Cyclops canadensis n.sp. and *Cyclops scutifer* Sars, 1863 (Crustacea: Copepoda) from northern Canada

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Received January 12, 1988

EINSLE, U. K. 1988. ***Cyclops canadensis*** n.sp. and *Cyclops scutifer* Sars, 1863 (Crustacea: Copepoda) from northern Canada. Can. J. Zool. **66**: 2146–2149.

The occurrence and distribution of *Cyclops* s.str. species (*strenuus* subgroup) in Canada and the United States has not yet been reliably studied. In this first attempt, *Cyclops scutifer* Sars, 1863 is characterized, and a new species, ***Cyclops canadensis***, is established. As no cytological investigations were possible, the species are described on the basis of morphological and morphometrical data. Most probably, the new species, *Cyclops canadensis*, formerly was identified as *Cyclops strenuus*.

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La présence et la répartition des espèces de *Cyclops* s.str. (sous-groupe *strenuus*) au Canada et aux États-Unis n'ont jamais fait, à ce jour, l'objet d'études détaillées. Dans une première étape, *Cyclops scutifer* Sars, 1863 est definie avec précision. Une nouvelle espèce, ***Cyclops canadensis***, est établie. Vu l'impossibilité d'en faire un examen cytologique, les espèces sont décrites en fonction de critères morphologiques et morphométriques. Selon toutes probabilités, la nouvelle espèce, *Cyclops canadensis*, a toujours été identifiée comme *Cyclops strenuus*.

[Traduit par la revue]

The taxonomy of the genus *Cyclops* s.str. (*strenuus* subgroup) has, in the past, presented problems because of the extreme temporal and spatial variability it shows; in particular it has been difficult to calibrate the differences among morphometric aspects (Kozminski 1936; Lindberg 1957). For most European species, these difficulties have been cleared up by the author. On the basis of a comprehensive morphometrical evaluation of about 6000 specimens, the identification of most species was possible by the comparison of chromatin diminution (Beermann 1959, 1966; Einsle 1964, 1975, 1980). A further criterion was also found in the ornamentation of the coxopodite and the connecting lamella (coupler) of the fourth pair of swimming legs (P4) (Einsle 1985).

Very little is known about the *Cyclops* species (*strenuus* subgroup) from Canada and the United States. According to Yeatman (1944), only the presence of *C. scutifer* and *C. vicinus* (the latter determined by the spine formula 2-3-3-3) is certain, while the occurrence of *C. strenuus* is questionable. Lindberg (1957) has recorded *C. strenuus*, *C. columbianus*, and *C. kolensis alaskaensis*, the latter a redesignation of the abovementioned *C. vicinus* found by C. D. Marsh in 1920 and denominated by Yeatman (1944). Wilson and Yeatman (1959) however, found four species from Canada and the United States: *Cyclops insignis* (questionable record from New York); *Cyclops vicinus* (collected 1920 in Alaska by Marsh); *Cyclops scutifer* (Canada, Alaska, New York); *Cyclops strenuus* (collected in Alaska). In several publications (Reed 1963, 1964; Chengalath et al. 1984; Davis 1972, 1973), only *C. scutifer* is registered; other authors also recorded *C. strenuus* (Reed 1962; Patalas 1975; Smith and Fernando 1979). There seems to be evidence that *C. strenuus* may be identical with *C. canadensis*, described in this paper.

Considering this *terra incognita*, it is useful to revise the taxonomy of the genus *Cyclops* s.str. from the northern part of the continent. As a first step such a revision should be done on the basis of morphological observations. Cytological studies may be added in the future. Here is presented a first contribution from a collection of samples taken by P. Hebert (at Igloolik, August 1987: pond near Lailor Lake, Pond 75) and at Inuvik by M. Boileau (August 1986), where some populations of *C. scutifer* and of a new species were found.

Cyclops canadensis n.sp.

The specimens investigated (15 females, 1 male) are rather large and robust (Fig. 1). The females had a length of about 1700 to 2000 μm (Table 1), the single male, about 1700 μm; exact lengths were not measured before dissection. In the samples from Inuvik, only one female was found.

The antennulae (A1 ♀) are distinctly shorter than the cephalothorax; the deliminations of its 17 segments are not always clearly seen, and the proximal articles are weakly denticulated at their lateral margins. The broadest part of the fourth thoracic somite is at the middle and the margins are well developed but not really pointed.

The shape of the fifth thoracic somite is striking and characteristically shows prolongations laterally towards the genital segment. The caudal margins of the fourth and fifth thoracic segment present a wave-like chitinous structure.

The first abdominal segment (genital segment) is slightly broader than long with the proximal part well developed laterally. The furcal branches are about 5 times as long as they are broad.

In Fig. 2 the details of morphometrical analysis according to Kozminski (1936) are presented with denomination of furcal setae: the internal terminal seta (1), the median internal seta (2), the median external seta (3), the external terminal seta (4), and the dorsal furcal seta (5).

Morphometrical studies are helpful for a correct description of specimens, but must be used with caution in defining a species or subspecies. Therefore, the few animals presented in Table 1 only give an idea on the actual local variation of the species.

As the numbers of specimens are too low, it is inappropriate to discuss the range of variability, apart from the differences in body length. The internal terminal seta is rather short, about as long as the furcal branch and 1.5 times as long as the external terminal seta. Typical for the new species is the insertion of the external terminal seta which is extraordinarily close to the tip

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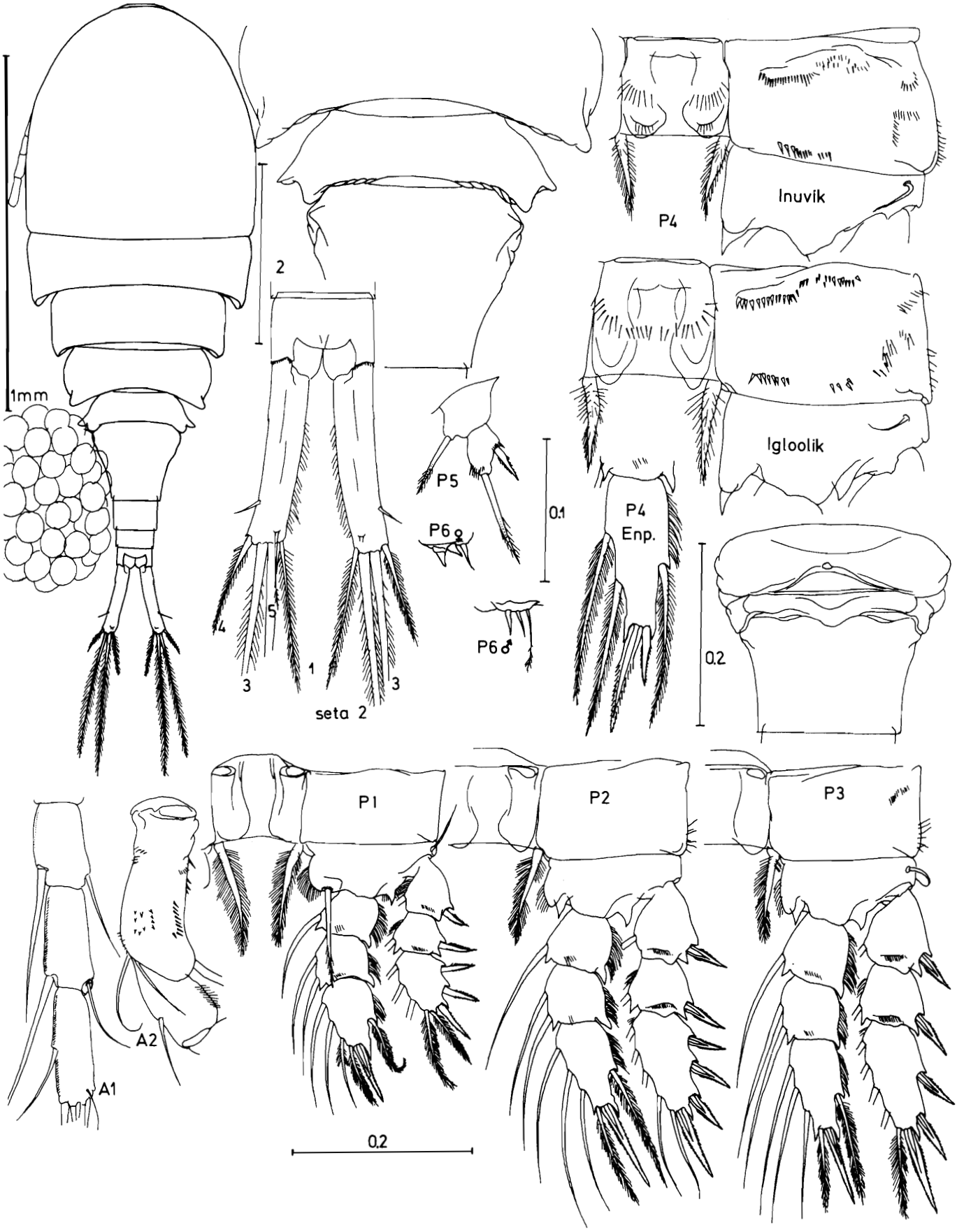

FIG. 1. *Cyclops canadensis* n.sp. Furcal setae are numbered 1–5; Enp., endopodite. All scale bars are in millimetres.

