

No. 8. — *Preliminary Report on the Echini collected, in 1902, among the Hawaiian Islands, by the U. S. Fish Commission Steamer "Albatross," in charge of COMMANDER CHAUNCEY THOMAS, U. S. N., Commanding. By ALEXANDER AGASSIZ and HUBERT LYMAN CLARK.*

THE collection of Echini made by the U. S. F. C. S. "Albatross" in the spring of 1902 among the Hawaiian Islands is a very extensive one. A preliminary examination shows it to contain no less than 2,450 specimens distributed among 49 genera five of which are new, and 67 species of which 36 are new. It was hoped that the collection would extend to sufficient depths to show the connection of an oceanic insular fauna with the surrounding abyssal region. Unfortunately, as in the case of the Hawaiian starfishes,¹ the depths from which Echini were collected by the "Albatross" did not extend much beyond 500 fathoms. Of the 126 stations from which starfishes were obtained, only 11 were in depths greater than 500 fathoms; and of the 180 stations from which Echini were collected, only 14 were in greater depths than 500 fathoms; so that as regards these two groups of Echinoderms, the collections can only be considered as representing the fauna of the Hawaiian slopes to a depth of about 500 fathoms, and that at a comparatively short distance from the shore, the 1000-fathom line rarely being more than 20 miles, usually eight to ten miles, distant, and frequently, as around Hawaii,² much less. The species, therefore, naturally belong to what has been called the Continental fauna in an analysis of the known Echini prepared for the "Challenger" reports.³ No dredgings containing Echini were made beyond 1278 fathoms, and none of the typical deep sea Echini already known from the Central Pacific, from the Panamic district, and from the tropical regions of the Eastern Pacific were collected.

The following species were recorded from the Hawaiian Islands previous to the visit of the "Albatross." Those which are not in the present

¹ The Starfishes of the Hawaiian Islands. By Walter K. Fisher. Bull. U. S. Fish Com. Vol. 23, Part 3, p. 989. 1906.

² See Chart of the U. S. Hydrographic Office, No. 1368.

³ The Voyage of H. M. S. "Challenger." Report on the Echinoidea, by Alexander Agassiz, p. 222, 232-237, 1881.

collection are marked with an *, and the name of the collection, in which there is a specimen from the Hawaiian Islands, follows in parentheses.

- Cidaris metularia* Bl.
Chondrocidaris gigantea A. Ag.
 * *Phyllacanthus verticillata* A. Ag. (Mus. Godef.).
Diadema setosum (probably = *paucispinum* of this list).
 * *Echinothrix Desorii* Pet. (M. C. Z.)
Echinothrix diadema Linné.
 * *Astropyga pulvinata* Agass. ("Challenger").
Colobocentrotus atratus Br. (probably = *Quoyi* of this list).
Heterocentrotus mammillatus Br.
 * *Heterocentrotus trigonarius* Br. (M. C. Z.).
Echinometra lucunter Bl. (= *Mathaei* of this list).
Echinometra oblonga Bl.
 * *Strongylocentrotus nudus* A. Ag. (M. C. Z.).
 * *Pseudoboletia granulata* A. Ag. (M. C. Z.).
Echinostrephus molare A. Ag.
 * *Mespilia globulosus* Agass. (Mus. