

Revision of *Foxiphalus*
and *Eobrolgus* (Crustacea:
Amphipoda: Phoxocephalidae)
from American Oceans

J. LAURENS BARNARD
and
CHARLINE M. BARNARD

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ABSTRACT

Barnard, J. Laurens, and Charline M. Barnard. Revision of *Foxiphalus* and *Eobrolgus* (Crustacea: Amphipoda: Phoxocephalidae) from American Oceans. *Smithsonian Contributions to Zoology*, number 372, 35 pages, 5 figures, 1982.— Three species formerly in *Paraphoxus* (*major*, *similis*, and *cognatus*) are transferred into *Foxiphalus* for the first time and redescribed in expanded format. From materials of previously described species (*Paraphoxus obtusidens*, type-species of *Foxiphalus*; *P. major*; *P. similis*; *P. cognatus*; and *Eobrolgus spinosus*), the following new species are described: *Foxiphalus xiximeus*, *F. aleuti*, *F. secasius*, *F. apache*, and *F. golfensis*. This completes the revision of old collections, and a new key to certain American genera of Phoxocephalidae is presented as well as a key to the species of *Foxiphalus* and *Eobrolgus*.

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Revision of *Foxiphalus* and *Eobrolgus* (Crustacea: Amphipoda: Phoxocephalidae) from American Oceans

J. Laurens Barnard
and *Charline M. Barnard*

Introduction

Eobrolgus J.L. Barnard (1979b) and *Foxiphalus* J.L. Barnard (1979b) were created for four species formerly placed in *Paraphoxus* Sars. The latter genus is now reduced to two species, *Paraphoxus oculatus* (Sars) and *P. simplex* (Gurjanova). Examination of Smithsonian collections and revisionary studies show that *Eobrolgus* has two species, and *Foxiphalus* is composed of nine species, four of which were described previously (one being elevated herein from subspecific level to full specific status), and five of which are described herein as new.

The purpose of this paper is to modernize the taxonomy of this group in the context established by Barnard and Drummond (1978) in their revision of Australian Phoxocephalidae. In the process of trying to elevate the taxonomic fineness, several new species have been discovered, but exploration is far from being exhausted in this group. Many collections in the Smithsonian Institution and other repositories remain unstudied. For the moment *Foxiphalus* is distinguished from *Grandifoxus* by one main characteristic, the pres-

ence of only two facial setae on article 2 of antenna 1 (in contrast to numerous setae in *Grandifoxus*), but one might expect further exploration to eliminate this difference. Perhaps another way to divide genera will be found possible by further refinements.

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Resurvey Project Methods and Presentation

This review completes the resurvey of certain American Phoxocephalidae intended by Barnard and Drummond (1976, 1978), which has been carried out in papers by Barnard (1979b, 1980a,b) and Barnard and Barnard (1980, 1981, 1982). Taxa formerly in *Paraphoxus* and *Microphoxus* have been allocated to other genera listed in the "Key to Certain American Phoxocephalid

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Genera," which does not include subfamilies other than Birubiinae and Parharpiniinae. The brologins, phoxocephalins, and harpiniins have not been treated.

The method of this study is to go over the old material of Barnard (1960) and similar materials and to modernize the systematic position of the taxa, recast the descriptions in the upgraded fashion of Barnard and Drummond (1978), and to describe any new taxa that were mistakenly hidden in the old material; however, the search for new taxa in new materials is released in favor of other specialists known to be investigating *Paraphoxus* and its affiliates elsewhere. The Smithsonian collections (with the designation USNM for the former United States National Museum collections deposited in the National Museum of Natural History, Smithsonian Institution) have several new species to be made available; because of the provisional nature of taxa such as *Foxiphalus*, *Grandifoxus*, and *Rhepoxynius*, diagnoses of species are left to future studies when more of the taxa are described and decisions made as to the validity of the several genera.

TERMS.—The term "pluseta" refers to a plumose seta. A "setule" is a small seta and usually under oil immersion microscopy is found to be armed with dense, flaccid, hair-like projections; if described as "penicillate," this fine pubescence is confined apicalwards to form a tufted setule. The term "proliferate" means subsidiary parts are prolific. The term "Mark" (M.) followed by a number refers to a point on a line between the

base and apex of a subject part, the distance from which point to the base of the part is expressed as a percentage of the total length of that part. For example, a spine at M. 70 on the side of an appendage is 70 percent of the appendage length from the base of the appendage (and 30 percent from the apex).

New specific names are taken from names of American Indian tribes except for "*golfensis*," which is from the Spanish *golfo* (gulf).

FIGURE ABBREVIATIONS (in specimen drawings).—Capital letters refer to morphology.

<i>A</i>	antenna	<i>M</i>	mandible
<i>C</i>	coxa	<i>O</i>	outer ramus
<i>D</i>	dactyl	<i>P</i>	pereopod
<i>E</i>	prebuccal mass, lateral	<i>R</i>	uropod
<i>G</i>	gnathopod	<i>T</i>	telson
<i>H</i>	head	<i>W</i>	pleon
<i>I</i>	inner ramus	<i>X</i>	maxilla
<i>J</i>	right lacinia mobilis		

Lower case letters to the left of capital letters refer to specimens as cited in the text; lower case letters to the right of capital letters or in the body of drawings (as in the case of "*b*" and "*s*") refer to modifications as follows:

<i>b</i>	broken	<i>s</i>	setae removed
<i>d</i>	dorsal	<i>t</i>	right
<i>m</i>	medial		

Numbers to the right of capital letters refer to the number of the part being illustrated; numbers in the body of drawings refer to the articles or segments of the part.

PHOXOCEPHALIDAE

Key to Certain American Phoxocephalid Genera

(Including only Birubiinae and Parharpiniinae)

1. Rostrum unstricted 2
- Rostrum constricted side to side 5
2. Mandibular molar with 1 elongate spine among shorter spines (epimeron 3 lacking any long posterior seta) 3
- Mandibular molar with ordinary subsimilar spines (epimeron 3 with at least 1 seta directly marginal on posterior edge) 4

3. Gnathopod 2 enlarged, article 4 of antenna 2 with proximal spines, inner plate of maxilliped with 1 main spine *Fuegiphoxus*
 Gnathopod 2 small, article 4 of antenna 2 without distinct proximal spines, inner plate of maxilliped with 2 main spines *Eyakia*
4. Setae on article 2 of antenna 1 confined to apex (female; not so strong in male) *Eobrolgus*
 Setae on article 2 of antenna 1 spread ventrally *Foxiphalus*
5. Subapical nail present on 1 ramus of uropods 1-2 6
 No subapical nails present, rami not continuously spinose to apex 8
6. Urosomite 3 with large cusp *Microphoxus*
 Urosomite 3 with blunt hump or no process 7
7. Rami of uropods 1-2 without fully apical nails (only subapicals), setae on article 2 of antenna 1 widespread ventrally *Metharpinia*
 Rami of uropods 1-2 with true apical nails, setae on article 2 of antenna 1 confined to apex *Phoxorgia*
8. Article 3 of antenna 2 with more than 2 facial setae *Grandifoxus*
 Article 3 of antenna 2 with only 2 facial setae *Rhepoxynius*

The *Foxiphalus-Eobrolgus* Complex

Foxiphalus and *Eobrolgus* converge very closely. Females of the two species of *Eobrolgus* have a very short article 2 of antenna 1 with the ventral setae somewhat to strongly displaced distally and running continuously to the apex, whereas in *Foxiphalus* there is a long naked gap between

ventral setae and the apex of article 2. In males of *Eobrolgus* this gap also occurs, and so males are very difficult to detect.

The diagnostic difference between the two genera is in the placement of setae on article 2 of antenna 1 (see "Key to Certain American Phoxocephalid Genera").

Key to the Species of *Foxiphalus* and *Eobrolgus*

1. Peduncle of uropod 1 with displaced apicomedial spine 2
 Peduncle of uropod 1 lacking displaced apicomedial spine 7
2. Epistomal cusp sharp, medium to large 3
 Epistome with weak cusp or none 4
3. Cusp of epistome large *F. similis*
 Cusp of epistome medium *F. cognatus*
4. Dorsolateral pairs of telsonic setules very close to base *F. major*
 Dorsolateral pairs of telsonic setules remote from base 5
5. Apical nail on inner ramus of uropod 1 flexible and articulate
 *F. obtusidens*
 Apical nail on inner ramus of uropod 1 immersed and rigid 6
6. Article 2 on outer ramus of uropod 3 elongate, right lacinia mobilis simple, molar lacking disjunct spine, inner plate of maxilliped with only 1 main spine *F. xiximeus*, new species
 Article 2 on outer ramus of uropod 3 very short, right lacinia mobilis formed of 2 elements (bifid), molar with disjunct spine, inner plate of maxilliped with 2 main spines *F. aleuti*, new species

7. Article 2 of pereopod 7 with long ventral setae . . . *F. golfensis*, new species
 Article 2 of pereopod 7 with short ventral setules 8
8. Cusp of epistome sharp, apicomedial corner of peduncle on uropod 1 with
 2 equal spines *F. apache*, new species
 Cusp of epistome blunt or absent, first 2 spines at apicomedial corner on
 peduncle of uropod 1 unequal 9
9. Inner ramus of uropod 1 with flexible and articulate apical nail
 *F. secasius*, new species
 Inner ramus of uropod 1 with immersed and rigid apical nail 10
10. Epimeron 3 with 1-2 ventral setae *E. chumashi*
 Epimeron 3 without ventral setae *E. spinosus*

Foxiphalus J.L. Barnard

Foxiphalus J.L. Barnard, 1979b:372.

DIAGNOSIS.—See J.L. Barnard, 1979b.

When originally conceived, *Foxiphalus* was considered to have an ensiform antenna 2, but there are now species and morphs without that process; the genus is therefore even closer to *Birubius* from Australia than originally considered but remains distinct by the presence of posterior setae on epimeron 2 and the poorly developed apical nail on the dactyl of the maxilliped.

Foxiphalus and *Grandifoxus* converge very closely, especially in intergrading species *Grandifoxus robustus* and *F. aleuti*. The head of the giant species of *Grandifoxus* is scarcely constricted and almost matches some of the heads of giant species in *Foxiphalus*, such as *F. aleuti*, *F. obtusidens*, and *F. major*. The ultimate difference between the two genera resides only in the 3+ facial setae on article 3 of antenna 2 in adults of *Grandifoxus* as contrasted to the presence of only two setae in *Foxiphalus*; otherwise, all species of *Foxiphalus* have an unconstricted rostrum, and most species of *Grandifoxus* have a strongly constricted rostrum.

TYPE-SPECIES.—*Pontharpinia obtusidens* Alderman, 1936, original designation.

COMPOSITION.—*Foxiphalus major*, *F. xiximeus*, new species, *F. aleuti*, new species, *F. similis*, *F. cognatus*, *F. secasius*, new species, *F. apache*, new species, *F. golfensis*, new species, *F. obtusidens*.

Foxiphalus obtusidens (Alderman)

FIGURE 1 (part)

Pontharpinia obtusidens Alderman, 1936:54-56, figs. 1-13, 19.—Hewatt, 1946:199.—J.L. Barnard, 1954:4.

Paraphoxus obtusidens.—J.L. Barnard, 1960:249-259, pl. 33-37 [in part, not *major* and not pl. 33: fig. F, G, pl. 36: fig. G-K, P, pl. 37; see *F. golfensis*, *F. secasius*, and sur phenotype herein]; 1964a:105, chart 6; 1964b:244; 1966a:89; 1966b:29; 1969a:197; 1971:70.

DESCRIPTION OF FEMALE "k" (typical form).—Head about 23 percent of total body length, greatest width about 70 percent of length, rostrum unconstricted, broad, elongate, almost reaching apex of article 2 on antenna 1. Eyes medium, largely occluded with pigment, ommatidia ordinary. Article 1 of peduncle on antenna 1 about 1.6 times as long as wide, about 2.4 times as wide as article 2, ventral margin with about 11 setules-setae, article 2 about 0.5 times as long as article 1, with ventral narrowly spread doubled crescent of 11 setae and 3 apicofacial setae, primary flagellum with 10 articles, about 0.6 times as long as peduncle, bearing 1 short aesthetasc on each of articles 6-9, accessory flagellum with 8 articles. Antenna 2 strongly ensiform, article 3 with small anterodorsal setule besides normal facial armaments, spine formula of article 4 = 1-3-4-6, dorsal margin with 2 notches each bearing 3 spine-setae and 1 spine, ventral margin with 9 groups of 1-4 long to medium setae, 1 ventrodistal long spine, article 5 about 0.85 times as long as article 4, facial spine formula = 5, dorsal-margin bearing 3 sets of 1-2 small setae, ventral

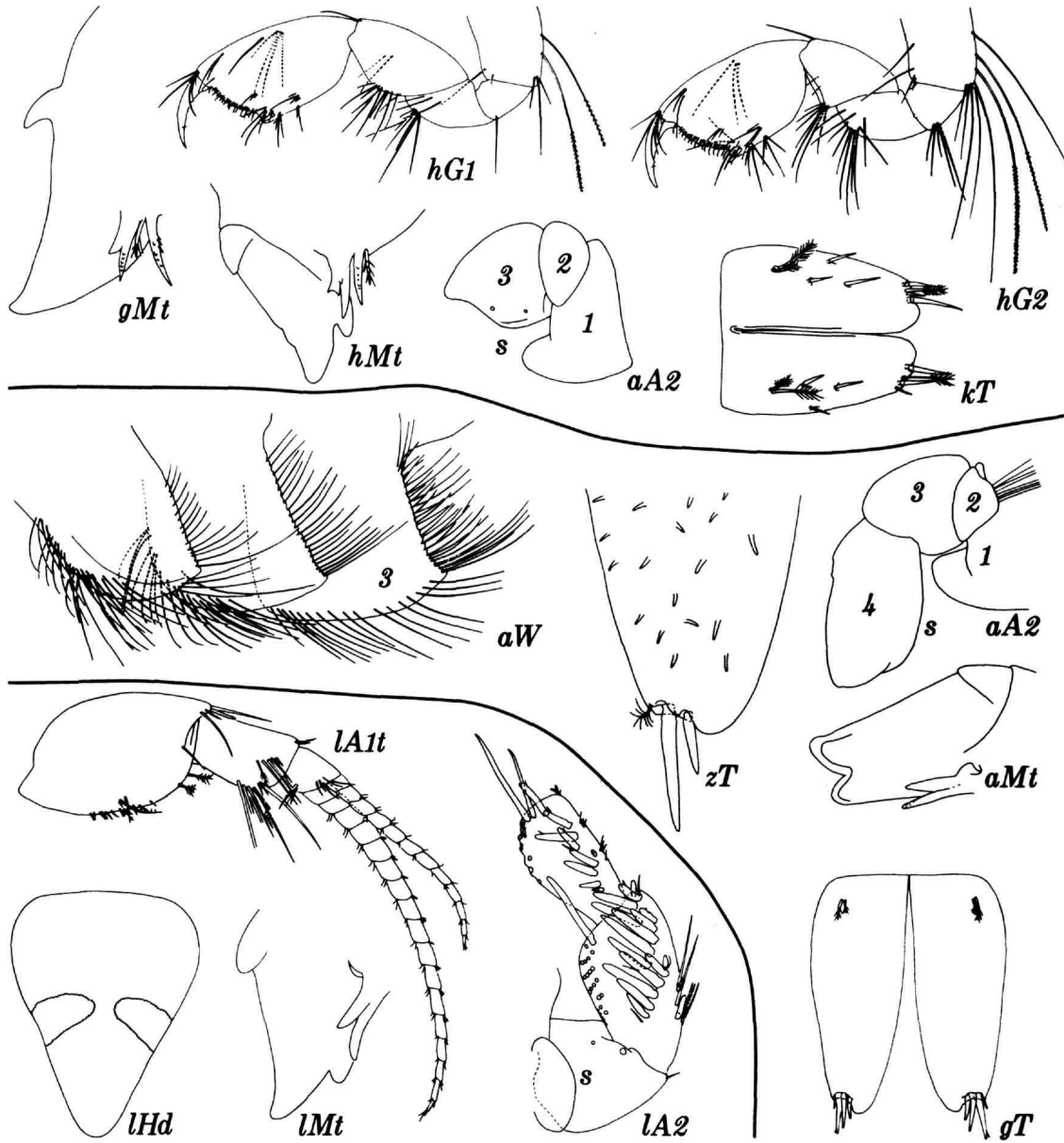


FIGURE 1.—Upper: *Foxiphalus obtusidens* (a = female “a,” g = male “g,” h = female “h,” k = female “k”). Middle: *F. major* (a = female “a,” g = female “g,” z = male “z”). Lower left: *F. aleuti*, new species (l = female “1”).

margin with 6 sets of 1–2 long to short setae, 3 ventral long to medium spines set facially; flagellum about 0.7 times as long as articles 4–5 of peduncle combined, with 10 articles.

Epistome unproduced. Mandibles with medium palpar hump, right incisor with 3 teeth, third almost in middle of medial edge, left incisor with 3 humps in 2 branches, right lacinia mobilis

bifid, distal branch shorter than proximal, narrow, proximal branch simple, pointed, left lacinia mobilis with 5 teeth, middle teeth slightly shortened, right rakers 7 plus 1 rudimentary, left rakers 7, molars composed of elongate plaques, right molar with 7 primarily long spines plus 1 short spine strongly disjunct, left molar with 5 primarily medium spines plus 1 short spine strongly disjunct, each molar with plume; palp article 1 short, article 2 with 3 medium inner apical setae and 5 other medium and short inner setae, article 3 about 0.95 times as long as article 2, oblique apex with 13 spine-setae, basofacial formula = 0-4. Each outer lobe of lower lip with 1 cone. Inner plate of maxilla 1 ordinary, bearing 1 medium apical pluseta, 1 shorter apicomedia seta, 2 apicolateral shorter setae, outer plate with 11 spines, palp article 2 with 1 apical spine, 1 apicolateral, 2-3 medial and 2-3 submarginal setae.

