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Contributions to the Knowledge of Hyperiid Amphipods of the Family Scinidae from near Hawaii, with a Description of a New Species, *Scina hawaiensis*[1]

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ABSTRACT: This report includes a key and description of nine species of the family Scinidae collected with midwater trawls from off the coast of Oahu, Hawaii. One new species, *Scina hawaiensis*, is described. Thirty-five additional species from the same samples are discussed by Brusca (1973). Notes are included on vertical distribution and migrations, and the known geographic distributions of the species are reported.

NINE SPECIES OF THE FAMILY Scinidae (Amphipoda, Hyperiidea) were collected from midwater trawls off the coast of Oahu, Hawaii, during June 1971. All the other amphipods taken from these samples have been identified and are discussed by Brusca (1973). The major works on the Scinidae include a revision, descriptions, and keys to the species presented by Hurley (1956), Pirlot (1929), and Wagler (1926, 1927). Vinogradov (1960) reported on members of this family from the tropical western Pacific.

The most useful key in the literature is the one given by Hurley (1956), wherein he added new species described by Pirlot and clarified many of the more obscure points in Wagler's key. Even with these works at hand, I have found some degree of variation and inconsistency in certain species from Hawaii, and have prepared a key which hopefully eliminates some of the problems of identification.

A total of 251 individuals of the family Scinidae was collected during this study from the complete sorting of 22 samples. These individuals represent nine species of the genus *Scina*, including one previously undescribed species, *S. hawaiensis*. *Scina crassicornis* and *S. curvidactyla* were by far the most commonly encountered members of the genus, constituting about 96 percent of the specimens examined. This report, in conjunction with that of Brusca (1973), brings the total number of species from Hawaiian waters to 44, representing 14 families.

MATERIALS AND METHODS

The 22 samples analyzed for this study were all collected during June 1971 from the RV *El Pescadero IV* from the waters southwest of Oahu, Hawaii (approximately 21° N, 158°20′ W). The samples were taken with a 10-ft Issacs-Kidd Midwater Trawl (Issacs and Kidd 1953). The water depth in the study area ranged from 1850 to 3700 meters, and sample depths ranged from about 15 to 1275 meters. Complete station data are given in Brusca (1973). As is so often the case, sampling bias and the use of a nonclosing trawl make accurate analyses of vertical distributions and migrations difficult at best.

The samples were initially preserved in formalin; the amphipods were later transferred to 70 percent isopropyl alcohol solution. All length measurements are from the anterior margin of the head to the tips of the longest uropods. The type specimen of *Scina hawaiensis* is deposited in the Bernice P. Bishop Museum, Honolulu, Hawaii. All other specimens are deposited in the Humboldt State University Invertebrate Museum, Arcata, California.

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TABLE 1

SPECIES OF THE GENUS *Scina* COLLECTED FROM HAWAIIAN WATERS

SPECIES	NUMBER OF MALES	NUMBER OF FEMALES	NUMBER OF POSITIVE SAMPLES (22 TOTAL)	DEPTH RANGE (meter)
S. crassicornis	85	115	22	15–1275
S. curvidactyla	7	34	17	15–1275
S. incerta	0	3	2	450–775
S. borealis	0	2	2	330–580
S. latifrons	0	1	1	850–975
S. lepisma	1	0	1	450–600
S. langhansi	0	1	1	160–170
S. wolterecki	0	1	1	425
S. hawaiensis	0	1	1	725–775

SYSTEMATICS AND REMARKS

A total of nine species of the genus *Scina* (family Scinidae) was collected from the samples. Table 1 lists the species along with numbers of individuals and positive depth ranges. The key below includes only those species taken during this study; the reader should refer to Hurley (1956) and Wagler (1926) in cases where specimens do not accurately fit key traits and figure descriptions.

KEY TO THE HAWAIIAN SPECIES OF *Scina*

1. Anterior margin of basis of pereopod 5 smooth; posterior margin with numerous small teeth; uropod 1 inner margin smooth ..... *S. latifrons* (Figure 5*a*, *b*).
1. Both margins of basis of pereopod 5 variably toothed (teeth may be very small); inner margin of uropod 1 toothed ..... 2.
2. Uropod 1 with a single large tooth on inner margin opposite outer ramus; smaller teeth above and below ..... *S. wolterecki* (Figure 6).
2. Uropod 1 without predominant larger tooth on inner margin ..... 3.
3. First antennae distinctly longer than pereon, often as long as pereon plus pleon ..... 6.
3. First antennae shorter than, or at most slightly longer than, pereon ..... 4.
4. Pereopod 5 propodus as long as or longer than merus; dactylus nearly one-half propodus length; dactylus of pereopod 6 very short and hooked ..... *S. lepisma* (Figure 5*c*, *d*).
4. Pereopod 5 propodus at least slightly shorter than merus; dactylus much shorter than propodus; dactylus of pereopod 6 relatively straight ..... 5.
5. Uropod 1 outer margin smooth proximally; teeth on inner margin small ..... *S. hawaiensis* (Figures 7, 8).
5. Uropod 1 outer margin toothed entire length; teeth on inner margin large ..... *S. borealis* (Figure 4).
6. Inner margin of uropod 3 toothed distal to origin of outer ramus ..... *S. incerta* (Figure 3).
6. Inner margin of uropod 3 smooth entire length ..... 7.
7. Outer margin of uropod 2 toothed ..... *S. langhansi* (Figure 5*e*, *f*).
7. Outer margin of uropod 2 smooth ..... 8.
8. Dactyls of pereopods 3, 4, and 6 short and curved ..... *S. curvidactyla* (Figure 2).
8. Dactyls of pereopods 3, 4, and 6 relatively long and straight ... *S. crassicornis* (Figure 1).

