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FRESH-WATER COPEPODA OF MASSACHUSETTS

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IN her excellent review of the Crustacea of New England, Miss Rathbun (:05) lists nine species of fresh-water copepods for Massachusetts, as follows: —

? <i>Heterocope</i> sp.	<i>Diaptomus leptopus</i> Forbes.
<i>Cyclops vernalis</i> Fischer.	<i>Cyclops viridis insectus</i> Forbes.
<i>Cyclops bicuspidatus</i> Claus.	<i>Cyclops albidus</i> (Jurine).
<i>Cyclops serrulatus</i> Fischer.	<i>Cyclops prasinus</i> Fischer.
<i>Cyclops phaleratus</i> Koch.	

As her paper cites the original description of each of these species and the authority for its occurrence in Massachusetts, these points need not be taken up here. The occurrence of *Heterocope* in America is doubtful and it cannot properly be included on the evidence that Cragin ('83) offers.

To the above list I am now able to add the following: —

<i>Eurytemora affinis</i> Poppe.	<i>Epischura massachusettsensis</i> n. sp.
? <i>Diaptomus ashlandi</i> Marsh.	<i>Diaptomus sanguineus</i> Forbes.
<i>Diaptomus pygmaeus</i> n. sp.	<i>Diaptomus spatulocrenatus</i> n. sp.
<i>Cyclops edax</i> Forbes.	<i>Cyclops leuckarti</i> Claus.
<i>Cyclops viridis brevispinosus</i> Herrick.	<i>Cyclops fuscus</i> (Jurine).
<i>Cyclops bicolor</i> Sars.	<i>Cyclops varicans</i> Sars.
<i>Cyclops fimbriatus poppei</i> Rehberg.	
<i>Canthocamptus illinoisensis</i> Forbes.	<i>Canthocamptus staphylinoides</i> Pearse.
<i>Canthocamptus northumbri- canus</i> Herrick.	<i>Canthocamptus minutus</i> Claus.

I have also observed all the species in Miss Rathbun's list except *Heterocope* and *Cyclops prasinus*. *Eurytemora affinis* has never been observed before in America outside the Gulf of Mexico (Foster, :04). The previous eastern range of *Diaptomus ashlandi* is Indiana; *Diaptomus massachusettsensis* and *Diaptomus spatulocrenatus* are apparently new to science. The ranges of all the species of *Canthocamptus* here listed, are considerably extended. The ranges of several species of *Cyclops* are widened somewhat but this is of no very great significance as it is a cosmopolitan genus and all the species have been previously found in the United States.

My thanks are rendered to J. A. Cushman for specimens from various stations and for collections from Nantucket Island which were made by Mariana Hussey, E. W. Morgan, and S. D. Richmond. I am also indebted to I. L. Shaw for specimens from Brookline, Wellesley, and Randolph.

The types of the new species here described have been presented to the Boston Society of Natural History.

GENUS EURYTEMORA Giesbrecht

Eurytemora affinis Poppe.—This species occurred in a collection from Squam Pond, Nantucket Island, made by S. D. Richmond, June 4, 1905.

GENUS EPISCHURA Forbes

Epischura massachusettsensis n. sp.

This species is described from nine females collected by I. L. Shaw at Wellesley, Mass., April 20, 1905. No males were taken at that time nor in October when several dredgings were made.

Description.—Of medium size, cephalothorax elliptical seen from above, broadest about the middle, truncate at anterior end; six-segmented, first segment almost half the cephalothorax and having a suture at its middle; last segment distinct. Abdomen (Fig. 4) symmetrical, slender, five-segmented (furca included). First segment very short, second segment longest, third segment longer than first but shorter than fourth. Furca twice as long as wide, hairy on inner margin, bearing three strong plumose terminal setæ and a smaller one at both the inner (not plumose) and outer distal angles. Antennæ twenty-five-segmented and when reflexed, extending to middle of furca.

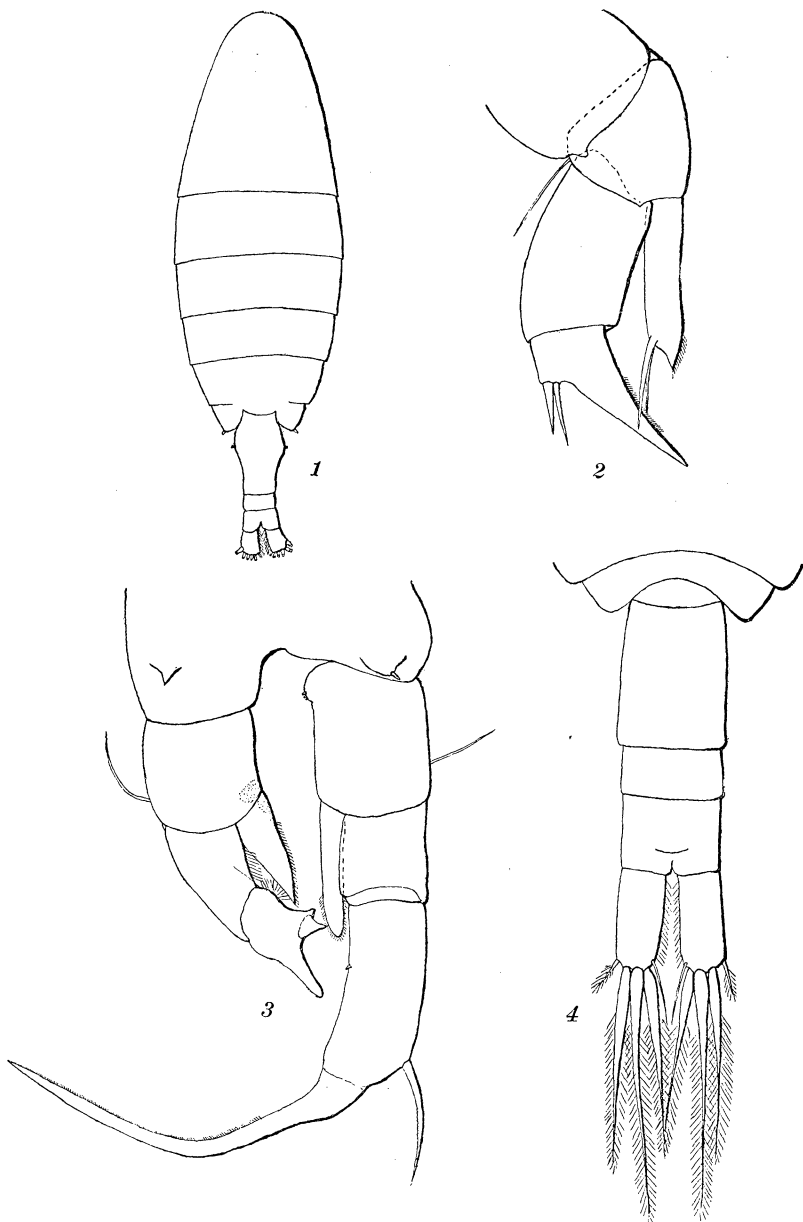


FIG. 1.—*Diaptomus pygmaeus*. Dorsal view of female. $\times 66$.

FIG. 2.—*Diaptomus pygmaeus*. Left fifth foot, female. $\times 343$.

FIG. 3.—*Diaptomus pygmaeus*. Left fifth foot, male. $\times 290$.

FIG. 4.—*Epischura massachusettsensis*. Abdomen, female. $\times 65$.

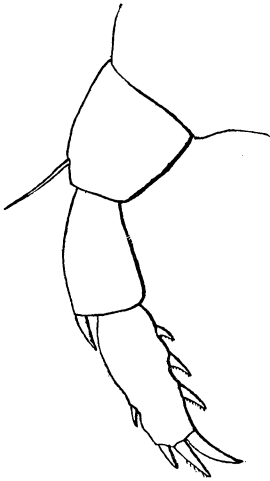


FIG. 5.—*Epischnura massachusettsensis*. Fifth foot, female. \times 155.

Fifth foot (Fig. 5) uniramose, three segmented. First segment about as broad as long, slightly tapering toward its free end; armed at outer distal angle with a slender spine. Second segment two thirds as broad as long, slightly longer than preceding segment, armed on distal end with a sharp spine at outer angle. Third segment half as broad as long and one third longer than second segment, armed on inner margin with three strong acute spines which are denticulate on the outer side; at the apex with three strong spines (middle one denticulate) the innermost of which is longest, being one third the length of the segment; on the outer margin at the distal third armed with a small strong spine.

Length of female 2.04–2.81 mm.

Genus *DIAPTOMUS* Westwood

? *Diaptomus ashlandi* Marsh.—A single specimen, doubtfully identified as belonging to this species, was taken at Cambridge, May 5, 1905.

Diaptomus leptopus Forbes.—This species was common from the middle of May to the middle of October. Localities: Cambridge, Medford, Wellesley.

Diaptomus sanguineus Forbes.—Collected at Wellesley and Medford in April and May.

Diaptomus pygmæus n. sp.

Figs. 1–3

Description.—A rather slender species of small size as the name indicates. The cephalothorax (Fig. 1) is widest at the middle; first segment is thrice the length of the following ones, which are about equal; last two segments are confluent above; last segment produced posteriorly and armed on each side with a short acute spine. First abdominal segment dilated laterally and armed on each side with a minute spine; second segment shorter than the third which equals the furca. The furca are two thirds as wide as long and hairy on the inner margin.

Antennæ twenty-five-segmented; in the female reaching beyond tips of furcal setæ and in the male to the ends of furcal rami. Male right antenna not swollen anterior to geniculate joint; antepenultimate segment without special armature.

First basal segment of right fifth foot of male (Fig. 3) slightly longer than broad and bearing a tubercle at its outer distal angle which is armed with a sharp strong spine. Second basal segment three fourths as broad as long; provided with a tubercle bearing three minute spines at the inner distal angle, and the usual hair on the outer margin. First segment of the outer ramus is as broad as long and has a ridge projecting on its caudal surface near the distal end. Second segment of the outer ramus is two and one half times as long as wide and bears a small spine on its inner margin; outer margin has a long spine more than half as long as the segment, which is placed slightly beyond the beginning of its proximal third and is denticulate on its inner margin. Terminal hook about twice as long as the preceding segment, not strongly tapering; curved somewhat sharply near the center; inner margin denticulate throughout its outer three fourths. Inner ramus of right fifth foot, one-segmented; extending well beyond the end of the first segment of the outer ramus; hairy at the distal end on both margins.

Basal segment of male left fifth foot broader than long; armed with a spinous process at its outer distal angle. Second basal segment about as broad as long; provided with the usual hair, and roughened at its inner distal angle. First segment of the outer ramus longer than preceding segment; twice as long as broad; inner surface hairy. Second segment hairy on inner proximal surface; armed with a long finger-like terminal process and also with a shorter conical process on the projecting inner surface; the latter is separated from the rest of the segment by a suture. Inner ramus one-segmented; broad at base and strongly tapering; hairy on outer two thirds of inner surface and rough on basal third; about as long as first segment of outer ramus.

First basal segment of female fifth foot (Fig. 2) produced at the outer distal angle. Second basal segment triangular and bearing the usual hair on the outer margin. First segment of outer ramus almost twice as long as wide; slightly arcuate. Terminal segment about equal to the preceding in length; slightly curved; denticulate on the middle third of its inner margin; armed on the outer side with two spines, the inner of which is one third as long as the segment and the outer one somewhat less. The inner ramus is longer than the first segment of the outer ramus; acutely pointed; hairy on inner surface at the tip; armed with two spines slightly more than one half as long as the segment.

Length: female, 1.0–1.09 mm.; male, 0.97–1.0 mm.

This species strongly resembles *D. reighardi* Marsh, but differs from it in enough points to be easily distinguished. Specimens

have been examined from Arlington, Brighton, Cambridge, and Wood's Hole, which were taken in June, July, and August. It therefore seems probable that this species is common in eastern Massachusetts during the summer months.

