

PROCEEDINGS
OF THE
ZOOLOGICAL SOCIETY OF WASHINGTONEURYTEMORA RICHINGSI, A NEW SPECIES OF
DEEP-WATER CALANOID COPEPOD FROM THE
ARCTIC OCEAN¹

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There are 32 described species of *Eurytemora* of which 12 are considered to be synonyms (Table 1) (Giesbrecht and Schmeil, 1898; Sars, 1902; Gurney, 1931, 1933; Smirnov, 1931). Of the 20 valid *Eurytemora* species (Table 2), 7 are restricted to fresh water, 7 are found in both fresh and brackish water, and 4 occur only in brackish water. *Eurytemora affinis*, *E. herdmanni*, and *E. pacifica* are the only species known to live also in marine waters, but usually they have been found close to shorelines and always above a continental shelf. This paper describes a new species, *E. richingsi*, from deep samples collected in the Canada Basin of the Arctic Ocean. *Eurytemora richingsi* is the first *Eurytemora* species to be reported only from a marine environment.

Gurney (1931) suggested the possibility that *Eurytemora* may have evolved from the marine genus *Temora* in the "arctic sea of glacial times." The genus has a definite northern distribution and it is therefore not surprising to find an Arctic marine representative.

Eurytemora richingsi was collected from Fletcher's Ice Island (T-3) using 1-m closing nets with mesh aperture of 0.110 mm (Damkaer, 1975). Figures were drawn with the aid of a Wild M20 drawing tube. The letter after each figure legend refers to the 0.10-mm scale to which the figure was

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Table 1. *Eurytemora* synonymy.

<i>E. affinis</i> (Poppe, 1880)	<i>E. lacustris</i> (Poppe, 1887)
<i>E. inermis</i> (Boeck, 1865)	<i>E. intermedia</i> Nordquist, 1887
<i>E. hirundo</i> Giesbrecht, 1881	<i>E. pacifica</i> Sato, 1913
<i>E. hirundoides</i> (Nordquist, 1888)	<i>E. johanseni</i> Willey, 1920
<i>E. americana</i> Williams, 1906	<i>E. velox</i> (Lilljeborg, 1853)
<i>E. thompsoni</i> Willey, 1923	<i>E. lacinulata</i> (Fischer, 1853)
<i>E. transversalis</i> Campbell, 1930	<i>E. clausii</i> (Hoek, 1878)
<i>E. kieferi</i> Smirnov, 1931	<i>E. adleri</i> Schiklejew, 1931
<i>E. canadensis</i> Marsh, 1920	
<i>E. tolli</i> Rylov, 1922	

drawn. Body length measurements were taken from specimens in glycerine, from the anterior border of prosome to posterior edge of uropods.

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Eurytemora richingsi, new species

Figures 1-17

Material studied: Holotype female, 1.68 mm (USNM 154756) 1000-500 m, 83°14'N, 153°48'W, 12 June 1968; allotype male, 1.52 mm (USNM 154757) 400-350 m, paratypes, 1 female and 1 male (USNM 154758) 500-400 m, 83°14'N, 154°2'W, 10 June 1968.

