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THE CALIGID COPEPOD GENUS DENTIGRYPS (CRUSTACEA: CALIGOIDA)

By Alan G. Lewis[1]

Introduction

The genus *Dentigryps* was erected by C. B. Wilson (1913) for *D. curtus*, which Wilson described on the basis of six female specimens taken from the mouth and gill cavities of *Mycteroperca venenosa apua* (Bloch) in Bermuda. Only one additional species has since been described in the genus, *D. bifurcatus* Lewis (1964), although several closely allied species have been described in other genera without any comment on their affinities with *Dentigryps*.

Wilson (1913) indicates that *Dentigryps* may be a connecting link between several genera which include representatives of the families Caligidae and Euryphoridae. This implication is discussed following the description of the four species included in this survey.

This work is based largely on material, including the types of the new species, deposited in the collections of the United States National Museum. The specimens were collected from fishes taken in Florida, the Hawaiian Islands, and at Eniwetok Atoll in the Marshall Islands. The author was assisted by a Sigma Xi RESA grant-in-aid for the summer of 1961. He is grateful for this and for the aid given to him

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by the U.S. Atomic Energy Commission and the Eniwetok Marine Biological Laboratory during the time that the Eniwetok Atoll collections were being made. The loan of some specimens of *Dentigryps curtus* by the division of marine invertebrates, U.S. National Museum, is also deeply appreciated. Additionally, the assistance given to the author by Eugene Shinn, David Au, John Shoup, Samuel Kaolulo, and Lester Zukeran in the collection of the fish hosts greatly facilitated the study.

The drawings included in the figures were made in one of two ways: The entire animal was drawn, with the aid of a Bausch and Lomb Tri- simplex microprojector provided by the University of New Hampshire Central University Research Fund, from specimens stained in Methyl Blue, placed in 85 percent lactic acid and covered with a 9-mm. cover slip; the appendages and processes were drawn, with the aid of a camera lucida, either in situ on the wholemount or removed and mounted in Hoyer's mounting medium. Measurements of the copepods and their component parts were made with an ocular micrometer.

In the figures the ♂ and ♀ signs are used separately under each drawing to indicate a difference between the appendage of the female and that of the male, and together (♂♀) to indicate similarity; the sex from which the drawing was made is indicated by a line under the appropriate symbol.

The terminology used is basically the same as that in Lewis (1964). To facilitate the use of the thoracic leg tables, a hypothetical thoracic leg is shown in figure 1, and the component parts of the armament of the legs are shown in tabular form in table 1.

TABLE 1.—*Armature of hypothetical thoracic leg shown in figure 1.*

Leg	Margin	Sternal plate	Protopodite		Exopodite			Endopodite		
			1	2	1	2	3	1	2	3
	outer	m		m, rh	2s	d, dH	H, h, Q, P	C	c	c, 2p' P
	inner		P, s	m, p, s	P, H	c, fH	fh, mH, Q, 2P	P	c, 2P	c, 3P

Subclass Copepoda: Order Caligoida

Genus *Dentigryps* Wilson

Dentigryps Wilson, 1913, pp. 221-222; Lewis, 1964, p. 203.

Diagnosis.—Adult (emended from Wilson, 1913): Total length of body, excluding setae, ranging from slightly more than 2 mm. to over 7 mm., males smaller than females.

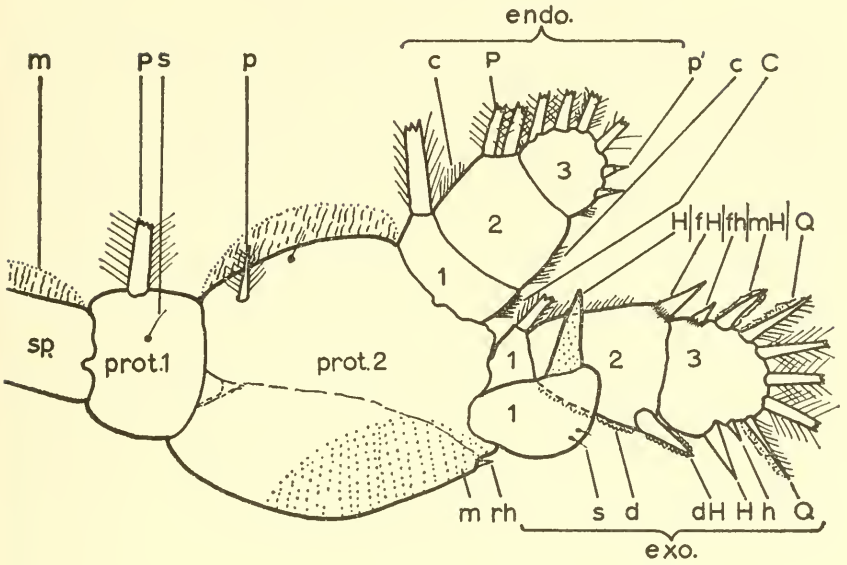

FIGURE 1.—Hypothetical thoracic leg showing the various armament components:

C: heavy fringing setules
c: light fringing setules
d: denticulations
dH: large denticulated spine
endo: endopodite
exo: exopodite
fH: large spine with frill around base
fh: small spine with frill around base
H: large spine
h: small spine
m: membrane
mH: large membrane-margined spine
P: large plumose seta
p: small plumose seta
p': small naked seta
prot.: protopodite
Q: large seta plumose on one side, membrane-margined on other
rh: spinule
s: solitary hairlike process
sp: sternal plate
Numbers: segment numbers

Cephalothorax strongly compressed dorsoventrally, consisting of cephalosome and four thoracic somites, the first bearing a single pair of maxillipeds, the next three pedigerous. Frontal plates present, flattened, with membrane along anterior margin but without lunules. Lateral cephalothoracic margins with membrane. Lateral posterior surfaces with distinct sinus, median portion of posterior surface forming junction with free fourth pedigerous segment.

Free fourth pedigerous segment either partially or completely covered dorsally by extension of median portion of posterior cephalothoracic surface or bearing some indication of dorsal plates. Dorsal plates, if present, very small, not well developed, not overlapping genital segment. Division between fourth pedigerous and genital segments visible, at least laterally, although often indistinct and incomplete.

Genital segment probably consisting of two segments, at least in the male, as indicated by male fifth and sixth legs. Segment well developed, with or without lobate projections of posterior lateral surfaces. Fifth leg of female and male a distinct, dactyliform or acuminate projection without serrations, sixth leg of male usually a small, knoblike projection although sometimes, as in *D. curtus*, similar to but smaller than male fifth leg.

Abdomen 1-segmented. Caudal rami flattened, not filiform, possessing six setalike projections that are all usually plumose.

Antennules 2-segmented, first segment larger than second, with plumose setae on anterior ventral and distal ventral surface of first segment and naked setae on distal end of second except for one naked seta on distal posterior surface. Antennae 3-segmented, prehensile, female with simple, clawlike terminal process, male with complex terminal process often consisting of several parts. Mandibles rodlike, 4-parted, fourth part short, curving inwards, with inner margin denticulated. Postantennal process present, spikelike, with three nodules, each bearing several hairlike processes. Postoral process present, either bifurcate or simple, frequently with either knob or weakly sclerotized acuminate process on inner surface. Maxillae 2-segmented, second segment tipped by two saber-shaped processes.

Maxillipeds 2-segmented, prehensile, with well sclerotized, clawlike terminal process. Maxillipeds of male frequently with small but

TABLE 2.—*Basic thoracic leg armature for members of the genus* Dentigryps.

Leg	Margin	Sternal plate	Protopodite		Exopodite			Endopodite		
			1	2	1	2	3	1	2	3
I	outer		p		rh	3II, P				
	inner		p		c	3P				
II	outer	m		m, p	m, H	H	2H, Q, 2P	c	c	c, P(2-3)[1]
	inner		s, P	m, s	c, P	c, P	c, 3P	P	c, 2P	c, P(3-4)[1]
III	outer	m	m, P[2]		s(2-3)	c, p'[3] c, p', (c), 3p', P[4]	c, 3p', P[3]	c	c,P(2-3)[1]	
	inner		P, s, m, s		P, H	c, P[3] c, 4P[4]	(c), 3P	P	c, P(3-4)[1]	
IV	outer		p		h	H	3H			

[1] The sum of the plumose setae on the segment is six.
[2] May be p.
[3] Members with a 3-segmented exopodite.
[4] Members with a 2-segmented exopodite.
(c): c may be absent.

distinct knoblike protrusion from inner surface of first segment that appears to receive distal end of clawlike terminal process of second segment when segment flexed. Sternal furca present, situated between and slightly posterior to maxilliped bases.

First thoracic leg biramous although endopodite reduced to minute, knoblike rudiment in adult. Protopodite 1-segmented, exopodite 2-segmented, second segment tipped by three spines and one seta (see table 2 for remaining basic armature), inner two spines frequently with small, weakly sclerotized, acuminate projection from inner surface. Second thoracic leg distinctly biramous, protopodite 2-segmented, exopodite and endopodite both 3-segmented. Third thoracic leg biramous, protopodite broad, laminate, 1-segmented, exopodite either 2- or 3-segmented, endopodite 2-segmented. Fourth thoracic leg uniramous, protopodite 1-segmented, exopodite (presumably) 3-segmented, denticulations present either on outer surface of second and third exopodite segments, on one or more terminal spines of third exopodite segment or on both segments and spines.

Dentigryps ulua, new species [2]

FIGURES 2; 3; 4; 12*a,e,i*; 13*a*

(Ulua is the Hawaiian name for many of the carangid fishes.)

MATERIAL.—One adult, nonovigerous female designated as the holotype (USNM 107864) taken by the author from the external surface of specimen of *Caranx melampygus*? Cuvier and Valenciennes, captured in trap between Diamond Head and Koko Head, Oahu, Hawaii, by Samuel Kaolulo. One adult male designated as the allotype (USNM 107865) taken from holotype host. Two ovigerous, two nonovigerous adult females, and 1 adult male designated as paratypes (USNM 107866) taken from holotype host. Four ovigerous females, six nonovigerous adult females, and ten adult males designated as paratypes (retained by author) taken from external surface of several specimens of *Caranx melampygus*? captured in traps between Diamond Head and Koko Head, Oahu, Hawaii, by Samuel Kaolulo.

MEASUREMENTS.—Holotype: Greatest length, excluding caudal setae and fifth legs, 6.90 mm. Greatest length of cephalothorax, including frontal region, 4.50 mm.; greatest width, excluding marginal flanges, 3.60 mm. Greatest length of genital segment, excluding fifth legs, 1.65 mm.; greatest width 1.80 mm. Greatest length of abdomen 0.68 mm. Greatest length of fifth legs 1.37 mm. Greatest length of fifth-leg terminal process 0.07 mm.

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[2] For a comparison of this species with *Lepeophtheirus spinifer* Kirtisinghe, see Discussion (p. 368).

Allotype: Greatest length, excluding caudal setae and fifth legs, 4.88 mm. Greatest length of cephalothorax, including frontal region, 3.30 mm.; greatest width, excluding marginal flanges, 2.78 mm. Greatest length of genital segment, excluding fifth and sixth legs, 0.83 mm.; greatest width 0.98 mm. Greatest length of abdomen 0.30 mm. Greatest length of fifth leg 1.08 mm. Greatest length of fifth-leg terminal process 0.07 mm. Greatest length of sixth leg 0.29 mm. Greatest length of sixth-leg terminal processes 0.18 mm.

For measurements of all specimens, see tables 7 and 8.