Plates of maxilla 2 extending subequally, outer not broader than inner, outer with 5 apicolateral setae, inner with 2 medial setae. Inner plate of maxilliped with 1 large thick apical spine, 3 apicofacial setae, 3 medial setae, outer plate with 7 medial spines, 3 lateral setae, palp article 1 with 1 apicolateral seta, article 2 with 4 groups of 5 lateral setae, medial margin of article 2 moderately setose, article 3 with 10 facial setae, 6 lateral setae, nail of article 4 fully fused, with 2 accessory setules.

Coxa 1 strongly expanded apically, anterior margin weakly concave, main ventral setae of coxae 1-4 = 11-11-11-13, posteriormost seta of coxae 1-3 slightly shortened; anterior and posterior margins of coxa 4 almost parallel, posterior margin almost straight, posterodorsal corner rounded, posterodorsal margin ordinary, concave, width-length ratio = 29:33. Gnathopods generally ordinary, width ratios on articles 5-6 of gnathopods 1-2 = 30:35 and 29:36, length ratios = 65:75 and 51:70, palmar humps ordinary, palms strongly oblique, article 5 of gnathopod 1 elongate, ovate, posterior margin rounded, article 5 of gnathopod 2 short, ovate; posterior margin rounded, short, triangular.

Pereopod 4 slightly stouter than pereopod 3, formula on article 4 = 7 and 5, almost parallel to apex, on article 5 = 9 and 9, main spine of article 5 extending to M. 90 on article 6, article 5 with no proximoposterior spines, spine formula of article 6 = 7 + 7 and 7 + 7 plus small middistal seta, no spines especially long, acclivity on inner margin of dactyls of pereopods 3-4 obsolescent, setule almost fully immersed, midfacial pluseta ordinary. Coxae 5-7 posteroventral setae formula = 18-19-12. Articles 4-5 of pereopods 5-6 narrow, facial spine rows moderately developed, facial ridge formula of article 2 on pereopods 5-7 = 0-1-1. Width ratios of articles 2, 4, 5, 6 of pereopod 5 = 45:31:28:16, of pereopod 6 = 71:34:23:11, of pereopod 7 = 87:22:20:9, length ratios of pereopod 5 = 74:34:40:40, of pereopod 6 = 90:62:52:75, of pereopod 7 = 100:26:26:30, article 2 of pereopod 7 reaching apex of article 4, posterior margin with 6 small serrations, medial apex of article 6 very weakly combed, bearing 2 weak digital processes.

Posteroventral corner of epimeron 1 rounded-quadrate, posterior margin straight, weakly serrate, setose (7), corner without setule, anteroventral margin with 9 long to medium setae, posteroventral face with 1 long seta, ventral margin with 4 narrowly constrained posterior setae. Posteroventral corner of epimeron 2 rounded, weakly protuberant, posterior margin straight, weakly serrate, setose (12), facial setae = 9, posteriormost pair set obliquely. Posteroventral corner of epimeron 3 rounded, weakly protuberant, posterior margin weakly concave, serrate, setose (16), without setule notches, ventral margin with 8 setae.

Urosomite 1 with 2 lateral facial setae, articulation line almost complete, urosomite 3 unprotuberant dorsally. Rami of uropods 1-2 with articulate but tightly fixed apical nails, except inner ramus of uropod 1 with flexible nail, outer ramus of uropod 1 with 5 dorsal spines, inner with 3, outer ramus of uropod 2 with 4 dorsal spines, inner with no dorsomedial spines, peduncle of uropod 1 with 3-4 basofacial setae and 3 apicolateral spines, medially with 7 medium marginal widely spread spines, apicalmost ordinary

plus enlarged displaced spine. Peduncle of uropod 2 with 11 dorsal spines and setae, apicalmost shortest and stoutest, medially with 1 small apical spine, apicolateral corners of peduncles on uropods 1-2 without comb. Peduncle of uropod 3 with 10 ventral spines, dorsally with 1 lateral spine, 1 medial spine, and 1 setule, rami submasculine, inner extending to M. 100 on article 1 of outer ramus, apex with 2 setae, medial and lateral margins with 2 and 1 setae each, article 2 of outer ramus ordinary to elongate, 0.27, bearing 2 medium setae, medial margin of article 1 with 3 setae, lateral margin with 4 acclivities, spine formula = 2-2-2-2-2, setal formula = 0. Telson especially long, moderately glandular, length-width ratio = 7:6, almost fully cleft, each apex wide, rounded, lateral acclivities narrow, weak, with 1-2 lateral and 1-2 medial spines separated by setule, latter position variable, dorsal surface of each lobe with 3 supernumerary spines, mid-lateral setules diverse, largest medium, at M. 25.

VARIANTS.—Female “n” (of Rocky Point, California, USNM Acc. 100940): Extremely well developed but cannot be identified as *F. major* because the dorsolateral telsonic setule pairs are at M. 30; each lobe of the telson has 4 or 5 supernumerary dorsal spines; some glandular material is present in the telson but not to the degree found in *F. major*.

Female “o” (from *Velero IV* AHF 5606): Typical except for the poorly ensiform antenna 2; this is followed up later in the phenotype called “sur” from southern waters.

BAY FORM.—Inside bays such as Bahía de San Quintín, Baja California, *F. obtusidens* appears to have a phenotype characterized especially by the poor development of posterior setae on epimeron 2 and the absence of supernumerary telsonic spines. Specimens of this form are described below (female “h” and male “g”).

Description of Female “h” (San Quintín form = bay form): Head about 23 percent of total body length, greatest width about 65 percent of length, rostrum unconstricted, broad, elongate, almost reaching apex of article 2 on antenna 1. Eyes medium to large for female, largely occluded

with pigment, ommatidia ordinary. Article 1 of peduncle on antenna 1 about 1.4 times as long as wide, about twice as wide as article 2, ventral margin with 7 setules, produced dorsal apex with 2 setules-setae, article 2 about 0.45 times as long as article 1, with widely spread ventral doubled crescent of 12 setae and 3 apicofacial setae, primary flagellum with 7 articles, about 0.45 times as long as peduncle, aesthetasc formula = 0-0-0-0-1-1-0, accessory flagellum with 8 articles. Antenna 2 strongly ensiform, article 3 with 1 anterodorsal setule, spine formula of article 4 = 1-3-4-5, dorsal margin with notch bearing 3 setae and 1 spine, ventral margin with 8 groups of 1-3 long to short setae, 1 ventrodorsal long spine, article 5 about 0.7 times as long as article 4, facial spine formula = 5, dorsal margin bearing 2 sets of small setae, ventral margin with 4 sets of 1-2 long to short setae, 3 ventrodorsal long to medium spines, flagellum about 0.9 times as long as articles 4-5 of peduncle combined, with 9 articles.

Epistome unproduced. Mandibles with weak palpal hump, right incisor with 3 teeth (normal), left incisor with 3 humps in 2 branches, right lacinia mobilis bifid, distal branch much shorter than proximal, broad, subbifid, proximal branch simple, pointed, without marginal denticles, left lacinia mobilis with 4 teeth plus 2 accessory teeth, middle teeth shortened; right rakers 7, left rakers 9; molars composed of bulbous hump on right and elongate plaque on left, right molar with 8 primarily short to medium spines plus 1 short spine strongly disjunct, left molar with 5 primarily medium spines plus 1 short spine strongly disjunct, each molar with plume; palp article 1 short, with 1 setule, article 2 with 3 medium inner apical setae and 6 other long and short inner setae, article 3 about 1.1 times as long as article 2, oblique apex with 14 spine-setae, basofacial formula = 1-3. Each outer lobe of lower lip with 1 cone. Inner plate of maxilla 1 broad, bearing 1 medium apical pluseta, 1 similar apicomedial seta, 2 apicolateral slightly shorter setae, outer plate with 11 spines, palp article 2 with 1 apical spine, and 1 apicolateral and 4 medial and 2

submarginal setae. Inner plate of maxilla 2 scarcely shorter than outer, outer slightly broader than inner, outer with 4 apicolateral setae, inner with 2 medial setae. Inner plate of maxilliped with 1 large thick apical spine, 2 apicofacial setae, 2 medial setae, outer plate with 7 medial spines, 2 apicolateral setae and 3 cusps, palp article 1 without apicolateral seta, article 2 with 2 groups of 7 lateral setae, medial margin of article 2 strongly setose, article 3 with 8 facial setae, pair of lateral setae, nail of article 4 short, almost fully fused, with 2-3 accessory setules.

Coxa 1 expanded apically, anterior margin weakly concave, main ventral setae of coxae 1-4 = 9-10-11-8, posteriormost seta of coxae 1-3 shortest; anterior and posterior margins of coxa 4 almost parallel, posterior margin convex, not setose, posterodorsal corner rounded, posterodorsal margin ordinary, concave, width-length ratio of coxa 4 = 6:7. Coxal gills 2-7. Gnathopods generally ordinary, width ratios on articles 5-6 of gnathopods 1-2 = 26:32 and 25:34, length ratios = 49:59 and 41:57, palmar humps ordinary, palms oblique, article 5 of gnathopod 1 not elongate, ovate, posterior margin rounded, short, article 5 of gnathopod 2 short, triangular, posterior margin rounded, short, produced. Pereopods 3-4 similar, facial setae formula on article 4 = 5 and 4, parallel to apex, on article 5 = 9 and 8, main spine of article 5 extending to M. 95 on article 6, article 5 without proximoposterior spines, spine formula of article 6 = 6 + 5 and 6 + 5 plus middistal setule, no spines especially long, acclivity on inner margin of dactyls of pereopods 3-4 absent, emergent setule short, midfacial pluseta ordinary. Coxae 5-7 posteroventral seta formula = 10-12-5; articles 4-5 of pereopods 5-6 narrow to ordinary in width, facial spine rows sparse, facial ridge formula of article 2 on pereopods 5-7 = 0-1-1. Width ratios of articles 2, 4, 5, 6 of pereopod 5 = 45:31:30:16, of pereopod 6 = 70:32:21:10, of pereopod 7 = 89:23:20:10, length ratios of pereopod 5 = 75:31:37:39, of pereopod 6 = 85:56:45:63, of pereopod 7 = 100:25:25:28, article 2 of pereopod 7 reaching middle of article 4, posterior margin with 7-8 small serrations,

medial apex of article 6 finely combed, bearing 2-3 digital processes, moderately spinose.

Posteroventral corner of epimeron 7 rounded, posterior margin straight, with 2 setules, anteroventral margin with 7 long to medium setae, posteroventral face with 3 long setae in groups of 1 and 2, latter set vertically. Posteroventral corner of epimeron 2 weakly protuberant, posterior margin straight, weakly serrate, setose (5), facial setae = 11, no pair set vertically. Posteroventral corner of epimeron 3 weakly protuberant, posterior margin straight or weakly concave, serrate, setose (11), without setule notches, ventral margin with 5 setae mainly posterior.

Urosomite 1 with lateral setule at base of uropod 1, face with pair of setae, articulation line short, urosomite 3 unprotuberant dorsally. Rami of uropods 1-2 with articulate but tightly fixed apical nails, except inner ramus of uropod 1 with flexible nail, outer ramus of uropod 1 with 4 dorsal spines, inner with 2, outer ramus of uropod 2 with 4 dorsal spines, inner without dorsomedial spines. Peduncle of uropod 1 with 2 small apicolateral spines, medially with 6 medium marginal widely spread spines, apicalmost ordinary plus enlarged displaced spine. Peduncle of uropod 2 with 8 mostly elongate (except apicalmost) dorsal spines, medially with 1 small apical spine; apicolateral corners of peduncles on uropods 1-2 without comb. Peduncle of uropod 3 with 7 ventral spines, dorsally with 1 lateral spine and setule, 1 medial spine and setule, rami submasculine, inner extending to M. 95 on article 1 of outer ramus, apex with 2 setae, medial and lateral margins with 2 and 1 setae respectively, article 2 of outer ramus ordinary, 0.19, bearing 2 medium setae, apicomедial margin of article 1 with 3 setae, lateral margin with 3 acclivities, spine formula = 2-2-2-2, setal formula = 0. Telson especially long, poorly glandular, length-width ratio = 14:11, almost fully cleft, each apex wide, rounded, lateral acclivities shallow, narrow, with short lateral and medium medial spines separated by medium setule, no dorsal supernumerary armaments, mid-lateral setules diverse, largest medium, at M. 30.

Male "g": Rostrum scarcely narrower than in female. Article 2 of antenna 1 with 6 narrowly confined ventral setae, primary flagellum with 11 articles, 1 calceolus each on articles 2-6, aesthetascs weakly developed. Ventral setae on antenna 2 sparse, facial spine formula on article 4 = 3-4-3, formula on article 5 = 4, latter with 3 dorsal sets of male setae and 1 calceolus, ventrodiscal apex with 2 thin spines, flagellum formula = 2, 3, 4, 6, 8 . . . n. Basofacial setal formula of article 3 on mandibular palp = 0-3; right incisor with only 2 teeth, left with 2 sharp branches; right lacinia mobilis bifid (illustrated), left with 5 sharp teeth, middle 3 shortened. Article 2 of pereopods 5, 6, 7 narrower than in female. Epimera 1-3 broadened, posterior margin of epimeron 3 not shortened, setal formulas, epimeron 1 anteroventral = 8, posteroventral = 3, all on margin, epimeron 2 facial = 9, posterior = 4; epimeron 3 posterior = 9, facial = 0, ventral = 5 short. Spine formulas of uropods, uropod 1 peduncle apicolateral = 3, basofacial = 5, uropod 2 peduncle dorsal = 10, dorsal spines on outer ramus of uropod 1 = 3 crowded, of uropod 2 = 3 crowded small, inner ramus of uropod 1 = 1 larger, of uropod 2 = 0, ventral spines on peduncle of uropod 3 = 5, small spine formula on article 1 of outer ramus = 1-1-1-1-1, setal formula = 0-1-1-1-1; article 2 length = 0.09. Telson not elongate, slightly broadened, distal spines shortened, each lobe with 1 dorsolateral spine at M. 50 and long dorsal denticle row in single file.

THE SUR PHENOTYPE.—At first our reanalysis of *F. obtusidens* in Hancock collections produced a taxon we considered to be a distinct species in which article 5 of pereopods 3-4 bears a strong proximal posterior spine apart from the long distoposterior spine normal to most phoxocephalids in this phyletic vicinity. As more and more specimens were encountered, the variability in correlation of the pereopodal spine with greater or lesser degrees of setosity on epimeron 2, greater and lesser degrees of ensiformity on antenna 2 (especially in AHF 2788), and presence of 0, 1, or 2 of the stated pereopodal spines in various specimens, seemed to negate the clear distinction

needed to consider this a distinct species. It is therefore called a "sur phenotype" and occurs mostly in warm southern waters of the northeastern Pacific south of California.

Specimens of this form already are shown in J.L. Barnard, 1960, on pl. 33: fig. F, pl. 35: fig. A, and pl. 36: figures G-K in AHF samples 478 and 442. Two females (sur females "p" and "s") are described below to show the congruence with normal *F. obtusidens*.

Description of Sur Female "p": Head about 20 percent of total body length, appearing stubby, greatest width about 65 percent of length, rostrum unconstricted, broad, elongate, almost reaching apex of article 2 on antenna 1. Eyes medium to large, mostly occluded with pigment, ommatidia ordinary. Article 1 of peduncle on antenna 1 about 1.45 times as long as wide, about 2.2 times as wide as article 2, ventral margin with about 16 setules, weakly produced dorsal apex with 2 setules-setae, article 2 about 0.45 times as long as article 1, with 2 tightly confined ventral rows of 7 and 2 setae, and 6 lateral setae, primary flagellum with 17 articles, about 1.2 times as long as peduncle, bearing 1 short aesthetasc each on articles 5-16; accessory flagellum with 14 articles. Antenna 2 not ensiform, article 3 with 1 anterodistal setule, spine formula of article 4 = 1-3-3-5, dorsal margin with notch bearing 2 setae and 1 spine, ventral margin with 7 groups of 1-6 long to medium setae, 1 ventrodiscal long spine, article 5 about 0.9 times as long as article 4, facial spine formula = 3-4, dorsal margin bearing 2 sets of short setae, ventral margin with 5 sets of 1-3 long to short setae, 1 ventrodiscal medium subdistal facial spine; flagellum about 1.5 times as long as articles 4-5 of peduncle combined, with 18 articles.

Mandibles with medium palpar hump, right incisor with 3 teeth, third about in middle of medial edge, left incisor with 3 humps in 2 branches; right lacinia mobilis bifid, distal branch little shorter than proximal, distal branch flabellate, narrow, proximal branch simple, pointed, left lacinia mobilis with 5 short teeth, middle teeth not shortened; right rakers 10 plus

2 rudimentaries, left rakers 12 plus 1 rudimentary; molars composed of elongate plaques, right molar with 6 primarily long spines plus 1 shorter spine strongly disjunct, left molar with 8 primarily long spines plus 1 shorter spine strongly disjunct, each molar with plume; palp article 1 short, article 2 with 1 long medium inner apical seta and 4 other medium and short inner setae, article 3 about 0.9 times as long as article 2, oblique apex with 8-9 spine-setae, basofacial formula = 0-2 or 0-3. Each outer lobe of lower lip with 1 cone. Inner plate of maxilla 1 especially large, bearing 1 long apicomedial pluseta, 1 shorter similar faciomedial seta, 2 apicolateral much shorter setae, outer plate with 11 spines, palp article 2 very thin, with 1 apical spine, 1 apicolateral spine-seta, 11 medial spines mostly in pairs on margin. Plates of maxilla 2 extending equally, outer not broader than inner, outer with 7 apicolateral setae, inner with 5 medial setae. Inner plate of maxilliped with 2 large thick apical spines, 3 apicofacial setae, 5 medial setae, outer plate with 13 medial and apical spines, 7 apicolateral setae, palp article 1 without apicolateral seta, article 2 with 2 apicolateral setae, medial margin of article 2 moderately setose, article 3 with 12-13 facial setae, 5-6 lateral setae, article 4 with 2-4 accessory setules, nail absent.

Coxa 1 strongly expanded apically, anterior margin weakly concave, main ventral setae of coxae 1-4 = 8-7-7-3, posteriormost seta of coxae 1-2 shortest, anterior and posterior margins of coxa 4 strongly divergent, posterior margin almost straight, posterodorsal corner rounded, posterodorsal margin ordinary, almost straight, width-length ratio of coxa 4 = 20:21. Gnathopods generally ordinary, width ratios on articles 5-6 of gnathopods 1-2 = 25:37 and 28:42, length ratios = 65:64 and 54:64, palmar humps ordinary to large, palms strongly oblique, article 5 of gnathopod 1 elongate, ovate, posterior margin rounded, long, article 5 of gnathopod 2 ovate, posterior margin rounded, short, almost lobate.