***Diaptomus spatulocrenatus* n. sp.**

Figs. 6-9

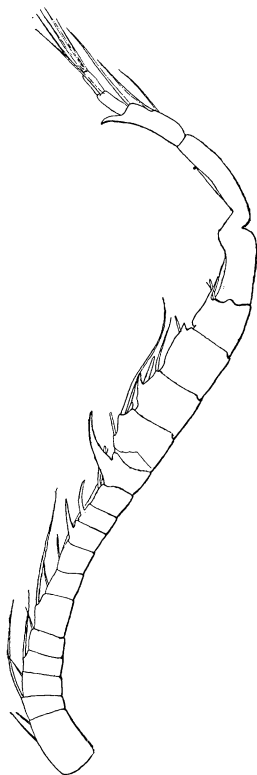


FIG. 6.—*Diaptomus spatulocrenatus*. Right antenna, male. $\times 88$.

Description.—Cephalothorax robust and six-segmented. The first segment is three fourths the length of the cephalothorax, shows a dorsal transverse groove at about its middle. Last two segments indistinct on the dorsal surface. Last segment produced posteriorly and armed with two sharp spines on each side (Fig. 7). Abdomen stout, first segment longer than the remainder of the abdomen; second segment one sixth as long as first and one half as long as third. Furcal rami one fourth longer than wide; hairy on inner margin.

Antennæ twenty-five-segmented; those of the female extending to the tips of the furca.

Right antenna of male (Fig. 6) geniculate; swollen from the eleventh segment to the geniculate joint; twelfth segment armed with a strong pointed process which is longer than the segment is wide; ninth and tenth segments armed with shorter processes; antepenultimate segment armed with a sharp curved process which is a little over half as long as the penultimate segment.

Fifth feet of male (Fig. 8) characteristic. First basal segment of left foot reaching almost to end of first segment of outer ramus of right fifth foot; as wide as long; armed on the posterior surface with a long slender spine at the outer distal angle. Second basal segment two thirds as wide

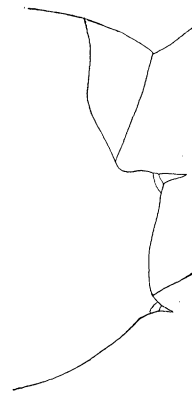


FIG. 7.—*Diaptomus spatulocrenatus*. Left side of female showing end of cephalothorax. $\times 136$.

as long, slightly tapering, the usual hair on the outer margin. First segment of outer ramus not quite half as wide as long, hairy at the inner distal angle. Second segment hairy within, armed at the outer distal angle with a strong blunt process which is minutely denticulate on its inner margin, and at the inner distal angle with a slender hair which is as long as the segment and hairy on the inner margin. Inner ramus two-segmented, reaching almost to tip of outer ramus; first segment one fifth

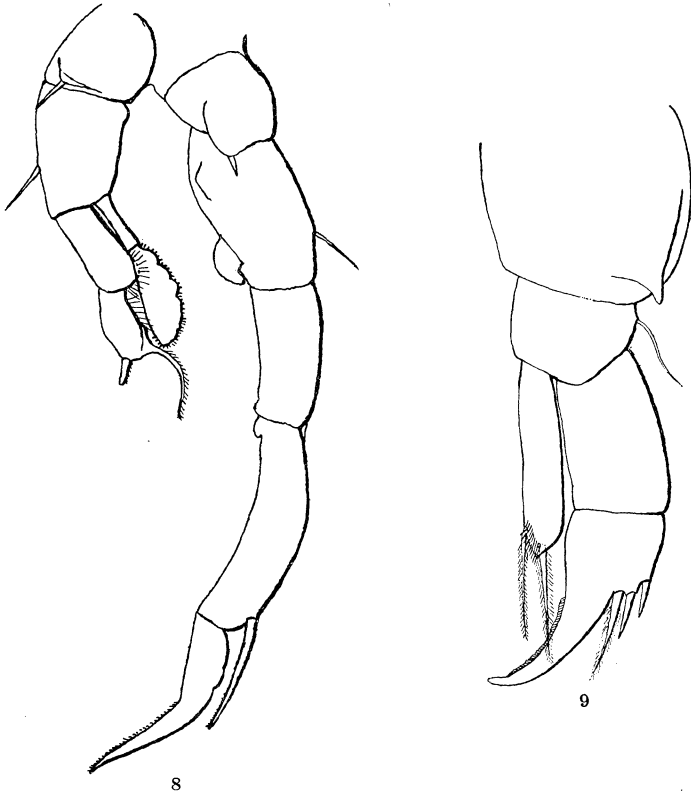


FIG. 8.—*Diaptomus spatulocrenatus*. Fifth feet, male. $\times 168$.