Description.—Adult: Body large, female approximately 6–7 mm. in length, excluding setae, male approximately 4.7–5.3 mm. in length, excluding setae. Anterior lateral cephalothoracic margins forming sharply-angled, posteriorly-directed protrusion. Free fourth pedigerous segment slightly covered by posteriorly-projecting median cephalothoracic region, dorsal cuticle appearing as indistinct, platelike structure that does not overlap genital segment. Division between fourth pedigerous and genital segments distinct. Genital segment of female large, lateral posterior surfaces extending posteriorly as distinct, lobate projections. Female and male fifth legs long, heavily sclerotized, extending posteriorly well past posterior end of caudal rami but not past caudal setae, terminating in blunt, scoop-shaped tip bearing plumose setule. Sixth legs of male knob-shaped, with two terminal plumose setules.

First antennular segment with small, heavily sclerotized, shelflike extension of posterior distal surface. Male antenna with terminal

Table 3.—*Armature of thoracic legs I-IV in* Dentigryps ulua, *new species.*

Leg	Margin	Sternal plate	Protopodite		Exopodite			Endopodite		
			1	2	1	2	3	1	2	3
I	outer		sss[1], p		rh	3 mH, P				
	inner		p		c	3P				
II	outer	m		m, p	m, fmII	mII	2mH, Q, 2P	c	c	c, 3P
	inner		s, P	m, s	c, P	c, P	c, 3P	P	c, 2P	c, 3P
III	outer	m	m, p		3s	c, p'	c, 3p', P	c	c, 2P	
	inner		P, s, m, s		P, H	c, P	3P	P	c, 4P	
IV	outer		p		s, fh	d, fmH	d, 2fmH, fdH			

[1] sss: A nodule bearing three hairlike processes.

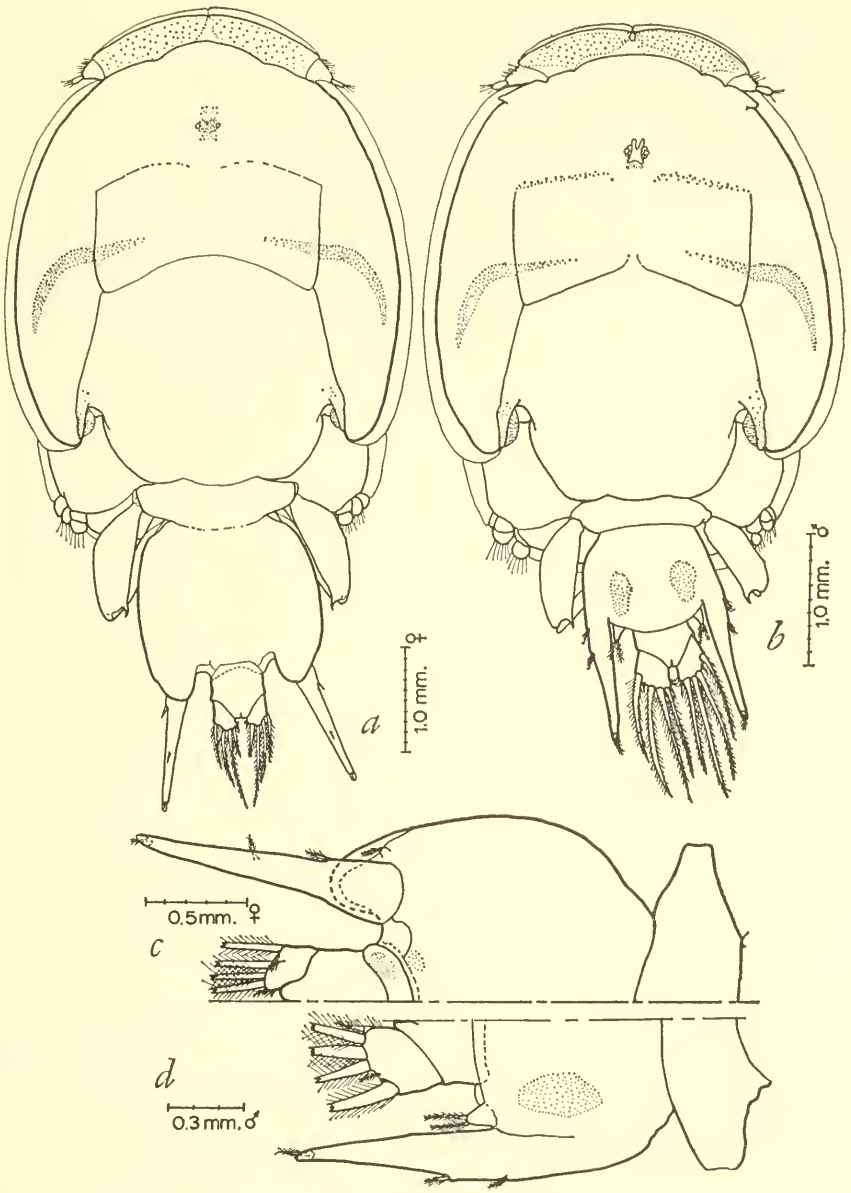

FIGURE 2.—*Dentigryps ulua*, new species: *a*, ♀, dorsal view (holotype); *b*, ♂, dorsal view (allotype); *c*, ♀, ventral view of fourth pedigerous, genital and abdominal segments, fifth leg, and caudal ramus; *d*, ♂, ventral view of fourth pedigerous, genital and abdominal segments, fifth and sixth legs, and caudal ramus.

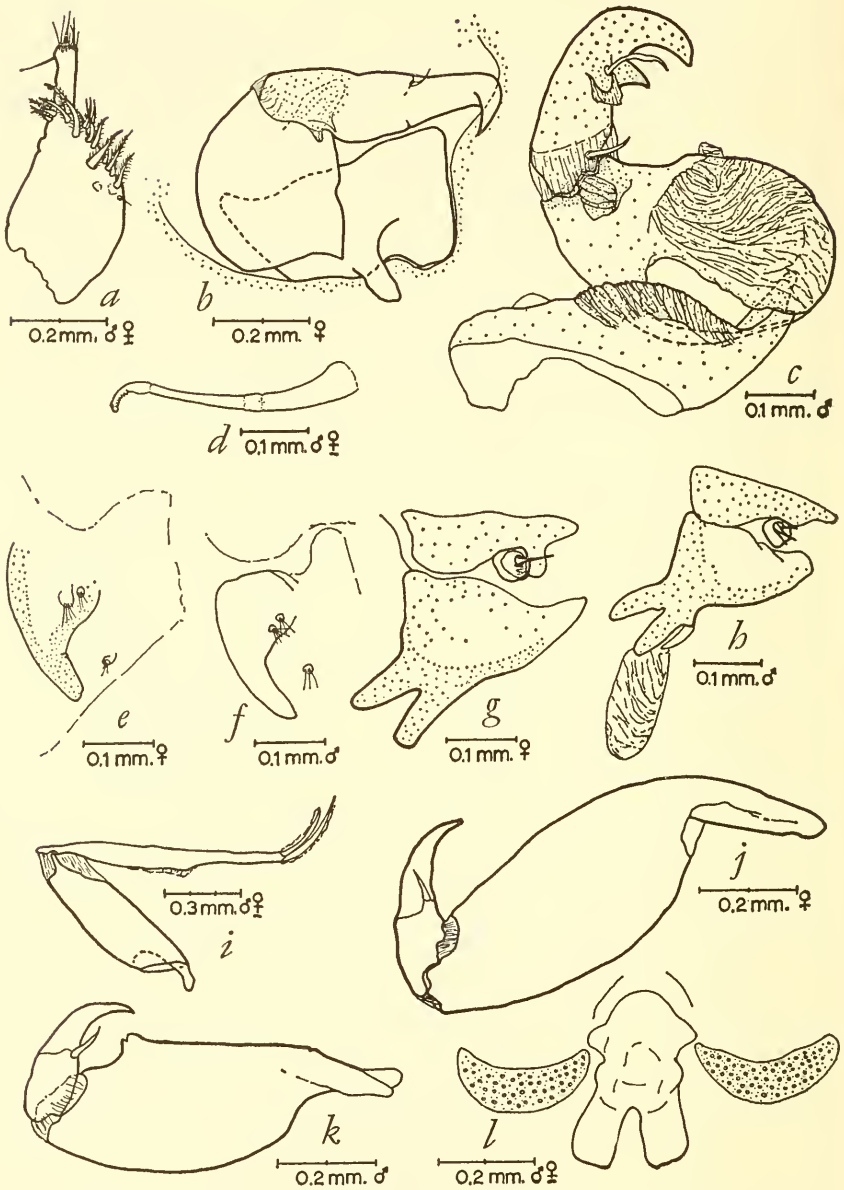

FIGURE 3.—*Dentigryps ulua*, new species: *a*, Antennule; *b*, ♀ antenna; *c*, ♂, antenna; *d*, mandible; *e*, ♀, postantennal process; *f*, ♂, postantennal process; *g*, ♀, postoral process; *h*, ♂, postoral process and adhesion pad posterior to process; *i*, maxilla; *j*, ♀, maxilliped, *k*, ♂, maxilliped; *l*, sternal furca.

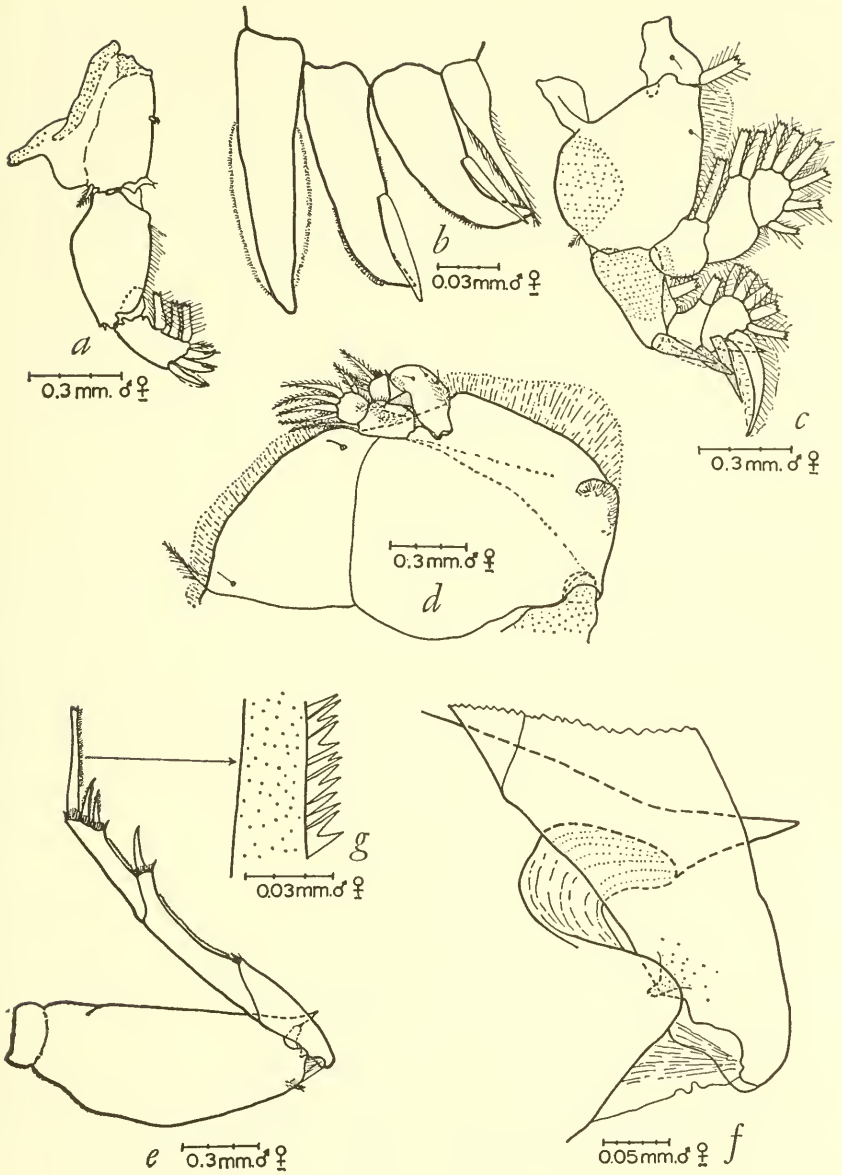

FIGURE 4.—*Dentigryps ulua*, new species: *a*, First thoracic leg; *b*, terminal processes of second exopodite segment of first thoracic leg; *c*, second thoracic leg; *d*, third thoracic leg; *e*, fourth thoracic leg; *f*, proximal end of first exopodite segment and distal end of protopodite; *g*, part of innermost terminal spine with denticulations.

process consisting of bifurcate claw bearing lappet-shaped, membrane-covered process at level of proximalmost furcal ramus. Male with pair of rugose adhesion pads just posterior to mouth cone. Postoral process of female consists of bifurcate protrusion and process-bearing node, of male similar except protrusion constricted at apex of bifurcation and giving rise to short, dactyliform process on inner surface. Sternal furca with chisel-shaped tines. Exopodite of third thoracic leg 3-segmented. Protopodite of fourth thoracic leg with spikelike protrusion of cuticle on inner distal corner.