Pereopod 4 stouter than pereopod 3 especially on article 4, facial setae formula on article 4 = 3 + 4, parallel to apex, on article 5 = 3 + 5, main

spine of article 5 extending to M. 90 on article 6, article 5 with 3 and 2 proximoposterior spines, spine formula of article 6 = 4 + 5 and 4 + 5 plus small middistal seta, some spines especially long, acclivity on inner margin of dactyls of pereopods 3-4 obsolescent, emergent setule almost fully immersed, midfacial pluseta ordinary. Coxae 5-7 posteroventral setae formula = 7-?-8; articles 4-5 of pereopods 5-6 narrow, facial spine rows sparse, facial ridge formula of article 2 on pereopods 5-7 = 0-1-1; width ratios of articles 2, 4, 5, 6 of pereopod 5 = 50:30:30:12, of pereopod 6 = 70:30:20:11, of pereopod 7 = 83:17:17:8, length ratios of pereopod 5 = 86:35:41:51, of pereopod 6 = 97:67:50:77, of pereopod 7 = 100:25:29:38, article 2 of pereopod 5 tapering slightly apically and lacking posteroventral lobe, article 2 of pereopod 7 reaching middle of article 4, posterior margin with 8 small serrations, medial apex of article 6 very weakly combed, bearing 5 weak digital processes.

Posteroventral corner of epimeron 1 rounded, posterior margin weakly convex, with 5 short setae or setules, anteroventral margin with 14 short to medium setae, posteroventral margin with 3 long setae. Posteroventral corner of epimeron 2 rounded, posterior margin straight, with 6 setules, facial setae = 5, none set vertically. Posteroventral corner of epimeron 3 rounded, posterior margin straight, with 4 setae at corner, ventral margin naked.

Urosomite 1 with lateral setule at base of uropod 1, articulation line almost complete, urosomite 3 unprotuberant dorsally. Rami of uropods 1-2 with articulate but tightly fixed apical nails, except inner ramus of uropod 1 with flexible nail, outer ramus of uropod 1 with 7 tightly packed dorsal spines, inner with 2 larger spines, outer ramus of uropod 2 with 6 dorsal spines, inner with 1 large dorsomedial spine. Peduncle of uropod 1 with 5 basofacial setal spines and 6 apicolateral spines, medially with 5 marginal spines, apicalmost an ordinary spine plus enlarged displaced spine. Peduncle of uropod 2 with 11 short distal spines, medially with 1 small apical spine; apicolateral corners of peduncles on uropods 1-2

without comb. Peduncle of uropod 3 with 6 ventral spines, dorsally with 1 lateral spine and setule, 1 medial spine and setule, rami submasculine, inner extending to M. 95 on article 1 of outer ramus, apex with 2 setae, medial and lateral margins setose, article 2 of outer ramus short, 0.10, bearing 2 medium setae, medial margin of article 1 setose, lateral margin with 4 acclivities, spine formula = 2-2-2-2-1, short setal formula = 0-0-0-0-2. Telson especially long, length-width ratio = 4:3, almost fully cleft, each apex of medium width but attenuate, lateral acclivity broad, shallow, with short lateral and medial spines separated by longer setule, plus small lateral spine at M. 55, midlateral setules diverse, largest of medium size.

Sur Female "s": Smaller and more normal (less extremely developed than sur female "p"); ventral setae on article 2 of antenna 1 = 4, lateral = 3, primary flagellum with 13 articles, accessory with 10. Facial spine formula on article 4 of antenna 2 = 1-3-4-5, dorsal notch with 1 spine and 3 setae; facial formula on article 5 = 5, apical face with 3 medium to long spines, 1 set fully facial, flagellum with 14 articles.

Setal formula on coxae 1-7 = 6-6-6-3-5-6-4. Armament formulas on article 4 of pereopods 3-4 = 3 and 3, setae on face, article 5 facial setae = 4 and 4, posteroproximal spines 2 and 1, spine formula on article 6 = 4 + 4 + 1 on both pairs. Article 2 of pereopod 7 with 9 posterior serrations.

Epimeral setae, epimeron 1 anteroventral = 5, posteroventral = 2, facial oblique = 2, posterior margin = 2 setules; epimeron 2 facial = 5, and 2 verticals, posterior = 2 setules; epimeron 3, ventral 2, posterior = 7-8, not widely spread.

Urosomite 1 with 1 setule at lateral base of uropod 1. Setal and spine formulas on uropods, uropod 1 peduncle basofacial = 3, peduncle apicolateral = 6, outer ramus = 3, inner 1; uropod 2 peduncle dorsolateral = 10, outer ramus = 3, inner = 10; uropod 3 ventral peduncle = 5, inner ramus reaching to M. 70 on article 1 of outer, setose apicomediaally and laterally, spine formula on article 1 outer ramus lateral = 2-2-2-2, short

setae = 0-0-0-2, article 2 = 0.23 times length of article 1.

Apex of telsonic lobe with 2 spines separated by setule, dorsolateral setule pairs at M. 60.

VOUCHER MATERIAL.—AHF *Velero IV* 5606, southern California, 32 m, female "k," 7.73 mm; *Velero IV* 5045, same, 24 m, female "a," 7.73 mm; Bahía de San Quintín, Mexico, Beaudette Foundation, 21 Apr 1960, 18-24 feet (5-7 m), male "g," 5.77 mm; SQ-12, 22 Apr 1960, 7 feet (2 m), female "h," 5.62 mm; sur phenotype, *Velero III* 478-35, Bahía Salinas, Costa Rica, 1.5 fms (3 m), female "s," 7.45 mm; *Velero III* 285, Thurloe Head, Baja California, 30 fms (55 m), female "p," 13.55 mm.

OTHER MATERIAL.—*Velero III* and *IV* samples: 871 (1), 888 (14), 889 (1), 1140 (1), 1169 (1), 1197 (1), 1205 (2), 1232 (2), 1241 (3), 1295 (1), 1372 (1), 1390 (1), 1598 (1), 2018 (7), 2026 (1), 2032 (2), 2125 (1), 2126 (5), 2232 (2), 2291 (1), 2311 (1), 2312 (7), 2313 (2), 2348 (5), 2394 (1), 2444 (14), 2496 (3), 2497 (3), 2498 (2), 2501 (2), 2606 (4), 2629 (1), 3047 (3), 3048 (7), 3161 (24), 3162 (34), 3164 (2), 3204 (2), 3213 (12), 3394 (1), 3727 (9), 4746 (1), 4767 (3), 4769 (7), 4779 (1), 4810 (3), 4818 (9), 4853 (20), 5098 (1), 5605 (1); southern California samples from other sources: off Corona del Mar, G.E. MacGinitie, 15 Jul 1937, 12 fms (22 m) (6, form A) (6, form A-1); same area 31 Jan to 3 Mar 1933, near bell buoy, 15 fms (27 m), G.E. MacGinitie (14); San Diego, Sunset Cliffs, tidepool of sand, 13 Mar 1949, T.E. Bowman (2); off San Diego at 32°36.1'N, 117°13'W, sandy bottom, 20 fms (36 m), 31 Mar 1949, coll R. Cifelli (1); AHF, Hubbs 47-86 [locality unknown] (1); AHF, Rocky Point, California, 10 May 1924, Acc. A.R. Ulrey, University of Southern California (1); AHF, Santa Catalina Island, Avalon 16 and 24, 1951, C. Horvath and J.L. Mohr (4); AHF, Coronado Islands, 16 Mar 1949, sandy bottom, 8 fms (15 m), coll. T.E. Bowman (2); same, 10 Aug 1949, larvae trap, 7:05-9:10 P.M. (8); Bahía de San Quintín, Mexico, 6 Apr 1950, various samples coll. by D.J. Reish and R.J. Menzies (45); same, Beaudette Foundation, coll. J.L. Barnard and party, SQ-12

and SQ-18 (for additional material see "Voucher Material"); Isla Cedros, Mexico, 9 May 1950, nightlight, dip net, 2000–2400 hours, coll. Backwith and Huffer (23 males).

MATERIAL OF SUR PHENOTYPE.—*Velero III* and *IV* samples: 259 (1), 279 (2), 283 (1), 285 (1), 442 (2), 477 (1), 478 (18), 564 (1), 582 (1), 1140 (1), 2091 (2), 2611 (2), 2788 (17), 2967 (2), 5043 (1 male); Pt. Fermin, California, 21 Oct 1949, intertidal on *Phyllospadix*, coll. J.L. Barnard (1); La Jolla, California, 9 Mar 1949, sand in tidepool, coll. T.E. Bowman (1).

DISTRIBUTION.—Based on new analysis of restricted material; typical phenotype, California from Monterey Bay southward to Isla Cedros, Baja California, including Bahía de San Quintín and all Channel Islands, 0–210 m, males often in neritic nightlights or traps, sur phenotype ranging from Redondo Beach, California, south to Bahía Piñas, Panama, 0–55 m, including Santa Catalina Island only (of Channel Islands as far as known), Bahía Salinas, Costa Rica, Bahía Tangola Tangola, Bahía Santa Maria (Baja California), Thurloe Head, and into the Gulf of California at Isla Tiburón and Isla San Marcos.

***Foxiphalus major* (J.L. Barnard), new status,
new combination**

FIGURE 1 (part)

Paraphoxus obtusidens major J.L. Barnard, 1960:259–261, pl. 32.

DESCRIPTION OF FEMALE "a".—Head about 21 percent of total body length, greatest width about 67 percent of length, rostrum unstricted, elongate, broad, tapering to narrow apex, slightly exceeding apex of article 3 on antenna 1. Eyes small, largely occluded with pigment, ommatidia ordinary. Article 1 of peduncle on antenna 1 about 1.66 times as long as wide, about 2.1 times as wide as article 2, ventral margin with about 7 setules, unproduced dorsal apex with 2 setules, article 2 about 0.70 times as long as article 1, with widely spread ventral cycle of 14 setae, plus 4 apicolateral setae, primary flagellum about

0.5 times as long as peduncle, with 10 articles, bearing 1 short aesthetasc, on each of the articles 4–8; accessory flagellum partly fused to peduncle, with 9 articles. Antenna 2 ensiform, lobe large though curled inward, spine formula of article 4 = 4–6–6, dorsal margin with 2 notches bearing total of 5 setae and 2 spines, ventral margin with 13 groups of 2–3 long to medium setae, 2 short and 4 long ventrodistal setae, ventrodistal face with medium spine, article 5 about 0.85 times as long as article 4, facial spine formula = 3–3–3–3–2, apicodorsal margin bearing 2 small setae, ventral margin with 11 sets of single long setae, 3 ventrodistal short to medium spines more or less facial; flagellum short, about 0.66 times as long as articles 4–5 of peduncle combined, with 11 articles.

Epistome unproduced. Mandibles with medium palpal hump, right incisor with 3 teeth, third tooth unusually distad (illustrated), left incisor with 3 humps in 2 branches, right lacinia mobilis bifid, distal branch little shorter than proximal, distal branch narrow, scarcely denticulate, proximal branch simple, pointed, with marginal denticles; left lacinia mobilis with 4 teeth, middle teeth not shortened; right rakers 10, left rakers 14 plus 2 rudimentaries; molars composed of elongate granular-striate plaques, right molar with 9 primarily long spines, plus medium, sharp spine strongly disjunct, left molar with 9 primarily long, plus 2 short spines, plus 1 medium sharp spine strongly disjunct, each molar with plume; palp article 1 short, article 2 stout, with 4 long to medium inner apical setae and 6 other long and short inner setae, 8 lateral setae in 3 groups plus 17–20 outer setae in 2 patterns, article 3 about 1.2 times as long as article 2, oblique apex with 20–22 spine-setae, basofacial formula = 7–5, and 7–4 groups opposite but skewed. Each outer lobe of lower lip with 1 cone. Inner plate of maxilla 1 ordinary, bearing 1 long apical pluseta, 1 shorter mediofacial seta, 2 apicolateral much shorter setae, outer plate with 11 spines, palp article 2 with 1 thin apical spine, 1 apicolateral seta, 5 medial spine-setae and 7 scarcely submarginal setae. Inner plate of maxilla 2 shorter than

outer, outer slightly broader than inner, outer with 5 apicolateral setae, inner with 3 medial setae. Inner plate of maxilliped with 2 large thick apical spines, 2 apicofacial setae, 4 medial setae, outer plate with 10 medial spines, 5-6 apicolateral setae, palp article 1 with 4 lateral seta, article 2 with 6-8 groups of 8-9 apicolateral setae, medial margin of article 2 strongly setose, article 3 with 15 strewn facial setae, 4 lateral setae in 3 sets, nail of article 4 distinct, short, with 2 accessory setules.

Coxa 1 expanded apically, anterior margin weakly concave, main ventral setae of coxae 1-4 = 13-14-16-38, not widely spread except on coxa 4, latter with posterior setae shortened, posterior-most seta of coxae 1-4 slightly shortened, anterior and posterior margins of coxa 4 parallel, posterior margin very convex, posterodorsal corner rounded, posterodorsal margin short, concave, width-length ratio of coxa 4 = 7:8. Coxal gills 2-7. Gnathopods generally ordinary but palms strongly oblique, width ratios on articles 5-6 of gnathopods 1-2 = 31:38 and 29:38, length ratios = 65:76 and 61:70, palmar humps very small, palms strongly oblique, article 5 of gnathopod 1 elongate, ovate, posterior margin flat, short, article 5 of gnathopod 2 elongate, ovate, posterior margin rounded, short, almost produced.

Pereopod 4 scarcely stouter than pereopod 3, facial setae formula on article 4 = 6 and 6, parallel and near middle of apex, on article 5 = 10 and 10, main spine of article 5 extending to M. 95 on article 6, article 5 with no proximoposterior spines nor setae!; spine formula of article 6 = 16 + 13 and 16 + 13 and no middistal spine or seta, some spines especially long, acclivity on inner margin of very short dactyls of pereopods 3-4 obsolescent to absent, emergent setule short, almost fully immersed, midfacial pluseta very short, highly distad. Coxae 5-7 posteroventral setal formula = 26-19-13; articles 4-5 of pereopods 5-6 ordinary to slightly narrow, facial spine rows dense to sparse, facial ridge formula of article 2 on pereopods 5-7 = 0-1-1; width ratios of articles 2, 4, 5, 6 of pereopod 5 = 55:44:37:20, of

pereopod 6 = 88:38:23:14, of pereopod 7 = 101:32:30:10, length ratios of pereopod 5 = 100:46:45:48, of pereopod 6 = 105:67:65:84, of pereopod 7 = 100:32:38:38, article 2 of pereopod 7 reaching middle of article 4, posterior edge with 4 small serrations, medial face with numerous scattered setae, medial apex of article 6 not combed, bearing 7+ digital processes, especially strongly spinose.

Posteroventral corner of epimeron 1 quadrate, posterior margin straight, weakly concave, serrate, setose (15), anteroventral margin and face with 26 long to medium setae, several 2 abreast, posteroventral margin with 6 long setae. Posteroventral corner of epimeron 2 with small blunt tooth, posterior margin weakly concave, serrate, setose (23), anterior setae = 7, facial setae = 14, several middle pairs set vertically. Posteroventral corner of epimeron 3 with small tooth, posterior margin straight, serrate, setose (42, many paired medial and lateral), ventral margin with 17 setae evenly spread throughout.

Urosomite 1 without lateral facial setae or ventral setule at base of uropod 1, ventral setae scarcely climbing side of segment, articulate line almost complete, urosomite 3 unprotuberant dorsally. Inner rami of uropods 1-2 with freely articulate apical nails (perhaps accessory), outer rami with fused immersed apical nails, outer ramus of uropod 1 with 8 thin dorsal spines falling well short of apex, inner with 6 thin spines, outer ramus of uropod 2 with 13 thin dorsal spines reaching well towards apex, inner with no dorsomedial spines, peduncle of uropod 1 with 9 basofacial and 4-5 ventromedial setae and 1 small apicolateral spine, medially with 13-15 thin marginal setae and spines, apicalmost scarcely enlarged, plus giant displaced spine. Peduncle of uropod 2 with 12 dorsal spines, apicalmost thick and short, remainder thin and elongate, medially with 1 small setule; apicolateral corners of peduncles on uropods 1-2 without comb. Peduncle of uropod 3 with 11 ventral spines, dorsally with 1 lateral spine, 1 medial spine, and 1 setule, rami submasculine, rami very elongate and thin, inner extending to M. 100+ on article 1 of outer ramus,

all setae very short, apex with 2 setae, medial and lateral margins with 4 and 2 setae respectively, article 2 of outer ramus short, 0.13, bearing 2 short setae, apicomедial margin of article 1 setose, lateral margin with 6 acclivities, spine formula = 1-1-2-2-2-2-2 or 1-2-2-2-2-2-2, setal formula = 0. Telson especially long, very glandular, length-width ratio = 19:14, fully cleft, each apex narrow, truncate, excavate, bearing short lateral setule, spine next medial much longer than setule, next spine slightly longer than setule, dorsal surface of each lobe with supernumerary pair or 3 setules, so-called mid-lateral setules completely basal, small, equal.

NOTES.—Mature Male (from literature): Setae of uropod 3 much longer than in female, inner ramus strongly setose on both margins; on article 1 of outer ramus at least 1 seta joined with spine in each acclivity on lateral margin.

Young Adults: Telson with distinct apico-medial protrusion and lateral acclivity.

Young Male "z": Article 1 of antenna 1 and articles 3-4 of antenna 2 with slight and dense medial pubescence respectively; article 2 of antenna 1 with 15 ventral setae, primary flagellum with 10 articles, 1 large leaflike calceolus each on articles 2-6, single aesthetascs moderately developed. Facial spine formula on article 4 of antenna 2 = 0-3-3-3-3-3, article 5 with 7 dorsal sets of male setae and 7 calceoli, ventrodiscal apex with 3 thin spines and 1 setule, flagellum with calceoli. Telson like that of female but densely furnished with cuticular pores and subcuticular spikelike ducts leading from dense glands to pores (female with glands but ducts sparse), denticle rows single file, over two-thirds length of telson. Young male otherwise like female.

