

(BESP)

Ti 453

U. S. COMMISSION OF FISH AND FISHERIES,
GEORGE M. BOWERS, Commissioner.

SCHIZOPODS OF THE HAWAIIAN ISLANDS COLLECTED
BY THE STEAMER ALBATROSS IN 1902.

BY

A. E. ORTMANN,

Curator of Invertebrate Zoology, Carnegie Museum, Pittsburg, Pa.

Extracted from U. S. Fish Commission Bulletin for 1903, Part III.
Pages 961 to 973.

ISSUED DECEMBER 28, 1905.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1905.

SCHIZOPODS OF THE HAWAIIAN ISLANDS COLLECTED BY THE ALBATROSS
IN 1902.

BY A. E. ORTMANN,

Curator of Invertebrate Zoology, Carnegie Museum, Pittsburg, Pa.

In the present collection there are represented 21 recognizable species, none of which are new, although one might be regarded as a new variety. Six species are already known from this region, 5 of which are distinctly pelagic forms, although the two species of *Stylocheiron* seem to prefer a certain depth. These 5 are: *Euphausia bidentata*, which was captured by the *Albatross* on a previous trip between San Francisco and the Hawaiian Islands; *Stylocheiron carinatum*, which is known from the "North Pacific" (*Challenger*, without exact locality); *Stylocheiron abbreviatum*, which was captured by the *Challenger* north of the Hawaiian Islands; *Siriella thompsoni*, which is known from the "North Pacific" (*Challenger*) and from between San Francisco and the Hawaiian Islands (*Albatross*); and *Siriella gracilis*, which has been reported from the Northern Pacific by Streets and the *Challenger*. The sixth species previously known from this region is *Boreomysis obtusata*, which was found by the *Challenger* north of the Hawaiian Islands. This seems to be a deep-sea form.

The other 15 species in this collection have not been found previously near the Hawaiian Islands. For some of them this new locality is not remarkable, since they have been found in other parts of the Pacific Ocean; but other cases are more or less interesting on account of the great distance of the localities from which they have been previously recorded. The discovery in the Pacific of the two pelagic forms, *Euphausia pseudogibba* and *Stylocheiron longicorne*, which were known hitherto only from the Atlantic Ocean, is in keeping with what is known of the distribution of related forms, and the same may be said of *Nematodactylus boöpis*, which up to the present time was known only from Ireland. In two instances, however, *Lophogaster* and *Anchialus*, a very close examination of the material at hand was necessary to remove all doubt as to the actual identity of the species in question, since the known facts of distribution rather led to the expectation that the Hawaiian forms would prove to be distinct.

Further detail concerning the geographical distribution of the single species will be given below at the proper places.

SYSTEMATIC ACCOUNT OF THE SPECIES.

Order EUPHAUSIACEA Boas.

Family EUPHAUSIIDÆ Dana.

Genus THYSANOPODA Milne-Edwards.

1. *Thysanopoda obtusifrons* G. O. Sars.

Thysanopoda obtusifrons G. O. Sars, Rep. Voy. *Challenger*, 13, 102, pl. 18, figs. 1-14, 1885; Alcock & Anderson, Journ. Asiat. Soc. Bengal, 1894, 63, 3.

A careful comparison of the present material with Sars's description has led to the conviction that these specimens agree better with this species than those collected by the Plankton Expedition in the Atlantic, and described by the present writer under this name.^a The only difference from Sars's account I am able to discover is that the preanal spine in most of our specimens is present and simple; it was seen in 14 of them, while 3 did not show it (the remaining 1 was dissected before it was examined in this respect). Sars calls this spine "obsolete," but we must bear in mind that he had only 3 individuals at his disposal.

Further, the lobe of the first joint of the antennula is different in shape from that given in Sars's figure (fig. 2 on pl. 18); its inner portion, projecting over the base of the second joint, is drawn as square (with rounded angles), while in our specimens (I have made, however, only one slide) it is rather triangular, the inner angle being produced.

For the rest, our specimens agree completely with *T. obtusifrons*, and we are to mention especially that there is no lateral denticle on the carapace, and that the serrate keels of the telson correspond closely to Sars's description and figure (fig. 3, pl. 18). In these respects and in size (our largest is 19 mm. long; Sars gives 23 mm.) they differ from the specimens taken by the Plankton Expedition and specimens recorded under this name from the Mediterranean.^b This Atlantic species has recently been called *T. vulgaris* by Hansen.^c

Stations: 3806, 50 fathoms, 23° 25' 36" N., 152° 24' 30" W., Erben Bank to Kaiwi Channel, 5 specimens; 3808, 50 fathoms, 22° 10' N., 155° 35' 45" W., northeast of Kaiwi Channel, 13 specimens. 3808: T. aquatilis

Distribution.—"Pacific" and "South Pacific" are the localities given for the specimens collected by the *Challenger*. Alcock and Anderson mention it from the Laccadive Sea, Indian Ocean, 1,250 fathoms.

2. *Thysanopoda agassizi* Ortmann. = *T. monacantha*, Ort. 25'

Thysanopoda agassizi Ortmann, Bull. Mus. Harvard, 14, 1894, 99.

The individual at hand is much larger than the specimens previously recorded. The largest from the Panama region measures 19 mm., while the present one is 32 mm.; but it agrees completely with the description, except that the preanal spine is well developed and has two points, one shorter than the other.

Color in life, according to label: "Light vermilion, darkest on thoracic feet."

Station: 3804, 50 fathoms, 24° 58' 42" N., 149° 11' W., between Erben Bank and Kaiwi Channel, 1 specimen.

Distribution.—Gulf of Panama, 200 fathoms, and between Galapagos and Acapulco, 0-200 fathoms (Ortmann).

Genus EUPHAUSIA Dana.