TABLE 1. Morphometrical data (according to Kozminski 1936; Einsle 1975)

	Cyclops canadensis n.sp. (Igloolik)		*Cyclops scutifer*	
	Pond near Lail Lake (n = 10)	Pond 75 (n = 3)	Igloolik (n = 5)	Inuvik (n = 10)
Total length (μm)	1780 (1680–1890)	1970 (1905–2005)	1355 (1310–1450)	1570 (1525–1625)
Length of abdomen, as % of length of cephalothorax	42 (40–43)	39 (39–40)	44 (43–46)	45 (43–47)
Length of furca : width of furca	4.9 (4.2–5.3)	4.9 (4.5–5.3)	3.8 (3.5–4.2)	4.0 (3.4–5.1)
Length of furca	118 (103–127)	111 (104–117)	101 (96–107)	109 (102–118)
Width of thoracic somite 4	247 (238–256)	260 (256–264)	285 (264–300)	259 (245–269)
Width of thoracic somite 5	196 (182–202)	214 (212–214)	254 (244–264)	234 (223–244)
Width of cephalothorax	383 (373–397)	368 (362–374)	333 (327–342)	329 (315–337)
Seta 1	109 (100–119)	113 (111–114)	135 (130–142)	150 (133–168)
Seta 2	310 (300–344)	282 (275–290)	285 (280–289)	261 (246–290)
Seta 3	259 (232–282)	250 (240–256)	202 (197–210)	198 (178–211)
Seta 4	72 (66–76)	69 (67–70)	69 (67–71)	82 (71–91)
Seta 5	51 (44–55)	50 (46–53)	78 (74–84)	89 (80–109)
Seta 1, as % of seta 4	152 (133–165)	165 (163–167)	196 (193–200)	183 (163–215)
Seta 3, as % of seta 2	86 (76–91)	88 (87–91)	71 (69–75)	76 (72–82)

NOTE: Values given as mean with range in parentheses. See Figure 2 for definition of characters. Setae 1–5 are given as percentages of total body length.

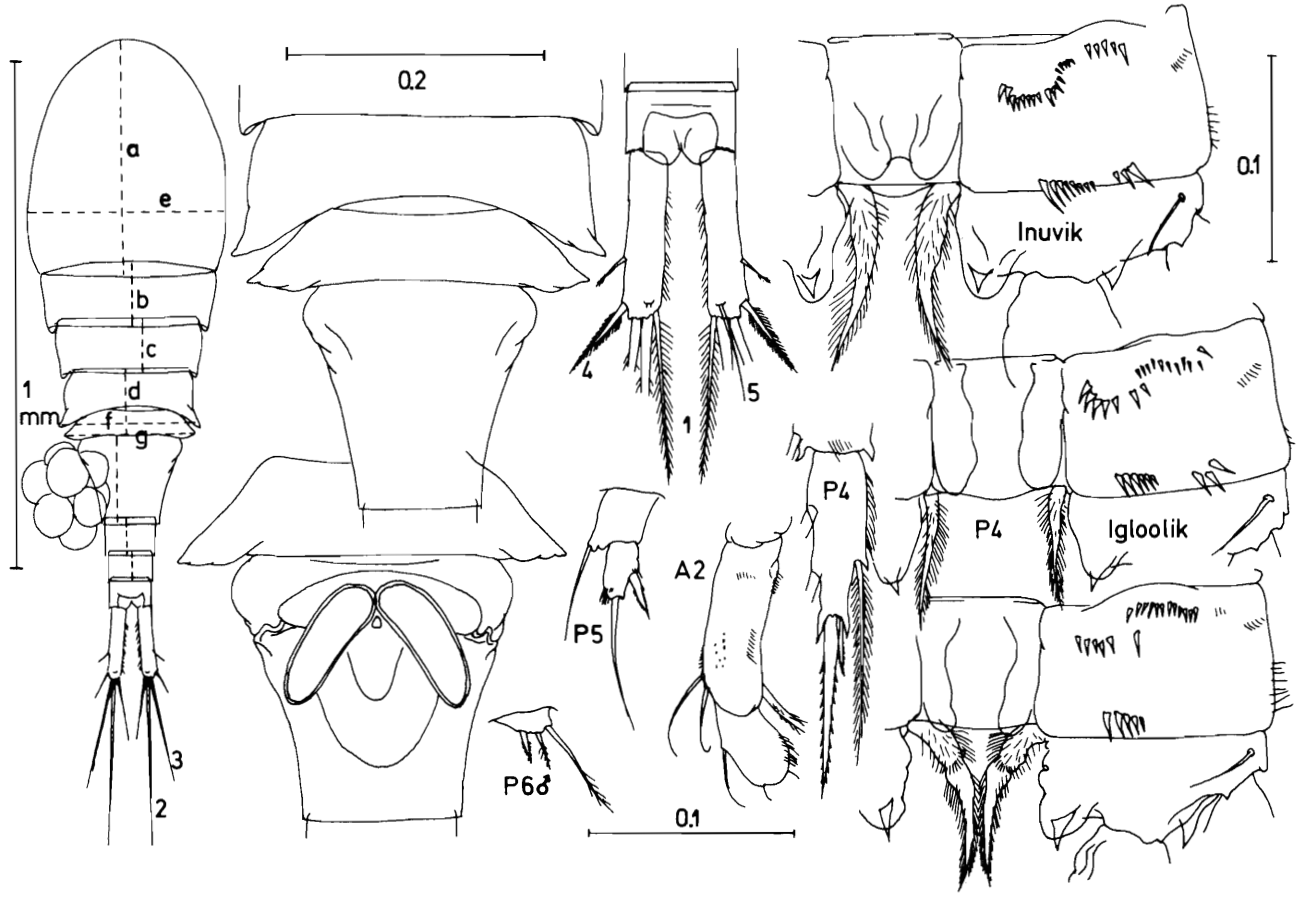

FIG. 2. *Cyclops scutifer* Sars. Furcal setae are numbered 1–5. All scale bars are in millimetres. Morphometrical method (Kozminski 1936): $a + b + c + d$ = length of cephalothorax + four thoracic somites (cephalothorax); length of cephalothorax + length of abdomen = body length; body length + length of furca = total length; e, width of cephalothorax; f, width of thoracic somite 4 between caudal tips; g, width of thoracic somite 5.

of the furcal branch. The dorsal furcal seta is distinctly shorter than seta 4. The median internal seta and median external seta are not very different in length.

The spine formula of the four pairs of swimming legs (spines at the last article of exopodites) is 3-4-3-3. The ornamentation of the coxa and the connecting lamella are shown in Fig. 1. However, there are small differences in this pattern between the population from Inuvik and that from Igloolik.

The large spines at the connection between the coupler and the coxa are broad but relatively short. Beginning from about the middle of the spine, they are remarkably more slender than at their base, although some variations can also be seen in both populations studied. Among the apical setae on endopodite P4, the median seta is about twice as long as the external seta. The spines of P5 are strong and short compared with those of *Cyclops* species.

Summarizing the typical features of this species visible at a low magnification, there are the short antennulae (A1), the shape of the fifth thoracic somite, and the insertion of the external terminal furcal seta. These properties have never been found in European *Cyclops* species and, therefore, the name characterizes these new features of the Canadian populations.

Type material will be deposited at the National Museum of Natural Science, Ottawa, Ont., Canada.

Cyclops scutifer Sars, 1863

As is the case in Scandinavia, *C. scutifer* also occurs frequently in subarctic Canada. The course of the chromatin diminution has not yet been studied in this species.

The specimens from the Northwest Territories (Fig. 2) were typical and can be separated from *C. canadensis* by their smaller body length and their broad fifth thoracic segment. In contrast to *C. vicinus* (record from C. D. Marsh), the lateral margins of the fourth somite are pointed too, but not formed as "wings" as in the other species. The females often show large spermatophores which are fixed angularly on the ventral side of the genital segment. The antennulae reach the middle of the second thoracic somite. The furcal branches were short in the few populations studied and were about 4 times as long as broad. The internal terminal seta is about one third longer than the furcal branch and about twice as long as the external terminal seta.

On the coxa of P4, a remarkable grouping of strong spinules is observed. The connecting lamella (coupler) has no spines. The shape of this coupler can vary depending on the pressure in the preparation slide. The lateral spines at the coupler are different in the populations from Inuvik and Igloolik. The spine formula is 3-4-3-3, with some variations.

The smaller *C. scutifer* is therefore distinguished from *C. canadensis* by the longer antennulae, the broad shape of the fifth thoracic somite, and the shape of the coxa and coupler P4.

Conclusions

As most of the older reports on *Cyclops* species (*strenuus* subgroup) from Canada were not reliable, a beginning was made with the identification of the two species described in this paper. Further collections will perhaps give more information on the range of geographical variation, but correct determinations and descriptions ought to be proposed. In addition, cytological studies on chromatin diminution are recommended in the future.

The author would greatly appreciate collections of cyclopids from Canada for taxonomical investigations.

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