Juveniles: Telsonic basal setule pairs diverse, 1 small, 1 tiny.

Juvenile "j": Anterior body generally like adult; setal formulas on epimera, anteroventral on face = 12, posteroventral face = 2, posterior = 9; epimeron 2, anteroventral = 2, facial = 8, posterior = 14, epimeron 3, ventral = 9 fully spread, posterior = 21 mixed long and short and pairs.

Setae and spine counts on uropods, uropod peduncle 1, basofacial = 6, apicolateral peduncle = 1, outer ramus = 5, inner = 2; uropod 2 peduncle dorsolateral = 8, apicalmost stout, all others thin, outer ramus = 7.

MATERIAL.—Pacific Grove, California, Jul 1895, J.Q. Snyder, female "g," 17.5 mm (formerly labeled by Shoemaker as *grandis* in the Smithsonian collections but not published). Osoflacos, California, 31 Aug 1955, C. Limbaugh, 22 ft (7 m), 1 specimen. Oregon 1, 30 m (Oregon, data in J.L. Barnard, 1971), 1 specimen. *Velero IV* 4819, off Pt. Conception, California, 17 m, male "z," 13.92 mm, female "a," 14.64 mm, juvenile "j," 6.70 mm.

RELATIONSHIP.—Like *F. obtusidens* but dorsolateral setules on telson highly basad, telson elongate and filled with brown glandular material; telson in adults otherwise without supernumerary spines, thus like bay form of *F. obtusidens* but much larger and occurring in open sea intertidal; juveniles with fully elongate inner ramus of uropod 3; article 4 of pereopod 5 and articles 4-5 of pereopod 7 broadened; palms of gnathopods more oblique; antenna 2 more strongly ensiform; article 2 on outer ramus of uropod 3 very short; articles 4-5 of pereopod 6 narrow and poorly spinose; generally dactyls of pereopods 3-4 short; article 6 of pereopods 3-4 very long, spines numerous and extending far basad.

DISTRIBUTION.—Oregon to Bahía Blanca, Baja California, 0-91 m, in cold water or upwelling south of Point Conception.

Foxiphalus aleuti, new species

FIGURE 1 (part)

DESCRIPTION OF HOLOTYPE (young male "1").—Head about 21 percent of total body length, greatest width about 75 percent of length, rostrum scarcely constricted, broad, elongate, reaching apex of article 2 on antenna 1. Eyes medium to large, clear of pigment, ommatidia ordinary. Article 1 of peduncle on antenna 1 about 1.6 times as long as wide, about 1.8 times as wide as

article 2, ventral margin with about 13 setules, weakly produced dorsal apex with 2 setules-setae, article 2 about 0.5 times as long as article 1 with ventral cycle of 9 setae, primary flagellum with 18 articles, about 1.15 times as long as peduncle, bearing 1 short aesthetasc each on articles 5-17; accessory flagellum with 12 articles, only 0.6 times as long as primary flagellum. Antenna 2 weakly ensiform, apex of process turned inward; spine formula on article 4 = 1-3-5-6, dorsal margin with 1-2 notches bearing 3 and 2 setae and 2 spines, ventral margin with 7-8 groups of 1-4 mostly medium setae, 1 ventrodorsal long spine, article 5 being about 0.7 times as long as article 4, facial spine formula = 3-5, dorsal margin bearing 3 sets of small setae, ventral margin with 5 sets of 1-2 long to short setae, 3 ventrodorsal long to medium spines set facially; flagellum broken but clearly longer than articles 4-5 of peduncle combined.

Epistome unproduced anteriorly. Mandibles with weak palpar hump, right incisor with 3 teeth, left incisor with 3 humps in 2 branches, right lacinia mobilis bifid, distal branch long but much shorter than proximal, branches simple, pointed, left lacinia mobilis with 4 teeth, middle teeth scarcely shortened; right rakers 10 plus 1 rudimentary, left rakers 9 plus 1 rudimentary; molars composed of elongate narrow humps, each molar with about 10 spines, half short and half medium plus 1 short spine weakly disjunct; molar with plume; palp article 1 short, article 2 with 1 long and 1 short inner apical setae and 3-4 other long to short inner setae; article 3 about as long as article 2, oblique apex with 13-11 spine-setae, basofacial formula = 1-4 or 1-3. Inner plate of maxilla 1 ordinary, bearing 1 apicofacial pluseta, 1 similar apicomedia seta, 2 apicolateral much shorter setae, outer plate with 11 spines, palp article 2 with 1 apical spine, 1 apicolateral, 3 medial and 5 submarginal setae. Plates of maxilla 2 extending equally, outer not broader than inner, outer with 7 apicolateral setae, inner with 4 medial setae. Inner plate of maxilliped with 2 large thick apical spines, 2 apicofacial setae, 6 medial setae, outer plate with 9 medial and apical

spines, 7 lateral setae, palp article 1 without apicolateral seta, article 2 with 2 groups of 4 lateral setae, medial margin of article 2 moderately setose, article 3 with 9 facial setae, 2 lateral setae, nail of article 4 short, fused to article 4, with 2 accessory setules.

Coxa 1 slightly expanded apically, anterior margin straight, main ventral setae of coxae 1-4 = 11-11-12-6, posteriormost seta of coxae 1-3 slightly to scarcely shortened, anterior and posterior margins of coxa 4 strongly divergent, posterior margin oblique, almost straight, postero-dorsal corner sharp, posterodorsal margin long, scarcely concave, width-length ratio of coxa 4 = 7:8.

Gnathopods generally ordinary, width ratios on articles 5-6 of gnathopods 1-2 = 25:37 and 29:40, length ratios = 65:67 and 56:67, palmar humps ordinary to large, palms oblique, article 5 of gnathopod 1 elongate, ovate, posterior margin flat, long; article 5 of gnathopod 2 ovate, posterior margin rounded, short, triangular (almost lobate).

Pereopods 3-4 similar, slender!, facial setae formula on article 4 = 6 and 6, parallel to apex, on article 5 = 7 and 8, main spine of article 5 extending to M. 100 on article 6, article 5 with 2 and 2 proximoposterior spines, spine formula of article 6 = 4 + 5 and 5 + 5 plus middistal seta, some spines scarcely elongate, acclivity on inner margin of dactyls of pereopods 3-4 obsolescent, emergent setule almost fully immersed, midfacial pluseta ordinary but somewhat distad. Coxae 5-7 posteroventral setae formula = 11-9-12, article 4-5 of pereopods 5-6 narrow, facial spine rows sparse, facial ridge formula of article 2 on pereopods 5-7 = 0-1-1; width ratios of articles 2, 4, 5, 6 of pereopod 5 = 44:32:33:15, of pereopod 6 = 73:37:30:14, of pereopod 7 = 95:22:23:?, length ratios of pereopod 5 = 80:35:43:52, of pereopod 6 = 100:63:56:70, of pereopod 7 = 105:30:31:?, article 2 of pereopod 7 = reaching middle of article 4, posterior margin with 11 small serrations, appearance of pereopods 5-6 like *F. similis* of J.L. Barnard (1960), pereopod 5 especially thinner than in *F. cognatus*, pereopod 7 like plate

34H for *F. obtusidens* in J.L. Barnard (1960); medial apex of article 6 finely combed, bearing 7-8 digital processes (from specimen "k").

Posteroventral corner of epimeron 1 rounded, with faint notch, posterior margin weakly convex, with 2-3 weak setae, anteroventral margin with 21 long to medium setae, posteroventral face with 1 long seta. Posteroventral corner of epimeron 2 rounded but with moderate notch, posterior margin weakly convex, setose (5), facial setae = 11 in 1 line. Posteroventral corner of epimeron 3 rounded-quadrate, posterior margin straight, serrate, setose (8) and with 1 setule notch, all setae near ventral part of margin, ventral margin with 4 setae mainly posterior.

Urosomite 1 with 1 lateral seta near base of uropod 1 and normal ventral brush, articulation line almost complete, urosomite 3 weakly protuberant dorsally. Rami of uropods 1-2 with large articulate but tightly fixed apical nails, that on inner ramus of uropod 1 not flexed but rigidly contained, outer ramus of uropod 1 with 6 small dorsal tightly packed spines, inner with 2 large spines, outer ramus of uropod 2 with 4 small dorsal tightly packed spines, inner without dorsomedial spines, peduncle of uropod 1 with 6 basofacial setae and 4 small apicolateral spines, medially with 6 marginal spines, apicalmost ordinary, plus large displaced spine. Peduncle of uropod 2 with 10 short dorsal spines, medially with 1 small apical spine; apicolateral corners of peduncles on uropods 1-2 without comb. Peduncle of uropod 3 with 7 ventral spines, dorsally with 1 lateral spine, 8 medial and dorsal setules, rami submasculine, inner extending to M. 90 on article 1 of outer ramus, apex with 3 setae, medial and lateral margins with short setae, article 2 of outer ramus short, bearing 2 setae of unknown length, medial margin of article 1 setose, lateral margin with 5 acclivities, spine formula = 1-2-1-2-1-2, setal formula = 0. Telson ordinary, length-width ratio = 19:17, not fully cleft, each apex wide, rounded, lateral acclivity broad, shallow, with short lateral and medial spines separated by short setule (right side aberrant = 1 spine, 1 vestigial setule), midlateral setules di-

verse, larger of medium size, each lobe with row of denticles.

NOTES.—Female "k": Apical setae on outer ramus of uropod 3 also broken, therefore full length of these unknown in large adults of this species; inner ramus of uropod 3 reaching to M. 50 on article 1 of outer ramus, bearing only apical setae; width of articles 5-6 on pereopod 7 = 23:13, length = 31:42 (to fill out data missing on holotype owing to breakage).

HOLOTYPE.—USNM 171435, young male "l," 13.7 mm.

TYPE-LOCALITY.—W.H. Dall, 1874, between Pinnacle and Ulakhla, Unalaska, 1874, 16 fms (29 m).

MATERIAL.—Type-locality, female "k," 12.7 mm; *Velero IV* 1354-41, off Church Rock, Santa Catalina Island, 60 fms (110 m), 1 female.

RELATIONSHIP.—This species reminds one how little *Foxiphalus* differs from *Grandifoxus* and *Rhepoxynius*. For all practical purposes, *F. aleuti* would be in *Grandifoxus* except for the presence of only two facial setae on article 3 of antenna 2 and would be in *Rhepoxynius* except that the weakly constricted rostrum is not much more strongly constricted. No wonder J.L. Barnard (1960) thought all world birubiins belonged in one genus. This species differs from any in *Rhepoxynius* in the presence of two (versus 1) spines on the inner plate of maxillipeds, although other species of *Foxiphalus* also have only one of these spines (*F. obtusidens*, for example).

Like *Foxiphalus xiximeus*, *F. aleuti* differs from *F. obtusidens* in the rigid apical nail on the inner ramus of uropod 1 and differs from *F. xiximeus* in the bifid or appressed pair of elements in the right lacinia mobilis, the ensiform antenna 2, two (versus one) apical spines on each lobe of the telson, disjunct molarial spine and two main spines on the inner plate of the maxilliped. *Foxiphalus cognatus* has a medium epistomal process (versus none), a long article 2 on the outer ramus of uropod 3, and an untapered rostrum.

DISTRIBUTION.—Aleutian Islands to Santa Catalina, Southern California, 29-110 m.

***Foxiphalus xiximeus*, new species**

FIGURE 2 (part)

DESCRIPTION OF HOLOTYPE (female "k").—Head about 18 percent of total body length, greatest width about 70 percent of length, rostrum unstricted, broad, short, reaching apex of article 2 on antenna 1. Eyes medium, largely occluded with pigment, ommatidia ordinary. Article 1 of peduncle on antenna 1 about 1.6 times as long as wide, about twice as wide as article 2, ventral margin with about 10 setules, strongly produced dorsal apex with 4 setules, article 2 about 0.55 times as long as article 1, with ventral cycle of 9 setae; primary flagellum with 8 articles, about 0.7 times as long as peduncle, aesthetasc formula = 0-0-1-1-1-1-1-0; accessory flagellum

with 6 articles. Spine formula of article 4 on antenna 2 = 1-3-4-3, dorsal margin with notch bearing 3 setae and 1 spine, ventral margin with 8 groups of 2-4 long to short setae, 1 ventrodiscal long spine, article 5 about 0.7 times as long as article 4, facial spine formula = 3, dorsal margin naked, ventral margin with 4 sets of 2 long and short setae, 3 ventrodiscal long to medium spines set facially; flagellum about 0.9 times as long as articles 4-5 of peduncle combined, with 8 articles.

Epistome rounded-falcate in front, lacking cusp. Mandibles with weak palpar hump, right incisor with 3 teeth, left incisor with 3-4 teeth in 2 humps, right lacinia mobilis simple, like raker, left lacinia mobilis with 4 teeth plus 0-1 accessory teeth, middle teeth slightly shortened; right rakers 9, left rakers 10 plus 1 rudimentary; molars com-

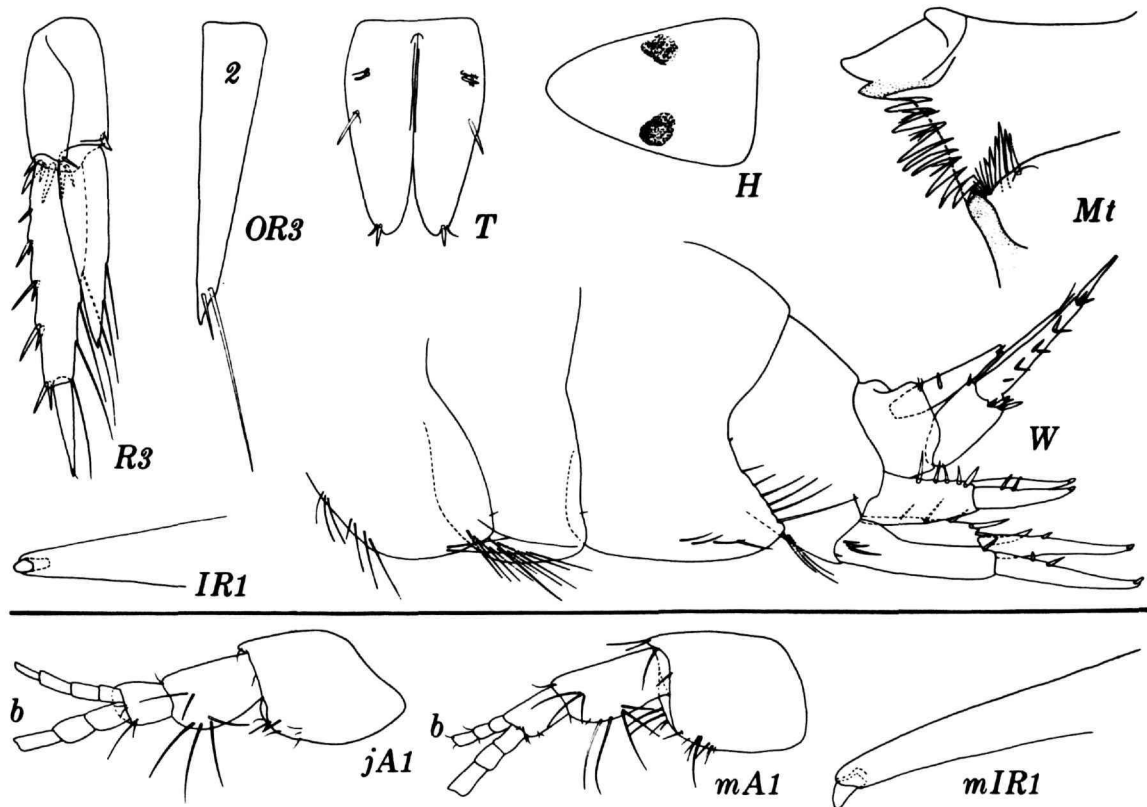


FIGURE 2.—Upper: *Foxiphalus xiximeus*, new species, holotype, female "k." Lower: *Eobolagus spinosus* (Holmes) (j = juvenile "j," m = male "m").

posed of short protrusions demarcated mainly by spines, right molar with 6 primarily long spines, no spine disjunct, left molar with 5 primarily long spines, no spine disjunct, each molar with plume; palp article 1 short, article 2 with 2 long inner setae and one other short inner seta, article 3 about 1.3 times as long as article 2, oblique apex with 11–12 spine-setae, basofacial formula = 1–3. Each outer lobe of lower lip with 1 cone. Inner plate of maxilla 1 ordinary, bearing 1 short apical pluseta, 1 similar apicomedial seta, 2 apicolateral much shorter setae, outer plate with 11 spines, palp article 2 with 1 apical spine, 1 apicolateral, 2 medial and 3–4 submarginal setae.

Plates of maxilla 2 extending subequally, outer scarcely broader than inner, outer with 3 apicolateral setae, inner with 2 medial setae. Inner plate of maxilliped with 1 large thick apical spine, 2 apicofacial setae, 3 medial setae, outer plate with 6–7 medial and apical spines, 2 apicolateral setae; palp article 1 without apicolateral seta, article 2 with 1 apicolateral seta, medial margin of article 2 moderately setose, article 3 with 4 facial setae, 3 lateral setae, nail of article 4 short, mostly immersed, with 2 accessory setules.

Coxa 1 not expanded apically, anterior margin weakly convex, main ventral setae of coxae 1–4 = 10–8–8–10, posteriormost seta of coxae 1–2 slightly shortened, anterior and posterior margins of coxa 4 almost parallel, posterior margin almost straight, posterodorsal corner rounded, posterodorsal margin short, concave, V-shaped, width-length ratio of coxa 4 = 8:9. Gnathopods generally ordinary, width ratios on articles 5–6 of gnathopods 1–2 = 22:27 and 21:29, length ratios = 45:52 and 37:51, palmar humps small, palms oblique, article 5 of gnathopod 1 scarcely elongate, ovate, posterior margin rounded, article 5 of gnathopod 2 ovate, posterior margin short, almost triangular.