3. *Euphausia bidentata* (G. O. Sars).

Euphausia pellucida G. O. Sars, Rep. Voy. *Challenger*, 13, 1885, 75, pl. 11 and 12; Ortmann, Decap. & Schizop. Plankton Exped., 11, 1893; Ortmann, Bull. Mus. Harvard, 25, 1894, 101. Caullery, Ann. Univ. Lyon, fasc. 2, 1896, 367. Holt & Tattersall, Rept. Fish. Ireland, 2 app., 4, 1905, 101 and 133.

^aOrtmann, Decapoden und Schizopoden Plankton Exped., 1893, p. 10.

^bSalv. lo Bianco, Pelagische Tiefseefischerei der "Maja," p. 35, pl. 14, fig. 48, 1904. Capri, Naples, about 1,000 m.

^cHansen, Bull. Mus. Oceanogr. Monaco, No. 30, 1905, p. 15.

Euphausia bidentata Stebbing, Pr. Zool. Soc. London, 1900, 544.

Euphausia pellucida S. lo Bianco, Pelag. Tiefseefisch. Maja, 37, pl. 16, fig. 50, 1904.

I follow Stebbing (1900) in using the name of *E. bidentata* Sars for this species, without being fully convinced that *E. pellucida* of Dana is a different form. I readily concede, however, that *E. pellucida* (as well as *E. muelleri* Claus) is at least doubtful, which is sufficient reason for discarding this name.

Stations: 3797, surface, 31° 55' N., 135° W., East Pacific, 4 specimens; 3797, 25 feet below surface, 31° 55' N., 135° W., East Pacific, 2 specimens; 3829, surface, south coast of Molokai Island, 1 specimen; 3867, surface, Pailolo Channel, 16 specimens; 3901, surface, Pailolo Channel, 24 specimens; 3912, surface, south coast of Oahu Island, 1 specimen; 3928, surface, 21° 20' N., 158° 43' W., southwest of Oahu, 5 specimens; 3929, surface, 23° 19' N., 166° 54' W., between Honolulu and Laysan, 2 specimens; 3980, surface, 21° 23' N., 158° 19' W., between Honolulu and Kauai, 1 specimen; 4009, surface, 21° 50' 30" N., 159° 15' W., southeast of Kauai, numerous specimens; 4011, surface, 21° 20' N., 158° 21' W., between Kauai and Oahu, 1 specimen; 4145, surface, 22° 27' 30" N., 160° 40' W., between Kauai and Modu Manu, 9 specimens.

Distribution.—Almost cosmopolitan; reported from the Arctic and Northern Atlantic (as far north as 60° N.), subtropical and tropical Atlantic, South Atlantic, South and Central Pacific, Indian Ocean. (See Ortmann, 1893.)

In addition to the localities listed by Ortmann in 1893, we have to record numerous localities off the west coast of America: Panama, Galapagos, off California, and between California and the Hawaiian Islands (Ortmann, 1894). Vertical distribution, surface to about 900 meters. Caullery (1896) reports this species from 1,710 meters in the Gulf of Biscay. Lo Bianco (1904) says that at Capri the young are found near the surface, while the adult forms prefer depths of over 500 meters.

4. *Euphausia pseudogibba* Ortmann. = *E. hemigibba*

Euphausia pseudogibba Ortmann, Decap. & Schizop. Plankton Exped., 12, pl. 1, fig. 6, 1893. Stebbing, Pr. Zool. Soc., London, 1900, 545. Hansen, Bull. Mus. Ocean. Monaco, 30, 1905, 11.

The specimens agree completely with this form. The preanal spine has been described as 1 to 4 pointed (rarely 1-pointed). Among 9 individuals of the present material (station 3867), 4 have it 1-pointed and 4 have it 2-pointed (in the ninth it is damaged). In the specimen from station 3799, which is larger than any of the others, it is 3-pointed.

Stations: 3799, 100 fathoms, 29° 22' N., 139° 31' W., East Pacific, 1 specimen; 3867, surface, Pailolo Channel, 10 specimens.

Distribution.—This is the first record of this species outside of the Atlantic Ocean. On account of the similarity to *E. gibboides*, this is important. *E. pseudogibba* has been found hitherto only by the Plankton Expedition and the *Princess Alice* in the Atlantic: Sargasso Sea, North Equatorial, Guinea, and South Equatorial currents, between surface and 650 meters, but not at the surface.

Genus NEMATOSCELIS.

Material belonging to this genus and to the one following has been obtained at various stations situated between California and the Hawaiian Islands, namely, 3799, 100 fathoms; 3801, 100 fathoms; 3802, 150 fathoms; 3803, 50 fathoms; 3805, 50 fathoms; 3807, 50 fathoms.

This material generally is in a very poor condition. In the first line the legs are missing, and, further, the eyes are largely destroyed; both organs are absolutely necessary for the proper identification of genus and species. The latter fact, the destruction of the eyes, is very remarkable, and has been noticed before in these genera by the writer. In my opinion, it is due to the hauling up of the specimens from a certain depth, as indicated by the present records, 50 to 150 fathoms. Apparently the change of pressure causes this deformation of the eyes, which is best described as a bursting. Although the specimens have been largely rendered useless for systematic purposes, the condition in which they are tends to confirm their actual existence at the recorded depths.

E. mutica

3829

3867

3901

3912

4009

4011

E. recurva

3867

3901

3926

E. brevis

3797

3867

3901

14, 1885; Alcock &

the conviction that Expedition in the presence from Sars's present and simple; stated before it was mind that he had

that given in Sars's joint, is drawn as (by one slide) it is

mention especially telson correspond size (our largest is plankton Expedition species has recently

Kaiwi Channel, 5 3808. T. aqua specimens collected dian Ocean, 1,250

reanha, Ort.