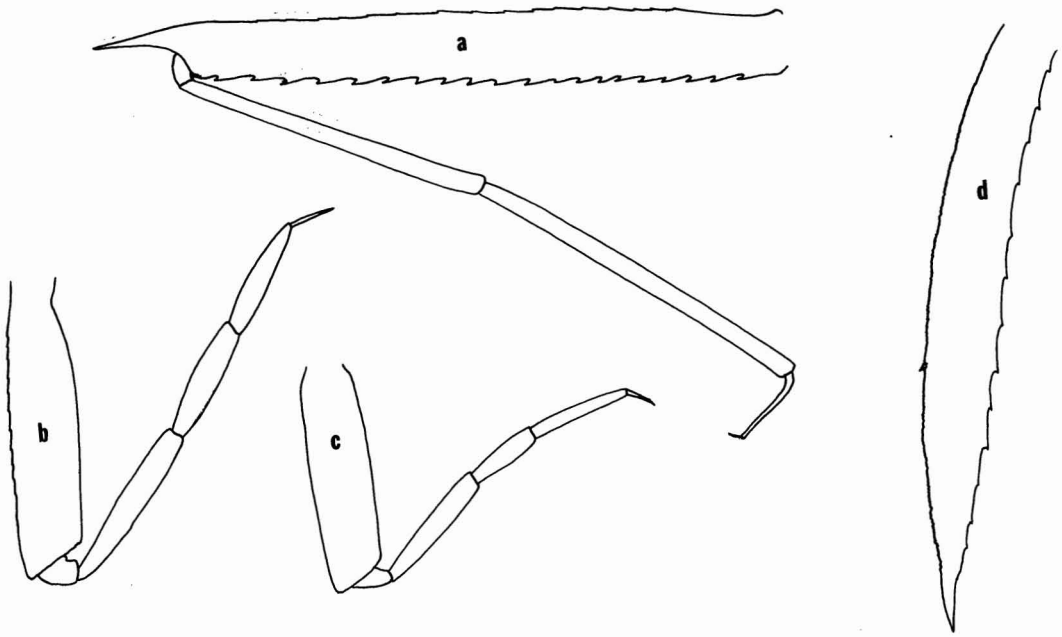

FIGURE 1. *Scina crassicornis* (12-mm female). *a*, pereopod 5; *b*, pereopod 6; *c*, pereopod 7; *d*, uropod 1.

Scina crassicornis (Fabricus, 1775)

Astacus crassicornis Fabricus 1775, p. 415.
Tyro sarsi Bovallius 1887, p. 9, pl. 1, 2.
Tyro atlantica Bovallius 1887, p. 13, pl. 2.
Scina crassicornis Stephensen 1918, pp. 19–27; Wagler 1926, pp. 324–328, figs. 2, 3; Wagler 1927, pp. 90–92, fig. 1; Pirlot 1929, pp. 64–66; Barnard 1932, pp. 258–259; Shoemaker 1945, pp. 228–230, fig. 31; Hurley 1955, p. 124; Hurley 1956, p. 8; Hurley 1960, p. 278; Vinogradov 1960, pp. 227–228, fig. 15; Thurston 1976, pp. 393–395, fig. 2

Scina crassicornis was the most common species of the genus taken in this study; it occurred in all the samples. One hundred and fifteen females, 85 males, and 4 juveniles were examined. The females ranged in length from 6 to 20 mm (average 10.5 mm) and the males from 8 to 13 mm (average 10 mm). The juveniles were less than 5 mm long. One 10-mm ovigerous female was taken from a night sample at 0–425 meters.

The variations in relative segment length of pereopods 5–7 have been discussed by Hurley (1956), Shoemaker (1945), Thurston (1976), and Vinogradov (1960), wherein Shoemaker and Vinogradov established three varieties of *S. crassicornis*. Thurston (1976) indicated that his material displayed characteristics not only of each of these varieties, but of intermediates as well. The specimens taken in the present study do not precisely fit any of the described varieties. Figure 1 illustrates pereopods 5–7 from Hawaiian specimens. Pereopod 5 fits the description given by Shoemaker (1945) for *S. crassicornis* var. *bermudensis* and agrees especially well with his figure in that the anterior teeth on the basis are extremely small. Wagler's (1926) figure of this appendage illustrates much larger teeth.

Pereopod 6 agrees more with that figured by Wagler (1926) than with the description given by Shoemaker (1945), especially in the relative lengths of the merus, carpus, and propodus. The length of the dactylus is about one-quarter of the length of the propodus, similar to that shown for *S. crassicornis* var. *varia* described by Vinogradov (1960). Shoe-

maker diagrams the dactylus as about one-sixth to one-fifth the propodus length, and Wagler about one-half the propodus length, similar to *S. crassicornis* var. *typica* (Vinogradov 1960). Pereopod 7 fits the description given by Wagler (1926) in the relative lengths of the segments, but the dactylus of the Hawaiian specimens is much straighter.

I have also noticed some variation in the nature of the dentition of the inner margin of the first uropod. The number of teeth has been previously shown to vary between about 18 and 24 (Shoemaker 1945, Wagler 1926). Specimens examined in the present study have as few as 12 teeth and as many as 19 (Figure 1). The number of teeth along the inner margin of the first uropod has been used as a trait in separating species (Hurley 1956), but because this characteristic is so variable in *S. crassicornis*, it is invalid to use this trait for such purposes. However, all the teeth are relatively small (a feature also noted in Hurley's key), and this characteristic serves as a consistent criterion for separation when used in a combination with other traits (see key).

Because of the inconsistencies in the nature of the last three pairs of pereopods, and the overlap and variation within single populations as pointed out here and by Thurston (1976), I suspect that true and stable varieties do not exist. Rather, it appears that *S. crassicornis* displays a high degree of genetic flexibility where these traits are concerned and that they are of little taxonomic use.

Scina crassicornis is a widespread species. A review of the literature indicates a cosmopolitan distribution approximately between the polar circles. Thurston (1976) discusses the vertical distribution and migration of this species and compares his results to previous studies. In general, those data suggest that *S. crassicornis* migrates upward during the night from daytime depths of greater than about 300 meters for adults. Males were recorded by Thurston within 50 meters of the surface at night, although females were not captured above 250 meters. Juveniles in Thurston's study were taken from as shallow as 150 meters during the day and 50 meters at night. Although nonclosing nets were used in the present study and no shallow daytime samples were taken, the results do not generally contradict the conclusions made by Thurston. There were, however, no significant differences in the vertical distributions of males and females. There is no question that the population was concentrated above 400 meters during the night, and the abundance of individuals below 400 meters was greater during the day than during the night. The numbers may be considered even more significant because the shallow night trawls were of a shorter duration than the deep samples (Table 2). The four juveniles recovered were all in a single nighttime sample at 50 meters. Both males and females were taken in a 15- to 20-meter night trawl.

TABLE 2

AVERAGE NUMBERS PER TRAWL OF *Scina crassicornis* ABOVE AND BELOW 400 METERS

DEPTH (meter)	AVERAGE NUMBER PER TRAWL
>400 (day)	6.7
>400 (night)	2.5
<400 (night)	16.3

Scina curvidactyla Chevreux, 1914

Scina curvidactyla Chevreux 1914, p. 3, fig. 2; Wagler 1926, pp. 328–331, fig. 4; Wagler 1927, pp. 92–93, fig. 2; Shoemaker 1945, p. 230; Hurley 1955, p. 124; Vinogradov 1960, pp. 228–230, figs. 15, 17; Thurston 1976, p. 395

Scina curvidactyla occurred in 16 of the 22 samples examined. Thirty-four females and seven males were recovered. The females ranged in length from 7 to 20 mm (average 13.5 mm) and the males from 9 to 14 mm (average 12 mm). The specimens taken in the present study closely resemble *S. crassicornis*, but can be separated on the basis of the traits given in the key. The dactyls of pereopods 3, 4, and 6 of *S. curvidactyla* are relatively short and curved (Figure 2) as opposed to the longer and straight dactyls on these appendages of *S. crassicornis*. These speci-

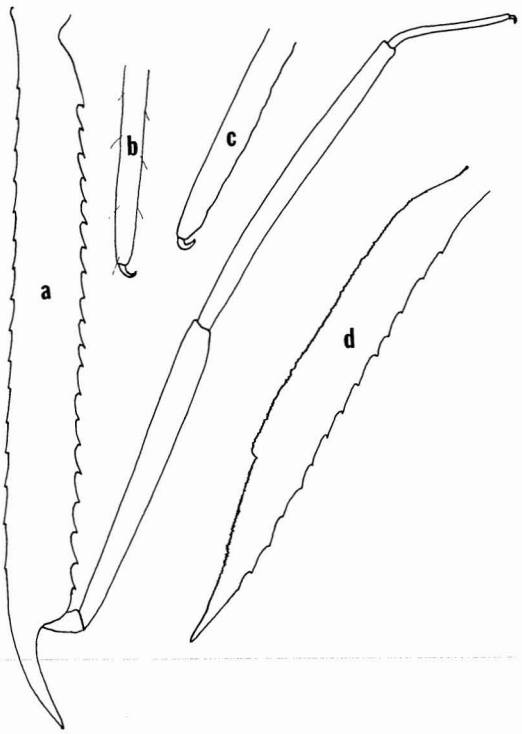

FIGURE 2. *Scina curvidactyla* (14-mm female); *a*, pereopod 5; *b*, *c*, propodus and dactylus of pereopods 3 and 6; *d*, uropod 1.

mens fit reasonably well with Wagler's (1926) description, except that the teeth on the anterior margin of pereopod 5 do not extend well onto the distal spine. Also, the number of teeth on the inner margin of the first uropod is variable (Figure 2) and there were never as many as shown by Wagler. Again, these traits seem to be quite variable and should not be considered definitive. A single 15-mm ovigerous female was taken in a deep night sample.

Previous reports suggest that this species is widespread but probably not as abundant as *S. crassicornis*. These reports include records from the northwest Pacific and the northern Indian Ocean (Vinogradov 1957, 1964), the Caribbean (Lewis and Fish 1969), the Antarctic (Barnard 1930), and near the Canary Islands (Thurston 1976).

