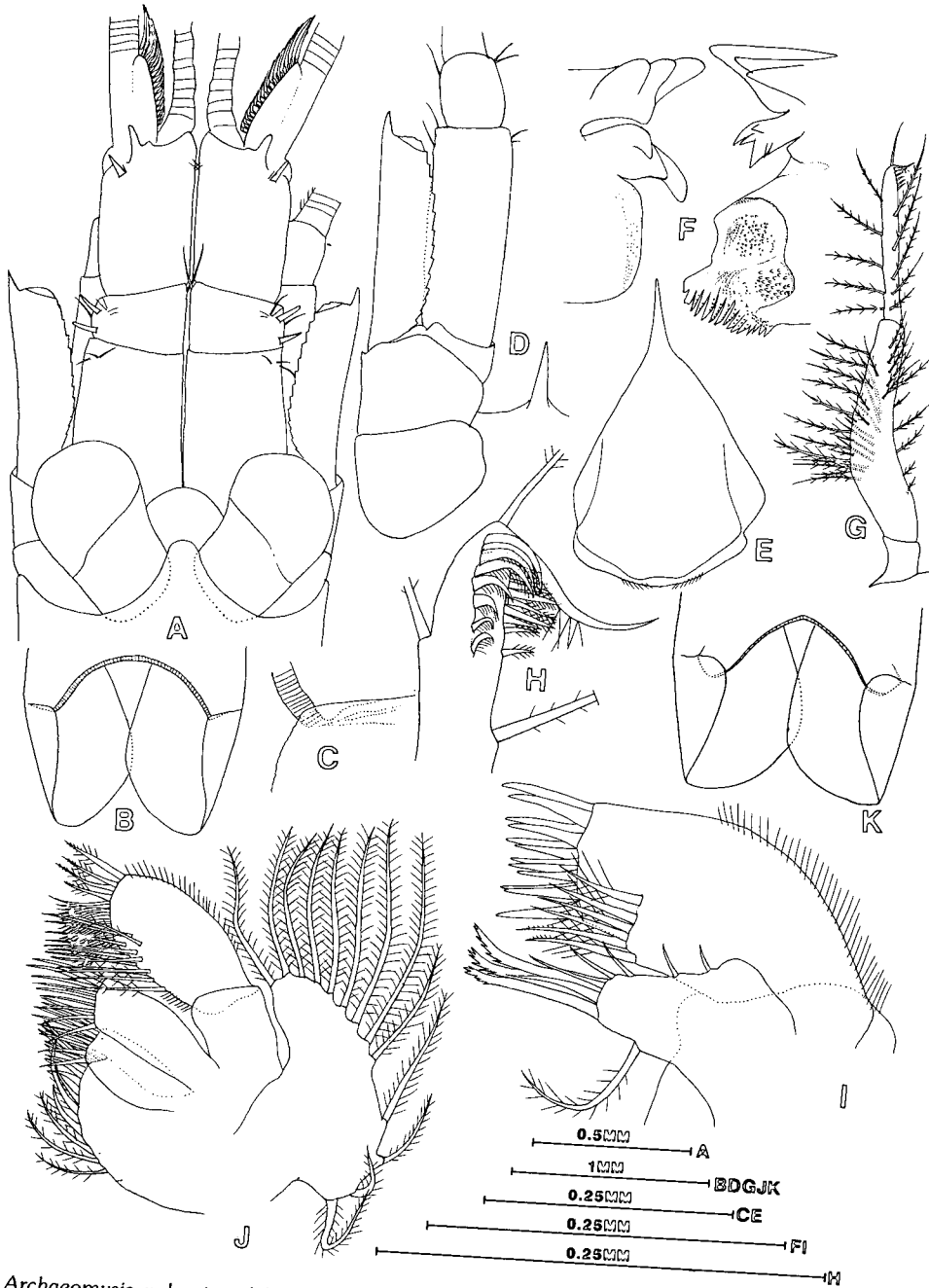


Fig. 1. *Archaeomysis vulgaris*, adult male (7.4 mm) except for K: A, anterior end; B, posterior margin of carapace; C, overlapping of posterior margin; D, antenna and antero-ventral part of body; E, labrum; F, mandible; G, mandibular palp; H, distal part of palp; I, maxillule; J, maxilla; K, posterior margin of carapace of male *A. kokuboi* (10.5 mm).