Dentigryps bifurcatus Lewis, 1964

FIGURES 5; 12*b*,*f*,*j*; 13*b*

Dentigryps bifurcatus Lewis, 1964, p. 203, figs. 17, 18.

LOCALITY.—Hawaii.

HOSTS.—*Acanthurus olivaceous* Bloch and Schneider, *Acanthurus triostegus sandvicensis* Streets, *Naso hexacanthus* (Bleeker).

MATERIAL.—Two nonovigerous adult females and two adult males taken by the author from the external surface of a specimen of *Myripristis* sp. captured by spear in Hanauma Bay, Oahu, Hawaii, by Bruce Walsh. Two adult males taken by the author from the external surface of specimen of *Fistularia petimba* Lacépède taken by trap between Diamond Head and Koko Head, Oahu, Hawaii, by Samuel Kaolulo. One nonovigerous adult female taken by the author from

TABLE 4.—*Armature of thoracic legs I-IV of* Dentigryps bifurcatus *Lewis, 1963.*

Leg	Margin	Sternal plate	Protopodite		Exopodite			Endopodite		
			1	2	1	2	3	1	2	3
I	outer		s?[1], p		h	H, 2mH, P				
	inner		p		c	3P				
II	outer	m		m, p	m, fmdH	mII	dII, mH, Q, 2P	c	c	c, 2P
	inner		s, P	m, s	c, P	c, P	c, 3P	P	c, 2P	c, 4P
III	outer	m	m, P		3s	c, p′	c, 3p′, P	c	c, 3P	
	inner		P, s, m, s		P, II	c, P	c, 3P	P	c, 3P	
IV	outer		p		fh	d, fmII	dm, fmH, fmdH, fmH			

[1] Number of hairlike processes not established with certainty.

a specimen of *Acanthurus olivaceous* Bloch and Schneider captured by trap between Diamond Head and Koko Head, Oahu, Hawaii, by Samuel Kaolulo. All specimens retained by the author.

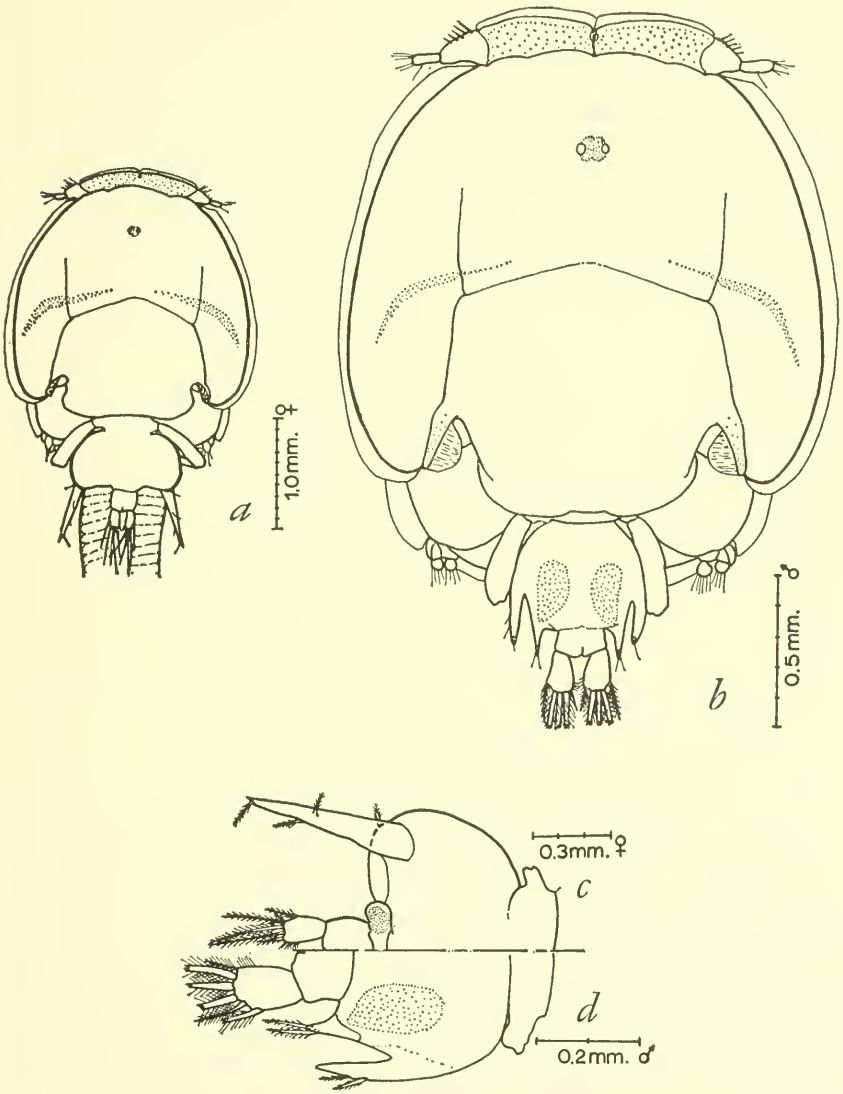

FIGURE 5.—*Dentigryps bifurcatus* Lewis, 1964: *a*, ♀, dorsal view; *b*, ♂, dorsal view; *c*, ♀, ventral view of fourth pedigerous, genital and abdominal segments, fifth leg, and caudal ramus; *d*, ♂, ventral view of fourth pedigerous, genital and abdominal segments, fifth and sixth legs, and caudal ramus.

For measurements of specimens, see tables 7 and 8 under Discussion of the Species.

Description.—Adult: Female approximately 3.0–3.5 mm. in length, male approximately 2.0–2.3 mm., excluding setae. Anterior lateral cephalothoracic margin not forming sharply-angled, posteriorly-directed protrusion. Fourth pedigerous segment of female not covered dorsally by projecting median cephalothoracic region, that of male partially covered. Dorsal cuticle of fourth pedigerous segment indistinctly platelike. Division between fourth pedigerous and genital segments indistinct and incomplete in female, distinct and complete in male. Width of female genital segment slightly less than twice the length. Female fifth legs well developed, heavily sclerotized, extending posteriorly well past caudal rami but not ramal setae, distal end pointed, bearing plumose setule. Male fifth and sixth legs short but distinct, acuminate, projecting posteriorly past posterior end of genital segment. Fifth leg with one plumose setule distally, sixth with two.

Antennule with small, knob-shaped projection of distal posterior lateral surface. Male antenna with terminal process consisting of single, clawlike structure bearing large, bifurcate process from median posterior surface. Male with indistinct indications of pair of adhesion pads posterior to mouth cone base. Third thoracic leg with 3-segmented exopodite.

Dentigryps curtus Wilson

Figures 6; 7; 8; 12*c,g,k*; 13*c*

Dentigryps curtus Wilson, 1913, p. 222, pl. 32, figs. 127–135; Wilson, 1935, p. 331; Yeatman, 1957, p. 346, figs. 1–16; Lewis, 1964, p. 210, figs. 17*d,l*.

Localities.—Bermuda, Dry Tortugas, Fla.

Hosts.—*Mycteroperca venenosa apua* (Bloch), *Mycteroperca tigris* (Cuvier and Valenciennes), *Mycteroperca venenosa* (Linnaeus).

Material.—One ovigerous and three nonovigerous adult females loaned to the author by the U.S. National Museum (USNM 69789), taken by O. L. Williams from the skin of a specimen of *Mycteroperca venenosa* (Linnaeus) captured at Dry Tortugas, Florida. Three ovigerous and three nonovigerous adult females loaned to the author by the U.S. National Museum (USNM 64040), taken by C. B. Wilson from the head of a specimen of *Mycteropreca venenosa apua* (Bloch) captured at Dry Tortugas, Florida. (All U.S. National Museum specimens identified by C. B. Wilson.) Two ovigerous and eleven nonovigerous adult females in addition to one adult male (without caudal rami) collected by Eugene Shinn from the external surface of an unidentified grouper speared off Tennessee Reef, Florida (specimens

retained by author). One adult male collected by the author from the left opercle of an unidentified grouper captured by hook and line off Ft. Lauderdale, Florida (USNM 107871).

For measurements of specimens see tables 7 and 8.

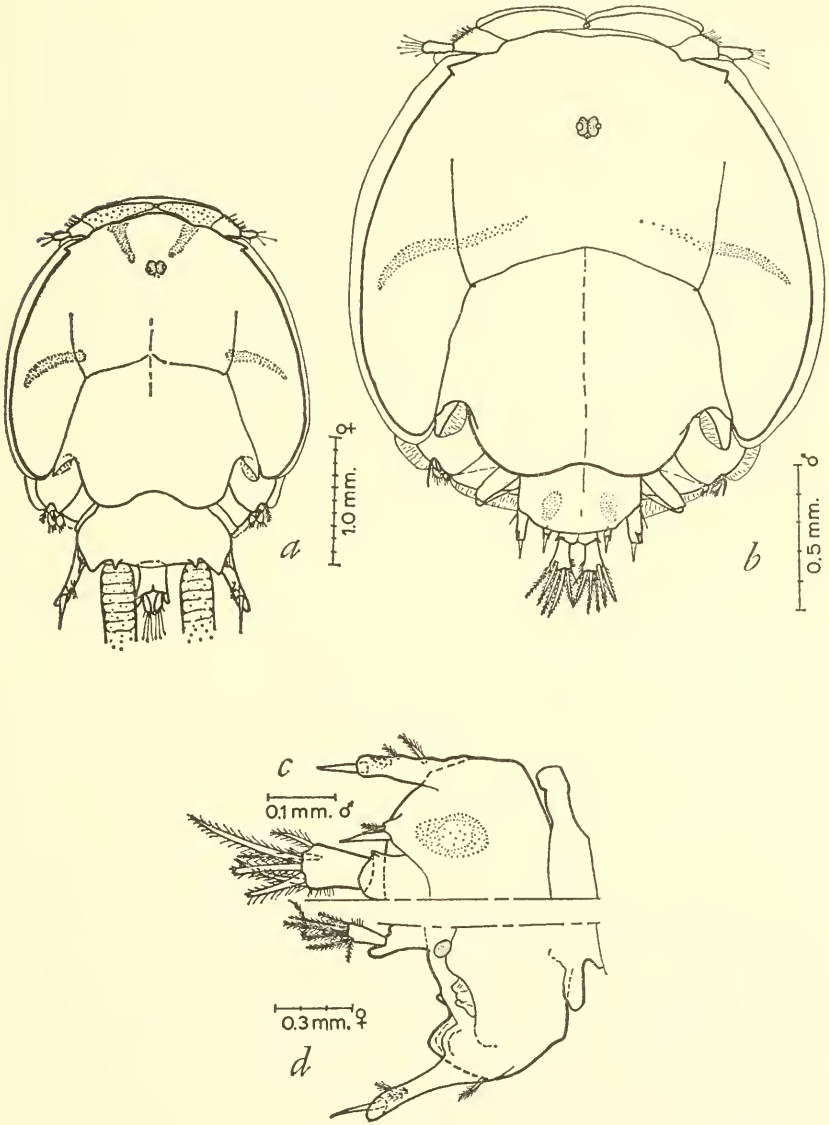

FIGURE 6.—*Dentigryps curtus* Wilson, 1913: *a*, ♀, dorsal view; *b*, ♂, dorsal view; *c*, ♂, ventral view of fourth pedigerous, genital and abdominal segments, fifth and sixth legs, and caudal ramus; *d*, ♀, ventral view of fourth pedigerous, genital and abdominal segments, fifth leg, and caudal ramus.