25/

The largest from s completely with one shorter than

d Kaiwi Channel,

co, 0-200 fathoms

id 12; Ortmann, rd, 25, 1894, 101. i. Ireland, 2 app.,

about 1,000 m.

Genus *STYLOCHEIRON* G. O. Sars.

In a few specimens belonging to *Stylocheiron* the elongated legs are preserved, and thus the writer was enabled to identify them. They are the following:

✓ 5. *Stylocheiron carinatum* G. O. Sars.

Stylocheiron carinatum G. O. Sars, Rep. Voy. *Challenger*, 13, 137, pl. 26, 1885. Ortmann, Decap. & Schizop. Plankton Exped., p. 17, 1893.

Only two specimens are fairly well preserved, but they unquestionably belong here.

Station 3801, 100 fathoms, 28° 31' N., 141° 47' W., between Erben Bank and Kaiwi Channel 2 specimens.

Distribution.—This species has been found by the *Challenger* in the North Pacific; in the Central Pacific (off Kandavu, Fidji); off Mindanao, Philippines, and in the South Atlantic. The Plankton Expedition obtained it in the Sargasso Sea and the South Equatorial Current; it has also been recorded from the Brazil Current (Ortmann). Vertical distribution, 0-200 fathoms.

6. *Stylocheiron suhmi* G. O. Sars. = *S. carinatum*.

Stylocheiron suhmi and *longicorne* G. O. Sars, Rep. Voy. *Challenger*, 13, 142, 144, pl. 27, f. 1-5, 1885. Ortmann, Decap. & Schizop. Plankton Exped., 13, 1893.

Stylocheiron suhmi Hansen, Bull. Mus. Ocean. Monaco, 30, 1905, 30.

Stylocheiron longicorne Holt & Tattersall, Rept. Fish. Ireland, 2 app., 4, 1905, 109, 140.

Our specimen is much damaged; head and carapace are separated from the rest of the body, but the second true leg is preserved, and this agrees with that of *S. longicorne*; also the eyes and other characters seem to indicate that we have to deal with this species.

Station 3803, 50 fathoms, 25° 39' 45" N., 147° 41' 45" W., 1 specimen.

Distribution.—This species was found by the *Challenger* south of the Cape of Good Hope and in the Pacific (New Guinea and Philippines), and Sars mentions it from Messina, Mediterranean Sea. The Plankton Expedition and the *Princess Alice* found it widely distributed in the Atlantic: Gulf Stream, Sargasso Sea, North and South Equatorial, and Guinea Currents.

✓ 7. *Stylocheiron abbreviatum* G. O. Sars.

Stylocheiron abbreviatum G. O. Sars, Rep. Voy. *Challenger*, 13, p. 147, pl. 27, f. 11-13, 1885. Ortmann, Decap. & Schizop. Plankton Exped., p. 17, 1893; Bull. Mus. Harvard, 25, 1894, p. 104.

Hansen, Bull. Mus. Ocean. Monaco, 30, 1905, 31.

Stylocheiron chelifera Chun, Bibl. Zool., 7, 1896, 167, pl. 11; Holt & Tattersall, op. cit., p. 110, 141.

The present specimen is about 14 mm. long, and thus much larger than that of Sars (8 mm.); but it agrees well with the latter except that the second pair of true legs is comparatively longer and stronger, which, however, is easily accounted for by the age.

Station 3805, 50 fathoms, 24° 08' 15" N., 150° 51' W., 1 specimen.

Distribution.—The *Challenger* took this species in the Pacific, north of the Hawaiian Islands, in the tropical and northern Atlantic. The Plankton Expedition found it widely distributed in the tropical and subtropical Atlantic to a depth of 1,500 meters. The *Albatross* had taken it previously off Galera Point in the Panama region of the Eastern Pacific.

Genus *NEMATOBRACHION* Calman.8. *Nematobrachion boöpis* (Calman).

Nematodactylus boöpis Calman, Trans. Roy. Irish Acad., 31, 1896, 17, pl. 2, f. 19-28. Hansen, Bull. Mus. Ocean. Monaco, 30, 1905, 29.

Nematobrachion boöpis Calman, Rept. Fish. Ireland, 2 app., 4, 1905, 153, pl. 26.

The present specimen is in poor condition (broken in two), but the legs are well preserved. These, as well as the shape of the carapace and the eyes, of antennæ and antennule, agree well with Calman's description. Especially the very characteristic, greatly elongated, second true leg is abso-

ed, and thus the writer

i. Ortmann, Decap. &

ng here.
and Kaiwi Channel 2

Pacific; in the Central
Atlantic. The Plankton
has also been recorded

carinatum.

144, pl. 27, f. 1-5, 1885.

5, 109, 140.

rest of the body, but
o the eyes and other

of Good Hope and in
a, Mediterranean Sea.
in the Atlantic: Gulf

1-13, 1885. Ortmann,
5, 1894, p. 104.

op. cit., p. 110, 141.
of Sars (8 mm.); but
paratively longer and

waiian Islands, in the
ibuted in the tropical
previously off Galera

9-28. Hansen, Bull.

6.
are well preserved.
lae, agree well with
nd true leg is abso-

lutely identical with Calman's account and figure (fig. 26). Also the general shape of the abdomen corresponds to that of this species; the telson is damaged. A more minute investigation of the other characters (chiefly those of generic value) was not advisable, since only one individual is at hand, and this in very poor state of preservation. The only difference noticed is that the antennal scale is slightly longer than in Calman's species, reaching to the middle of the third joint of the peduncle.

Station: 4005, 577-480 fathoms, vicinity of Kauai Island, 1 specimen.