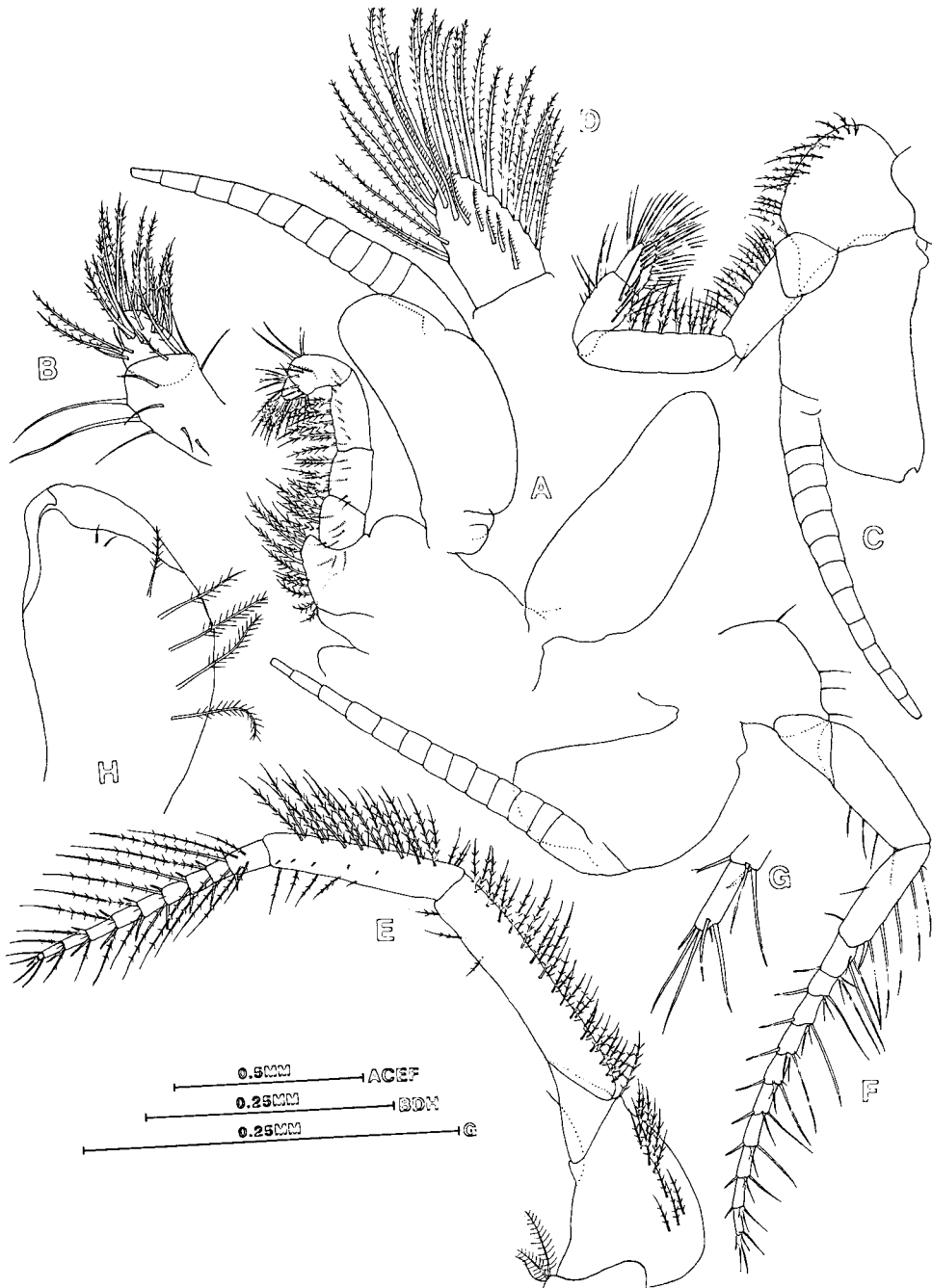


Fig. 2. *Archaeomysis vulgaris*, adult male (7.4 mm): A, thoracic limb 1; B, extremity of thoracic endopod 1; C, thoracic limb 2; D, extremity of thoracic endopod 2; E, thoracic limb 4; F, thoracic limb 8; G, extremity of thoracic endopod 8; H, penis.

corner, flagella of third to eighth thoracic exopods segmented into 13-14 (Fig. 2E-G).

Penis with 5 plumose and 2 short setae on posterior margin (Fig. 2H).