DESCRIPTION.—Adult: Female approximately 3–4 mm. in length, male approximately 2 mm. (measurement from one specimen), excluding setae. Anterior lateral cephalothoracic margin forming sharply-angled, posteriorly-directed protrusion. Free fourth pedig-

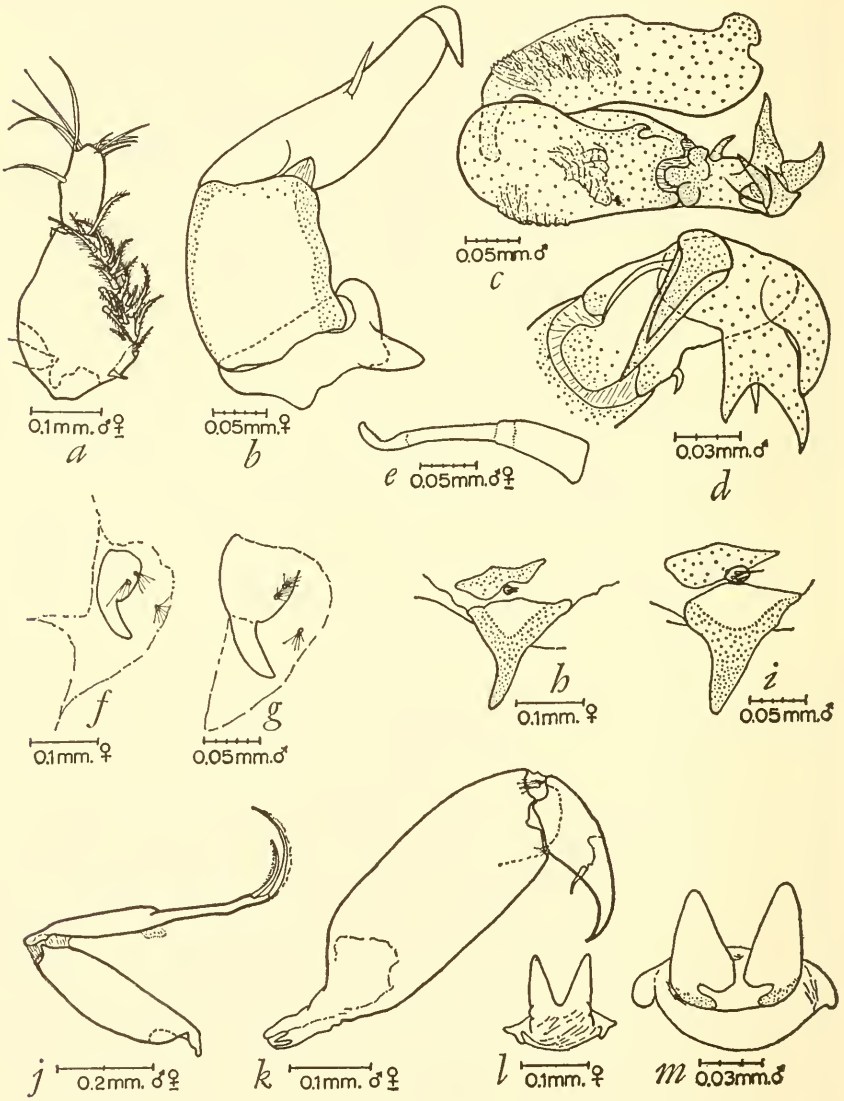

FIGURE 7.—*Dentigryps curtus* Wilson, 1913: *a*, Antennule; *b*, ♀, antenna; *c*, ♂, antenna; *d*, ♂, third segment and terminal process of antenna; *e*, mandible; *f*, ♀, postantennal process; *g*, ♂, postantennal process; *h*, ♀, postoral process; *i*, ♂, postoral process; *j*, maxilla; *k*, maxilliped; *l*, ♀, sternal furca; *m*, ♂, sternal furca.

erous segment of female covered completely or almost completely by median cephalothoracic region, male completely covered by region which also covers anterior end of genital segment. Division between fourth pedigerous and genital segments indistinct in female, distinct in male. Genital segment of female more than twice as wide as long, with pair of small but distinct projections on each lateral posterior dorsal surface. Male genital segment without posterior processes. Female and male fifth legs appearing 2-parted, consisting of well-

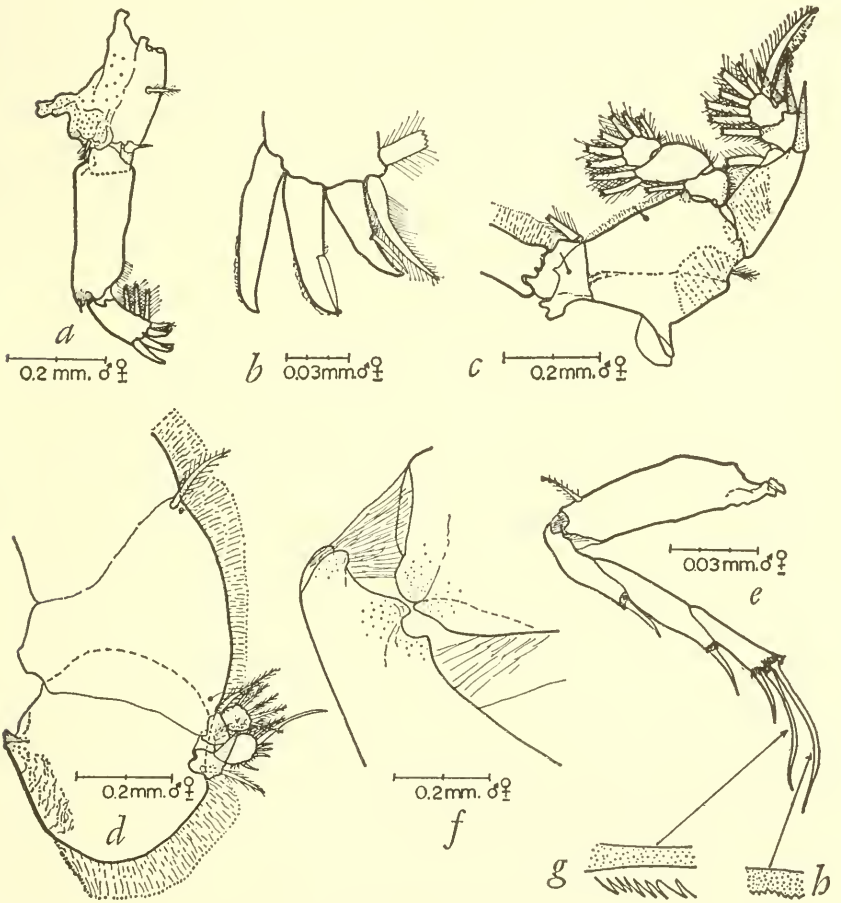

FIGURE 8.—*Dentigryps curtus* Wilson, 1913: *a*, First thoracic leg; *b*, distal end and terminal processes of second exopodite segment of first thoracic leg; *c*, second thoracic leg; *d*, third thoracic leg; *e*, fourth thoracic leg; *f*, proximal end of first exopodite segment and distal end of protopodite of fourth thoracic leg; *g*, denticulations on outer margin of middle terminal spine of fourth thoracic leg; *h*, denticulations on outer margin of inner terminal spine of fourth thoracic leg.

developed, heavily sclerotized proximal portion with scoop-shaped distal end bearing naked but strongly developed spike-shaped terminal seta. Proximal part of leg extending posteriorly to posterior end of abdomen. Male sixth leg short but bearing single, naked, spike-shaped terminal seta. Female with small, lobate extension of posterior lateral abdominal surface, male also with extension but reduced in size.

Distal end of first antennular segment with minute, bifurcate projection of posterior surface. Male antenna with terminal process consisting of double-spined posterior part in which one spine lies above (distal to) other, giving bifurcate appearance in lateral view, additional bifurcate part on anterior lateral portion of process and bearing single accessory process from apex of bifurcation in addition to single, clawlike projection curving anteriorly from base of bifurcation. Third thoracic leg with 2-segmented exopodite, although position and nature of armature elements on outer lateral margin of segment 2 reminiscent of *Dentigryps* species with 3-segmented exopodite (see Discussion of Species).

TABLE 5.—*Armature of thoracic legs I–IV in* Dentigryps curtus *Wilson, 1913.*

Leg	Margin	Sternal plate	Protopodite		Exopodite			Endopodite		
			1	2	1	2	3	1	2	3
I	outer		p		rh	3mH, P				
	inner		p		c	3P				
II	outer	m		m, p	m, mH	mH	2mH, Q, 2P	c	c	c, 3P
	inner		s, P	m, s	c, P	c, P	c, 3P	P	c, 2P	c?, 3P
III	outer	m	m, P		2s	c, p′, c, 3p′, P		c	c, 3P	
	inner		P, s, m, s		P, mH	c, 4P		P	c, 3P	
IV	outer		p		fmH	fmH	3fmdH [1]			

[1] fmdH: A membrane-encircled spine with a denticulated membranous margin.

Dentigryps litus, new species

FIGURES 9; 10; 11; 12*d*,*h*,*l*; 13*d*

(The name "litus," Latin for the coast, the shore, refers to the habitat in which the hosts of this copepod live.)

MATERIAL.—One ovigerous female designated as the holotype (USNM 107867) taken by the author from the external surface of a specimen of *Plectropomus leopardus* (Lacépède) speared by David Au,

John Shoup, and Charles King at Eniwetok Atoll. One adult male designated as the allotype (USNM 107868) taken by the author from the external surface of a specimen of *Epinephelus fuscoguttatus* (Forskål) captured by hook and line at Eniwetok Atoll. Two ovigerous and one nonovigerous adult females in addition to one adult male designated as paratypes (USNM 107869) taken by the author from the external surface of the allotype host. Two ovigerous adult females and one nonovigerous adult female designated as paratypes (USNM 107870) taken by the author from the external surface of a specimen of *Aulostomus chinensis* (Linnaeus) captured by hook and line at Eniwetok Atoll. Three ovigerous females and one adult male designated as paratypes (retained by the author) taken from the external surface of a specimen of *Balistoides viridescens* (Bloch) captured by hook and line at Eniwetok Atoll.

Measurements.—Holotype: Greatest length, excluding caudal setae and fifth legs, 3.56 mm. Greatest length of cephalothorax, including frontal region, 2.80 mm.; greatest width excluding marginal flanges, 2.64 mm. Greatest length of genital segment, excluding fifth legs, 0.58 mm.; greatest width 1.10 mm. Greatest length of abdomen 0.35 mm. Greatest length of fifth leg 0.68 mm. Greatest length of fifth-leg terminal process 0.22 mm.

Allotype: Greatest length, excluding caudal setae and fifth legs, 2.78 mm. Greatest length of cephalothorax, including frontal region, 2.33 mm.; greatest width excluding marginal flanges, 2.18 mm. Greatest length of genital segment, excluding fifth and sixth legs, 0.30 mm.; greatest width 0.53 mm. Greatest length of abdomen 0.11 mm. Greatest length of fifth leg 0.32 mm. Greatest length of fifth-leg terminal process 0.14 mm. Greatest length of sixth leg 0.18 mm. Greatest length of sixth-leg terminal process 0.11 mm.