Thurston (1976) has summarized the available information concerning the vertical distribution of *S. curvidactyla*, which illustrates an overall depth range of from 50 to at least 2000 meters and a definite migration toward the surface at night. The present study indicates that over 70 percent of the population is above the 400-meter level during the night. Only 33 percent of the nighttime samples taken deeper than 400 meters contained *S. curvidactyla*, while it occurred in 89 percent of the daytime samples over 400 meters—and in much higher numbers.

Scina incerta Chevreux, 1900

Scina incerta Chevreux 1900, p. 123, figs. 9, 12; Wagler 1926, pp. 331–335, figs. 5–7; Wagler 1927, p. 93, fig. 3; Shoemaker 1945, p. 230; Vinogradov 1960, pp. 230–231

Shoemaker (1945) summarized the geographic distribution of *S. incerta* as including the north, tropical, and south Atlantic, and the Indian Ocean. Only three specimens were taken in the present study, and all were females ranging in length from 9 to 14 mm. All three individuals were collected during the day at depths greater than 450 meters. Shoemaker (1945) records a range from 700 to 1000 fathoms (~1260–1800 meters). These specimens fit the description given by Wagler (1926); the key features are illustrated in Figure 3.

Scina borealis (Sars, 1882)

Clydonia borealis Sars 1882, p. 77, pl. 3.
Scina borealis Stephensen 1918, pp. 30–31; Chevreux and Fage 1925, pp. 380–382, fig. 387; Wagler 1926, pp. 334–337, figs. 9–11; Wagler 1927, pp. 94–95, fig. 4; Thorsteinson 1941, pp. 86–87, fig. 78; Shoemaker 1945, p. 230; Hurley 1955, p. 124; Hurley 1956, pp. 8–9; Sanger 1974, p. 3; Sanger 1973, pp. 1–29; Vinogradov 1960, p. 231; Thurston 1976, pp. 392–393, fig. 1

Only two specimens of this cosmopolitan species were taken during the present study. Both individuals were females (7 and 12 mm); the larger one was taken at night from about 350 meters, the smaller during the day at about 600 meters. Thurston (1976) reviews

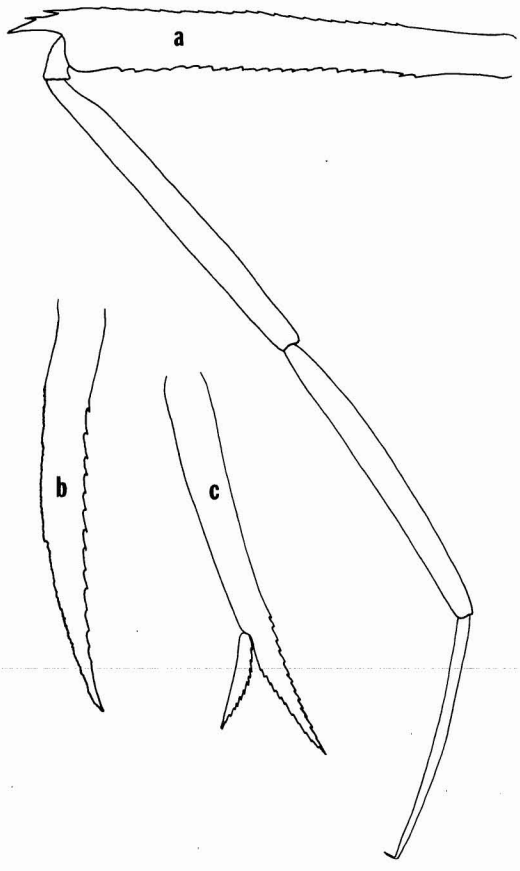

FIGURE 3. *Scina incerta* (14-mm female); *a*, pereopod 5; *b*, *c*, uropods 1 and 3.

the details of vertical distribution and migration for this species.

Figure 4 illustrates the key features. It is worthwhile to note the characteristic large teeth on the inner margin of uropod 1 in contrast to the smaller teeth in *S. crassicornis* and *S. curvidactyla*. Since the numbers of teeth are variable in those two species, these figures offer a comparison of size for identification purposes.

Scina latifrons Wagler, 1926

Scina latifrons Wagler 1926, pp. 401–404, fig. 41; Wagler 1927, p. 107, fig. 12

Wagler (1926, 1927) reported this species in the Atlantic Ocean and Indian Ocean; the

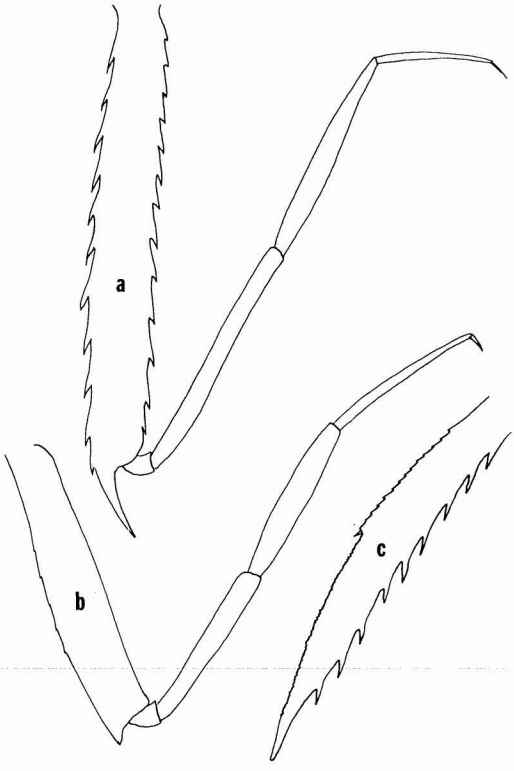

FIGURE 4. *Scina borealis* (12-mm female); *a*, pereopod 5; *b*, pereopod 6; *c*, uropod 1.