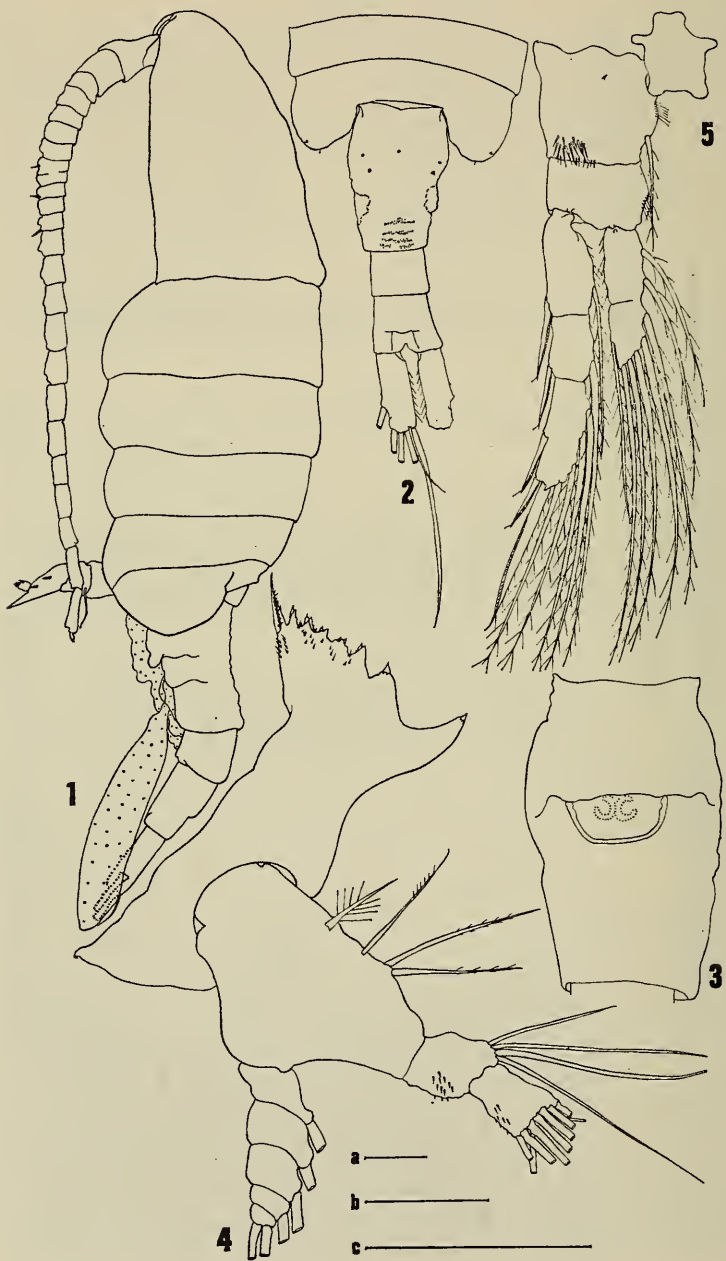
Female: Body with moderately stocky prosome (Fig. 1). Length about 1.74 mm (4 specimens, 1.68-1.80 mm). Last prosomal segment (Fig. 2) with rounded corners, hyaline margins slightly produced ventrolaterally. Cephalic segment with depression in lateral view. Genital segment (Fig. 2) lateral margins asymmetrical, with circumscribed hyaline areas where some *Eurytemora* species have protrusions; most surfaces rugose; rows of minute spinules on distal third of dorsal surface. Genital operculum protruding ventrally, about twice as wide as long (Fig. 3). Uropod length approximately equal to that of anal segment; inner marginal hairs. All specimens with damaged uropodal setae except dorsal and innermost terminal setae.

Rostral filaments extend to half the width of first antenna basal segment. First antenna reaching to distal edge of prosome, 25-segmented; 8-9 and 24-25 with incomplete sutures. Numerical armature (Table 3)

Table 2. Characteristics of *Eurytemora* species, compiled from literature.

	Length, mm		Metasomal wings	Anal segment/ Uropod*	Environment	
	Female	Male			Fresh	Marine
<i>E. affinis</i> (Poppe, 1880)	0.80-1.90	0.75-1.65	+ ⁰	7/17	+	+
<i>E. americana</i> Williams, 1906	1.14-1.85	0.75-1.60	+	4/7	+	+
<i>E. anadryensis</i> Borutsky, 1960	1.30-1.60	1.20-1.40	+	2/3	+	
<i>E. arctica</i> Wilson & Tash, 1966	1.85-2.02	1.56-1.65	+	6/11	+	
<i>E. asymmetrica</i> Smirnov, 1935	1.74-1.95	1.60-1.79	+	3/4		+
<i>E. bilobata</i> Akatova, 1949	1.58		+	1/2	+	
<i>E. canadensis</i> Marsh, 1920	1.30-2.30	1.20-2.10	0	1/2	+	
<i>E. composita</i> Keiser, 1929	1.21-1.46	1.07-1.20	+	7/9	+	+
<i>E. foreola</i> Johnson, 1961	1.12-1.25	1.00-1.20	+	1/2	+	+
<i>E. gracilicauda</i> Akatova, 1949	1.54-1.65	1.16-1.33	+	1/2	+	+
<i>E. gracilis</i> (Sars, 1898)	1.20-1.40	1.25-1.30	+	9/13	+	+
<i>E. grimmeri</i> (Sars, 1897)	1.50-1.70	1.30-1.40	0	11/17	+	+
<i>E. herdmani</i> Thompson & Scott, 1897	1.05-1.60	1.16-1.50	+	6/11		+
<i>E. kurenkovi</i> Borutsky, 1960	1.23-1.40	1.02-1.12	+	2/5		
<i>E. lacustris</i> (Poppe, 1887)	1.10-1.40	1.10-1.30	0	2/3	+	+
<i>E. pacifica</i> Sato, 1913	0.99-1.46	0.99-1.16	+ ⁰	8/9		
<i>E. raboti</i> Richard, 1897	1.20-2.20	1.10-2.10	+	1/2	+	+
<i>E. richingsi</i> new species	1.68-1.80	1.40-1.56	0	1/1		+
<i>E. velox</i> (Lilljeborg, 1853)	1.30-2.20	1.20-1.80	+	10/11	+	+
<i>E. wolterecki</i> Mann, 1940	1.09-1.16	0.97-1.04	+	12/13	+	
<i>E. yukonenensis</i> Wilson, 1953	1.64	1.38	+	7/9	+	+

* Relative lengths of anal segment and uropods (terminology after Bowman, 1971).



typical for the genus, except segment 10, with a seta in addition to the usual spine.

Mandible (Fig. 4) with wide gap on blade separating outer denticle. Hyaline setules between and at bases of some denticles and anterior edge. Second antenna, first maxilla, second maxilla, and maxilliped with setation and segmentation typical for the genus.

Leg 1 (Fig. 5) atypical for the genus: endopod with 8 instead of 6 setae, and incipient segmentation on anterior surface. Anterodistal cluster of setules on first basipod. Legs 2-4 (Figs. 6-8) with segmentation and setation typical for the genus; exopods with hyaline pointed cusps at anterior base of each spine. Legs 1-4 with outer exopod spines trowel-shaped, posterior view; each edge with hyaline serrated flange, usually apparent in anterior view. Sars' (1902) figure of *Eurytemora velox* leg 1, third exopod, is missing a spine, but his illustration of the species as *Temorella lacunculata* (Fischer) in 1897 correctly shows 1 long and 2 short spines.

Leg 5 (Fig. 9) with outer sclerotized margins, conspicuous at posterior articulation of exopod (Fig. 10). First exopod with 2 finely barbed outer spines; robust inner spinous process with anterior and posterior row of short spinules. Second exopod small, oval, with 2 outer and 1 terminal finely barbed, sinuate spines; 2 delicate setules on inner margin.

Male: Body with moderately stocky prosome (Fig. 11). Length about 1.49 mm (4 specimens, 1.40-1.56 mm). Last prosomal segment rounded, not produced. Uropod length about equal to combined length of preceding 2 segments (Fig. 12). Uropodal setae longer than uropod.

First antenna (Table 3) differs from other males in the genus with the additions of an esthete on segments 4 and 5, a seta on left segment 10, and a spine on right segment 10 (Fig. 13). Right and left segment 5 with 1 elongate and 1 short esthete; delicate setules on segments 4, 5, and 7. Esthetes on right and left segments 11, 13, and 15 elongate, with dilated bases. Left segment 17 with elongate esthete. Right segments 6-11 ridged and curved with dorsal coalescence; segments 13-16 expanded; segment 16 (Fig. 14) with 2 spinous protuberances partially covering 2 pores, a setule between them; segments 17-19 each with complex sclerotized pointed processes bearing scale-like modified setules, geniculation between 18, 19. Second antenna, mandible, first maxilla, second maxilla, and maxillipeds like those of female.

Legs 1-4 similar to those of female. Leg 5 (Figs. 15-16) with first basal segments fused left to right. Left ramus 3-segmented: second basal segment and first exopod robust; second exopod mitten-shaped

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FIGS. 1-5. *Eurytemora richingsi* new species, female: 1, Lateral (a); 2, Posterior of prosome and urosome, dorsal (a); 3, Genital segment, ventral (b); 4, Right mandible (c); 5, Leg 1, anterior (b).