For measurements of all specimens, see tables 7 and 8.

Description.—Adult: Female approximately 3.4–4.0 mm. in length, male approximately 2.4–2.8 mm., excluding setae. Anterior lateral cephalothoracic margin forming sharply-angled, posteriorly-directed protrusion. Free fourth pedigerous segment of female and male almost, if not completely, covered dorsally by median cephalothoracic region. Division between fourth pedigerous and genital segments indistinct in female, distinct in male. Genital segment of female almost twice as wide as long, without posterior dorsal projections but with two small, irregular ventral projections, in region of oviducal opening. Male genital segment irregularly bell-shaped. Female and male fifth legs appearing 2-parted, consisting of well-developed, heavily sclerotized proximal portion with scoop-shaped distal end bearing plumose, strongly developed, spike-shaped terminal seta. Proximal part of female fifth leg extending posteriorly past

caudal rami but not ramal setae, proximal part of male fifth leg extending slightly past posterior end of abdomen but not past caudal rami. Male sixth leg bearing two plumose terminal setae. Abdomen without small, lobate extensions of posterior lateral surfaces present in *D. curtus*.

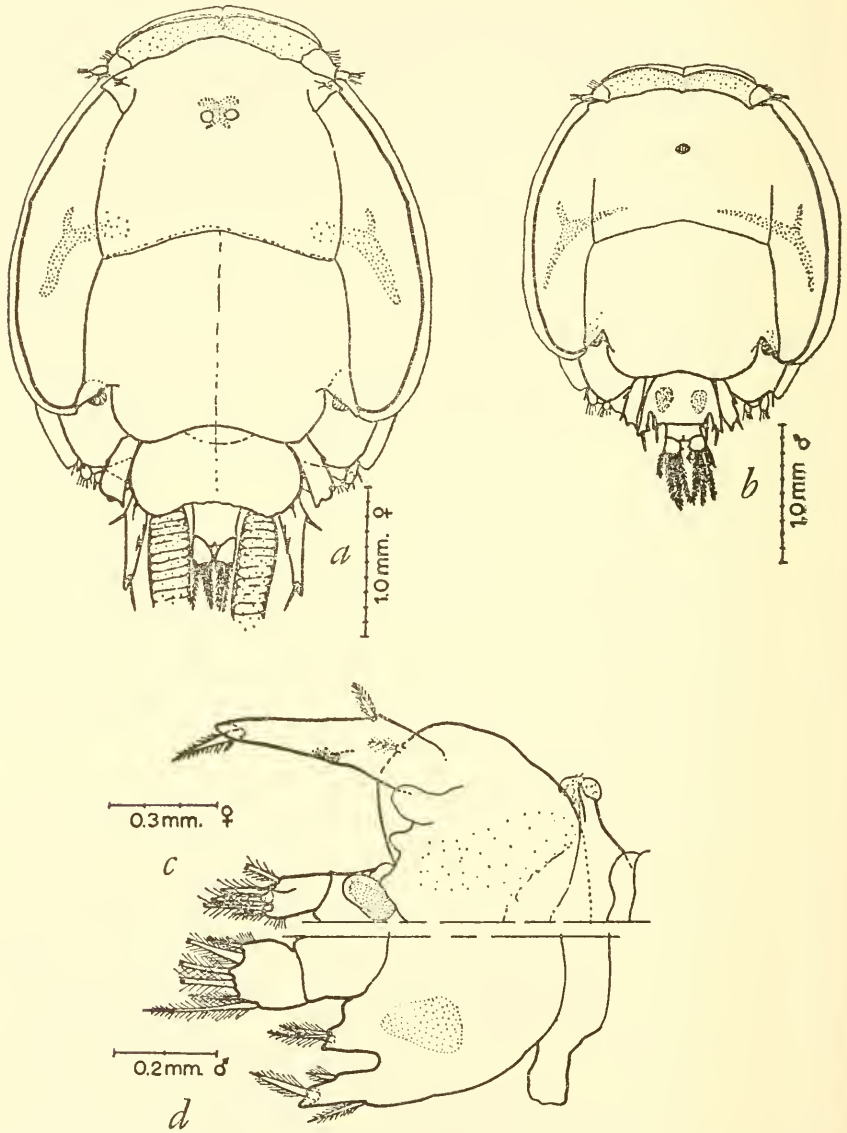

FIGURE 9.—*Dentigryps litus*, new species: *a*, ♀, dorsal view (holotype); *b*, ♂, dorsal view (allotype); *c*, ♀, ventral view of fourth pedigerous, genital and abdominal segments, fifth leg, and caudal ramus; *d*, ♂, ventral view of fourth pedigerous, genital and abdominal segments, fifth and sixth legs, and caudal ramus.

Anterior lateral surface of first antennular segment with single, spike-shaped projection proximally, junction of distal and posterior lateral surfaces forming sharp, slightly projecting point. Male antenna with terminal process consisting of double-spined inner part

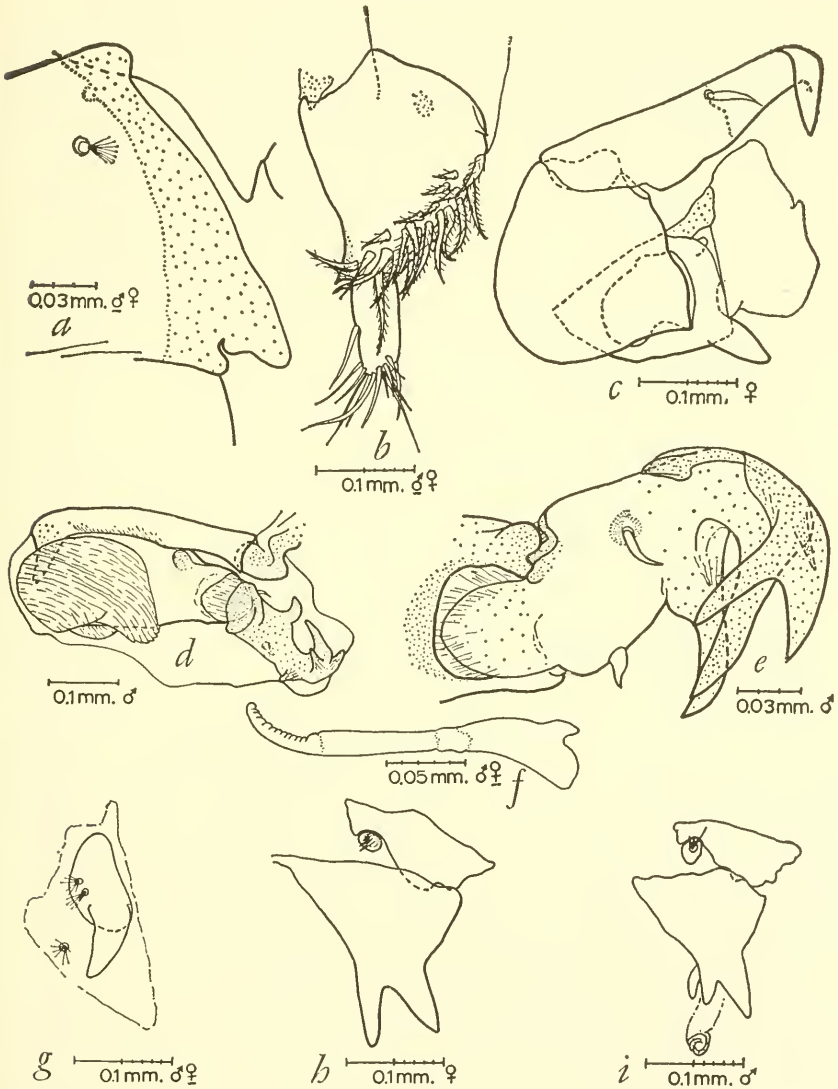

FIGURE 10.—*Dentigryps litus*, new species: *a*, Dorsal view of anterior lateral surface of cephalothorax showing projection of cephalothorax and process-bearing nodule; *b*, antennule; *c*, ♀, antenna; *d*, ♂, antenna; *e*, ♂, third segment and terminal process of antenna; *f*, mandible; *g*, postantennal process; *h*, ♀, postoral process; *i*, ♂, postoral process.

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in which one spine lies above (distal to) other, giving bifurcate appearance in lateral view. Additional armature of male antenna terminal process a bifurcate part in distal region, overlying first, double-spined, part and at right angles to it. Second part bearing single, knoblike projection on anterior surface and one on posterior surface, just proximal to distal part of terminal process. Male with distinct indications of pair of adhesion pads posterior to mouth cone. Third thoracic leg with 2-segmented exopodite but armature of second segment not reminiscent of *Dentigryps* with 3-segmented exopodite as is that of *D. curtus*.

TABLE 6.—*Armature of thoracic legs I–IV in* Dentigryps litus *new species.*

Leg	Margin	Sternal plate	Protopodite		Exopodite			Endopodite		
			1	2	1	2	3	1	2	3
I	outer		ss, p		rh	H, 2mII, P				
	inner		p		c	3P				
II	outer	m		m, p	m, mII	mH	2mH, Q, 2P	C, c	c	c, 2P
	inner		s, P	m, s	c, P	c, P	c, 3P	P	c, 2P	c, 4P
III	outer	m	m, P		3s	c, 4p′, P		c	c, 3P	
	inner		P, s, f, s		P, H	c, 4P		P	c, 3P	
IV	outer		p [1]		frh	fmH	fmH, 2fmdH			

[1] The hook-shaped process on the medial outer surface is considered as an extension of the segment, not part of the associated armature. Hairlike processes are scattered over the surface of the protopodite but are not recorded in this table.

Discussion of the Species

The shape of the cephalothorax is similar in all four species although that of the larger species, *D. ulua*, is slightly more elongate. The anterior region of the lateral cephalothoracic margin is sharply indented in the male of *D. ulua* and in the female and male of *D. curtus* and *D. litus*, and it forms a posteriorly-directed, spikelike projection not present in the female of *D. ulua* or in the female and male of *D. bifurcatus*.

The free fourth pedigerous segment is partially covered by the cephalothorax in the male of *D. bifurcatus* and is almost if not completely covered in both the female and male of *D. curtus* and *D. litus*. The segment is not covered in *D. ulua* and in the female of *D. bifurcatus*. The dorsal cuticle of the fourth pedigerous segment of the female and male *D. ulua* and *D. bifurcatus* appears as an indistinct platelike structure. The junction between the fourth pedigerous segment and genital segment is indistinct and incomplete in the female of *D. bifurcatus*, *D. curtus*, and *D. litus*.