Distribution.—Found so far only at the southwest coast of Ireland in 1,020 fathoms, and Bay of Biscay, 237-1,000 fathoms (Calman), and subtropical Atlantic between Gibraltar, Azores, and Canary Islands (Hansen).

Order MYSIDACEA Boas.

Family LOPHOGASTRIDÆ G. O. Sars.

Genus LOPHOGASTER M. Sars.

9. *Lophogaster typicus* M. Sars.

Lophogaster typicus M. Sars, in Forh. Skand. Naturf. Moede Christiania, 1856, 160. M. Sars, in Christiania Univ. Progr., 1862, 1, pl. 1-3. G. O. Sars, Rep. Voy. *Challenger*, 13, 14, pl. 1, f. 1-7, 1885. Norman, in Ann. Nat. Hist. (6) 9, 459, 1892. Caullery, in Ann. Univ. Lyon, fasc. 2, 1896, 367. Walker, in Trans. Liverpool Biol. Soc. 12, 1898, 164. Holt & Beaumont, in Trans. Roy. Dublin Soc. (2) 7, part 7, 1900, 3. Thompson, Catal. Crust. & Pycnog. Mus. Dundee, 23, 1901. Lo Bianco, Pelag. Tiefseefisch. Maja, 33, pl. 12, f. 44, 1904.

Ctenomysis alata Norman, in Rep. Brit. Assoc., 1861, 151.

The discovery of a *Lophogaster* at the Hawaiian Islands made necessary a close investigation of its relation to the known form of the Atlantic. The abundant material at hand rendered this a comparatively easy task, and it was found that the present form agrees very closely with the descriptions furnished by M. and G. O. Sars for the Norwegian and the Cape forms. Only a few remarks seem necessary.

(1) The rostral spine is generally in our material a little longer than in the typical form, but there is considerable variation in this respect, as has already been pointed out by G. O. Sars. In a few of the present specimens, the rostrum does not differ from the typical shape, but in most cases it is slightly longer, although falling short of the end of the peduncle of the antennules. Sometimes, however, it reaches the end of the latter, and even surpasses it, as is most distinctly the case in the large female from station 3965.

(2) In most of our specimens, there is only 1 small lateral denticle on either margin of the telson while there are 3 in the typical form. In fact, I found only 1 denticle in all the younger specimens examined (I examined a large number from station 4101, although not all of them); in the large female from station 3965, however, there are 3 denticles, as usual.

(3) Most of our specimens do not seem to be fully adult; those of stations 3847, 3858 and 4101 hardly surpass 20 mm. (one of 3858 is 22 mm.), and generally the males are a little larger than the females, as has been stated by Sars for the typical form. The male from station 3857 is 24 mm. long, and the female from 3965 is 28 mm. This latter, consequently, exceeds all measurements previously given. Nevertheless, the much smaller females from station 4101 seem to be adult—at least, are able to propagate, since the marsupium is full in some of them.

(4) The lateral wings of the carapace are produced posteriorly into a point, which is more or less distinctly spiniform, most distinctly so in the large female from station 3965.

(5) The outer margin of the antennal scale has 3 to 5 teeth, a variation already noticed by Sars. I have found that this number may even differ on the right and left side of the same individual.

None of the above aberrations justify the creation of a new species, not even of a variety. Although there is a tendency in the Hawaiian form to develop a longer rostrum and to reduce the number of the marginal denticles of the telson, this furnishes no constant characters, the normal conditions being found at least in some specimens.

Stations: 3847, 23 to 24 fathoms, south coast of Molokai, 2 males; 3857, 127 to 128 fathoms, Pailolo Channel, 1 male; 3858, 128 to 138 fathoms, Pailolo Channel, 9 males; 3884, 284 to 290 fathoms, Pailolo Channel, 1 male; 3965, 147 to 116 fathoms, vicinity of Laysan Island, 1 female; 4101, 143 to 122 fathoms, Pailolo Channel, numerous specimens, male and female, males much more abundant,

Distribution.—Coast of Norway, Shetland Isles, west and southwest coast of Ireland, 20-100 fathoms (Sars, Norman, Walker, Holt & Beaumont). Bay of Biscay, 35-60 fathoms (Norman), 400 meters (Caullery). Mediterranean: Messina (Norman), Toulon, 445 meters, Naples, 500 meters and more (Bianco); south of Cape of Good Hope, 98-150 fathoms (G. O. Sars).

According to previous records, this species would seem to be bipolar, but the present localities in the region of the Hawaiian Islands completely overthrow this assumption, hinted at by G. O. Sars. This form is also found in the tropical belt, and there in about the same depth as in the European waters and at the Cape. The extremes recorded for our specimens are 23 and 290 fathoms. We are to expect that this species will be discovered elsewhere in the circumtropical regions as well as in other parts of the seas, and very likely it will finally prove to be cosmopolitan at the proper depth.

Genus GNATHOPHAUSIA Willemoes-Suhm.

10. *Gnathophausia gigas* Willemoes-Suhm.

Gnathophausia gigas, G. O. Sars, Rep. Voy. *Challenger*, 13, 33, pl. 3, 1885.

Our specimen differs from the description given by Sars in the following points: The infero-posterior spines of the carapace are a little longer; the posterior dorsal spine is well developed, resembling in size and shape that of *G. calcarata*; the branchiostegal spine is much stronger than in Sars' specimen, and decidedly longer than either the antennal or the supraocular spines. The outer edge of the antennal scale has 4 teeth, of which the posterior is very small. The rostrum (which was broken in Sars' specimen) is very long—longer than indicated in Sars' figure; the part in front of the supraocular spines is exactly as long as the carapace between supraocular spines and base of the posterior dorsal spine. The color of our specimen is preserved and is a delicate crimson.