Pereopods 3–4 similar, facial setae formula on article 4 = 6 and 5, on article 5 = 8–7, main spine of article 5 extending to M. 80–95 on article 6, article 5 without proximoposterior spines, spine formula of article 6 = 5 + 6 or 6 + 6 plus middistal setule, no spines especially long, accliv-

ity on inner margin of dactyls of pereopods 3–4 obsolescent, emergent setule almost fully immersed, midfacial pluseta ordinary or highly distad. Coxae 5–7 posteroventral setae formula = 0–3–1; articles 4–5 or pereopods 5–6 of ordinary width, facial spine rows moderately developed to sparse, facial ridge formula of article 2 on pereopods 5–7 = 0–1–1; width ratios of articles 2, 4, 5, 6 of pereopod 5 = 48:47:38:13, of pereopod 6 = 71:34:13:9, of pereopod 7 = 85:19:16:8, length ratios of pereopod 5 = 78:30:40:33, of pereopod 6 = 87:50:38:47, of pereopod 7 = 100:20:21:26, article 2 of pereopod 5 scarcely tapering, of pereopod 7 reaching apex of article 4, ventral margin with 7 setule-notches, medial apex of article 6 finely combed, bearing 4 digital processes.

Posteroventral corner of epimeron 1 rounded, quadrate, posterior margin weakly convex, naked, corner with setule, anteroventral margin with 7 long to medium setae, posteroventral face with 2 long setae. Posteroventral corner of epimeron 2 rounded, weakly protuberant, with setule sinus, posterior margin almost straight, naked, facial setae = 10, 2 pairs set vertically. Posteroventral corner of epimeron 3 rounded, quadrate, weakly protuberant, without setule sinus, posterior margin straight, serrate, setose (6), ventral face with oblique horizontal row of 4 setae, mainly posterior, epimera 1–3 with small seta on posterodorsal margin set in weak notch.

Urosomite 1 with lateral setule at base of uropod 1, articulation line absent, urosomite 3 protuberant dorsally. Rami of uropods 1–2 with weakly articulate but deeply immersed, small blunt apical nails, no accessory nails, outer ramus of uropod 1 with 2 dorsal spines, inner with 1, outer ramus of uropod 2 with 2 dorsal spines, inner with no dorsomedial spine. Peduncle of uropod 1 with 3 basofacial setae and 1 apicolateral spine, medially with 4 marginal setae and spines, plus apicalmost enlarged displaced spine. Peduncle of uropod 2 with 5 dorsal spines, medially with 1 tiny apical spine; apicolateral corners of peduncles on uropods 1–2 without comb. Peduncle of uropod 3 with 6 ventral spines, dorsally with 1 lateral spinule, 1 medial spine, rami

submasculine, inner extending to M. 85 on article 1 of outer ramus, apex with 1 seta, medial margin with 2-3 setae, article 2 of outer ramus elongate, 0.40, bearing 1 tiny setule, medial margin of article 1 with 3 setae, lateral margin with 4 acclivities, spine formula = 1-2-2-2-2, setal formula = 0. Telson especially long, length-width ratio = 36:23, almost fully cleft, each apex narrow, rounded, lateral acclivity shallow, bearing short lateral setule, spine next medial of length equal to setule, each side with dorsal spine at M. 45, midlateral setules small, diverse, not highly basad.

NOTES.—Young Male: With antenna 2 flagellum proliferate but not otherwise sufficiently distinct from female for description.

VARIABLES.—Article 2 on outer ramus of uropod 3 often damaged or aberrant, often with longer seta missing and only socket remaining, shorter seta often very tiny, thus confusing because specimens appear to have tapering article 2 without major apical armaments.

HOLOTYPE.—AHF 5747, female "k," 5.00 mm.

TYPE-LOCALITY.—AHF *Velero IV* 4818-57, southern California, 34°30'20"N, 120°30'30"W, 19.8 m, 16 Jan 1957, bottom mud.

MATERIAL.—Four other similar specimens from type-locality, including young male, USNM 184162.

RELATIONSHIP.—This species resembles *F. cognatus* but especially *F. aleuti* in the poorly developed apical nails on the rami of uropods 1-2, with the nail on the inner ramus of uropod 1 especially being inarticulate and inflexible. *Foxiphalus xiximeus* differs from *F. cognatus* in the unproduced or uncuspidate epistome and therefore resembles *F. aleuti*, from which it differs in the elongate article 2 on the outer ramus of uropod 3. Apparently *F. xiximeus* lacks a real right lacinia mobilis, as the first element near the raker row looks like a raker; therefore, *F. xiximeus* differs markedly from *F. aleuti*, which has a doubled lacinia mobilis, and resembles *F. cognatus*, which also has the *F. xiximeus* condition.

DISTRIBUTION.—Southern California, 20 m.

Foxiphalus similis (J.L. Barnard), new combination

FIGURE 3 (part)

Paraphoxus similis J.L. Barnard, 1960:230-233, pls. 22, 23; 1966a:89; 1966b:30.

DESCRIPTION OF FEMALE "x".—Head about 22 percent of total body length, greatest width about 70 percent of length, rostrum unconstricted, broad, short, almost reaching apex of article 2 on antenna 1. Eyes medium, largely occluded with pigment, ommatidia ordinary. Article 1 of peduncle on antenna 1 about 1.5 times as long as wide, about 1.7 times as wide as article 2, ventral margin with about 9 setules, strongly produced dorsal apex with 3 setules-setae, article 2 about 0.5 times as long as article 1, with 2 widely spread ventral rows of 5 large and 4 small and 3 apicolateral setae towards apex, primary flagellum with 7 articles, about 0.6 times as long as peduncle, bearing short aesthetasc on article 6, accessory flagellum with 6 articles. Ensiform process of antenna 2 medium and thick; article 3 with anterodistal setule, spine formula of article 4 = 1-3-3-2, dorsal margin with notch bearing 1 seta and 1 spine, ventral margin with 7 groups of 2 long to medium setae, 1 ventrodiscal medium spine, article 5 about 0.7 times as long as article 4, facial spine formula = 3, dorsal margin bearing 2 sets of small setae, ventral margin with 4 sets of 1-2 long to short setae, 3 ventrodiscal long to medium spines set facially; flagellum about 0.9 times as long as articles 4-5 of peduncle combined, with 7 articles.

Cusp of epistome huge, massive, pointed bluntly. Mandibles with medium palpar hump, right incisor with 3 teeth (normal), left incisor with 3 hump-teeth in 2 branches, right lacinia mobilis simple (possibly absent), like raker, left lacinia mobilis with 5 teeth plus 1 accessory tooth, middle teeth not shortened, right rakers 9, left rakers 9 plus 1 rudimentary; molars composed of bulbous humps, right and left molars with 6 primarily medium spines plus 1 short seta strongly disjunct, each molar with plume; palp

article 1 short, article 2 with 1 medium inner apical seta, 1-2 long subapical setae and 1 short inner seta, article 3 about 0.9 times as long as article 2, oblique apex with 10 spine-setae, basofacial formula = 0-2. Each outer lobe of lower lip with 1 cone. Inner plate of maxilla 1 ordinary, bearing 1 long apical pluseta, 1 shorter apicomедial seta, 2 apicolateral much shorter setae, outer plate with 11 spines, palp article 2 with 3 apical-medial marginal spines and 4 submarginal setae. Plates of maxilla 2 extending equally, outer not broader than inner, outer with 3 apicolateral setae, inner with 2 medial setae. Inner plate of maxilliped with 1 large thick apical spine, 2 apicofacial setae, 3 medial setae, outer plate with 8 medial and apical spines, 2 apicolateral setae, palp article 1 without apicolateral seta, article 2 with 2 groups of 3 apicolateral setae, medial margin of article 2 weakly setose, article 3 with 5 facial setae in line, 2 lateral setae, nail of article 4 short, fully fused, with 2 accessory setules.

Coxa 1 scarcely expanded apically, anterior margin convex, main ventral setae of coxae 1-4 = 14-13-12-8, widely spread, coxae 3 and 4 with additional anteroventral setules of 2 and 1 (besides normal setules), posteriormost seta of coxae 1-3 slightly shortened, anterior and posterior margins of coxa 4 almost parallel, posterior margin weakly convex, posterodorsal corner rounded, posterodorsal margin short, concave, width-length ratio of coxa 4 = 17:20.

Gnathopods with short wrists and biconvex hands, with very oblique palms, width ratios on articles 5-6 of gnathopods 1-2 = 34:44 and 35:48, length ratios = 65:90 and 50:87, palmar humps ordinary to large, palms strongly oblique, article 5 of gnathopod 1 ovate, posterior margin rounded-flat, short, article 5 of gnathopod 2 triangular, posterior margin triangular, produced.

Pereopods 3-4 similar, facial setae formula on article 4 = 5 and 4, parallel to apex, on article 5 = 6 and 5, main spine of article 5 extending to M. 100+ on article 6, article 5 with no proximo-posterior spine, formula of article 6 = 5 + 3 and 6 + 4 plus small middistal seta, some spines especially long, acclivity on inner margin of dac-

tyls of pereopods 3-4 absent, no emergent setule, midfacial pluseta ordinary. Coxae 5-7 posteroventral setule formula = 2-3-2 (serrate); articles 4-5 of pereopods 5-6 narrow, facial spine rows sparse, facial ridge formula of article 2 on pereopods 5-7 = 0-1-1; width ratios of articles 2, 4, 5, 6 of pereopod 5 = 47:27:24:10, of pereopod 6 = 61:23:15:7, of pereopod 7 = 80:18:15:8, length ratios of pereopod 5 = 72:27:30:34, of pereopod 6 = 84:47:52:52, of pereopod 7 = 103:17:23:24, article 2 of pereopod 7 almost reaching middle of article 5, posterior margin with 9 small serrations, medial apex of article 6 not combed, bearing 5+ digital processes.

Posteroventral corner of epimeron 1 rounded-quadrate, posterior margin almost straight, with 6 setules, widely spread anteroventral margin with 2 short setae, posteroventral face with 1 long seta. Posteroventral corner of epimeron 2 quadrate, weakly protuberant, guarded by setal sinus, posterior margin straight, weakly undulate or serrate, setose (3), facial setae = 8, no pair set vertically. Posteroventral corner of epimeron 3 weakly protuberant, guarded by setal sinus, posterior margin straight, strongly serrate, setose (7), ventral margin with 5 setae mainly in middle but widely spread. Epimera 1-3 with small seta on posterodorsal margin set in weak notch.

Urosomite 1 with lateral seta and setule at base of uropod 1, no ventral setae, articulation line incomplete, urosomite 3 unprotuberant dorsally. Rami of uropods 1-2 with articulate and weakly fixed, moderately flexible apical nails, that on inner ramus of uropod 1 especially flexible, outer ramus of uropod 1 with 4 thin dorsal spines, inner with 2, outer ramus of uropod 2 with 3 dorsal spines, inner with 2 dorsomedial spines, peduncle of uropod 1 with 4 basofacial setae and 2 thin apicolateral spines, medially with 5 thin marginal spines, plus displaced apical enlarged spine. Peduncle of uropod 2 with 5-7 thin dorsal spines, medially with 1 medium apical spine; apicolateral corners of peduncles on uropods 1-2 without comb. Peduncle of uropod 3 with 6 ventral spines, dorsally with 1 lateral spine, 1 medial spine, rami feminine, inner extending to M. 55 on article 1 of

outer ramus, apex with 1 small seta, medial and lateral margins naked, article 2 of outer ramus elongate, 0.30, bearing 2 unequal medium setae, apicomedial margin of article 1 with 2 apical and 1 medial setae, lateral margin with 4 acclivities, short thin spine formula = 1-1-1-1-1, long spine formula = 0-1-1-1-1, setal formula = 0-0-0-0-1. Telson long, length-width ratio = 35:29, almost fully cleft, each apex of medium width, rounded attenuate, lateral acclivities shallow, narrow, with large lateral and medial spines separated by long setule, midlateral setules diverse, largest of medium size.

Remarks: Unusual attributes include the 3 apical spines on the palp of maxilla 1, the widely spread coxal setae, the short wrists of the gnathopods, the lowered inside count of spines on medial margins of article 6 on pereopods 3-4, and the absence of the ventral setal brush on urosomite 1.

NOTES.—Male “y”: Rostrum slightly longer than in female. Article 1 of antenna 1 with medial pubescence, article 2 with 5 and 2 ventral setae, primary flagellum with 8 articles, 1 calceolus each on articles 1-5, aesthetascs weakly developed. Articles 3-4 of antenna 2 peduncle with medial pubescence, facial spine formula on article 4 = 3-4-2, article 5 with fewer and shorter setae than in female, with 3 dorsal sets of male setae and 1 calceolus, ventrodistal apex with 2 thin spines, facial formula = 3.

Coxa 4 elongate. Article 2 of pereopods 5 and 7 narrower than in female, article 5 of pereopod 7 with 2 male spines.

Epimera 1-3 broadened, posterior margin of epimeron 3 not shortened, setal formulas, epimeron 1 broadly ventral = 3-6 (paired or not), posterior = 5 setules, epimeron 2 facial = 8 (all in anterior half), posterior = 2-3, epimeron 3 posterior = 5, facial = 0, ventral = 5. Spine formulas of uropods, uropod 1 peduncle apicolateral = 2 thin contiguous, basofacial = 4, uropod 2 peduncle dorsal = 10, dorsal spines on outer ramus of uropod 1 = 3, of uropod 2 = 3, inner ramus of uropod 1 = 2, of uropod 2 = 1, ventral spines on peduncle of uropod 3 = 5, thin spine formula on

article 1 of outer ramus = 1-3-2-2, setal formula = 1-1-1-1; article 2 of outer ramus reduced to 22 percent length of article 1, apical setae elongate. Telson slightly broadened, distal spines shortened, with long single row of denticles on each lobe.

DESCRIPTION OF ALASKAN SUPERMALE “m” (Figure 3, upper).—Head about 20 percent of total body length, greatest width about 65 percent of length, rostrum unstricted, broad, short, almost reaching apex of article 2 on antenna 1. Eyes large, weakly stained ochraceous, ommatidia ordinary. Article 1 of peduncle on antenna 1 about 1.5 times as long as wide, about 2.2 times as wide as article 2, ventral margin with about 15 setules, medial face with pubescence, strongly produced dorsal apex with 2-3 setules-setae, article 2 about 0.6 times as long as article 1, with ventral cycle of 6 setae towards apex and 3 lateral apical setae, primary flagellum with 9 articles, about 0.9 times as long as peduncle, bearing 1 long aesthetasc each on articles 1-8, calceolus on articles 1-6, accessory flagellum with 6 articles. Antenna 2 moderately ensiform, article 3 with dorsodistal setule, articles 3-4 with dorsomedial pubescence, spine formula of article 4 = 3-4-2, dorsal margin with notch bearing 1 spine, ventral margin with 5 groups of 2-3 short to medium setae, 1 ventrodistal medium spine; article 5 almost 0.9 times as long as article 4, facial spine formula = 3, dorsal margin bearing 3 sets of male setae and 1 calceolus, ventral margin with 2 sets of 2 short setae, 2 ventrodistal medium spines, flagellum formula = 27, 1-4, 6, 8 . . . 24.

Cusp of epistome sharp but of medium size only. Mandibles with weak palpar hump, right incisor with 3 teeth, left incisor with 3 hump-teeth in 2 branches, right lacinia mobilis debatably bifid or simple, “distal” branch not shorter than proximal, narrow, denticulate, proximal branch simple, pointed, with marginal denticles, left lacinia mobilis with 5 teeth plus 1 accessory tooth, middle teeth scarcely shortened; right rakers 8, left rakers 8 plus 1 rudimentary; molars composed of short bulbous humps, right molar with 6 primarily long spines, plus 1 long thin

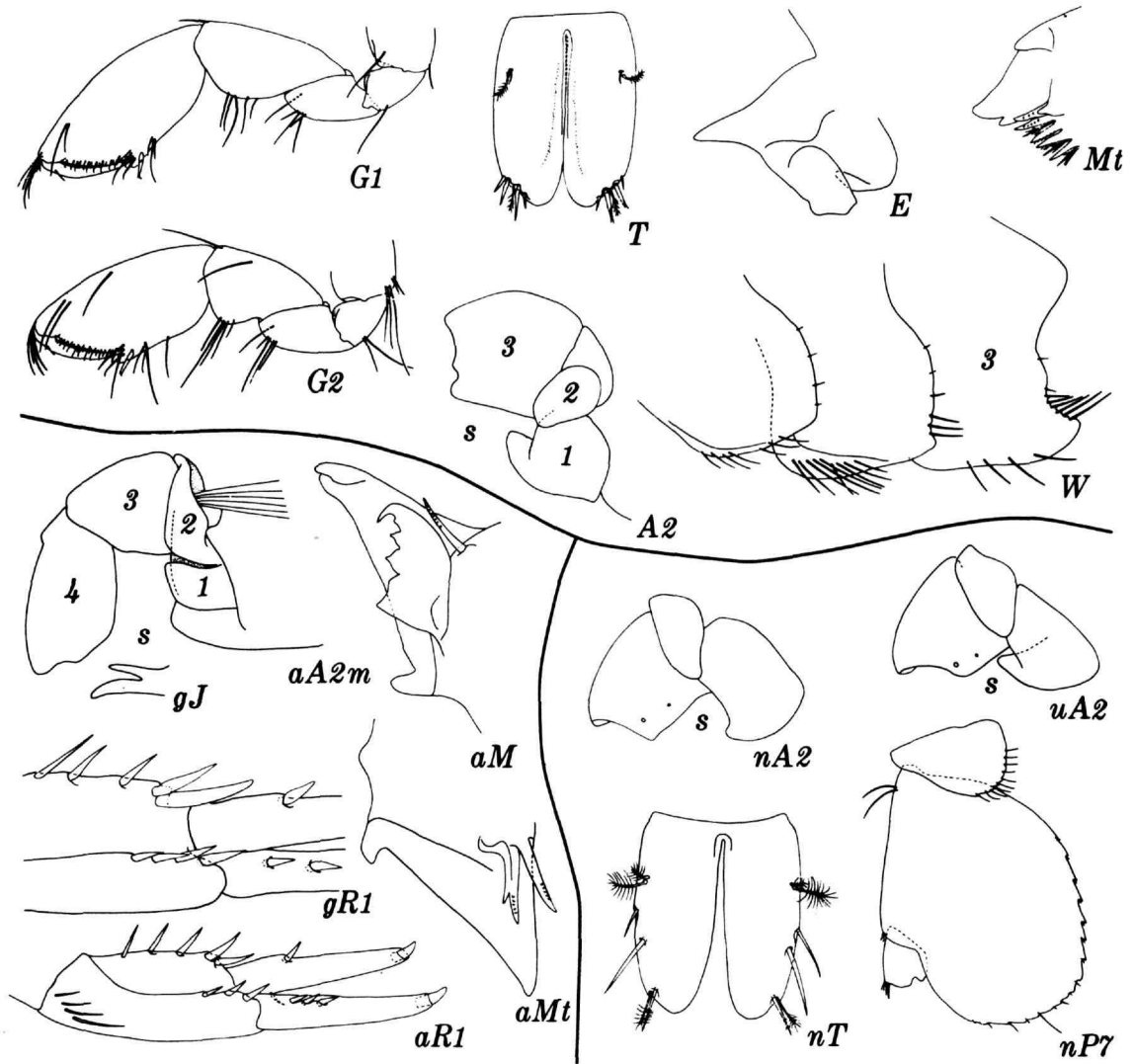


FIGURE 3.—Upper: *Foxiphalus similis*, supermale "m." Lower left: *F. apache*, new species (a = male "a," g = female "g"). Lower right: *F. golfensis*, new species (n = female "n," u = female "u").

spine strongly disjunct, left molar with 6 primarily long spines, plus long thin spine strongly disjunct, each molar with plume; palp article 1 short, article 2 with 1 short inner apical seta and 2 other short inner setae, article 3 about 1.1 times as long as article 2, oblique apex with 9 spine-setae, basofacial formula = 0-3. Each outer lobe

of lower lip with 1 cone. Inner plate of maxilla 1 ordinary, bearing 1 medium apical pluseta, 1 similar apicomедial seta, 2 apicolateral much shorter setae, palp article 2 with 1 apical and 1 medial spine, 1 apicolateral and 3 submarginal setae. Plates of maxilla 2 extending subequally, of similar breadth, outer with 3 apicolateral setae,

inner with 1 medial seta. Inner plate of maxilliped with 1 thick short apical spine, 2 apicofacial setae, 3 medial setae, outer plate with 9 medial and apical spines, 1 apicolateral seta, palp article 1 without apicolateral seta, article 2 with 1 apicolateral seta, medial margin of article 2 weakly setose, article 3 with 4 facial setae, 1 lateral seta, nail of article 4 obsolescent, with 2 accessory setules.