All pleopods biramous; first pleopod with small and unsegmented endopod armed with 8 plumose setae; exopod 6- to 8-segmented; first segment twice as long as endopod, with 2 setae on inner margin in addition to pair of setae at distal corners, second to seventh segments with one plumose seta at each distal corner; sympod about twice as long as broad at middle, with 9 plumose setae along swollen outer margin (Fig. 3A). Second pleopod with 2-segmented endopod almost as long as sympod; first segment bearing apophysis at about basal fourth of outer margin, second segment very small; exopod 6- to 8-segmented, about twice as long as endopod; sympod rectangular, 2.2 times as long as broad, with 3 curved plumose setae at inner distal corner (Fig. 3B). Third pleopod with endopod unsegmented, bearing small apophysis near basal end and outreaching slightly distal margin of first pseudosegment of exopod; exopod long and slender, reaching base of telson, 5- to 7-segmented; first segment divided into 1 to 3 subsegments with 5-7 plumose curved setae; following four segments without seta; distalmost segment with one naked and one barbed spines on apex and 1 to 3 small spines on distal part of outer margin; sympod rectangular, 1.8 times as long as broad, with pseudobranchial process at outer corner (Fig. 3C-E). Fourth and fifth pleopods with endopod unsegmented and bearing small apophysis near base; exopod 5- to 7-segmented, twice as long as endopod; sympod rectangular, as long as endopod (Fig. 3F).

Endopod of uropod reaching tip of apical spine of telson, longer than exopod, armed with 5-7 spines along inner margin at regular intervals except between proximal 2 spines with short interval; exopod with 9-17 regularly spaced spines along outer margin, these spines increasing in length posteriorly and with hairlike setae along inner margin (Fig. 3G).

Telson 3.1 times as long as broad at base, gradually narrowing, lateral margin armed with 8-9, rarely 10 or 11, irregularly spaced spines, distal 2 spines more closely set and markedly larger than others; cleft shallow, about 1/9 length of telson, with rounded bottom, armed with 15-16 closely packed and graduated spines on each side (Fig. 3H).

Female. As in male except for the following characters. Pleural plate of first abdominal somite well-developed, covering posterior half of marsupium consisting of 2 pairs of lamellae. All pleopods biramous. First pleopod with endopod armed with 2 long and 12 short setae; exopod slightly longer than endopod, armed with 4 plumose setae; sympod slightly curved inwardly, 5 times as long as broad, more than twice as long as endopod, armed with 2 long plumose setae at base and 7 long plumose setae on distal margin (Fig. 3I). Second to fifth pleopods similar in structure to each other, decreasing in length posteriorly, with each endopod unsegmented and obscurely budding from sympod; second endopod about 2.5 times as long as exopod; third endopod 3 times; fourth and fifth endopods 3.5 times; second to fifth exopods unsegmented and short, 2.5 times as long as broad; sympods of second to fifth pleopods with 2 plumose setae at anterodistal corner; second sympod approximately 2.2 times as long as broad; third to fifth sympods about 1.8 times as long as broad (Fig. 3J).

Remarks. As discussed by Li (1964) in detail, specimens described by Nakazawa (1910) under the species name *Gastrosaccus vulgaris* represent many morphological characters attributable to the genus *Archaeomysis*, such as the shallow cleft of telson, the elongated exopod of third male pleopod with 6 plumose setae on the basal segments, and first female pleopod biramous. Although we found