The differences in development of the postero-dorsal, infero-posterior, and branchiostegal spines are not so important, in my opinion, as to indicate that this form differs specifically from *G. gigas*. I rather believe that the differences are due to age, since among other material at hand (see *G. longispina*) just the parts named exhibit corresponding variations in specimens of different age. Our specimen is 50 mm. long, while that of Sars was 142 mm.

Among a collection of schizopods from Alaska which have been sent by the U. S. National Museum to the writer for identification, and which will be described elsewhere, there has been found a specimen of this species closely corresponding to the Hawaiian specimen. It is slightly larger than the latter (55 mm.), but the branchiostegal spine is even more developed, and the supraorbital spines are distinctly larger than the antennal spines. The outer margin of the antennal scale has 5 distinct teeth in this individual.

Station 4144, 850-767 fathoms, vicinity of Kauai Island, 1 male young.

Distribution.—Captured by the *Challenger* at station 69, west of the Azores, in 2,200 fathoms. Sars thinks that the "recently molted skin of the outer part of the tail of another specimen" brought up by the *Challenger* from 1,950 fathoms in the Antarctic Ocean, between Kerguelen and Australia (station 157), also belongs here; but I see no possibility of identifying this species from so meager remains, and it would be better to strike off this latter locality from the records until it is confirmed.

The present locality at the Hawaiian Islands extends enormously the range of this species, and suggests the cosmopolitan character of its distribution. As has been mentioned above, it is also present amongst material from Alaska.

11. *Gnathophausia calcarata* G. O. Sars.

Gnathophausia calcarata G. O. Sars, Rep. Voy. *Challenger*, 13, 35 pl., 4, 1885.

The measurements of our specimens are as follows: Station 4109, total length, 37 mm., of which 15 mm. belong to the rostrum (in front of the supraocular spines); station 4142, total length, 43 mm., of which 14 mm. belong to the rostrum. The measurements given by Sars for his two specimens are 68 and 98, respectively. Our specimens, consequently, are young, and they agree best with the smaller individual described by Sars, the carapace of which is figured on Sars's plate 4, figure 3. The postero-dorsal, the infero-posterior, and the branchiostegal spines are very strongly developed, even stronger than in the figure quoted, and they are a little more divergent, while antennal and

coast of Ireland, 20-100 fathoms (Norman), 400 fathoms (Naples, 500 meters and)).

at the present localities on, hinted at by G. O. e same depth as in the imens are 23 and 290 e in the circumtropical ove to be cosmopolitan

ing points: The infero- pine is well developed, is much stronger than ipraocular spines. The y small. The rostrum n Sars' figure; the part een supraocular spines erved and is a delicate

d branchiostegal spines eifically from *G. gigas*. aterial at hand (see *G.* imens of different age.

by the U. S. National where, there has been ecimen. It is slightly re developed, and the outer margin of the

in 2,200 fathoms. Sars specimen" brought up erguelen and Australia species from so meager ds until it is confirmed. ge of this species, and ioned above, it is also

5. gth, 37 mm., of which 2, total length, 43 mm., his two specimens are y agree best with the ars's plate 4, figure 3. ry strongly developed, it, while antennal and

supraocular spines agree well with Sars's account. The only difference is in the antennal scale, which, although similar to Sars's figure, has the oblique truncation of the apex hardly noticeable; it is more like fig. 2 on Sars's plate than like the figs. 4 and 5. The scale is generally narrower, with three serrations on the outer margin, the first one quite remote from the spiniform tip, but not separated from it by an emargination.

G. bengalensis Wood-Mason (Ann. Nat. Hist. (6) 8, 1891, p. 269), from the Bay of Bengal, 1,748 fathoms, is said to be near *G. calcarata*, but to differ, among other points, in the postero-inferior and other spines, which are almost smooth, in the antennal scale, which is more emarginate, and in the epimeral lappets of the last abdominal segment.

Stations: 4109, 442-449 fathoms, Kaiwi Channel, 1 male; 4142, 632-881 fathoms, vicinity of Kauai Island, 1 male.

Distribution.—This species was taken by the *Challenger* in the Arafura Sea, 800 fathoms, and at the Philippines (near Talaor Island, south of Mindanao), 500 fathoms.

12. *Gnathophausia willemoesi* G. O. Sars.

Gnathophausia willemoesi G. O. Sars, Rep. Voy. *Challenger*, 13, 38 pl., 5 f. 1-6, 1885. Faxon, Mem. Mus. Harvard, 18, 1895, 215.

Our male has the total length of 52 mm., of which 12 mm. belong to the rostrum. The female is 73 mm. long, of which 13 mm. belong to the rostrum; the latter, however, is damaged at the tip. The larger of the two specimens examined by Sars was 136 mm. long. Our specimens agree completely with Sars's account of this species.

Stations: 3887, 552-809 fathoms, north coast of Molokai, 1 male; 4038, 689-670 fathoms, west coast of Hawaii, 1 female.

Distribution.—Banda Sea, 1,425 fathoms (Sars). Panama region: Gulf of Panama, 1,270 fathoms; off Acapulco, Mexico, 493 and 664 fathoms; Tres Marias Islands, 680 fathoms. (Faxon.)

13. *Gnathophausia sarsi* Wood-Mason.

Gnathophausia sarsi Wood-Mason, Ann. Nat. Hist. (6) 7, 1891, 187.

Our specimens correspond completely to Wood-Mason's description of this species, with the exception of the last sentence, which says: "The telson * * * appears to be more produced at the tip than in any other species." No such peculiarity in the shape of the telson is apparent in our specimen.

The individual from station 4166 is 62 mm. long, of which 16 mm. belong to the rostrum (in front of the supraocular spines), but the rostrum is damaged at the tip. The specimens from station 4005 are all smaller than this one, the smallest possessing a total length of 34 mm. Wood-Mason gives 75 mm. from tip of the rostrum to end of telson.

