

64. A New Subterranean Copepod from Japan.¹⁾

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Eucyclops nagasaki sp. nov. (fig. 1).

Female: Colour white, without any trace of pigment. Eyes entirely absent. Body-form resembles very much that of *Eucyclops serrulatus* (Fischer). Cephalothorax is a little shorter than wide (374μ :

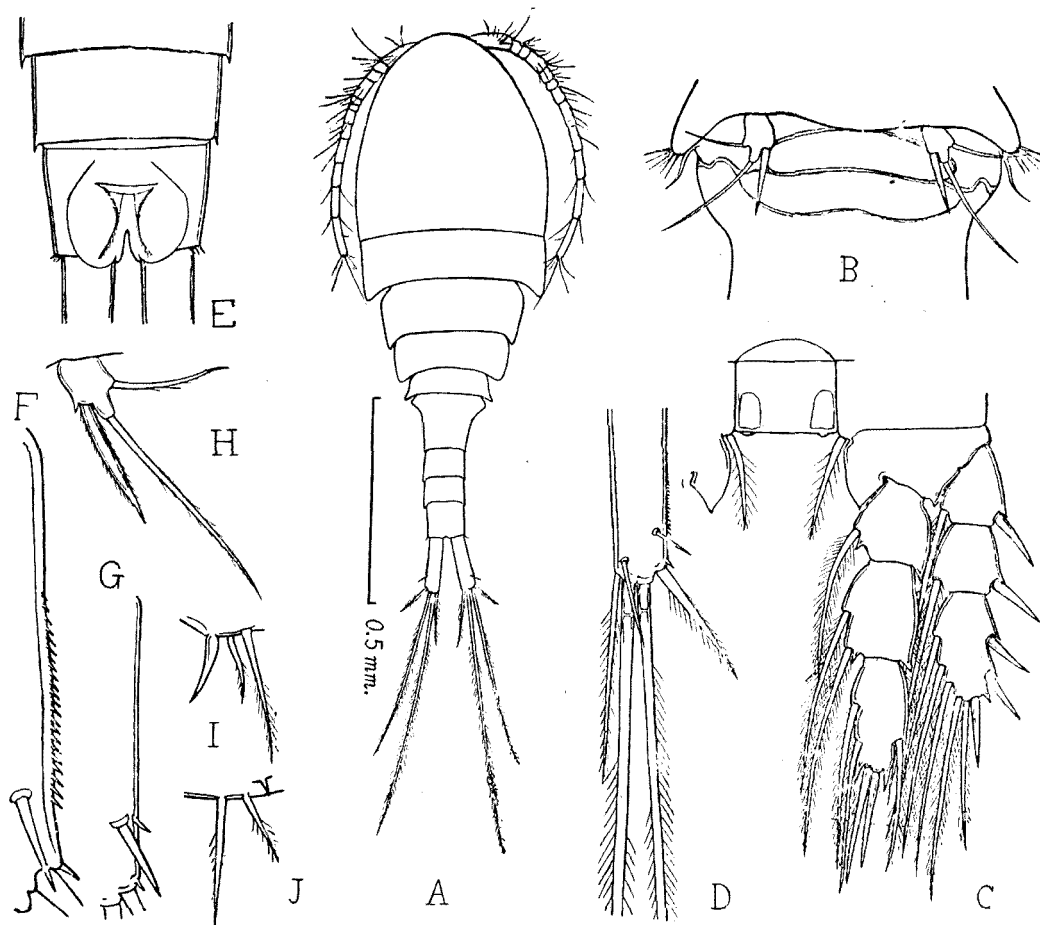


Fig. 1. *Eucyclops nagasaki* sp. nov.

A. Female, dorsal view. B. Receptaculum seminis, ventral view. C. Fourth limb of female. D. Right furcal ramus of female, dorsal view. E. Last three abdominal somites, dorsal view. F and G. Outer margin of furcal ramus; F. of female, G. of male. H. Fifth limb of female. I and J, Rudiment of sixth limb; I. of female, J. of male.

1) Contribution from the Ôtsu Hydrobiological Station, Kyoto Imperial University.

408 μ). Lateral margins of the fifth somite are produced behind, bluntly pointed and armed with 3-4 spines. Anterior part of the genital somite is slightly narrower than the last (the fifth) thoracic somite and narrows posteriorly. Telson or fifth abdominal somite is slightly longer than the preceding one. Two rami of caudal furca are about one-thirds as long as the posterior body or 1-5 abdominal somites combined (323 μ : 102 μ), divergent; each ramus about 4-times as long as wide (82 μ : 20 μ), the outer margin armed with a saw-like series of minute denticles on the distal half before the lateral spine. The number of these denticles varies very much in individuals, often only a few denticles being visible close to the lateral spine. Furcal setæ 4, well-developed; their relative length is, from the outer to the inner, as 68:323:510:85 μ (outermost: innermost=1:1.25).

First antenna is 12-jointed, extending to the middle of the second thoracic somite in the natural state; without hyaline membranes on the distal joints.

Four pairs of thoracic limbs are of the ordinary structure; the connecting plate of these limbs quadrangular, with a pair of small chitinous thickenings on both sides. The exopods and endopods of all limbs have three joints respectively. The arrangement of spines and setæ on these limbs are as follows:

Joints	L ₁		L ₂		L ₃		L ₄	
	Exp	Edp	Exp	Edp	Exp	Edp	Exp	Edp
1.	I, 1	0, 1	I, 1	0, 1	I, 1	0, 1	I, 1	0, 1
2.	I, 1	0, 2	I, 1	0, 2	I, 1	0, 2	I, 1	0, 2
3.	III, 2, 3	1, II, 3	III, II, 4	1, II, 3	III, II, 4	1, II, 3	II, II, 4	1, II, 2

L₁, L₂, L₃, L₄,..... first, second, third and fourth thoracic limbs; Exp.....exopod; Edp.....endopod.

Roman numerals.....spine; arabic numerals.....seta; left of the comma.....external side; right of the comma.....internal side; the letters between the two commas show the apical spine or seta (cf. Kiefer).¹⁾

Spine-formula 3. 4. 4. 3. The terminal joint of both exopod and endopod of the fourth limb is short, about twice as long as wide (42 μ : 20 μ in the endopod); the length of the two terminal spines of the endopod are 47 μ and 39 μ .

1) Kiefer, Fr.: Zool. Jahrb., Abt. f. System., 54 (1928), pp. 495-556.

Fifth limb is single-jointed, with three appendages, one serrated spine and the other two ciliated setæ, of which the middle is the longest. The rudiment of the sixth limb on the ventro-lateral sides of the genital somite consists of one strong spine and two setæ.

Receptaculum seminis resembles very much that of *Eucyclops serrulatus*.

Length of body excluding furcal setæ 1.2 mm. Egg-sac contains 8 eggs.

Male: Smaller than female, 0.8 mm long. Both rami of caudal furca are a little shorter than in female, about three times as long as wide; the outer margin without any series of denticles, provided with only a short spinule close to the lateral spine. The arrangement of spines and setæ on the thoracic limbs is equal to that of the female; terminal spines of the endopod of the fourth limb are 38μ and 28μ in length. Eye is entirely absent as in the female.

Locality: A subterranean pool ("Miwatari-ike") in a cave at Hirogawara, Taguchimura in the eastern part of Shinano. 11. VIII. 1933, collected by M. Uéno (see below).

This new species is closely allied to the wide-spread species *Eucyclops serrulatus* (Fischer), but differs from it by the absence of eye, the length of caudal furca and by having no denticles on the outer margin of the caudal furca in the male. In the last feature, namely the serra of the caudal furca ("Säge" of German authors), and in the relative length of four furcal setæ, the present species resembles very much *C. speratus* (Lilljeborg), but the rami of its caudal furca are much shorter than those of *C. speratus*. *E. nagasaki* is a true troglobiontic form which was no doubt derived from *E. serrulatus* (Fischer).

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Besides the type-locality, there are four subterranean pools in three caves formed among the crevices of palæozoic rocks. One of these three caves is composed of three branch cavelets, each of which has a pool at its deepest part, while the other two caves have only one pool each. According to the source of water, these pools may be said to belong to the so-called "Spaltengewässer".¹⁾ Excepting the pool "Ryuô-ike", the water of all is clear and cold and does not receive the penetration of sunlight at all. As is generally true of subterranean waters, the amplitudes of the water temperature of these pools are

1) Chappuis, P. A.: Abderhalden's Handb. d. biol. Arbeitmeth., Abt. IX, Teil 7, Heft 1 (Lief. 346). 1931.

very small; even in summer the temperature does not exceed 10° C and not fall below 6° C in winter.¹⁾ The oxygen dissolved in the water is greatly diminished, less than 5 ccm per litre (30% of saturation) even in winter. Besides such a lack of oxygen, these five pools show very different "active reaction"; their pH-values ranging from more than 7.0 in "Miwatari-ike" to as low as 3.4 in "Ryuô-ike".

It is of great interest ecologically that the individual numbers of the copepods occurring in each pool seems to be correlated rather well with the reaction of the water, i.e. the animal was found most abundant in weakly alkaline "Miwatari-ike", the type-locality, (pH 7.2-7.6); in "Hataori-ike" (pH 4.5) and "Ryuô-ike" (pH 3.4) it was very scarce. As "Ryuô-ike" receives weak sunlight, one important factor that limits the occurrence of crustaceans in this pool is seen probably in the pronounced acidity of the water rather than in light conditions. Since *Eucyclops nagasaki* was found in the water of such a wide range of pH and of nearly constant temperature, it must be regarded as one of the stenothermal and euryacidoactive organisms.

1) For the physical and chemical data obtained in winter, I am indebted to Mr. R. Hosino.