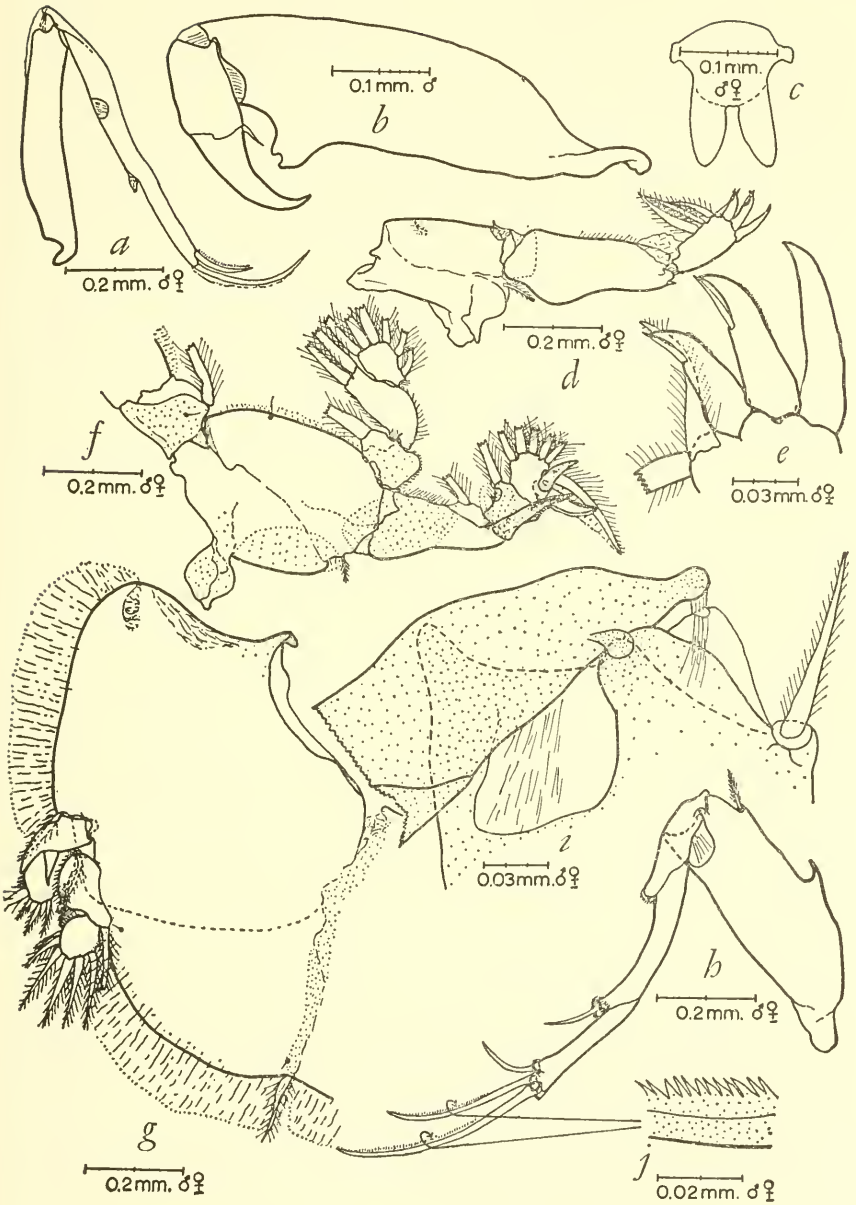

FIGURE 11.—*Dentigryps litus*, new species: *a*, Maxilla; *b*, male maxilliped (see description for difference between male and female); *c*, sternal furca; *d*, first thoracic leg; *e*, distal end and terminal processes of second exopodite segment of first leg; *f*, second thoracic leg; *g*, third thoracic leg; *h*, fourth thoracic leg; *i*, proximal end of first exopodite segment and distal end of protopodite of fourth leg; *j*, part of denticulated inner two terminal spines of fourth leg.

The female genital segment of *D. ulua* has distinct posterior lateral lobes. That of *D. curtus* has two sets of distinct knobs on the posterior surface, the posterior lateral of which may be compared to the posterior lateral lobes of *D. ulua*.

The fifth and sixth legs of the male members of the genus determine at least part of the shape of the segment, due to the association of the legs with the segment. Because of this, no distinct similarities or differences can be shown without discussing the fifth and sixth legs.

The female fifth leg (figs. 12*a–d*) is long and possesses a short terminal process in both *D. ulua* and *D. bifurcatus* and is long and possesses a long and well-developed terminal process in both *D. curtus* and *D. litus*. The only major difference between the female fifth leg of *D. curtus* and that of *D. litus* is that the terminal process of *D. curtus* is naked while that of *D. litus* is plumose.

The male fifth leg (figs. 12*e–h*) of *D. bifurcatus* is spikelike while that of *D. curtus* and *D. litus* is similar, in general makeup, being rather stocky, with a scoop-shaped distal end which gives rise to a naked terminal process in *D. curtus* and a plumose process in *D. litus*, as in the female. The fifth leg of *D. ulua* is much longer than that of *D. curtus* and *D. litus* but, like them, has a scoop-shaped distal end which gives rise to a short process that, in *D. ulua*, is plumose.

The male sixth leg (figs. 12*i–l*) of all four species is short and, in *D. ulua* and *D. bifurcatus*, is of a more generalized nature than the fifth leg. The sixth leg of *D. ulua* is knob-shaped while that of *D. bifurcatus* is spikelike, although with a broad base. The sixth leg of both *D. curtus* and *D. litus* is short and generally knob-shaped but has a scoop-shaped distal end similar to that of the fifth leg. The distal end of the sixth leg of *D. curtus* bears two naked, setalike processes and one plumose seta while that of *D. litus* bears two plumose, setalike processes.

The abdomen of all four species is 1-segmented. The female of *D. curtus* possesses an abdomen with a distinct lobate projection on each posterior lateral surface, while the female of the other three species has either a flat posterior surface, except for the anal indentation, or a biconcave posterior surface which forms the attachment and articulation surface for the caudal rami.

The caudal rami of all four species are fairly similar and do not present differences that appear sufficient to warrant any specific comment.

The antennule appears to present relatively few comparable characteristics, with the exception of one, that of the projection of the posterior distal surface of the first segment present in *D. bifurcatus*, *D. curtus*, and *D. litus*. This projection is heavily sclerotized and, in *D. bifurcatus*, is small and knob-shaped while in both *D. curtus* and

TABLE 7.—*Means and ranges of measurements (in mm.) of female specimens of the four known species of* Dentigryps [1]

Measurement	*D. ulua* (15 specimens)	*D. bifurcatus* (3 specimens)	*D. curtus* (23 specimens)	*D. litus* (10 specimens)
Total length [2]	6. 00–7. 13 (6. 59)	3. 08–3. 45 (3. 28)	3. 15–3. 60 (3. 36)	3. 45–3. 90 (3. 70)
Cephalothorax				
length [3]	4. 05–5. 25 (4. 43)	2. 33–2. 44 (2. 40)	2. 33–2. 63 (2. 45)	2. 70–3. 00 (2. 90)
width [4]	3. 23–3. 83 (3. 58)	2. 10–2. 33 (2. 25)	2. 25–2. 55 (2. 36)	2. 55–2. 93 (2. 68)
Genital segment				
length [5]	1. 05–1. 73 (1. 49)	0. 38–0. 60 (0. 53)	0. 53–0. 75 (0. 61)	0. 45–0. 68 (0. 55)
width	1. 28–1. 95 (1. 68)	0. 75–1. 20 (1. 00)	1. 20–1. 35 (1. 29)	1. 13–1. 20 (1. 17)
Abdomen length	0. 53–0. 68 (0. 62)	0. 23 [6]	0. 23–0. 38 (0. 29)	0. 15–0. 23 (0. 20)

[1] The dash-connected measurements indicate the range, and that in parentheses, the mean.
[2] Excluding setae.
[3] Including frontal region.
[4] Excluding marginal flanges.
[5] Excluding fifth legs.
[6] No variation.

TABLE 8.—*Means and ranges of measurements (in mm.) of male specimens of the four known species of* Dentigryps [1]

Measurement	*D. ulua* (12 specimens)	*D. bifurcatus* (4 specimens)	*D. curtus* (1 specimen)	*D. litus* (3 specimens)
Total length [2]	4. 73–5. 25 (4. 95)	2. 10–2. 25 (2. 18)	2. 03 [6]	2. 40–2. 78 (2. 65)
Cephalothorax				
length [3]	3. 30–4. 20 (3. 48)	1. 65–1. 73 (1. 67)	1. 65	2. 10–2. 33 (2. 20)
width [4]	2. 63–3. 00 (2. 78)	1. 43–1. 65 (1. 54)	1. 58	1. 95–2. 18 (2. 05)
Genital segment				
length [5]	0. 75–0. 83 (0. 79)	0. 30–0. 38 (0. 34)	0. 23	0. 30–0. 38 (0. 33)
width	0. 83–1. 05 (0. 91)	0. 38–0. 45 (0. 42)	0. 90	0. 53 [7]
Abdomen length	0. 30–0. 45 (0. 36)	0. 08–0. 15 (0. 11)	0. 23	0. 11–0. 15 (0. 14)

[1] The dash-connected measurements indicate the range, and that in parentheses, the mean.
[2] Excluding setae.
[3] Including frontal region.
[4] Excluding marginal flanges.
[5] Excluding fifth and sixth legs.
[6] Only one specimen.
[7] No variation

D. litus it forms a shelflike projection, the base of which extends proximally along the posterior lateral surface of the first segment. In *D. curtus*, this projection is bifurcate distally.

The basic design of the female antenna is similar in all four species. The size of the first and second segments varies to some degree and the complexity of the first segment differs. These are, however, not thought to be of a value sufficient to show interspecific similarities and differences.

The antenna of the male does however show some rather distinct interspecific differences, especially in the makeup of the third segment and the terminal process. The terminal processes of *D. curtus* and *D. litus* are so bizarre that a comparison is almost impossible. The The male antenna of *D. ulua* is quite similar to that of *Lepeophtheirus crassus* (Wilson et Bere) Shiino, 1960, in the position and extent of the adhesion surfaces and the shape and makeup of the third segment and terminal process, although that of *D. ulua* is somewhat more complex. The similarity of the male antenna of *D. bifurcatus* to the other species is questionable, although it is more like that of *D. ulua* in regard to the adhesion surfaces, third segment, and terminal process than either *D. curtus* or *D. litus*.

The postantennal process is fairly similar in all four species and the differences do not appear sufficient to warrant any specific comments.

TABLE 9.—*Female fifth leg measurements (in mm.) and relative lengths*

Species	Specimens	TL [1] / L-5 [2]	TL L-5 / TL body	TL / TP-5 [3]	TL TP-5 / TL L-5
D. ulua	15	1. 35	0. 21	0. 07	0. 05
D. bifurcatus	3	0. 78	0. 23	0. 07	0. 09
D. curtus	21	0. 69	0. 21	0. 22	0. 33
D. litus	7	0. 84	0. 22	0. 24	0. 28

[1] TL: total length.
[2] L-5: fifth leg.
[3] TP-5: terminal process of fifth leg.

TABLE 10.—*Male fifth and sixth leg measurements (in mm.) and relative lengths*

Species	Specimens	TL [1] / L-5 [2]	TL L-5 / TL body	TL / TP-5 [3]	TL TP-5 / TL L-5	TL / L-6	TL L-6 / TL body	TL / TP-6	TL TP-6 / TL L-6
D.ulua	12	1. 14	0. 23	0. 07	0. 06	0. 23	0. 05	0. 13	0. 54
D. bifurcatus	4	0. 25	0. 11	0. 05	0. 19	0. 11	0. 05	0. 06	0. 54
D. curtus	1	0. 18	0. 09	0. 04	0. 22	0. 07	0. 03	0. 04	0. 57
D. litus	3	0. 31	0. 12	0. 12	0. 39	0. 19	0. 07	0. 10	0. 50

[1] TL: total length.
[2] L-5: fifth leg (L-6: sixth leg).
[3] TP-5: terminal process of fifth leg (TP-6: terminal process of sixth leg).

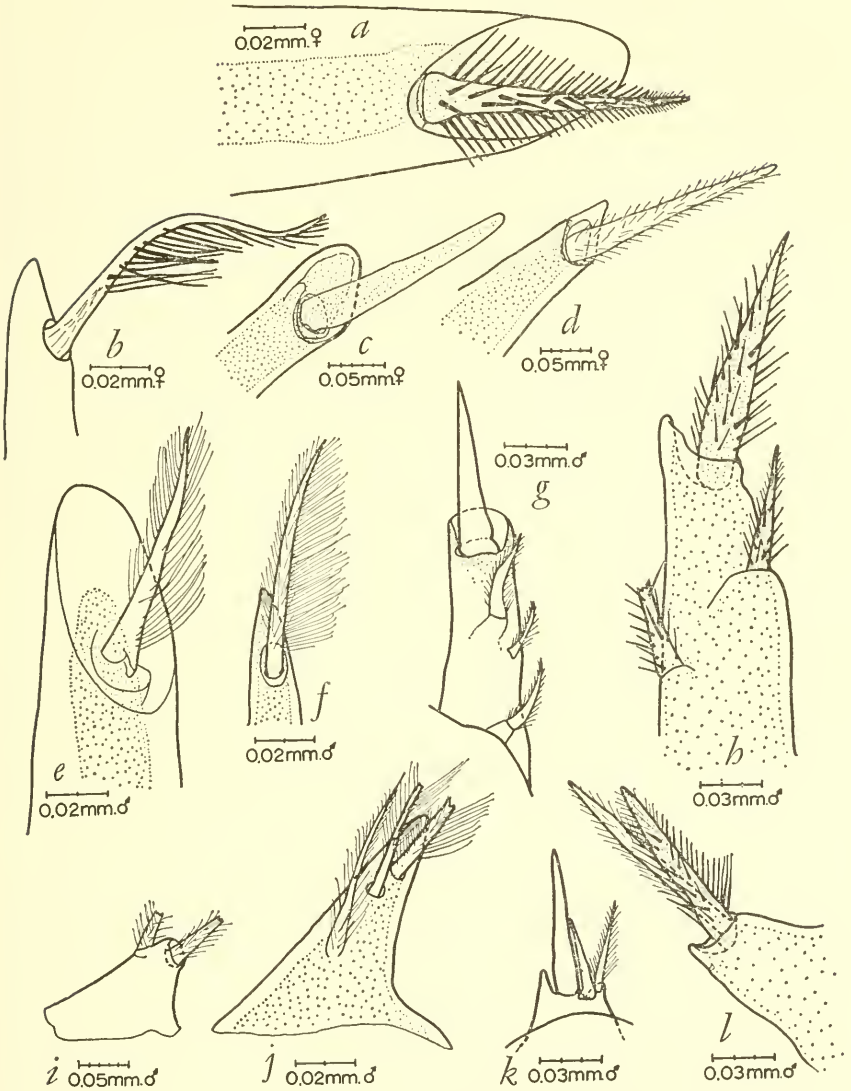

FIGURE 12.—Legs of species of *Dentigryps*: *a–f*, Distal end and terminal process of fifth leg: *a*, ♀, *D. ulua* (dorsal view); *b*, ♀, *D. bifurcatus* (dorsal view); *c*, ♀, *D. curtus* (dorsal view); *d*, ♀, *D. litus* (dorsal view); *e*, ♂, *D. ulua* (dorsal view); *f*, ♂, *D. bifurcatus* (dorsal view); *g*, fifth leg, ♂, *D. curtus* (dorsal view); *h*, fifth leg, ♂, *D. litus* (dorsal view); *i*, sixth leg, ♂, *D. ulua* (dorsal view); *j*, sixth leg, ♂, *D. bifurcatus* (dorsal view); *k*, sixth leg, ♂, *D. curtus* (dorsal view); *l*, sixth leg, ♂, *D. litus* (dorsal view).

One of the structures that has been used in applying the name appendage to the postantennal process is the nodule, arising from the platelike area of sclerotization, which Heegaard (1947) calls "the basal joint" of the first maxilla. In both the male and female of *D. litus* there is a nodule bearing hairlike processes (as do all three of the nodules of the postantennal process) on the dorsal anterior lateral surface of the cephalothorax, just posterior to the division between the frontal region and the cephalothorax (fig. 10*a*) and well separated from any appendage or process. Its presence in this position on *D. litus*, however, implies only that a nodule of this type does not necessarily have to be found in association with a process or an appendage.

The female postoral process of *D. curtus* is simple and not bifurcate while that of *D. ulua*, *D. bifurcatus*, and *D. litus* is bifurcate. The male postoral process of *D. curtus* is not bifurcate while, as in the female, that of *D. ulua*, *D. bifurcatus*, and *D. litus* is bifurcate. In the male of the last three species, however, a poorly sclerotized acuminate or dactyliform process arises from the inner margin of the inner tine at the level of the apex of the bifurcation.

A pair of small but distinct adhesion pads on the ventral cephalothoracic surface of the male of *D. ulua* extends posteriorly and medially from the region of the distal end of the postoral process to the region just posterior to the mouth cone. Distinct indications of this adhesion surface appear on the male of *D. litus* and indistinct indications of it on the male of *D. bifurcatus*. *D. curtus* is the only species in which the male does not exhibit any indication of these adhesion surfaces.

The basic structures comprising the maxilla—the two segments, two saber-shaped terminal processes, and the membrane on the second segment—are similar in all four species. The interspecific differences in this appendage are caused by the presence or absence of an accessory structure—a spine or spine-shaped process found in the region of the sharp indentation in the middle of the second segment, and by the minor differences in segment shape. *D. ulua* and *D. curtus* possess the membrane common to all four species but do not possess the spine, while *D. bifurcatus* and *D. litus* possess both the membrane and the spine.

The maxilliped, like the maxilla, is basically similar in all four species, the only major difference being the presence or absence of a distally indented swelling on the inner surface of the male appendage. The male of *D. ulua*, *D. bifurcatus*, and *D. litus* all possess this swelling while the male of *D. curtus* does not.

The sternal furca of *D. ulua* has chisel-shaped tines while the sternal furca of all of the other species has pointed or rounded tines. In ad-

dition, *D. ulua* has a platelike process on either side of the sternal furca while the others either do not have this process or else it is not distinct from the surrounding ventral cephalothoracic cuticle.

The adult first thoracic leg is basically similar in all four species, consisting of a 1-segmented protopodite, a 2-segmented exopodite, and a rudimentary endopodite that gives the leg an indistinctly biramous condition. The differences that occur do so in what could be called secondary armature elements, elements such as the membranes that are present on spines, the individual or small groups of hairlike processes that occur on the segments, the plumose conditions of some of the spines, and small dactyliform or acuminate projections found on some of the spines. These are in contrast to the primary elements such as the spines and setae. The single secondary armature element that appears to be of enough importance to be included in this comparison is a small, acuminate, poorly sclerotized process that projects from the inner surface of each of the inner two terminal spines of the second exopodite segment of *D. ulua*, *D. curtus*, and *D. litus*. Although *D. bifurcatus* does not possess this process there is, in the same region as the acuminate process on the other species, a distinct membrane, that appears folded and that projects very slightly past the distal end of the terminal spine (the projecting portion is believed to be the folded part of the membrane). As with the first thoracic leg, the comparable difference in the second thoracic leg of all four species occurs in the secondary armature elements. In the second leg however these differences are of such a nature that no distinct trend or grouping can be indicated.

The third thoracic leg (fig. 13, table 11) has a protopodite-exopodite-endopodite segment number of 1–3–2 in *D. ulua* and *D. bifurcatus* and of 1–2–2 in *D. curtus* and *D. litus*. The difference in the number of exopodite segments is important in that it suggests a distinct break between *D. curtus* - *D. litus* and *D. ulua* - *D. bifurcatus*. This break may not be as distinct as it seems, however, as part of the armament of the exopodite of *D. curtus* is unique and suggests a transition between the two groups. The outer margin of the distal two exopodite segments in both groups has four small and naked setae that appear to be divided into two parts. In the 1–3–2 group, the second exopodite segment bears one of these setae on its outer distal lateral surface, the remaining three are located on the third segment and are separated from the second segment seta by the division between the segments and by a plumose space. In *D. curtus*, a member of the 1–2–2 group, all four setae are on the second or distalmost segment but there is a distinct space between the proximalmost of the four and the succeeding three setae. This space is plumose. The separation of the proximalmost from the three succeeding setae and the presence of a plumose

space is, in *D. curtus*, strongly suggestive of the members of the 1–3–2 group except that there is no indication of segmentation between the proximalmost seta and the other three.

Along the inner lateral surface of the two distal exopodite segments of the 1–3–2 group are four plumose setae, one on the inner-distal lateral surface of the second segment and three on the lateral surface of the third. In addition, the proximal lateral margin of the third segment is plumose. Although both of the species in the 1–2–2 group, *D. curtus* and *D. litus*, have four plumose setae along the second or distal exopodite segment, there is no indication of a plumose surface between the first or proximalmost seta and the second. The spinelike process projecting inward from the inner surface of the first exopodite segment is distinctly separated from the segment by a line of division in all of the species except *D. bifurcatus*. Other than these two characteristics, the differences between the species are the shape of the segments and the variation in the position of the armature components.

Whether the difference in the exopodite makeup of the third leg indicates a fusion of segments (from a 1–3–2 to 1–2–2 condition), a division of segments (from a 1–2–2 to a 1–3–2 condition), or simply a peculiar series in the pertinent armature elements could not be ascertained. The indication is, however, that the distinct difference in the number of segments may possibly be explained by the position and arrangement of the armature.

The fourth thoracic leg protopodite has a distinct, spikelike projection of the inner distal surface in *D. ulua* and a distinct, bluntly tipped projection in *D. litus*. The general armature of the leg and

TABLE 11.—*Armature of third thoracic legs of four species of* Dentigryps.

Species	Margin	Sternal plate	Protopodite	Exopodite			Endopodite	
				1	2	3	1	2
D. ulua	outer	m	m, p	3s	c, p′	c, 3p′, P	c	c, 2P
	inner		P, s, m, s	P, H	c, P	3P	P	c, 4P
D. bifurcatus	outer	m	m, P	3s	c, p′	c, 3p′, P	c	c, 3P
	inner		P, s, m s	P, H	c, P	c, 3P	P	c, 3P
D. curtus	outer	m	m, P	2s	c, p′, c, 3p′, P		c	c, 3P
	inner		P, s, m, s	P, mH	c, 4P		P	c, 3P
D. litus	outer	m	m, P	3s	c, 4p′, P		c	c, 3P
	inner		P, s, m, s	P, H	c, 4P		P	c, 3P

the dimension and makeup of its components do not permit any clearcut comparisons to be made, but in general the armature of *D. curtus* most closely approximates that of *D. litus*, while those of *D. ulua* and D. *bifurcatus* show some similarities (table 12).

From the comparison of the body and the various appendages it is apparent that there is some interspecific similarity but that a similarity between two species based on one set of characteristics may be offset by differences in other sets of characteristics. The survey does indicate, however, that there is a good deal of similarity

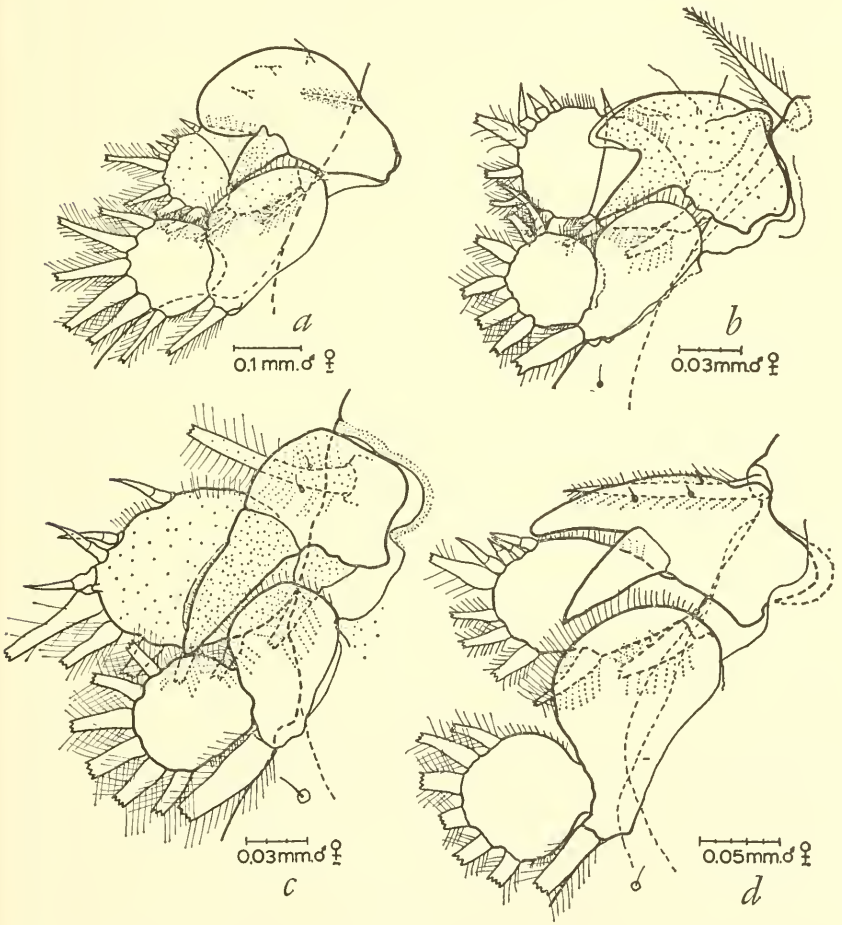

FIGURE 13.—Exopodite and endopodite portion of third thoracic leg of species of *Dentigryps*: *a*, *D. ulua* (ventral view); *b*, *D. bifurcatus* (ventral view); *c*, *D. curtus* (ventral view); *d*, *D. litus* (ventral view).

between *D. curtus* and *D. litus*, particularly with regard to the body shape, the female and male fifth legs, and the third legs. Evidence of similarity between *D. ulua* and *D. bifurcatus* also exists in the armature of the first four thoracic legs.

While the geographic distribution of the four species is not fully known, the reported localities (see table 13) suggest some rather interesting problems, especially with regard to the morphological similarity between *D. curtus* and *D. litus*. *D. curtus* has been reported from the tropical and subtropical Atlantic, *D. litus* has been described from specimens captured at Eniwetok Atoll in the Pacific and has not been found on Hawaiian fishes. It would be of interest to determine whether either of the two species, or a similar species, occurs on fishes in the Indian Ocean or on fishes from the west coast of Africa.

TABLE 12.—*Armature of fourth thoracic legs of four species of* Dentigryps.

Species	Margin	Protopodite	Exopodite		
			1	2	3
D. ulua	outer	p	s, fh	d, fmH	d, 2fmH, fdH
D. bifurcatus	outer	p	fh	d, fmH	d, fmH, fdmH, fmH
D. curtus	outer	p	fmH	fmH	3fmdH
D. litus	outer	p	frh	fmH	fmH, 2fmdH

TABLE 13.—*Reported localities for described species of* Dentigryps.

Species	Reported localities
D. ulua	Hawaiian Islands.
D. *bifurcatus*	Hawaiian Islands.
D. curtus	Bermuda, Dry Tortugas, Florida.
D. litus	Eniwetok Atoll (Marshall Islands).

Key to the Species of *Dentigryps*

The following key has been constructed to include both sexes of the four species discussed in this paper. The characters based on the fifth leg of the female and male of *D. curtus* and *D. litus* are some-

times unusable because the terminal process of that leg may be broken or lost completely.

1. Fifth leg not appearing 2-parted, terminal process short; median cephalothoracic region not completely covering fourth pedigerous segment, if covering it at all 2
   Fifth leg appearing 2-parted, terminal process forming the second part; median cephalothoracic region covering the fourth pedigerous segment . . 3
2. Sternal furca with chisel-shaped tines; fourth thoracic leg with spikelike projection of inner distal surface . . . . . **D. ulua**
   Sternal furca with bluntly pointed tines; fourth thoracic leg without spikelike projection of inner distal surface . . . . . **D. bifurcatus**
3. Terminal process of fifth leg naked; postoral process simple, not bifurcate. **D. curtus**
   Terminal process of fifth leg plumose; postoral process bifurcate . . . **D. litus**

Discussion of the Genus

In the original description of the genus *Dentigryps*, based on the female of *D. curtus*, Wilson (1913) indicated that owing to the similarity of their appendages the genus was allied to *Lepeophtheirus*, but differed from it in the nature of the free fourth pedigerous segment and genital segment. He also compared the genus with *Homoiotes* on the basis of the fourth pedigerous and genital segments which, he noted, were fused and covered "with a plate similar to the carapace." Wilson further compared the genus to the euryphorid genus *Gloiopotes* on the basis of the fifth legs, to the pandarids on the basis of the "dropping of the abdomen to the ventral surface and its transference forward," and finally to the euryphorid genus *Alebion* because of posterior lobes found on either side of the caudal rami of the female of *D. curtus*. With the availability of new material that includes several new species and the previously undescribed male of *D. curtus*, it is possible to reevaluate the genus and its relationships with members of the families Caligidae and Euryphoridae.

Members of the genus *Dentigryps* do indeed possess characteristics in common with members of the families Caligidae and Euryphoridae. But although the general composition of the cephalothorax, except for the euryphorid genus *Dysgamus*, is similar in both families, the presence of large and distinct fifth-leg projections, especially in the female, allies *Dentigryps* to the family Euryphoridae, although even in this family there are members without the projection (e.g., the female of *Alebion glaber*). In euryphorids that do possess it, however, the fifth-leg projection is often more complex than that of members of the genus *Dentigryps*, a condition that *Gloiopotes ornatus* exemplifies well, the fifth-leg process in this species being heavily serrated. The presence of some indication of platelike formations of the dorsal

cuticle of the fourth pedigerous segment of *D. ulua* is likewise a characteristic encountered in the euryphorids, although at least in the female, the usual euryphorid condition is that the plates are well developed and overlap part of the genital segment. The genital segment of female euryphorids is generally large and often lobed posteriorly, a characteristic also noted in *D. ulua*. In general then, the members of the family Euryphoridae and members of the genus *Dentigryps* are alike in several characteristics, of which the most noteworthy is the fifth-leg projection.

The presence of platelike formations of the dorsal cuticle of the fourth pedigerous segment of *D. ulua* is contrary to the diagnosis of the family Caligidae (Wilson, 1905). In this regard, however, the degree of development of these platelike formations in *D. ulua* and their reduced condition in *D. bifurcatus, D. curtus, and D. litus* suggest that on this character alone there is no justification for separating the genus from the family Caligidae, in which it was originally included by Wilson (1913). The problem of the fifth-leg projection and its effect on the family status of the genus cannot be answered by the author at the present time; many euryphorids possess the fifth-leg projection and it is also present in a much reduced state in some of the caligids. In general, however, the appendage complement of *Dentigryps*, and its makeup, especially that of the first four thoracic legs, is characteristic of the family Caligidae. This condition, in addition to the character of the cephalothorax, fourth pedigerous segment, genital segment, and abdomen, appears to warrant the continued inclusion of the genus in the family Caligidae.

Within the Caligidae, *Dentigryps* most closely approximates *Lepeophtheirus*. The major difference between these two genera is the strongly projecting fifth leg of *Dentigryps*. Some members of the genus *Lepeophtheirus*, however, possess small but distinct spikelike fifth legs (e.g., *L. goniistii* Yamaguti, 1936; *L. hastatus* Shiino, 1960). The question now arises as to the degree of relationship that species such as the three mentioned above have with members of the genus *Dentigryps*. The spinelike fifth-leg projections and evidences of platelike formations of the dorsal cuticle of the fourth pedigerous segment which have also been reported for one of these three species do not agree with the diagnosis of the genus *Lepeophtheirus* given in Wilson's review of 1905 but do agree with the modified diagnosis of Lewis (1964). It then appears that the major diagnostic difference between the two genera is the length of the fifth-leg projection, which is long and distinct in members of the genus *Dentigryps* and short and indistinct in those members of the genus *Lepeophtheirus* that possess the characteristic. *Lepeophtheirus spinifer* Kirtisinghe (1937), however, possesses a long and well-developed fifth leg in the female. It may well

be that this species also belongs in the genus *Dentigryps* and is closely allied to *D. ulua*. It differs from the latter primarily in the 2-segmented abdomen of the female, the female postoral process, the lack of a spinelike projection on the protopodite of the fourth thoracic leg, and the absence of fifth-leg projections in the male. *L. spinifer* appears to have about the same relation with *D. ulua* as *D. litus* has with *D. curtus*, although neither Kirtisinghe (1937) nor Rangnekar (1959) give a substantial description of the species and do not compare it with *Dentigryps*.

Two other species of the genus *Lepeophtheirus* may also belong in the genus *Dentigryps*. The first, *L. lichiae* Barnard, 1948 (Ann. Mag. Nat. Hist., vol. 12), appears similar to *D. ulua* and *L. spinifer* and, like these, has been taken from carangid fishes. The second, *L. molae* Heegaard, 1962 (Rec. Aust. Mus., vol. 25), has been taken from the sunfish *Mola mola* in Australia.

References

Bere, Rudy
1936. Parasitic copepods from Gulf of Mexico fish. Amer. Midl. Nat., vol. 17, no. 3, pp. 577–625, pls. 1–12.

Heegaard, Poul
1947. Contribution to the phylogeny of the arthropods. Spolia Zool. Mus. Hauniensis VIII. 227 pp., 27 pls.

Kirtisinghe, P.
1937. Parasitic copepods of fish from Ceylon. II. Parasitology, vol. 29, pp. 435–452, figs. 1–107.

Lewis, Alan G.
1964. Caligoid copepods of the Hawaiian Islands. 1. Parasitic on fishes of the family Acanthuridae, Proc. U.S. Nat. Mus., vol. 115, no. 3482, pp. 137–244, 24 figs.

Rangnekar, Malati, P.
1959. Parasitic copepods from fishes of the western coast of India with descriptions of one new and redescription of four known species. Journ. Univ. Bombay, vol. 28, no. 3, pp. 43–58, figs. 1–6.

Shiino, Sueo m.
1952. Copepods parasitic on Japanese fishes. 1. On the species of *Caligus* and *Lepeophtheirus*. Rep. Fac. Fish., Pref. Univ. Mie, vol. 1, no. 2, pp. 79–112, figs. 1–14.
1959. Sammlung der parasitischen Copepoden in der Präfekturuniversität von Mie. Rep. Fac. Fish., Pref. Univ. Mie, vol. 3, no. 2, pp. 334–374, figs. 1–17.
1960. Copepods parasitic on fishes from Seto, Province Kii, Japan. Rep. Fac. Fish., Pref. Univ. Mie, vol. 3, no. 3, pp. 501–517, figs. 1–7.
1960. Copepods parasitic on Remoras from the Bay of Bengal. Rep. Fac. Fish., Pref. Univ. Mie, vol. 3, no. 3, pp. 542–552, figs. 1–4.

Wilson, Charles B.

1905. North American parasitic copepods belonging to the family Caligidae. Part I, The Caliginae. Proc. U.S. Nat. Mus., vol. 28, no. 1404, pp. 479–672, pls. 5–29.

1913. Crustacean parasites of West Indian fishes and land crabs, with descriptions of new genera and species. Proc. U.S. Nat. Mus., vol. 44, no. 1950, pp. 189–277, pls. 18–53.

1935. Parasitic copepods from the Dry Tortugas. Carnegie Inst. Washington, Publ. 452, Pap. from Tortugas Lab., vol. 29, no. 12, pp. 327–347, pls. 1–6.

Yamaguti, Satyû

1936. Parasitic copepods from fishes of Japan: Part 2, Caligoida, I. Kyoto Imperial Univ., Japan, 22 pp., 12 pls.

Yeatman, Harry

1957. A redescription of two parasitic copepods from Bermuda. Journ. Washington Acad. Sci., vol. 47, no. 10, pp. 346–353, figs. 1–31.

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