Coxa 1 scarcely expanded apically, anterior margin straight, main ventral setae of coxae 1-4 = 7-7-7-7, posteriormost seta of coxae 1-3 shortened, anterior and posterior margins of coxa 4 scarcely divergent, posterior margin convex, posterodorsal corner sharp-rounded, posterodorsal margin short, V-shaped, width-length ratio of coxa 4 = 7:8. Gnathopods generally ordinary, width ratios on articles 5-6 of gnathopods 1-2 = 30:39 and 32:39, length ratios = 67:83 and 55:77, palmar humps ordinary to large, palms strongly oblique, article 5 of gnathopod 1 elongate, ovate, posterior margin rounded-flat, long, article 5 of gnathopod 2 ovate, posterior margin rounded, short, lobate.

Pereopods 3-4 similar, facial setae formula on article 4 = 4 and 4, almost parallel to apex, on article 5 = 4 and 4, main spine of article 5 extending to M. 85-95 on article 6, article 5 without proximoposterior spines, spine formula of article 6 = 4 + 4 and 4 + 3 plus small middistal seta, some spines especially long, acclivity on inner margin of dactyls of pereopods 3-4 obsolescent, emergent setule short, midfacial pluseta ordinary. Coxae 5-7 posteroventral setal formula = 3-4-3. Articles 4-5 of pereopods 5-7 narrow to medium, facial spine rows sparse, facial ridge formula of article 2 on pereopods 5-7 = 0-1-1; width ratios of articles 2, 4, 5, 6 of pereopod 5 = 42:27:24:11, of pereopod 6 = 55:21:13:7, of pereopod 7 = 75:16:13:6, length ratios of pereopod 5 = 68:25:34:36, of pereopod 6 = 83:47:47:50, of pereopod 7 = 100:21:23:24, article 2 of pereopod 7 reaching middle of article 4, posterior margin with 9 small serrations, medial apex of article 6 finely combed, bearing 6-7 digital processes.

Posteroventral corner of epimeron 1 rounded-quadrate, posterior margin almost straight, with 4 setules widely spread, anteroventral margin with 4 short setae, posteroventral margin with 3 short setae. Posteroventral corner of epimeron 2 quadrate, weakly protuberant, posterior margin weakly convex, undulate, serrate, setose (3 + 3 setules), facial setae = 9 in 2 weakly divergent rows. Posteroventral corner of epimeron 3 with medium tooth, posterior margin strongly concave, serrate, setose (7), ventral margin with 4 setae almost evenly spread.

Urosomite 1 with large lateral spinule at base of uropod 1, no ventral setae, articulation line complete, urosomite 3 unprotuberant dorsally. Rami of uropods 1-2 with articulate and weakly fixed, moderately flexible apical nails, that on inner ramus of uropod 1 especially flexible, outer ramus of uropod 1 with 3 thin dorsal spines, inner with 2, outer ramus of uropod 2 with 4 dorsal spines, inner with 1 dorsomedial spine, peduncle of uropod 1 with 5 basofacial setae and 2 thin apicolateral spines, medially with 4 marginal thin spines, apicalmost ordinary, plus displaced enlarged spine. Peduncle of uropod 2 with 9 thin dorsal spines, medially with 1 large apical spine; apicolateral corners of peduncles on uropods 1-2 without comb. Peduncle of uropod 3 with 6 ventral spines, dorsally with 1 lateral spine, 2 medial setae and 2 setules, rami masculine, inner extending to M. 90 on article 1 of outer ramus, apex with 2 setae, medial and lateral margins setose, article 2 of outer ramus short, 0.15, bearing 2 long setae, medial margin of article 1 setose, lateral margin with 3 acclivities, spine formula = 2-2-2-2, setal formula = 1-1-1-1. Telson long, length-width ratio = 19:14, almost fully cleft, each apex of medium width, rounded, lateral acclivities shallow, narrow, bearing short lateral spine, spine next medial longer, then short setule, third spine like second, fourth spine smaller, each lobe with long denticle row, mid-lateral setules diverse, largest of medium size.

Remarks: Supermale of Alaska differing from ordinary southern specimens in more sharply up-swept posteroventral tooth of epimeron 3, pres-

ence of 2 more spines on each lobe of telson, even shorter article 2 on outer ramus of uropod 3 (than in southern male), narrow spread of setae on coxae 1-3, and stronger spine on urosomite 1 at base of uropod 1.

NOTES.—Male "k" from Alaska: Epimeron 1 with 8 anteroventral setae and no gap; epimeron 2 with 10 facial setae in 3 groups; telsonic formula, lateral to medial = spine, setule, 2 spines; therefore, telson with only 3 spines, not 4 as in supermale; medial spine, however, very submarginal.

Male "i" from Alaska: Normal *F. similis*.

Males "a," "b," "c": Epistome small, like large form of *F. cognatus*; ensiform process of antenna 2 of unusual form as in *F. apache*; basofacial formula of setae on article 3 of mandibular palp = 0-4; disjunct spine on molar thin as in *F. similis* and right lacinia mobilis like *F. similis*; posterior margin of epimeron 3 normally straight; apical spine on inner ramus of uropod 1 normally articulate and flexible; article 2 on outer ramus of uropod 3 like southern form.

MATERIAL.—*Velero IV* 5168, southern California, 67 m, female "x," 3.81 mm, male "y," 3.44 mm; *Albatross*, Killisnoo, Alaska, 19 Sep 1897, male "i," 4.11 mm, male "k," 4.44 mm, supermale "m," 4.51 mm, and 30 other males; U.S. Fish Commission summer cruise, Ounalaska [Unalaska], electric light, 28 Jul 1888, many males; *Albatross*, Kodiak, Alaska, surface, electric light, 1888, 90 specimens; J.L. Mohr, FH 26, off Argyle Bay, San Juan Island, Puget Sound, Washington, in *Ulva* among *Epinebalia*, 19 Aug 1948 (USNM Acc. 183473), 2 specimens; Pacific Biological Laboratory [Ricketts] 103, near Hoodport, Washington, pelagic tow net, 8:30 P.M. (2030 hours), 23 Jul 1930 (USNM Acc. 111698), 15 males.

RELATIONSHIP.—Differing from other species in the genus in the giant epistome; from *F. obtusidens* and *F. major* in the simple right lacinia mobilis and usually (except bay form of *F. obtusidens*) in the poor posterior setation of epimeron 1; from *F. xiximeus* in the ensiform antenna 2; and from *F. aleuti* in the flexible apical nail on the inner ramus of uropod 1.

DISTRIBUTION.—Aleutian Islands to southern California, 30-324 m.

***Foxiphalus cognatus* (J.L. Barnard), new combination**

Paraphoxus cognatus J.L. Barnard, 1960:233-235, pl. 24; 1969b:219-222.

REDESCRIPTION OF HOLOTYPE (male "r").—Head about 19 percent of total body length, greatest width about 60 percent of length, rostrum unstricted, broad, short, reaching middle of article 2 on antenna 1. Eyes large, mostly occluded with pigment, ommatidia slightly enlarged.

Article 1 of peduncle on antenna 1 about 1.3 times as long as wide, about twice as wide as article 2, ventral margin with about 10 setules, medially pubescent, strongly produced dorsal apex with 4 setules and setae, article 2 about 0.55 times as long as article 1, with ventral crescent of 7 setae, primary flagellum with 9 articles, nearly 0.9 times as long as peduncle, bearing several short aesthetascs, calceolus formula = 1-1-1-1-1-0-0-0-0, accessory flagellum with 6 articles. Antenna 2 weakly ensiform, articles 3-4 medially pubescent, spine formula of article 4 = 3-4-1, dorsal margin with notch bearing 1 spine, ventral margin with 4 groups of 2 long to short setae, 1 ventrodiscal long spine, article 5 as long as article 4, facial spine formula = 3, dorsal margin bearing 3 sets of male setae, 2 calceoli, ventral margin with 2 sets of 2 medium to short setae, 2 ventrodiscal medium spines set facially; flagellum elongate in male fashion, calceolus formula = 1, 2, 3, 4, 6, 8, 10 . . . n.

Epistome with medium-sized sharp cusp. Mandibles with medium palpar hump, right incisor with 3 teeth, left incisor with 3 teeth in 2 humps, right lacinia mobilis simple, like raker, left lacinia mobilis with 4 teeth plus 2 accessory teeth, middle teeth not shortened; right rakers 7 plus 1 rudimentary, left rakers 8 plus 1 rudimentary, molars composed of bulbous plaques, right molar with 9 primarily short spines plus 1 spine strongly dis-

junct, left molar with 8 primarily short spines plus 1 spine strongly disjunct, each molar with plume; palp article 1 short, article 2 with 1 short inner apical seta and 2 other shorter inner setae, article 3 about 1.2 times as long as article 2, oblique apex with 8 spine-setae, basofacial formula = 0-2. Each outer lobe of lower lip with 1 cone. Inner plate of maxilla 1 ordinary, bearing 1 long apical pluseta, 1 shorter similar apicomedia seta, 2 apicolateral much shorter setae, palp article 2 with 1 apical spine, 1 apicolateral, 2 medial and 3 submarginal setae. Plates of maxilla 2 extending subequally, outer broader than inner, outer with 2 apicolateral setae, inner with 1 medial seta. Inner plate of maxilliped with 1 large thick apical spine, 2 apicofacial setae, 6 medial setae, outer plate with 8 medial and apical spines, 1 apicolateral seta, palp article 1 without apicolateral seta, article 2 with 1 apicolateral seta, medial margin of article 2 weakly setose, article 3 with 4 facial setae, 1 lateral seta, nail of article 4 absorbed, with 2 accessory setules.

Coxa 1 scarcely expanded apically, anterior margin weakly convex, main ventral setae of coxae 1-4 = 8-8-6-4, posteriormost seta of coxae 1-2 slightly shortened, anterior and posterior margins of coxa 4 strongly divergent, posterior margin oblique, convex, posterodorsal corner sharp, rounded, posterodorsal margin long, concave, width-length ratio of coxa 4 = 16:17. Gnathopods generally ordinary, width ratios on articles 5-6 of gnathopods 1-2 = 20:28 and 22:27, length ratios = 47:53 and 38:49, palmar humps small, palms strongly oblique, article 5 of gnathopod 1 scarcely elongate, ovate, posterior margin rounded, article 5 of gnathopod 2 short, posterior margin rounded, short, lobate.

Pereopods 3-4 similar, facial setae formula on article 4 = 3 and 2, and article 5 = 3 and 3, main spine of article 5 extending to M. 95 on article 6, article 5 without proximoposterior spines, spine formula of article 6 = 4 + 4 plus middistal seta, some spines especially long, acclivity on inner margin of dactyls of pereopods 3-4 absent, setule absent, midfacial pluseta absent. Coxae 5-7 posteroventral setule formula = 2-2-2. Articles 4-5

of pereopods 5-6 narrow to ordinary in width, facial spine rows sparse, facial ridge formula of article 2 on pereopods 5-7 = 0-1-1; width ratios of articles 2, 4, 5, 6 of pereopod 5 = 40:28:25:12, of pereopod 6 = 58:24:15:9, of pereopod 7 = 80:16:14:8, length ratios of pereopod 5 = 64:30:34:40, of pereopod 6 = 75:55:51:60, of pereopod 7 = 103:22:26:31, article 2 of pereopod 7 reaching apex of article 4, posterior edge with 7 small serrations, medial apex of article 6 bearing 4-5 digital processes.

Posteroventral corner of epimeron 1 rounded, posterior margin weakly convex, anteroventral margin with 1 long seta, ventral face with 1 long seta (or both ventral). Posteroventral corner of epimeron 2 rounded, guarded by setule sinus, posterior margin weakly convex, facial setae = 4. Posteroventral corner of epimeron 3 rounded, posterior margin straight, weakly serrate, setose (5), then with 1-2 setule notches, ventral margin with 3 setae mainly posterior. Epimera 1-3 with tiny setule on posterodorsal margin set in weak notch.

Urosomite 1 with lateral setule at base of uropod 1, articulation line complete, urosomite 3 unprotuberant dorsally. Rami of uropods 1-2 with articulate enlarged apical nails, that on inner ramus of uropod 2 of flexible category; outer ramus of uropod 1 with 4 dorsal spines, inner with 2, outer ramus of uropod 2 with 3 dorsal spines, inner with 1 dorsomedial spine, peduncle of uropod 1 with 3-4 basofacial setae and 2 apicolateral spines, medially with 4 marginal spines plus apicalmost enlarged displaced spine. Peduncle of uropod 2 with 9-10 dorsal spines, medially with 1 small apical spine; apicolateral corners of peduncles on uropods 1-2 without comb. Peduncle of uropod 3 with 2 ventral spines, dorsally with 2 lateral spines, 1 medial spine plus 2 disjunct setae, rami masculine, inner extending to M. 95 on article 1 of outer ramus, apex with 2 setae, medial and lateral margins setose, article 2 of outer ramus ordinary, 0.20, bearing 2 medium setae, apicomedia margin of article 1 setose, lateral margin with 3 acclivities, spine formula = 1-1-1-1, setal formula =

1-1-1-1. Telson especially long, length-width ratio = 4:3, almost fully cleft, each apex of medium width, rounded, lateral acclivity broad, shallow, with short lateral and medial spines separated by longer setule, each lobe with dorsomedial longitudinal row of denticles; mid-lateral setules diverse, largest large.

NOTE.—Female, JLB PAZ 6: Right lacinia mobilis bifid.

HOLOTYPE.—AHF 5114, male “r,” 4.73 mm, reexamined.

TYPE-LOCALITY.—*Velero IV* 2047-51, Emerald Cove, Santa Catalina Island, 33°28'04"N, 118°31'21"W, dip net, 27 Jul 1951.

MATERIAL.—JLB PAZ 6, female (see J.L. Barnard, 1979a); AHF *Velero IV* 3394 (3), 4755 (11), 4759 (1).

RELATIONSHIP.—Only the holotype has been reexamined, and no new material has come to light apart from that reported by J.L. Barnard (1969b). Detailed description of right lacinia mobilis, molar, and inner plate of maxilliped reveals only that *F. cognatus* continues to differ from *F. similis* in the smaller epistomal cusp plus the stouter displaced spine on the molar, but no other qualitative differences are apparent.

DISTRIBUTION.—Dillon Beach, California, southward through southern California (sample depths of 15, 31, 59, and 324 m) and into the Gulf of California at La Paz and Bahía de Los Angeles, sometimes caught in the dip net, neritic to 324 m.

Foxiphalus apache, new species

FIGURE 3 (part)

DESCRIPTION OF HOLOTYPE (young male “a”).—Head about 24 percent of total body length, greatest width about 65 percent of length, rostrum unstricted, broad, elongate, almost reaching apex of article 2 on antenna 1. Eyes medium to large, mostly occluded with pigment, ommatidia ordinary. Article 1 of peduncle on antenna 1 about 1.5 times as long as wide, about 2.1 times as wide as article 2, ventral margin with

about 11 setules, strongly produced dorsal apex with 2 setules-setae, article 2 about 0.6 times as long as article 1, with 2 ventral rows of 4 and 2 setae, and 3 lateral setae near apex, primary flagellum with 13 articles, about as long as peduncle, bearing 1 short aesthetasc each on articles 5-12, accessory flagellum short, with 10 articles. Ensiform process of antenna 2 blunt, inturned and hidden; article 3 with small apico-dorsal spinule; spine formula of article 4 = 1-3-4-4, dorsal margin with notch bearing 3 setae and 1 spine, ventral margin with 4 groups of 2-5 long to medium setae, 1 ventrodistal long spine, article 5 about 0.75 times as long as article 4, facial spine formula = 2-2, dorsal margin bearing 2 sets of small setae, ventral margin with 3 sets of 2 long-short setae, 3 ventrodistal long to medium facial spines, flagellum proliferate, with 19 articles, in subadult condition.