The label of the set from station 4005 gives the color as "scarlet vermilion;" in the specimen from station 4166 the color is still preserved, and is of a brilliant scarlet. All our specimens seem to be males, since in none of them are incubatory lamellæ visible.

Stations: 4005, 577-480 fathoms, vicinity of Kauai Island, 4 males; 4166, 293-800 fathoms, vicinity of Modu Manu or Bird Island, 1 male.

Distribution.—Bay of Bengal, 16° 55' 41" N., 83° 21' 18" E., 840 fathoms (Wood-Mason).

The above localities extend considerably the range of this species.

14. *Gnathophausia longispina* G. O. Sars.

Gnathophausia longispina G. O. Sars, Rep. Voy. *Challenger*, 13, 46 pl., 7 f., 1-5, 1885.

An examination of the rich material of this species collected by the *Albatross* shows that there is quite a variability in the development of the different spines of the carapace. The length of the rostrum and dorsal spine varies considerably; generally they are comparatively longer in young specimens. The branchiostegal spines in older specimens are not quite so strong and are directed obliquely forward, and the outer spine of the antennal scale is not so excessively developed.

The following table of measurements gives an idea of the relative dimensions of rostrum, carapace, and posterior dorsal spine.

Sex.	Station.	Total length.	Length of rostrum. ^a	Length of carapace. ^b	Length of dorsal spine.	Dorsal spine reaches to abdominal segment.
Male.....	3909	mm. 29	mm. 11	mm. 5	mm. 5	Beginning of fifth.
Do.....	4105	51	17	13	8	Middle of fourth.
Do.....	4105	52	16	14	7	End of third.
Female.....	3908	54	16	14	7	Middle of third.
Male.....	4105	57	14	16	6	End of second.
Female.....	4106	62	16	17	7	Middle of third.

^aIn front of the supraocular spines.

^bExcluding rostrum and dorsal spine.

Comparing this table with the characters given by Sars we observe the following:

"Rostrum almost twice the length of the carapace." In very young specimens it is over twice the length, in large ones it is comparatively shorter, in the largest the rostrum is even absolutely shorter than the carapace.

"Dorsal spine projecting to about the end of the fourth (abdominal) segment." In larger specimens it does not project so far, in the smallest it projects a little farther.

Generally speaking, we may say that with advancing age the different spines and the rostrum become comparatively shorter; that is to say, they retain about the absolute size they had in medium-sized specimens, while the rest of the body grows. Thus only our small and medium-sized specimens correspond more or less exactly to Sars's description. Sars's largest specimen (out of five) was 59 mm. long.

The specimens from station 3824 are labeled "Carmine vermilion."

Stations: 3467, 310 fathoms, 1 female; 3471, 337 fathoms, 6 males, 3 females; 3473, 313 fathoms, 1 female; 3474, 375 fathoms, 5 males; 3475, 351 fathoms, 2 males, 1 female; all from the southeast coast of Oahu. 3824, 222-498 fathoms, 1 female, and 3826, 430-371 fathoms, 2 males, 1 female; from the south coast of Molokai. 3907, 315-304 fathoms, 2 males; 3908, 304-308 fathoms, 1 female; 3909, 308-322 fathoms, 6 males; 3911, 337-334 fathoms, 1 male; 3925, 323-299 fathoms, 3 males; all from the south coast of Oahu. 4105, 314-335 fathoms, 3 males; 4106, 335-350 fathoms, 1 male; 4107, 350-355 fathoms, 1 male; all from Kaiwi Channel.

Distribution.—Captured by the *Challenger*, off Sanboangan, Philippines, 250 fathoms.

Family EUCOPIIDAE G. O. Sars.^a

Genus EUCOPIA Dana.

15. *Eucopia australis* Dana.

Eucopia australis Dana, U. S. Expl. Exp. Crust. 1, p. 609, pl. 11, f. 10, 1852. G. O. Sars, Rep. Voy. *Challenger*, 13, 55, pl. 9 and 10, 1885. Wood-Mason, in Ann. Nat. Hist. (6) 8, 1891, 270. Faxon, Mem. Mus. Harvard, 18, 1895, 218. Calman, Trans. Roy. Irish Acad. 31, 1896, 15. Thompson, Catal. Crust. Pycnog. Mus. Dundee, 23, 1901. Holt & Tattersall, Rept. Fish. Ireland, 2, 1905; App. 4, 142. Hansen, Bull. Mus. Ocean. Monaco, 30, 1905, 5.

Chalaraspis unguiculata Willemoes-Suhm, in Trans. Linn. Soc. London (2) 1, 1873, p. 37, pl. 8.

The present specimen is in a very poor state of preservation, but the shape of the eyes, of the frontal margin, of the telson, and of the 3 anterior pairs of legs are recognizable, and agree well with Sars's account of this species. It is apparently a male, no marsupial lamellæ being seen.

Station: 3887, 552-809 fathoms, north coast of Molokai Island, 1 male.

Distribution.—Apparently cosmopolitan, in depths to about 2,000 fathoms (350 to 2,500 fathoms in the Atlantic according to Willemoes-Suhm). The species must go up into shallower water occasionally, however, since it has been taken out of the stomach of a penguin (Dana).

Special localities are the following: North Atlantic: Southwest coast of Ireland, 1,020 fathoms (Calman); south of Nova Scotia, 1,250 fathoms (Sars); west of Azores, 1,000 fathoms (Sars). Tropical

^aThis family, no doubt, is very closely allied to the *Lophogastridae*, and is not separated from them by some authors. The very peculiar differentiation of the legs, however, is in favor of the retention of Sars's family.

Atlantic: North of Cape Verde Islands, 1,975 fathoms (Sars); midway between Africa and Brazil, 1,500 fathoms (Sars). Antarctic Ocean: 66° 12' S., 149° 44' E. (Dana); between Cape of Good Hope and Kerguelen, 1,375 fathoms (Sars); south of Australia, 1,800 fathoms (Sars). Indian Ocean: Bay of Bengal, 561 fathoms, and Gulf of Manaar, 738 fathoms (Wood-Mason). Tropical Pacific: Off Peru, 0-1,770 fathoms; Galapagos, 551 fathoms; Gulf of Panama, 764 fathoms; Gulf of California, 0-700 and 1,218 fathoms (Faxon). North Pacific: Off Japan, 1,875 fathoms (Sars); Bering Sea, 660 fathoms (Thompson).

16. *Eucopia sculpticauda* Faxon.

Eucopia sculpticauda Faxon, Bull. Mus. Harvard, 24, 1893, 218. Faxon, Mem. Mus. Harvard, 18, 219, pl. K, f. 2, pl. 53 f. 1, 1895. Hansen, Bull. Mus. Ocean. Monaco, 30, 1905, 7, fig. 4.

With the female from station 4005 were the following notes about color:

"The carapace is very deep, velvety, port-wine red or "purple," so intense as to appear almost black in poor light, extending caudad along dorsum of abdomen, shading off to deep carmine on rest of abdomen, including swimmerets, and telson, which is a trifle lighter. Appendages of head and thorax: Long legs, madder carmine; short appendages, deep port-wine red; antenna, madder pink; exopodite, bright carmine; antennule, bright carmine."

Stations: 4005, 577-480 fathoms, 1 female, and 4144, 850-767 fathoms, 1 male, from vicinity of Kauai Island.

Distribution.—Gulf of Panama, 1,000 fathoms, and Galapagos Islands, 885 and 1,360 fathoms; subtropical Atlantic, between Gibraltar, Azores, and Canary Islands, between surface and 3,000 meters (Hansen).

Family MYSIDAE Dana.

Genus PETALOPHTHALMUS Willemoes-Suhm.

17. *Petalophthalmus pacificus* Faxon.

Petalophthalmus pacificus Faxon, Bull. Mus. Harvard, 24, 1893, 218. Faxon, Mem. Mus. Harvard, 18, 1895, 223, pl. 54.

Our specimen agrees absolutely with Faxon's species.

Station 4157, 762-1,000 fathoms, vicinity of Modu Manu, 1 male.

Distribution.—Gulf of California, 0-700 fathoms.

Genus BOREOMYSIS G. O. Sars.

18. *Boreomysis obtusata* G. O. Sars.

Boreomysis obtusata G. O. Sars, Rep. Voy. *Challenger*, 13, 182, pl. 33, f. 1-6, 1885.

Although not well preserved, the specimens agree clearly with this species. Sars says that the eyes have a dark reddish pigment; in our specimens the eyes are pale brown, which possibly is due to the action of the alcohol. The female from station 4014 has lost both eyes.

Stations: 4014, 399-362 fathoms, 1 male, 1 female; and 4018, 804-724 fathoms, 1 male; both from vicinity of Kauai Island.

Distribution.—Off coast of Japan, 35° 11' N., 139° 28' E., 345 fathoms, and north of Hawaiian Islands, 37° 52' N., 160° 17' W., 2,740 fathoms.

Genus SIRIELLA Dana.^a

19. *Siriella thompsoni* (Milne-Edwards).

Siriella thompsoni, G. O. Sars, Rep. Voy. *Challenger*, 13, 205, pl. 36, f. 1-24, 1885. Ortman, Decap. & Schizop. Plankton Exped., 23, 1893; Bull. Mus. Harvard, 25, 1894, 107.

The specimens (females) from station 3799 were marked: "Hyacinth blue eggs, body translucent." Stations: 3797, surface, Erben Bank to Kaiwi Channel, 31° 55' N., 136° W., 12 males, 8 females;

^a Norman (Ann. Nat. Hist. (6) 10, 1892, p. 149) abandoned *Siriella* Dana in favor of *Cynthia* Gray, June 15, 1850, but later (ibid., p. 263) restored it, *Siriella* having been published by Dana in the early part of 1850. This latter correction has been overlooked by Ehrenbaum (Beitr. Meeres. Helgoland 8, 1897, p. 424).

3799, surface, Erben Bank to Kaiwi Chann., 29° 22' N., 139° 31' W., 2 females; 3801, 100 fathoms, Erben Bank to Kaiwi Chann., 28° 31' N., 141° 47' W., 2 males, 1 female; 3802, 150 fathoms, Erben Bank to Kaiwi Chann., 27° 04' 15" N., 144° 18' 30" W., 1 male; 3829, surface, south coast of Molokai, 1 female; 3867, surface, Pailolo Channel, 2 males, 5 females; 3889, surface, north coast of Molokai, 2 males; 3912, surface, south coast of Oahu, 1 male, 2 females; 3926, surface, between Honolulu and Laysan, 21° 13' N., 158° 43' W., 2 males; 3927, surface, between Honolulu and Laysan, 21° 31' N., 161° 55' W., 6 males, 8 females; 3929, surface, between Honolulu and Laysan, 23° 19' N., 166° 54' W., 3 males; 3930, surface, between Honolulu and Laysan, 25° 07' N., 170° 50' W., 6 males, 1 female; 3980, surface, between Honolulu and Kauai, 21° 33' N., 158° 19' W., 1 male; 4011, surface, between Kauai and Oahu, 21° 20' N., 158° 21' W., 1 male, 1 female; 4086, surface, northeast coast of Maui, 1 male, 2 females; 4145, surface, between Kauai and Modu Manu, 22° 27' 30" N., 160° 40' W., about 100 males, 30 females.