single specimen collected in the present study represents the first Pacific record. This 5-mm female was taken in a deep night sample. The lack of teeth on the anterior margin of the basis of pereopod 5, coupled with the absence of teeth on the first uropods, distinguishes this species from other Hawaiian members of the genus *Scina* (Figure 5*a*, *b*). The teeth on the posterior margin of the basis of pereopod 5 are somewhat stronger in this specimen than in that figured by Wagler (1926).

Scina lepisma (Chun, 1889)

Scina lepisma Wagler 1926, pp. 410–413, fig. 45; Wagler 1927, pp. 107–108, fig. 13; Vinogradov 1960, pp. 234–235; Thurston 1976, pp. 396–397, fig. 3

A single 12-mm male was collected in a trawl between 450 and 600 meters at night.

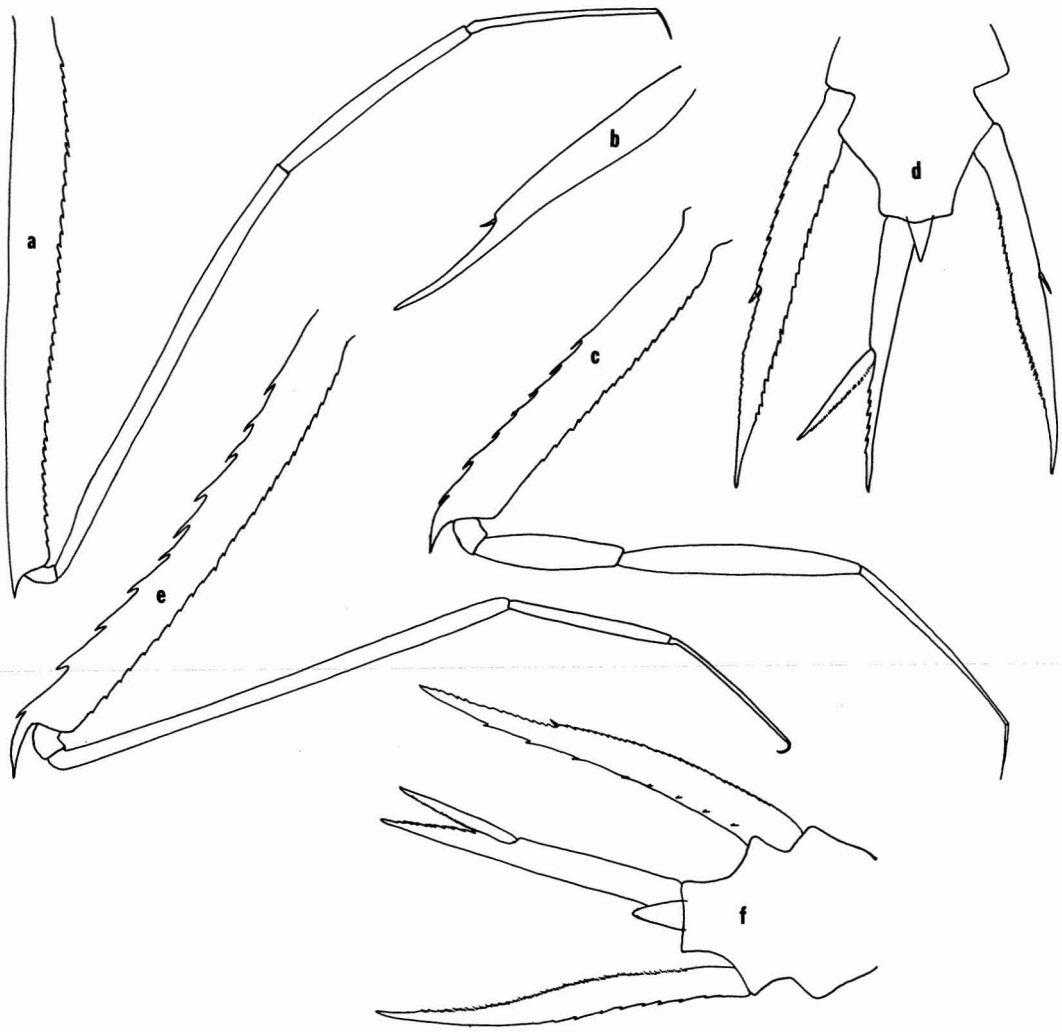

FIGURE 5. *Scina latifrons* (5-mm female); *a*, pereopod 5; *b*, uropod 1. *Scina lepisma* (12-mm male); *c*, pereopod 5; *d*, urosome, uropods, and telson. *Scina langhansi* (12-mm female); *e*, pereopod 5; *f*, urosome, uropods, and telson.

This specimen agrees with the description given by Wagler (1926). Based upon the relative lengths of the propodus and dactylus of pereopod 5, and the dentition of uropod 1 (Figure 5*c*, *d*), it can be easily identified.

Scina langhansi Wagler, 1926

Scina langhansi Wagler 1926, pp. 335–337, fig. 8

A single 12-mm female specimen was taken during this study that fits the original description for *S. langhansi* as given by Wagler (1926). The key features are shown in Figure 5*e*, *f*.

Scina wolterecki Wagler, 1926

Scina wolterecki Wagler 1926, pp. 372–375, figs. 27–28; Wagler 1927, pp. 100–101; Barnard 1932, p. 261; Vinogradov 1960, p. 233

The single 5-mm female taken in this study agrees well with the description given by

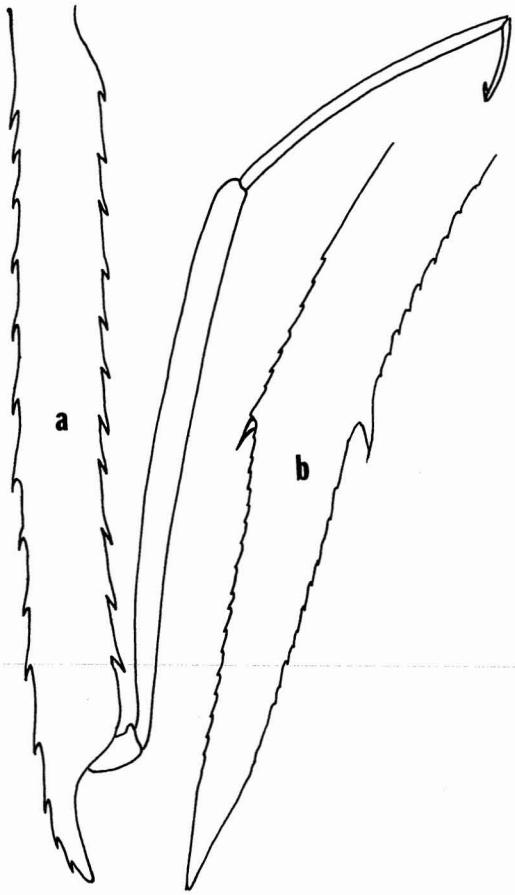

FIGURE 6. *Scina wolterecki* (5-mm female); *a*, pereopod 5; *b*, uropod 1.

Wagler (1926) except that the outer ramus on the first uropod is larger than shown by Wagler (Figure 6). Barnard (1932) reported *S. wolterecki* based upon a single female in which there were three large spines on the inner margin of the left first uropod and two on the right. These sorts of morphological variation may not be acceptable within the species, and further work with high numbers of specimens is needed. The individual *S. wolterecki* reported here was taken in a daytime trawl to 425 meters, which approximates the shallowest day catch reported by Thurston (1976) at 450 meters. His data indicate that the population spreads out to from 250 to 720 meters during the night.

Scina hawaiensis sp. nov.

A single 9-mm female was collected during this study that is not assignable to any previously described species. The specimen was recovered from a daytime trawl to a depth of about 750 meters (Station 71-6-5, see Brusca 1973). Similarities and differences between *S. hawaiensis* and other similar members of the genus are discussed following the description below.

Description of Female (Figures 7, 8)

Body proportions: length of body, 9 mm (anterior margin of head to tips of uropods); cephalon + pereon = 5 mm, pleon = 2.5 mm, urosome to tips of uropods = 1.5 mm.

First antennae: both broken, but obviously not significantly longer than pereon; margins smooth with dense setation along inner border; setae becoming progressively shorter distally.

Second antennae: short (approximately 1.6 mm), but easily seen folded across face.

First maxillae (Figure 7*a*): palp well developed, reaching length of main tooth; inner lobe small, rounded, lightly setose.

Maxillipeds (Figure 7*b*): outer lobes broad; inner margins nearly parallel and each bearing three prominent spines; each outer lobe terminating in two or three spines with an additional spine borne on a small process on distal outer margin; inner lobe distinctly truncate, about one-third length of outer lobes; margins nearly parallel, bearing two short terminal spines.

Pereopod 1 (Figure 7*c*): with two long setae on posterodistal angle of basis; ishium with a single short but heavy spine; merus serrated along posterior border; carpus and propodus setose and nearly equal in length; dactylus straight, about one-half as long as propodus.

Pereopod 2 (Figure 7*d*): subequal in length to pereopod 1, but somewhat less robust and more heavily setose; basis with ten long setae on posterior margin (the first located about one-third the distance from origin of basis with more dense setation near the postero-