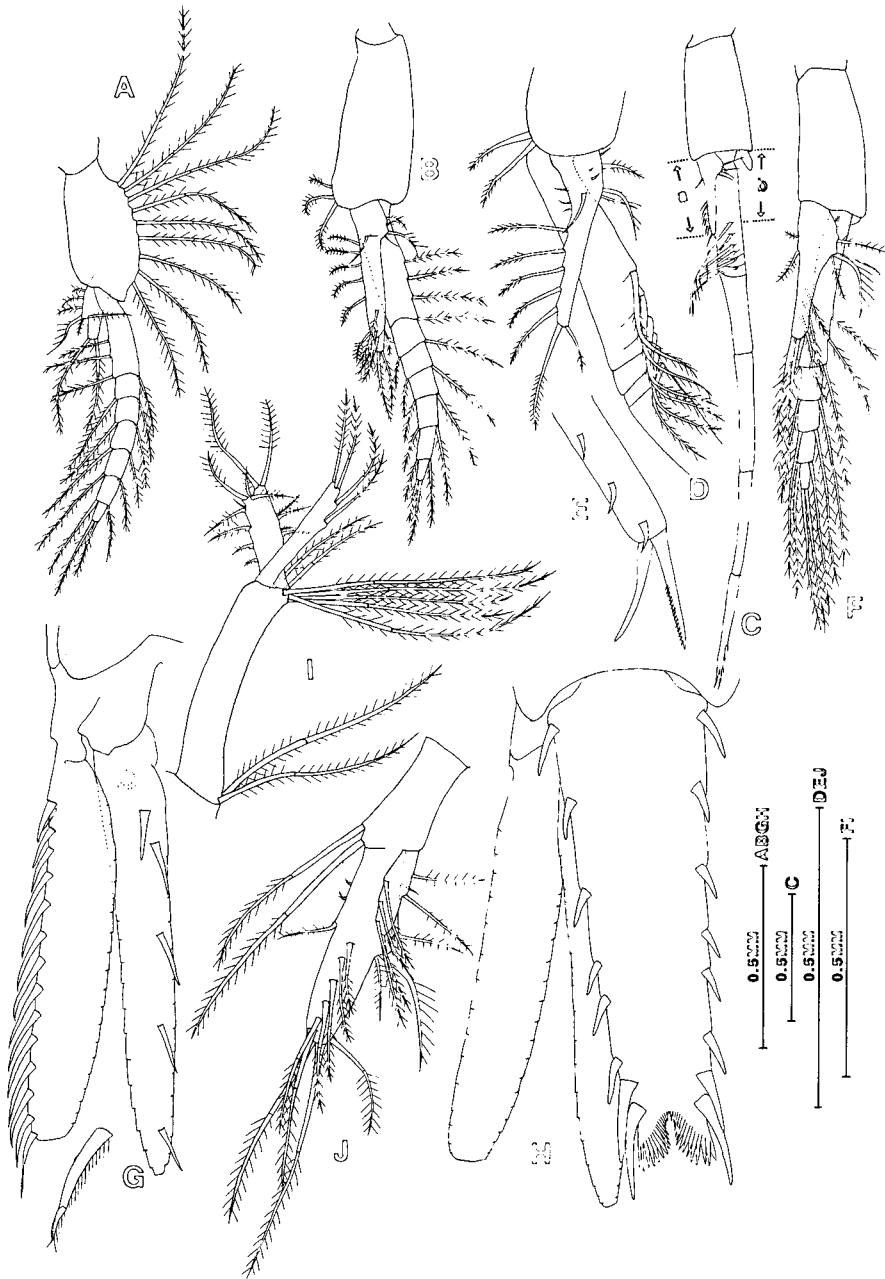


Fig. 3. *Archaeomysis vulgaris*, adult male (7.4 mm) except for I and J: A, pleopod 1; B pleopod 2; C, pleopod 3; D, proximal part of pleopod 3; E, distal part of exopod; F, pleopod 4; G, uropod; H, telson and uropod; I, pleopod 1 of female (8.9 mm); J, female pleopod 2.

an extensive number of *Archaeomysis* specimens in collections made along the coasts of Japan including the type localities such as Oarai and Ohara, no specimen referable to the genus *Gastrosaccus* could be obtained. Moreover, the occurrence of *G. vulgaris* has never been reported since Tattersall (1921). After due consideration of such circumstances, we reach a conclusion that specimens identified with *Gastrosaccus* by Nakazawa (1910) were those belonging to the genus *Archaeomysis* and that the minute exopods on the female pleopods might have been overlooked by the original author.

The present specimens of *A. vulgaris* differ in some points from the original illustration of the second male pleopod (Nakazawa, 1910, pl. 8, fig. 24); the endopod of second male pleopod is un- or usually 2-segmented and half length of the exopod in the present specimens, while Nakazawa (1910) illustrated it to be 8-segmented and slightly shorter than the exopod, showing a feature of the genus *Liella* rather than that of the genus *Archaeomysis*. In the same publication he also reported a new species *G. kojimaensis* (now *Liella kojimaensis*). We suppose that the illustration of the second male pleopod of *G. kojimaensis* might have slipped to that of *G. vulgaris* in a process of publication.