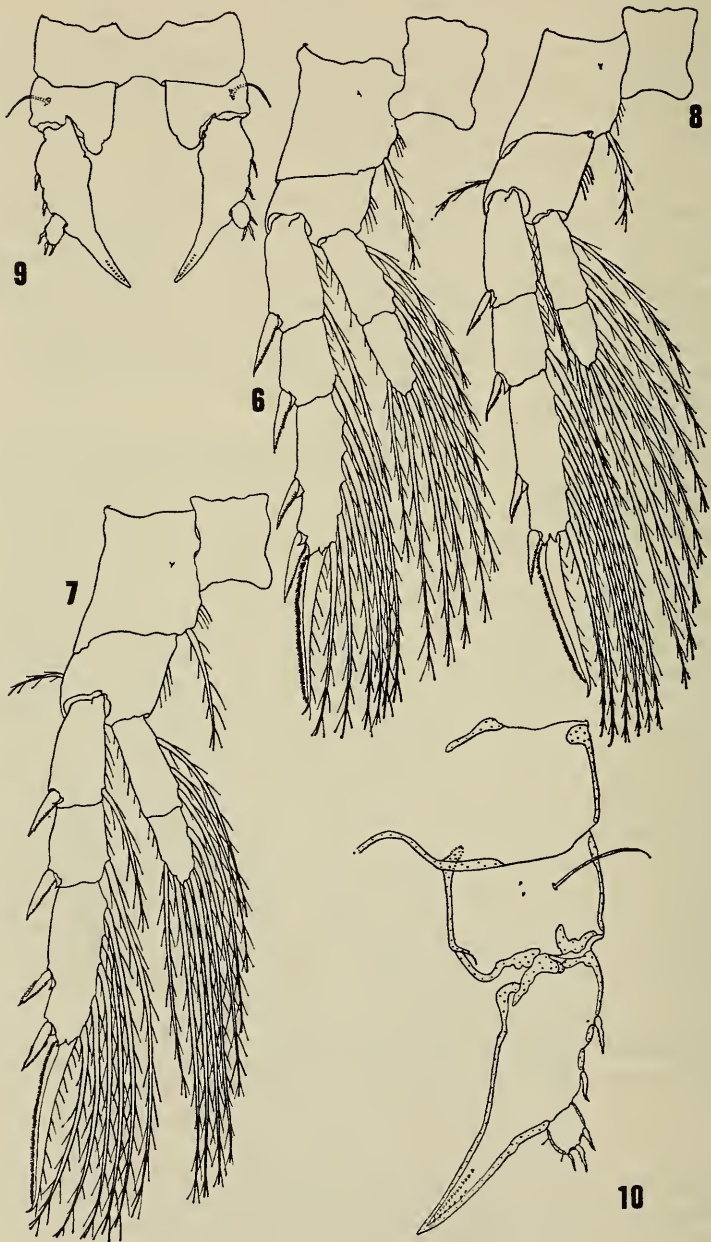


Table 3. *Eurytemora richingsi* first antenna armature: s = seta; e = esthete; Sp = spine;) = adjacent segments fused.

Segment	Male						Segment	Male												
	Female			Left				Right			Female			Left			Right			
	s	e	Sp	s	e	Sp		s	e	Sp	s	e	Sp	s	e	Sp	s	e	Sp	
1	3	1		3	1		3	1		13	2		2	1		2	1		2	1
2	3	1		3	1		3	1		14	2	1	2	1		2	1		2	1
3	2	1		2	1		2	1		15	2		2	1		2	1		2	1
4	1			1	1		1	1		16	2	1	2	1		2	1		2	1
5	2	1		2	2		2	2		17	2		2	1		2	1		1	1
6	1			1	1		1	1		18	2		2	1		2	1		1	1
7	2	1		2	1		2	1		19	2	1	2	1		2	1		1	1)
8)		1		1	1		1	1		20	1		1			1			1)
9)	2	1		2	1		1	1	1	21	1		1			absent				
10	1	1		1	1	1		1	2	22	2		2			2			2)
11	2	1		2	1		1	1	1	23	2	1	2	*		2	1		2	1)
12	1	1	1	1	1	1		1	1	1	1	1	6	1		6	1		6	1)
										24)										
										25)										

* Only 1 male had a complete left antenna; lack of the typical esthete on segment 23 should be verified.