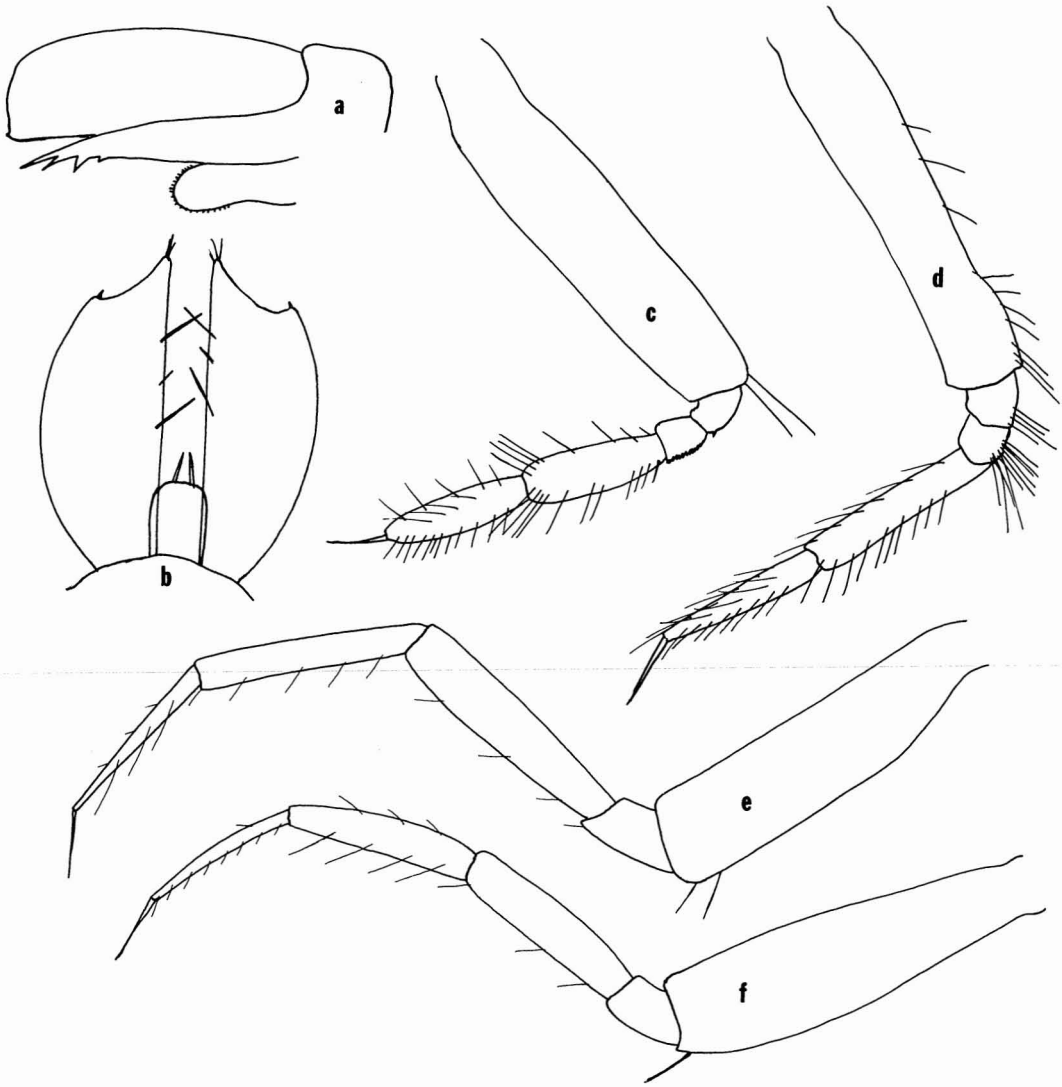

FIGURE 7. *Scina hawaiensis* (9-mm female); *a*, maxilla 1; *b*, maxillipeds; *c–f*, pereopods 1–4.

distal angle); ishium with four setae, merus with ten; carpus, propodus and dactylus similar to pereopod 1 but somewhat narrower relative to lengths.

Pereopods 3 and 4 (Figure 7*e*, *f*): third and fourth legs about equal in length with segments of similar proportions; merus, carpus, and propodus subequal in length; dactylus about one-half length of propodus; number, arrangement, and length of setae vary somewhat as illustrated.

Pereopod 5 (Figure 8*a*): both margins of basis toothed; anterodistal angle produced in a long tooth; teeth on anterior border of basis relatively small except for three large distal teeth; teeth on posterior border relatively large; merus and carpus about equal in length; propodus about one-half length of carpus; dactylus relatively short and straight.

Pereopod 6 (Figure 8*b*): anterior edge of basis weakly notched; merus slightly longer