A. vulgaris is so similar to *A. kokuboi* Li, 1964 that Li (1964) suspected the former species to be a senior synonym of the latter when he described *A. kokuboi*. However, this work revealed that *A. vulgaris* is clearly distinguishable from *A. kokuboi* as follows: (1) the posterolateral position of the carapace is slightly fused and consisting of a wrinkle in *A. vulgaris* (Fig. 1B, C), instead of the presence of deep slit formed by two broad and elliptical lobes in *A. kokuboi* (Fig. 1K); (2) the endopod of the third male pleopod in *A. vulgaris* usually extends beyond the distal margin of first pseudosegment of the exopod, whereas in *A. kokuboi* it never extends to first pseudosegment (Fig. 4); (3) the endopod of the second male pleopod is commonly 2-segmented or rarely unsegmented in *A. vulgaris*, but 3- to 5-segmented in *A. kokuboi*; (4) the lateral margin of telson is armed commonly with 8-9 spines in *A. vulgaris* as against usually 7, rarely 8 spines in *A. kokuboi* (Fig. 5).

A. vulgaris also resembles *A. grebnitzkii* Czerniavsky, 1882 but differs from the latter in the unsegmented endopod of the third male pleopod.

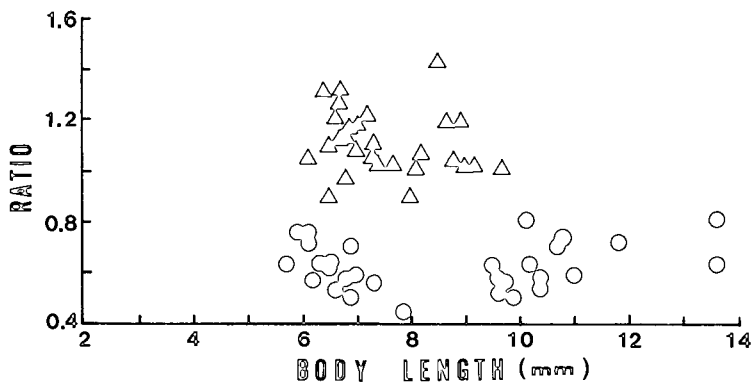


Fig. 4. Relationship between body length and length ratio (a/b, Fig. 3C) of endopod to pseudosegment 1 of exopod in the male pleopod 3. Triangles: *Archaeomysis vulgaris*, circles: *A. kokuboi*.

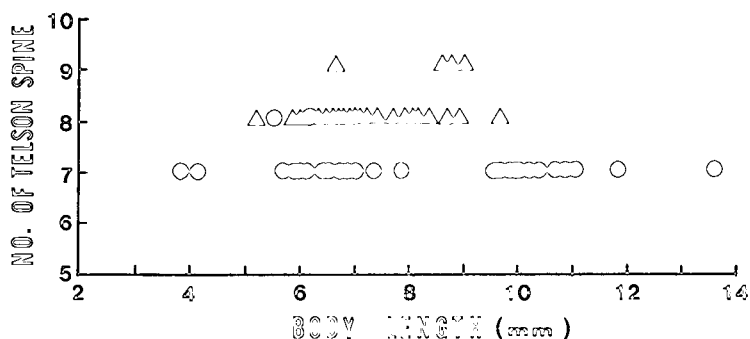


Fig. 5. Relationship between body length and number of lateral spines of the telson of male *Archaeomysis vulgaris* (triangles) and *A. kokuboi* (circles).

Revision of past works. Zimmer (1918) reported *G. vulgaris* from Takao (Kaohsiung), Taiwan, but judging from his description and illustrations, his specimen appears to be an immature of the genus *Iiella*, because the first female pleopod is uniramous and the second and fifth pleopods are in undeveloped condition.

Tattersall (1921) reported a single male of *G. vulgaris*, which was obtained from an Osaka market, Japan and sent to him by Nakazawa. As no description or drawing was included in his paper, any comment can not be given on this specimen.

Wang and Liu (1987) and Shen *et al.* (1989) recorded *A. kokuboi* from the coasts of China, but the present authors believe that their specimens were of *A. vulgaris*, by the characteristics of the posterodorsal margin of the carapace, telson and second and third male pleopods, all of which are attributable to the latter species.

On the other hand, the study on the biology of *G. vulgaris* by Matsudaira *et al.* (1952) does not appear to have been done on *A. vulgaris* comb. nov. but on *A. kokuboi*, because the third male pleopod shown by them is undoubtedly the same characteristics as those of *A. kokuboi*.

Geographical distribution. Previous reports show that *A. vulgaris* comb. nov. has been collected from the Pacific coasts of central Japan (Nakazawa, 1910) and from the Chinese coasts from Pohai Sea to South China Sea (Wang and Liu, 1987; Shen *et al.*, 1989). In this study, we obtained a large number of specimens from the sandy beaches of the Pacific, the Japan Sea and the East China Sea. This species does not seem to invade north beyond 38°N in Japan (Fig. 6).