Epistomal cusp medium to small. Mandibles with weak palpal hump, right incisor with 2 teeth only, left incisor with 3 humps plus 1 tooth, right lacinia mobilis not deeply bifid, distal branch much shorter than proximal, both branches narrow, pointed, proximal branch with facial denticles, left lacinia mobilis with 4 teeth plus 1 accessory tooth, middle teeth scarcely shortened; right rakers 8, left rakers 10; molars composed of elongate plaques, right molar with 6 primarily medium spines plus 1 spine strongly disjunct, left molar with 7 primarily long spines plus 1 spine strongly disjunct, each molar with plume; palp article 1 short, article 2 with 2 medium inner apical setae and 3 other shorter inner setae, article 3 about 1.1 times as long as article 2, oblique apex with 10 spine-setae, basofacial formula = 0-3. Each outer lobe of lower lip with 1 cone. Inner plate of maxilla 1 ordinary, bearing 1 long apical pluseta, 1 similar apicomedial seta, 2 apicolateral much shorter setae, outer plate with 11 spines, palp article 2 with 1 apical spine, 1 apicolateral, 4 medial and 3 submarginal setae. Plates of maxilla 2 extending equally, outer scarcely narrower than inner, outer with 4 apicolateral setae, inner with 3 medial setae. Inner plate of maxilliped with 1 large thick apical spine,

2 apicofacial setae, 5 medial setae, outer plate with 9 medial spines, 6 lateral setae, palp article 1 without apicolateral seta, article 2 with 2 groups of 2 lateral setae, medial margin of article 2 moderately setose, article 3 with 6 facial setae, 1 lateral seta, nail of article 4 fused, with 2 accessory setules.

Coxa 1 expanded apically, anterior margin weakly convex, main ventral setae of coxae 1-4 = 6-7-7-9, posteriormost seta of coxae 1-3 shortest, anterior and posterior margins of coxa 4 weakly divergent, posterior margin very convex, posterodorsal corner sharp-rounded, posterodorsal margin short, concave, width-length ratio of coxa 4 = 34:37. Gnathopods generally ordinary but hands slightly thinned, width ratios on articles 5-6 of gnathopods 1-2 = 27:32 and 27:34, length ratios = 65:66 and 57:62, palmar humps ordinary, palms oblique, article 5 of gnathopod 1 elongate, ovate, posterior margin rounded-flat, article 5 of gnathopod 2 elongate, ovate, posterior margin flat, short, almost produced.

Pereopod 4 stouter than pereopod 3 especially on articles 4-5, facial setae formula on article 4 = 3 and 4, almost parallel to slightly oblique, on article 5 = 4 and 3, main spine of article 5 extending to M. 70 on article 6, article 5 with 1 and 1 proximoposterior spines, spine formula of article 6 = 3 + 4 and 4 + 5 plus 1 middistal seta, some spines especially long, acclivity on inner margin of dactyls of pereopods 3-4 obsolescent, emergent setule short, midfacial pluseta ordinary. Coxae 5-7 posteroventral setal formula = 7-7-4 (latter 2 serrate); articles 4-5 of pereopods 5-6 narrow, facial spine rows sparse, facial ridge formula of article 2 on pereopods 5-7 = 0-1-1; width ratios of articles 2, 4, 5, 6 of pereopod 5 = 40:28:28:16, of pereopod 6 = 64:30:20:12, of pereopod 7 = 78:21:21:10, length ratios of pereopod 5 = 70:30:38:41, of pereopod 6 = 88:55:46:57, of pereopod 7 = 103:25:28:30, article 2 of pereopod 7 reaching apex of article 4, posterior margin with 7 small serrations, medial apices of articles 5-6 finely and sparsely combed, bearing 2-3 weak digital processes.

Posteroventral corner of epimeron 1 rounded,

posterior margin almost straight, with 1 setule, anteroventral margin with 6 short to medium setae, posteroventral face with 1 long seta. Posteroventral corner of epimeron 2 rounded-quadrate, posterior margin weakly convex, serrate, setose (5), facial setae = 8, no pair set vertically. Posteroventral corner of epimeron 3 rounded, posterior margin straight, serrate, setose (8) and with 1 setule notch, ventral margin with 3 setae mainly posterior but widely spread.

Urosomite 1 with lateral setule at base of uropod 1 and normal ventral setae, articulation line almost complete, urosomite 3 unprotuberant dorsally. Rami of uropods 1-2 with articulate but tightly fixed apical nails, outer ramus of uropod 1 with 3 tightly contiguous dorsal spines, inner with 1 spine, outer ramus of uropod 2 with 3 tightly contiguous dorsal spines, inner with no dorsomedial spines, peduncle of uropod 1 with 4 large basofacial setae and 3 apicolateral spines, medially with 3-4 marginal setae and spines, apicalmost an ordinary spine, plus similar sized weakly displaced spine. Peduncle of uropod 2 with 8 short dorsal spines, medially with 1 small apical spine; apicolateral corners of peduncles on uropods 1-2 without comb. Peduncle of uropod 3 with 5 ventral spines, dorsally with 1 lateral spine and 1 setule, 1 medial spine and 1 setule, rami submasculine, inner extending to M. 100+ on article 1 of outer ramus, apex with 2 short setae, medial and lateral margins with short apical setae, article 2 of outer ramus short, 0.07, bearing 2 medium setae, medial margin of article 1 with 5 short setae, lateral margin with 4 acclivities, spine formula = 1-2-2-2-4, apicalmost spines thin. Telson especially long, length-width ratio = 5:4, almost fully cleft, each apex wide, rounded, lateral acclivity broad, shallow, with short lateral and medial spines separated by longer setule, plus 1-2 supernumerary dorsolateral spines along lateral margin, midlateral setules diverse or not, largest of medium size.

NOTES.—Female "g," JLB PAZ 6: Body heavily calcified. Article 2 of antenna 1 with ventral crescent of 9 setae. Facial spine formula on article 4 of antenna 2 = 1-2-3-4, article 5 =

4. Right lacinia mobilis more deeply bifid than normal. Setal formulas, epimeron 1, anteroventral = 4, posteroventral = 2 in tandem, posterior edge = 4 setules; epimeron 2 ventral = 9, posterior = 6 long; epimeron 3 ventral = 3, posterior = 11 long. Spine formulas, uropod 1 peduncle dorso-lateral = 4, medial = 5 and 1 slightly displaced terminally, outer ramus = 2, inner = 1; uropod 2 peduncle dorsal = 9, outer ramus = 2, inner = 0.

Females of JLB PAZ 6, 11: Antenna 2 with normal ensiform process like *F. similis*, thick and medium to small.

HOLOTYPE.—USNM 184165, young male “a,” 6.70 mm.

TYPE-LOCALITY.—BLA 146 of Beaudette Foundation, Mexico, Gulf of California, Baja California, Bahía de Los Angeles, 31 Oct 1963, 6 m, coarse shell sand.

MATERIAL.—Type-locality, female “g,” 6.18 mm; JLB PAZ 6, female “f,” 7.74 mm (data in J.L. Barnard, 1979a); *Velero IV* 2024-51, female “o,” not measured; 1942-50 (1).

RELATIONSHIP.—This species is in the group of *F. secasius* and *F. golfensis* in which the inner apical spine on the peduncle of uropod 1 is not displaced or scarcely so. Unlike in the other two species, the two apicalmost spines are equal or almost equal in size and somewhat appressed.

DISTRIBUTION.—Anacapa Island, California, to Bahía de Los Angeles, Gulf of California, 0-53 m.

Foxiphalus golfensis, new species

FIGURE 3 (part)

Paraphoxus obtusidens.—J.L. Barnard, 1960:249-259, pl. 33-37 [in part, especially pl. 33: fig. c, pl. 37 (= AHF 677); not other parts and Alderman, 1936].

Paraphoxus spinosus.—Barnard, 1979a:133 [not Holmes, 1905].

DESCRIPTION OF HOLOTYPE (female “n”).—Head about 20 percent of total body length, greatest width about 60 percent of length, rostrum unconstricted, broad, elongate, exceeding

middle of article 2 on antenna 1. Eyes medium to large, clear of pigment (aged in alcohol), ommatidia ordinary. Article 1 of peduncle on antenna 1 about 1.6 times as long as wide, about 2.3 times as wide as article 2, ventral margin with about 8 setules, weakly produced dorsal apex with 2 setules-setae, article 2 about 0.6 times as long as article 1, with 2 tightly constrained ventral rows of 5 and 3 setae, primary flagellum with 12 articles, about 0.8 times as long as peduncle, bearing 1 short aesthetasc each on articles 3-11, accessory flagellum with 10 articles. Antenna 2 poorly ensiform; article 3 with 1 dorsodistal setule; spine formula of article 4 = 1-3-3-5, dorsal margin with notch bearing 3 setae and 1 spine, ventral margin with 5 groups of 1-5 long to short setae, 1 ventrodiscal long spine, article 5 about 0.75 times as long as article 4, facial spine formula = 4, dorsal margin bearing 2 sets of small setae, ventral margin with 3 sets of 1-3 long to short setae, 2 ventrodiscal long spines, 1 set subdistal and facial; flagellum about 1.25 times as long as articles 4-5 of peduncle combined, with 14 articles.

Epistome slightly produced, triangular anteriorly. Mandibles with medium palpar hump, right incisor with 3 teeth, third near middle of edge, left incisor with 3 hump-teeth in 2 branches, right lacinia mobilis bifid, distal branch shorter than proximal, narrow, proximal branch simple, pointed, left lacinia mobilis with 3 teeth plus 3 accessory teeth, middle teeth shortened; right rakers 7 plus 1 rudimentary, left rakers 9 plus 1 rudimentary; molars composed of elongate plaques, right side small, right molar with 5 primarily long to medium spines, plus 1 spine strongly disjunct, left molar with 6 primarily long to medium spines plus 1 spine strongly disjunct, each molar with plume; palp article 1 short, article 2 with 1 long inner apical seta and 2 other shorter inner setae, article 3 about as long as article 2, oblique apex with 11-10 spine-setae, basofacial formula = 0-2. Inner plate of maxilla 1 ordinary, bearing 1 apicofacial pluseta, 1 similar apicomедial seta, 2 apicolateral much shorter setae, palp article 2 with 1 apical spine, 1 apico-

lateral and 8 mediomarginal spine-setae. Plates of maxilla 2 extending subequally, outer not broader than inner, outer with 5 apicolateral setae, inner with 2 medial setae. Inner plate of maxilliped with 1 large thick apical spine, 2-3 apicofacial setae, 3 medial setae, outer plate with 10 medial and apical spines, 4 apicolateral setae, palp article 1 without apicolateral seta, article 2 with 2 groups of 2 apicolateral setae, medial margin of article 2 moderately setose, article 3 with 7 facial setae, 3 lateral setae, nail of article 4 almost fused, with 3 accessory setules.

Coxa 1 strongly expanded apically, anterior margin weakly concave, main ventral setae of coxae 1-4 = 7-8-9-7, posteriormost seta of coxae 1-3 shortened, anterior and posterior margins of coxa 4 strongly divergent, posterior margin convex, posterodorsal corner rounded, posterodorsal margin ordinary, concave, width-length ratio of coxa 4 = 1:1. Gnathopods generally ordinary, width ratios on articles 5-6 of gnathopods 1-2 = 28:34 and 28:38, length ratios = 65:73 and 56:70, palmar humps ordinary, palms strongly oblique, article 5 of gnathopod 1 elongate, ovate, posterior margin rounded, article 5 of gnathopod 2 ovate, posterior margin rounded, almost lobate.

Pereopods 3-4 similar, facial setae formula on article 4 = 5 and 4, almost parallel to apex, on article 5 = 5 and ?, main spine of article 5 extending to M. 80 on article 6, article 5 with 1 proximoposterior spine, spine formula of article 6 = 3 + 5 (only pereopod 3 known) plus small middistal seta, some spines especially long, acclivity on inner margin of dactyls of pereopods 3-4 obsolescent, emergent setule almost fully immersed, midfacial pluseta ordinary. Coxae 5-7 posteroventral setal formula = 7-15-8; articles 4-5 of pereopods 3-4 narrow, facial spine rows sparse, facial ridge formula of article 2 on pereopods 5-7 = 0-1-1; width ratios of articles 2, 4, 5, 6 of pereopod 5 = 43:32:32:18, of pereopod 6 = 68:36:22:10, of pereopod 7 = 83:23:20:9, length ratios of pereopod 5 = 75:32:41:45, of pereopod 6 = 92:58:50:80, of pereopod 7 = 100:26:30:34, article 2 of pereopod 7 almost reaching apex of article 4, posterior margin with 12 small serrations,

ventral margin with 11 notches each bearing long seta, medial apex of article 6 weakly combed, bearing 3 weak digital processes.

Posteroventral corner of epimeron 1 rounded, posterior margin weakly convex, serrate, setose (5), anteroventral margin with 4 short to medium setae, posteroventral face with 2 long setae set slightly oblique. Posteroventral corner of epimeron 2 rounded, posterior margin weakly convex, serrate, setose (6), facial setae = 9, none set vertically, posteroventral corner of epimeron 3 rounded, weakly protuberant, posterior margin weakly concave, serrate, setose (9), ventral margin with 5 setae mainly posterior.

Urosomite 1 with lateral setule at base of uropod 1 and 2 midfacial setae, articulation line complete, urosomite 3 unprotuberant dorsally. Rami of uropods 1-2 with articulate but tightly fixed apical nails, except inner ramus of uropod 1 with flexible nail, outer ramus of uropod 1 with 3 dorsal spines, inner with 1, outer ramus of uropod 2 with 3 dorsal spines, inner with no dorsomedial spines, peduncle of uropod 1 with 4 basofacial setae and 3 apicolateral spines, medially with 5 marginal setae and spines, apicalmost an ordinary spine, none displaced. Peduncle or uropod 2 with 8 dorsal spines, medially with 1 small apical spine; apicolateral corners of peduncles on uropods 1-2 without comb. Peduncle of uropod 3 with 5 ventral spines, dorsally with 1 lateral spine, 1 medial spine and setule, rami submasculine, inner extending to M. 95 on article 1 of outer ramus, apex with 2 setae, medial and lateral margins with 3 and 1 setae, article 2 of outer ramus short, 0.13, bearing 2 long setae, lateral margin of article 1 with 4 acclivities, short spine formula = 1-1-1-1-0, long spine formula = 1-1-1-1-1, setal formula = 0-0-0-0-2. Telson especially long, length-width ratio = 5:4, almost fully cleft, each apex of medium width, rounded, lateral acclivity shallow, narrow, bearing ordinary lateral setule, thin spine next medial slightly longer than setule, very long, with dorsolateral spine at M. 70 and slightly shorter lateral spine at M. 55, mid-lateral setules diverse, larger of medium size.

NOTES.—Male "n": Article 2 of antenna 1 with 6 ventral setae, primary flagellum with 11–12 articles, 1 calceolus each on articles 2–7, aesthetascs weakly developed. Facial spine formula on article 4 of antenna 2 = 3–3–5, article 5 with 3 dorsal sets of male setae and 1 calceolus, ventrodistal apex with 2 thin spines, calceoli on flagellum = 2, 3, 4, 5, 7, 9 . . . n. Basofacial setal formula of article 3 on mandibular palp = 0–2; right lacinia mobilis simple!

Article 2 of only pereopod 7 narrower than in female, ventral setae very short, article 5 with 2 special male spines. Epimera 1–3 broadened, posterior margin of epimeron 3 not shortened, setal formulas, epimeron 1 anteroventral = 4, posteroventral marginal = 3, posterior = 3 setules; epimeron 2 facial = 9, posterior = 4 setae, epimeron 3 posterior = 9, facial = 0, ventral = 6. Spine formulas of uropods, uropod 1 peduncle apicolateral = 6, basofacial = 4, medial = 6, uropod 2 peduncle dorsal = 11, dorsal spines on outer ramus of uropod 1 = 4, of uropod 2 = 3, inner ramus of uropod 1 = 2, of uropod 2 = 0; ventral spines on peduncle of uropod 3 = 6, spine formula on article 1 of outer ramus = 0–0–0–1–1–1, setal formula = 0–1–1–1–1–1; setule formula = 1–1–1–1–1–1. Urosomite 1 with 1 faciolateral seta. Apical spine of telson shortened, 1 short lateral spine at M. 45!, each lobe with long row of denticles.

Female "w": Antenna 1 normal. Ensiform process better developed than in holotype; spine formula on face of article 4 = 1–3–3–5, dorsally = 1 spine, 4 setae, on article 5 = 5 facial, 3 apical, 1 of these very dorsad.

Article 5 of pereopod 3 with no proximal spine, article 4 with 1.

Setal formulas, epimeron 1, anteroventral = 4, posteroventral = 1 at margin, posterior = 4 setae; epimeron 2, facial = 10, no verticals, posterior = 6; epimeron 3, ventral = 3, posterior = 10 widely spread.

Short spines on article 1 of outer ramus on uropod 1 = 1–1–1–0–0, long setae = 1–1–1–1–1, medium spine-setae = 0–0–0–1–1.

Telson with short lateral and long medial spine

separated by setule, plus 1 very long dorsomedial spine at M. 70.

Female "u": Differing from holotype in: ensiform process of antenna 2 almost as large as in *F. obtusidens*; epistome with medium cusp; urosomite 1 with only 1 facial seta; epimeron 3 with only 2 ventral setae; inner ramus of uropod 3 shorter, only extending to M. 75 on article 1 of outer ramus, with only 1 medial and 1 apical seta; telsonic lateral spine short, at M. 70.

Male "s": All ventral armaments on article 2 of pereopod 7 short except for 2 slightly elongate setae; epimeron 3 with 3 ventral setae; telson with very small supernumerary dorsolateral spine.

HOLOTYPE.—AHF 379, female "n," 9.13 mm.

TYPE-LOCALITY.—*Velero III* 677–37, Mexico, Gulf of California, off Isla Ildefonso, 26°37'20"N, 111°29'10"W, 50 fms (91 m), bottom of sand and shell, 15 Mar 1937.

MATERIAL.—Type-locality, 4 specimens: *Velero III* and *IV* samples, 257–34, Costa Rica, off S. Viradores Islands, 10 fms (18 m), female "u," 7.37 mm; 702–37, Bahía de Los Angeles, 18 fms (33 m), female "w," 7.91 mm; 1111–40, Mexico, San Lorenzo Channel, 6 fms (11 m), 1 specimen; 2214–52, California, San Nicolas Island, 22 m, 3 specimens; 4817, California, off Point Conception, 50 m, 4 specimens; 4845, California, off Port Hueneme, 31 m, 3 specimens. Mexico, Baja California, San Lucas Cove, pelagic anchorage, 29 Mar 1940, electric light, USNM Acc. 159124, male "n," 5.23 mm, male "s," 4.36 mm.

RELATIONSHIP.—Differing from all species of the genus in the setosity of the ventral margin on article 2 of pereopod 7. The species belongs to the group of *secasius-apache* in which the displaced spine on uropod 1 is absent.

DISTRIBUTION.—Costa Rica to Point Conception, California, 0–91 m.

Foxiphalus secasius, new species

FIGURES 4, 5

Paraphoxus obtusidens.—J.L. Barnard, 1960:249–259, pls. 33–37 [in part, especially pl. 36: fig. P (= AHF 456); not other parts and Alderman, 1936].

DESCRIPTION OF HOLOTYPE (female "f").— Head about 21 percent of total body length; greatest width about 65 percent of length, rostrum unstricted, broad, elongate, almost reaching apex of article 2 on antenna 1. Eyes medium, clear of pigment, ommatidia especially small. Article 1 of peduncle on antenna 1 about 1.7 times as long as wide, about twice as wide as article 2, ventral margin with about 8 setules, weakly produced dorsal apex with 2 setules-setae, article 2 about 0.45 times as long as article 1, with ventral tightly constrained double crescent of 8 setae, and 5 apicofacial setae, primary flagellum

with 14 articles, about 1.1 times as long as peduncle, lacking aesthetascs (possibly abraded), accessory flagellum with 13 articles. Antenna 2 not ensiform; spine formula of article 4 = 1-3-4-5, dorsal margin with notch bearing 2 setae and 1 spine, ventral margin with 5 groups of 2-5 long to medium setae, 1 ventrodiscal long spine set facially, article 5 about 0.8 times as long as article 4, facial spine formula = 3-3, dorsal margin bearing 3 small apical setae, ventral margin with 4 sets of 2-4 long to short setae, 3 ventrodiscal long to medium spines, 1 of these facial; flagellum about 1.6 times as long as article 4-5 of peduncle combined, with 16 articles.

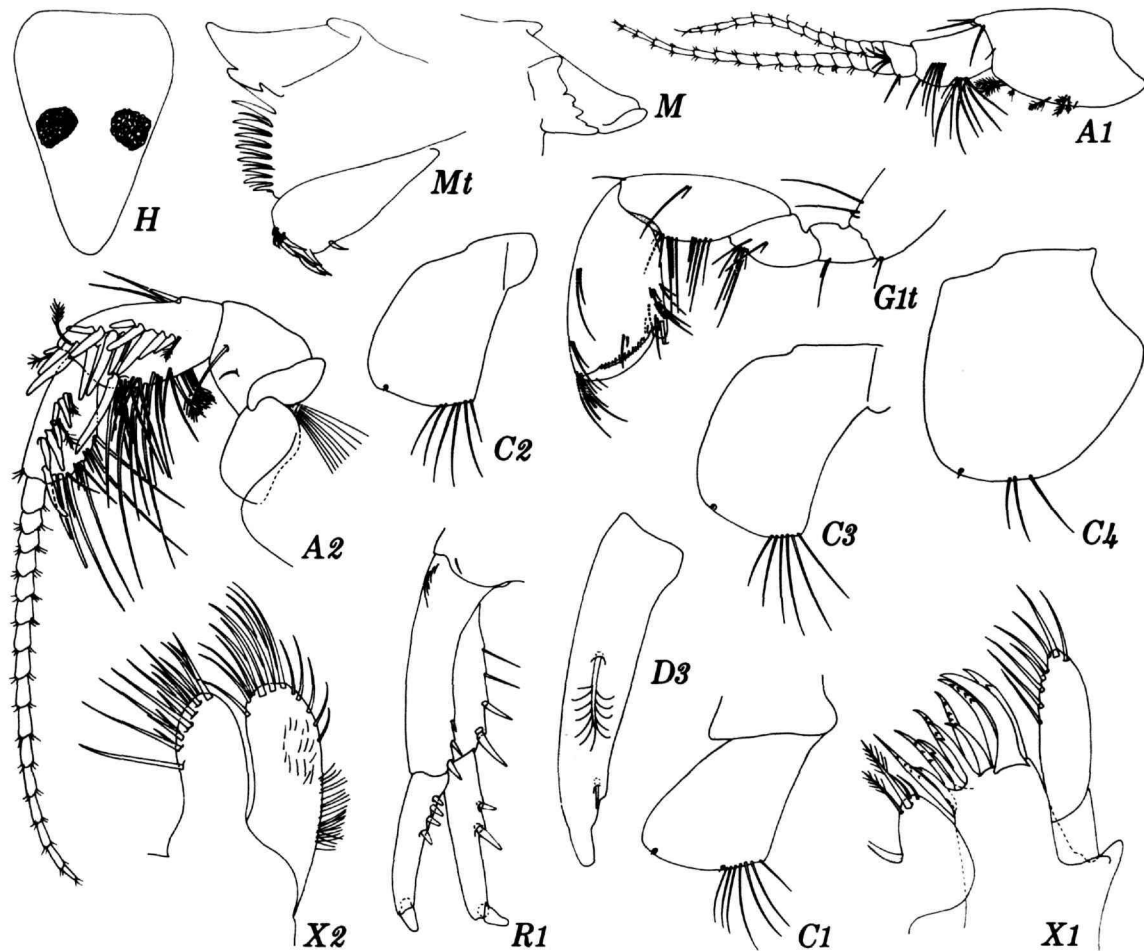


FIGURE 4.—*Foxiphalus secasius*, new species, holotype, female "f."

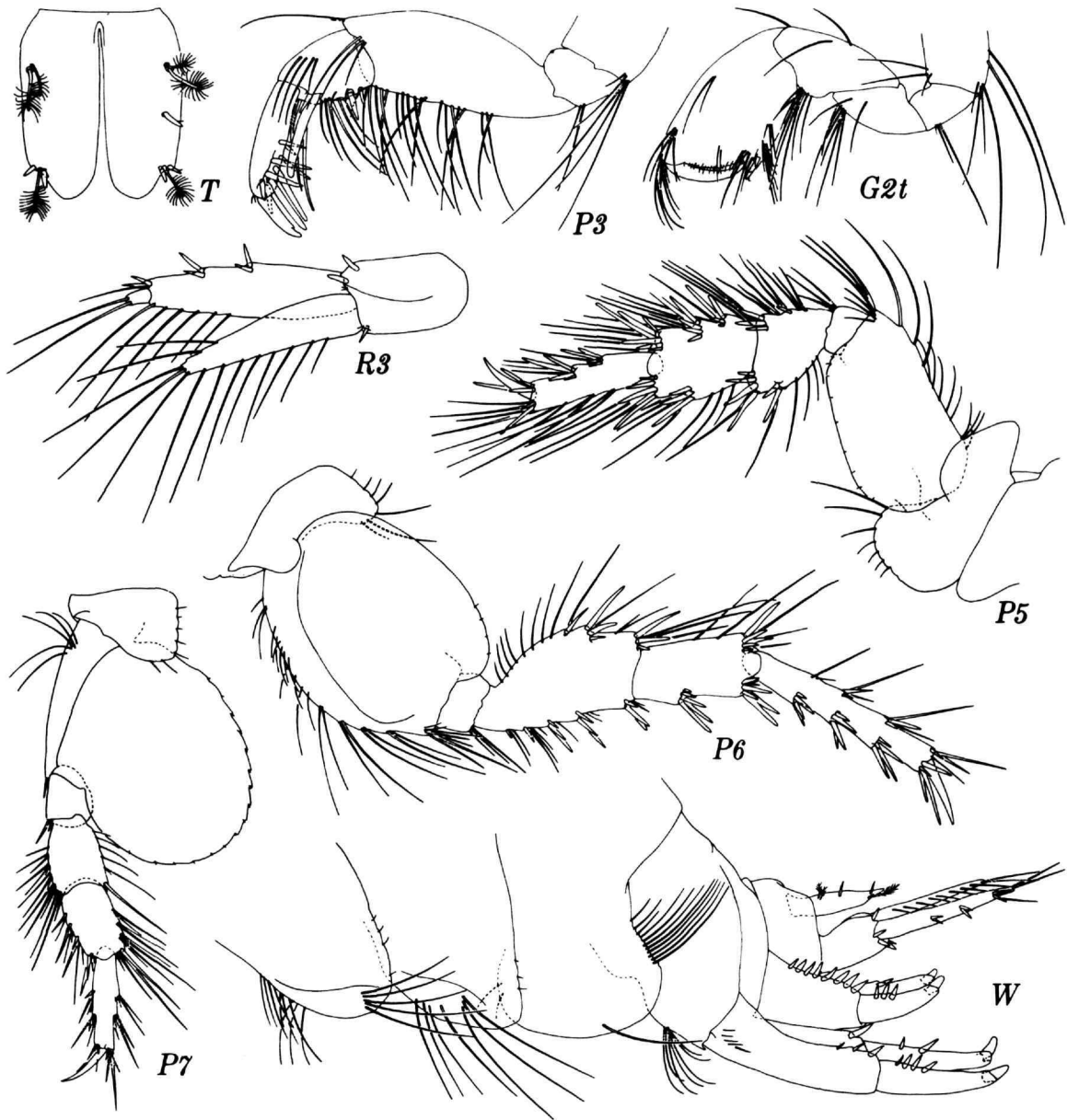


FIGURE 5.—*Foxiphalus secasius*, new species, holotype, female "f."

Epistome broadly rounded anteriorly; upper lip ordinary and dominant. Mandibles with medium palpar hump, right incisor with 3 teeth, left incisor with 3 humps in 2 branches; right lacinia

mobilis bifid, distal branch much shorter than proximal, both branches simple, pointed, left lacinia mobilis with 4 teeth plus 2 accessory teeth, middle teeth shortened, right rakers 8, plus 1

rudimentary, left rakers 10 plus 1 rudimentary; molars composed of elongate plaques, right molar with 7 primarily long spines plus 1 short spine strongly disjunct, left molar with 6 primarily long spines plus 1 short spine strongly disjunct, each molar with plume; palp article 1 short, article 2 with 1 short inner apical seta and 2 other short inner setae, article 3 about 0.9 times as long as article 2, oblique apex with 9 spine-setae, basofacial formula = 0-2. Each outer lobe of lower lip with cone. Inner plate of maxilla 1 large, broad, bearing 1 long apical pluseta, 1 shorter apicomedial seta, 2 apicolateral much shorter setae, outer plate with 11 spines, palp article 2 with 1 apical spine, 1 apicolateral, 5 medial and 1 submarginal setae. Plates of maxilla 2 extending subequally, outer not broader than inner, outer with 5 apicolateral setae, inner with 2 medial setae. Inner plate of maxilliped with 1 large thick apical spine, 2 apicofacial setae, 3 medial setae, outer plate with 8 medial spines, 5 lateral setae, no cusp, palp article 1 without apicolateral seta, article 2 with 1 apicolateral seta, medial margin of article 2 moderately setose, article 3 with 5 and 3 facial setae in 2 continuous rows, 5 lateral setae in 2 groups, nail of article 4 fused to article, with 2 accessory setules.

Coxa 1 strongly expanded, anterior margin almost straight, main ventral setae of coxae 1-4 = 7-6-6-3, posteriormost seta of coxae 1-3 shortest or shortened, anterior and posterior margins of coxa 4 strongly divergent, posterior margin oblique, almost straight, posterodorsal corner rounded, posterodorsal margin ordinary, concave, width-length ratio of coxa 4 = 1:1. Gnathopods generally ordinary, width ratios on articles 5-6 of gnathopods 1-2 = 24:36 and 25:38, length ratios = 65:66 and 52:63, palmar humps large, palms oblique, article 5 of gnathopod 1 elongate, ovate, posterior margin flat, long, article 5 of gnathopod 2 short, posterior margin rounded, short, weakly lobate.

Pereopod 4 slightly stouter than pereopod 3 especially on article 4, facial setae formula on article 4 = 3 and 3, parallel to apex, on article 5 = 4 and 5, main spine of article 5 extending to

M. 80 on article 6, article 5 with 2 and 1 proximoposterior spines, spine formula of article 6 = 4 + 5 and 4 + 5 plus small middistal seta, some spines especially long, acclivity on inner margin of dactyls of pereopods 3-4 weak, emergent setule almost fully immersed, midfacial pluseta ordinary. Coxae 5-7 posteroventral seta formula = 7-7-7; articles 4-5 of pereopods 5-6 narrow, facial spine rows sparse to moderately developed, facial ridge formula of article 2 on pereopods 5-7 = 0-1-1; width ratios of articles 2, 4, 5, 6 of pereopod 5 = 45:31:30:15, of pereopod 6 = 76:37:25:13, of pereopod 7 = 85:21:20:10, length ratios of pereopod 5 = 80:33:47:55, of pereopod 6 = 96:66:56:87, of pereopod 7 = 100:30:32:41, article 2 of pereopod 7 reaching middle of article 4, posterior margin with 10 small serrations, medial apex of article 6 scarcely combed, bearing 3-4 weak digital processes.

Posteroventral corner of epimeron 1 rounded, posterior margin straight, weakly serrate and with 3 setules, corner with setule, anteroventral margin with 11 medium setae, posteroventral face with 5 long setae set in vertical row. Posteroventral corner of epimeron 2 rounded, posterior margin straight, weakly serrate, with 3 setules, facial setae = 7, posteriormost triad set vertically. Posteroventral corner of epimeron 3 rounded, weakly protuberant, with tiny sinus, posterior margin straight but oblique, serrate, setose (11), ventral margin with 1 seta near middle.

Urosomite 1 with lateral setule at base of uropod 1, articulation line almost complete, urosomite 3 unprotuberant dorsally. Rami of uropods 1-2 with articulate but tightly fixed apical nails, except inner ramus of uropod 1 with flexible nail, outer ramus of uropod 1 with 4 tightly constrained dorsal spines, inner with 2, outer ramus of uropod 2 with 3 dorsal spines, inner with 1 dorsomedial spine. Peduncle of uropod 1 with 5 short basofacial setae, and 3 apicolateral spines, medially with 4 marginal setae and spines, apicalmost an ordinary spine, no displaced spine. Peduncle of uropod 2 with 8 short stout dorsal spines, medially with 1 small apical spine; apicolateral corners of peduncles on uropods 1-2

without comb. Peduncle of uropod 3 with 5 ventral spines, dorsally with 1 lateral spine and 2 setules, 1 medial spine and 1 setule, rami submasculine, inner extending to M. 95 on article 1 of outer ramus, apex with 3 setae, medial and lateral margins setose apically, article 2 of outer ramus short, 0.12, bearing 2 long setae, medial margin of article 1 setose, lateral margin with 2 acclivities, spine formula = 2-2-2, setal formula = 0-0-1. Telson especially long, length-width ratio = 17:14, almost fully cleft, each apex wide, rounded, lateral acclivity deep, with small lateral and medial spines separated by elongate setule, mid-lateral setules diverse, largest medium.

HOLOTYPE.—AHF 3512, female "f," 8.61 mm.

TYPE-LOCALITY.—*Velero III* 456-35, Panama, Islas Secas, 07°57'50"N, 82°01'15"W, 12 fms (22 m), bottom of sand and nullipores, 6 Feb 1935.

MATERIAL.—*Velero III* 449-35 (1 female).

RELATIONSHIP.—Differing from the *F. obtusidens* group in the absence of a displaced peduncular spine on uropod 1; like *F. apache* but with rounded anterior margin of epistome, only 1 ventral seta on epimeron 3, and vertically arranged setae on epimeron 2.

See *F. golfensis*.

DISTRIBUTION.—Panama, Secas Islands, 12-25 fms (22-46 m).

***Eobrolgus* J.L. Barnard**

Eobrolgus J.L. Barnard, 1979b:376.—Barnard and Barnard, 1981:295.

DIAGNOSIS.—See J.L. Barnard, 1979b.

TYPE-SPECIES.—*Paraphoxus spinosus* Holmes, 1905, original designation.

COMPOSITION.—*Eobrolgus spinosus*, *E. chumashi*.

***Eobrolgus spinosus* (Holmes)**

FIGURE 2 (part)

Paraphoxus spinosus Holmes, 1905:477, 478, fig. [unnumbered].—Kunkel, 1918:76-78, fig. 13.—Shoemaker, 1925:26, 27.—J.L. Barnard, 1959:18; 1960:243-249, pls. 29-31; 1961:178; 1964a:105; 1966a:89; 1969a:197, 198; 1969b:224.—Reish and Barnard, 1967:18.—Bousfield, 1973:125, pl. 34:1.—Barnard and Barnard, 1981:296.

DESCRIPTION.—For expanded format, see Barnard and Barnard, 1981.

This species is now seen to differ from members of *Foxiphalus* in the reduction of spines on the outer plate of maxilla 1 from 11 to 9 and in the female to the apical adjustment of the ventral setae on article 2 of antenna 1; in males this adjustment is not so strong (see Figure 2). The apical spine on the inner ramus of uropod 1 is articulate but not flexible (see Figure 2).

MATERIAL.—As in Barnard and Barnard, 1981: Noank, Connecticut, 1874, male "m," 4.14 mm; Amityville, Long Island, 1938, juvenile "j," 2.28 mm.

***Eobrolgus chumashi* J.L. and C.M. Barnard**

Eobrolgus chumashi J.L. and C.M. Barnard, 1981:301-304, fig. 1*e*.

DESCRIPTION.—For expanded format, see Barnard and Barnard, 1981.

This species retains 11 spines on the outer plate of maxilla 1, and therefore *Eobrolgus* differs from *Foxiphalus* only in the distal placement of setae on article 2 of antenna 1 in the female.

MATERIAL.—As in Barnard and Barnard (1981), distributional summary: southern California, 0-11 m.

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