Distribution.—North, Tropical, and South Atlantic; North and South Pacific; Australian seas; Indian Ocean; apparently generally distributed in the tropical and subtropical parts of all oceans, on the surface. Our stations 3801 and 3802 are remarkable, because they record this species from the depth of 100 and 150 fathoms (two open intermediate tow nets, set tandem).

20. *Siriella gracilis* Dana.

Siriella gracilis, Streets, Bull. U. S. Nat. Mus. I, 1877, No. 7, 123; G. O. Sars, Rep. Voy. *Challenger*, 13, 209, pl. 36, f. 25-28, 1885. Ortmann, Bull. Mus. Harvard, 25, 1894, 107. Thompson, Catal. Crust. Pycnog. Mus. Dundee, 24, 1901.

It is interesting to note that at station 4009 a large number of this species was captured, without *Siriella thompsoni*, with which it was found associated at the other stations.

Stations.—3867, surface, Pailolo Channel; 4 males; 4009, surface, between Kauai and Oahu, 21° 50' 30" N., 159° 15' W., about 35 specimens, male, female, and young; 4086, surface, northeast coast of Maui, 2 males, 2 females; 4145, surface, between Kauai and Modu Manu, 22° 27' 30" N., 16° 40' W., 13 males.

Distribution.—Pacific (Dana); West, North, and Tropical Pacific (Sars); North Pacific, 20°-30° N., 145°-149° W. (Streets); near Galapagos Islands and between Galapagos and Acapulco (Ortmann); Bay of Bengal (Thompson). Surface.

This species seems to be restricted to the tropical and subtropical parts of the Indian and Pacific Oceans. It has not been recorded from the Atlantic Ocean.

Genus ANCHIALUS Kröyer.

21. *Anchialus typicus* Kröyer.

Anchialus typicus, G. O. Sars, Rep. Voy. *Challenger*, 13, 193 pl. 34 f. 4-27, 1885.

The very remarkable new localities at which our material was secured have made necessary a very careful comparison with Sars's descriptions and figures (all parts are figured by Sars, except the first maxilla), and I am unable to discover any differences from the characters given by him (p. 193) as "specific," with the exception that he says that the apical incision of the telson occupies "one seventh of the length" of the telson, while in our specimens it occupies between one-fifth and one-sixth. This, however, is clearly due to a mistake on the part of Sars on page 193, since on page 196 he says that the incision occupies "about one-fifth" of the length, the correctness of which is further substantiated by the figure of the telson (pl. 34, fig. 26).

Going carefully over Sars's "description" of this species, I discovered only the following points which deviate in our specimens:

(1) The male gnathopod has, according to Sars, a strong triangular expansion on the inner edge of the carpal joint, which, according to the figure (pl. 34, fig. 17), is almost spiniform. In my slides this expansion is present, but less spiniform.

(2) I can not discover in my slides the peculiar structure of the outer branch of the fourth pair of male pleopods, described by Sars, and figured in figs. 24 and 25 on pl. 34. In my slides this branch is "somewhat more produced," but has no peculiarities in the shape of the joints and arrangement of natatory setae.

(3) The palp of the mandibles is more elongate in my specimens; the first joint is less wide, comparatively, and the second is much longer than represented in Sars's fig. 12; it is not ovate, but rather linear.

ales; 3801, 100 fathoms, Erben 802, 150 fathoms, south coast of Molokai, north coast of Molokai, between Honolulu and Laysan, 21° 31' N., 161° N., 166° 54' W., 3 males; 1 female; 3980, surface, between Kauai and Oahu, aui, 1 male, 2 females; t 100 males, 30 females. acific; Australian seas; parts of all oceans, on l this species from the

, Rep. Voy. Challenger, 07. Thompson, Catal.

was captured, without en Kauai and Oahu, 86, surface, northeast lanu, 22° 27' 30'' N.,

th Pacific, 20°-30° N., Acapulco (Ortmann);

he Indian and Pacific

5. ade necessary a very Sars, except the first n by him (p. 193) as cupies "one seventh fifth and one-sixth. on page 196 he says of which is further

he following points

i on the inner edge form. In my slides

of the fourth pair of slides this branch is. and arrangement of

joint is less wide. it is not ovate, but

(4) The first true leg of the male (Sars's fig. 18) has the propodite only slightly dilated, and consists apparently of one single joint (Sars draws three of them), followed by a very small terminal one, which is hidden by peculiarly developed, long spines; the latter are less numerous than in Sars's figure, and less distinctly fasciculate.

I am not prepared to say whether these differences might constitute specific or varietal characters. If they should prove to be of taxonomic value, we ought to create, for this form, a new species or variety, for which I should like to propose the name *Anchialus hawaiiensis*.

Stations.—3812, surface, south coast of Oahu, 2 males; 3829, surface, south of Molokai, close to Lanai Island, numerous specimens, all males; 3921, surface, off Honolulu, numerous specimens, male and female, females prevailing.

Distribution.—Tropical Atlantic, 14° N. (Kröyer); off Cape of Good Hope, surface; 34° 41' S., 18° 36' E. (Sars).

The present localities extend the known range of this species considerably. Sars believes that the species of the genus *Anchialus* are pelagic surface forms, and in this case the wide distribution would correspond to that of many other pelagic creatures. That they are captured rarely may be due to the fact that they seem to be nocturnal; at least at the three localities at which our material was taken the hauls were made at night (7.30 to 8.45 p. m.), with the aid of electric light, during the night anchorage of the *Albatross*. In two of our hauls this species was represented by a very large number of individuals, while not a single other haul in this region contains a trace of it. I think we have here the original home of this species, which is to be sought in shallow water near the shore, but it hides somewhere during the daytime, and appears as a planktonic form at night, possibly only during a certain season.