FIG. 9.—*Diaptomus spatulocrenatus*. Right fifth foot, female. $\times 247$.

as wide as long; second segment spatulate, crenate on inner margin, covered with minute hairs at tip and on inner and anterior surfaces. Right fifth foot of male with first basal segment armed at the distal end with a sharp spine; second basal segment armed with a large tubercle on its inner margin at the distal third and the usual hair on the outer margin. Inner ramus rudimentary being represented by a blunt curved process which does not reach beyond the end of the second basal segment. First

segment of outer ramus about as long as second basal segment, over twice as wide as long; second segment nearly twice as long as first, armed at outer distal angle with a stout hook more than one half as long as the segment. Terminal hook stout, tapering, with a sharp curve at about the middle, not quite as long as preceding segment, denticulate on inner margin beyond the sharp curve.

Fifth feet of female (Fig. 9) with the first basal segment bearing a very large pointed process at the outer distal angle; second basal segment armed with the usual marginal hair. Inner ramus one-segmented reaching beyond the first segment of outer ramus, tips hairy and armed with two plumose spines which are more than half as long as the ramus. Outer ramus two-segmented; first segment about twice as long as wide; second segment one third longer than first, curved, bluntly pointed, denticulate on outer two thirds of inner margin and armed with three spines on the outer margin of which the inner one (plumose) is longest and the outer one shortest.

Length: female, 1.47-1.58 mm.; male, 1.30-1.33 mm.

This species somewhat resembles *Diaptomus lintoni* Forbes. The specimens upon which the above description is based, were collected in Wigwam Pond, Nantucket Island, Mass., May 30, 1905, by G. D. Richmond. There were three males and two females. One of the latter was carrying eggs and both bore spermatophores.

Genus CYCLOPS O. F. Müller

Cyclops leuckarti Claus.—Localities: Cambridge, Middlesex Fells.

Cyclops edax Forbes.—Localities: Cambridge, Lexington.

Cyclops viridis insectus Forbes.—The most abundant member of this genus in the collections examined. Localities: Arlington, Cambridge, Brookline, Middlesex Fells, Nantucket, Waltham, Wood's Hole.

Cyclops viridis brevispinosus Herrick.—Localities: Cambridge, Watertown.

Cyclops vernalis Fischer.—Localities: Brookline, Arlington.

Cyclops bicuspidatus Claus.—This is a common species. Localities: Arlington, Cambridge, Middlesex Fells, Nantucket, Waltham.

Cyclops fuscus (Jurine).—Localities: Brookline, Middlesex Fells, Wellesley.

Cyclops albidus (Jurine).—An abundant species. Localities: Arlington, Brookline, Cambridge, Nantucket, Watertown, Wellesley.

Cyclops bicolor Sars.—This species was observed only once at Cambridge, on August 6, 1905.

Cyclops varicans Sars.—Occurred once in a collection made on Nantucket Island, May 30, 1905.

Cyclops serrulatus Fischer.—An abundant species. Localities: Arlington, Brookline, Cambridge, Middlesex Fells, Nantucket, Randolph, Watertown, Wellesley.

Cyclops phaleratus Koch.—Localities: Cambridge, Wellesley.

Cyclops fimbriatus poppei Rehberg.—Localities: Cambridge, Middlesex Fells, Nantucket.

GENUS *CANTHOCAMPTUS* Westwood

Canthocamptus staphylinoides Pearse.—This is an abundant species. Localities: Cambridge, Middlesex Fells, Nantucket, Reading, Wellesley.

Canthocamptus illinoisensis Forbes.—Common in a dredging made October 9, 1905, at Wellesley.

Canthocamptus minutus Claus.—Localities: Middlesex Fells, Stony Brook.

Canthocamptus northumbicus americanus Herrick.—This species occurred in a collection made October 9, 1905, at Wellesley. The length of the female was 1.16 mm. which is longer than Herrick ('95) gives. In other respects the female was similar to his figures in Plate 29. No males were taken.

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