Ecology. *A. vulgaris* is predominantly found in the intertidal zone of sandy beaches in which it burrows into the bottom substratum in accordance with wave actions. Interestingly, it is occasionally found together with two closely related species, *A. kokuboi* and *A. grebnitzkii*. Oviparous females were collected during a period from March to November in Oarai and Ohara, Pacific coasts of central Japan. However, the period of the reproduction may vary depending on geographical areas.

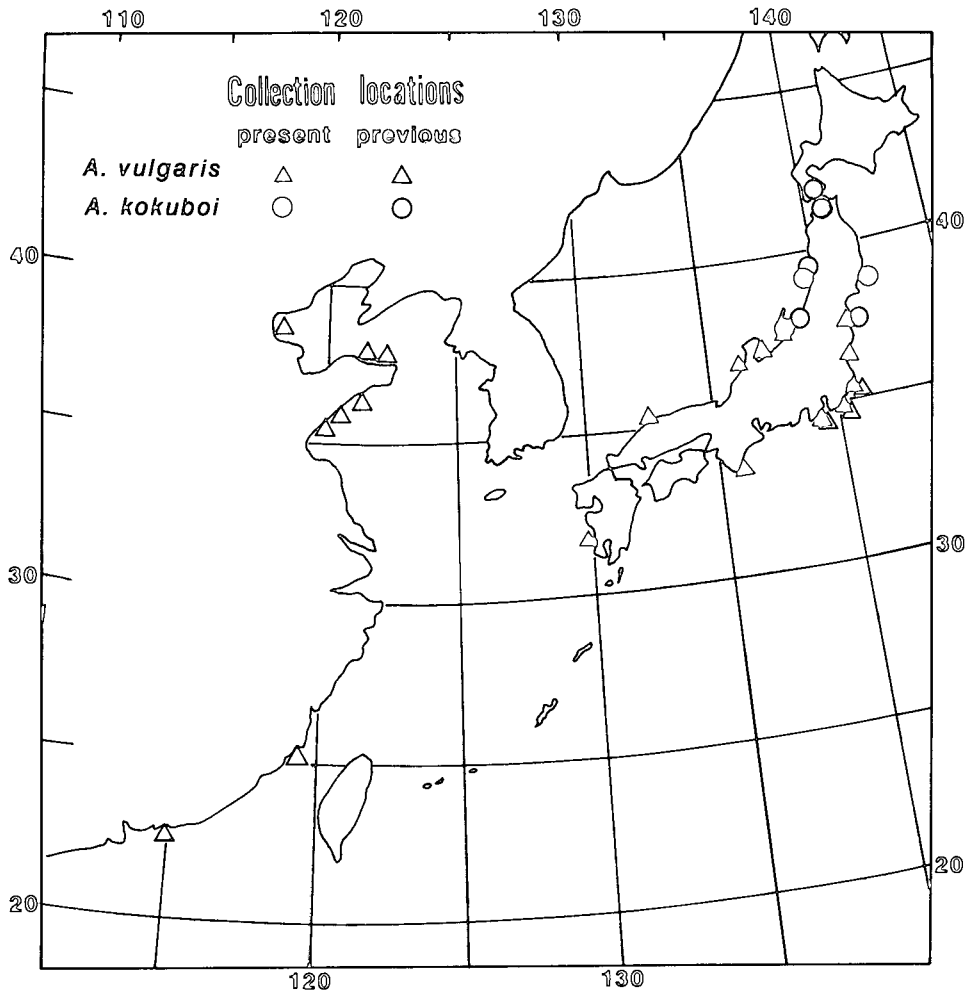


Fig. 6. Distribution of *Archaeomysis vulgaris* (triangles) and *A. kokuboi* (circles).

ABSTRACT

Gastrosaccus vulgaris Nakazawa, 1910 is transferred to the genus *Archaeomysis* and redescribed on the neotype, allotype, plus paratypes designated newly. *Archaeomysis vulgaris* is distinctly distinguishable from the closely related species *A. kokuboi* Li, 1964 by the slight overlapping in each side of posterodorsal margin of the carapace, the 2-segmented endopod of male pleopod 2, the endopod larger than the pseudosegment 1 of exopod of the male pleopod 3, 8-9 spines on the lateral margin of telson and the shallower cleft of the telson. Synonymy, geographical distribution and ecology of *A. vulgaris* are also given.

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