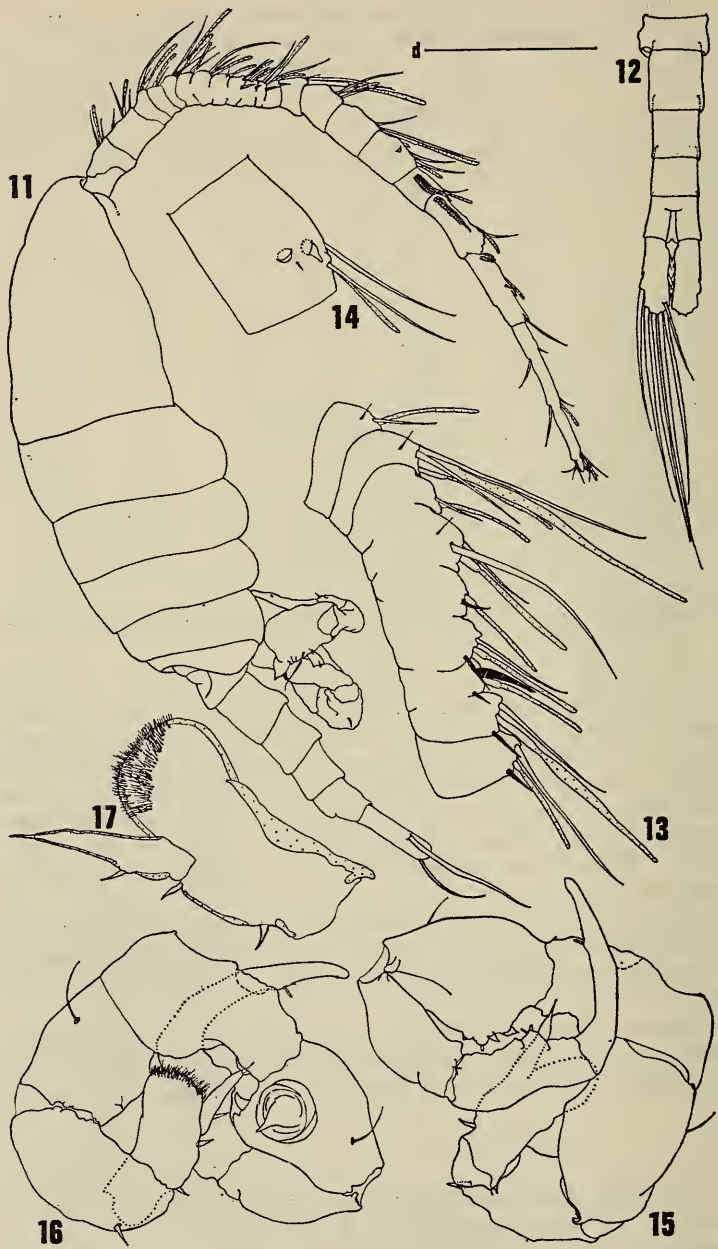
(Fig. 17), with 2 outer spines and 2 spines on the articulated thumb; dense clusters of setules on distal surfaces, margins heavily sclerotized. Right ramus 4-segmented: second basal segment robust, with prominent posterior boss; inner margin dilated, with 3 sclerotized petaloid flaps and 1 blunt hyaline spine. First exopod with distal sclerotized constriction. Second exopod with 1 setule and 1 spine on rugose inner margin. Third exopod a curved claw with a spine and 2 spinules on inner margin.

Etymology: This species is named for the late Michael Kent Richings, Department of Oceanography, University of Washington, in memory of his dedication to the Arctic field program, in which he participated for many years.

Remarks: *Eurytemora richingsi* was found in only 3 samples from a collection of 54 samples taken from May–September 1968. Most of these samples were taken in 500 m intervals between 3000–500 m; others

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FIGS. 6–10. *Eurytemora richingsi* new species, female: 6, Leg 2, anterior (b); 7, Leg 3, anterior (b); 8, Leg 4, anterior (b); 9, Leg 5, anterior (b); 10, Left leg 5, posterior (c).



were from shorter intervals from 500 m to the surface. Salinities at depth were: 34.607‰ (275 m), 34.751‰ (325 m), 34.857‰ (375 m), 34.927‰ (450 m), and 34.886‰ (1000 m). Three of the 4 females had a spermatophore attached to the ventral surface of the genital segment, each spermatophore fixed securely and similarly, with the distal part directed to the left (see Fig. 1).

Comparison with other species of Eurytemora: Only 3 other species have such short uropods in relation to the anal segment, *E. pacifica*, *E. velox*, and *E. wolterecki*. Leg 1 endopod differs from all other species of the genus with the presence in *E. richingsi* of an outer seta and an additional inner seta. *Eurytemora richingsi* is one of 4 species whose females have not been found with conspicuous wings. *Eurytemora affinis* and *E. pacifica* occur with and without wings (Gurney, 1931; Johnson, 1961; Heron, 1964) (Table 2).

Eurytemora richingsi female leg 5 has 3 short spines on exopod 2 in place of the typical 1 long and 1 shorter spine or seta. Male leg 5 left exopod 2 with distinctive mitten shape and articulated thumb. Several other *Eurytemora* species have bulbous projections on the left terminal exopod, but none is described as being articulate.

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FIGS. 11-17. *Eurytemora richingsi* new species, male: 11, Lateral (a); 12, Urosome, dorsal (a); 13, Right first antenna, segments 4-12, spines solid (d); 14, Right first antenna, segment 16 (d); 15, Leg 5, anterior (b); 16, Leg 5, posterior (b); 17, Left leg 5, second exopod, anterior (c).

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