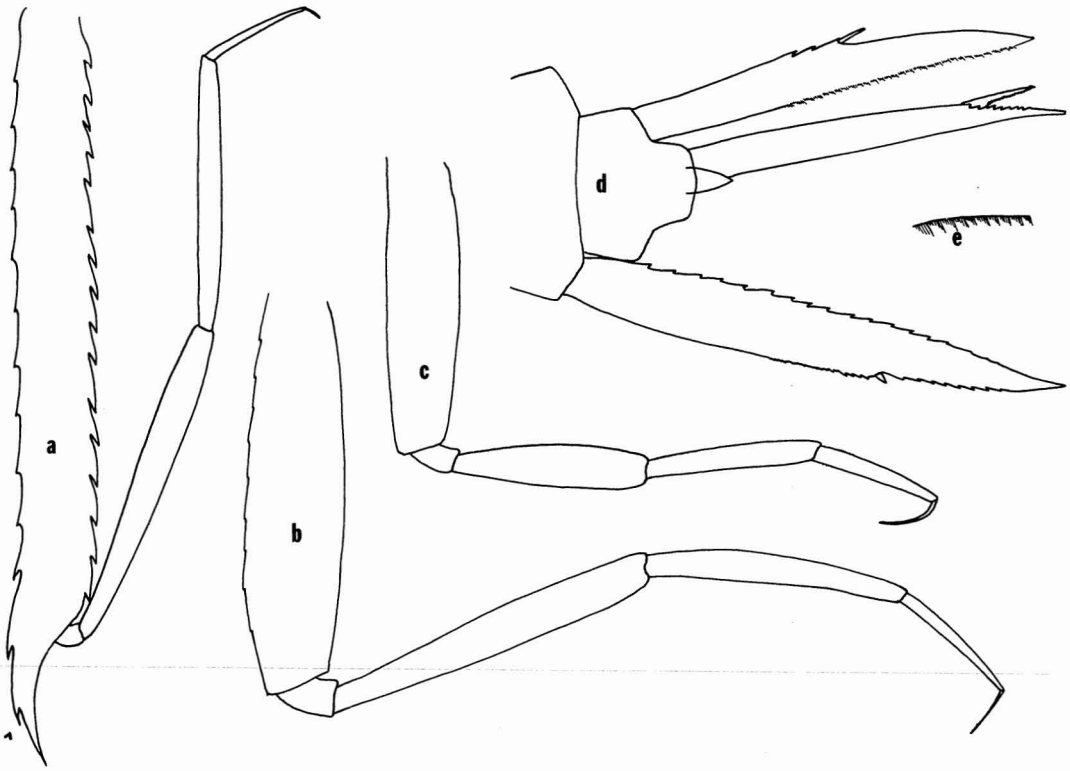

FIGURE 8. *Scina hawaiensis* (9-mm female); *a–c*, pereopods 5–7; *d*, urosome, uropods, and telson; *e*, details of inner margin of uropod 2.

than carpus, which is slightly longer than propodus; dactylus straight and about one-half length of propodus.

Pereopod 7 (Figure 8*c*): basis straight; sides nearly parallel; merus slightly longer than carpus, which is subequal to length of propodus; dactylus curved and about one-half length of propodus.

Uropod 1 (Figure 8*d*): outer margin smooth proximally; with small teeth immediately above origin of outer ramus and larger teeth distally; inner margin with about 18 teeth of moderate size becoming smaller distally; outer ramus arises about one-third distance back from tip of uropod.

Uropod 2 (Figure 8*d*): outer margin smooth except for two moderate-sized teeth immediately above origin of outer ramus; inner margin smooth proximally and toothed distally (under high magnification, dentition appears as repeating series of teeth of increasing length, Figure 8*e*); outer ramus arises slightly distal to uropod midpoint.

Uropod 3 (Figure 8*d*): outer margin smooth above outer ramus and toothed below; inner margin smooth; outer ramus arises about one-third distance from tip of uropod; outer ramus minutely serrated along inner margin.

Telson (Figure 8*d*): short, about one-third length of double urosomites 2 and 3; tapering to a blunt point.

Comparison of S. hawaiensis and similar members of the genus

The specimen described here as *Scina hawaiensis* displays certain similarities to *S. lepisma*, *S. curvidactyla*, and *S. crassicornis*. The first maxillae resemble those of *S. lepisma* but lack dense setation of the articles. The maxillipeds are also similar in *S. hawaiensis* and *S. lepisma*, except that each outer lobe bears three large spines in the former species and one in the latter. Additionally, the inner lobe is truncate and only about one-third

the length of the outer lobes in *S. hawaiensis*, while it is clearly one-half the length of the outer lobes and tapers to a rounded point in *S. lepisma*.

Pereopods 1 and 2 of *S. hawaiensis* are generally much more heavily setose than those of *S. lepisma*, more closely resembling *S. crassicornis* and *S. curvidactyla*, except that the setation on the basis of pereopod 2 occurs only on the distal third of that segment in those two species. Pereopods 3 and 4 are similar in *S. hawaiensis*, *S. crassicornis*, and *S. lepisma*, differing primarily in the number and arrangement of setae. The length and shape of the dactylus on each appendage easily separates *S. hawaiensis* from *S. curvidactyla*, being long and straight in the former and short and curved in the latter.

Pereopod 5 of *S. hawaiensis* is most similar to that of *S. curvidactyla* in terms of dentition and segment proportions except for the degree of size difference between the proximal and distal teeth on the anterior border (which is not great in *S. curvidactyla*) and, again, the length and shape of the dactylus. Pereopods 6 and 7 resemble those of *S. crassicornis* except for the relative lengths of the carpus and propodus. In *S. hawaiensis*, the carpus is slightly longer than the propodus; in *S. crassicornis*, it is slightly shorter than the propodus.

Uropod 1 of *S. lepisma* has teeth all along the outer margin, and the outer ramus arises about midway along the uropod. In *S. hawaiensis*, the outer margin is smooth proximally, and the outer ramus arises distal to the midpoint of the uropod. The arrangement of spines on the inner margin of uropod 2 is similar in all four species being discussed here, but the proximal area lacking spines is longer in *S. hawaiensis* than in the other three species. Also, *S. hawaiensis* is the only one of the four bearing two teeth on the outer margin, and the point of origin of the outer ramus differs. The serration of the inner margin of the outer ramus of uropod 3 occurs in all four species, but the origin of the outer ramus is clearly more distal along the uropod in *S. hawaiensis* than in the other three species.

The telson of *S. hawaiensis* is nearly identical in size and shape to that of *S. lepisma*; it is bluntly pointed. In *S. crassicornis* and *S. curvidactyla*, the telson is broadly rounded.

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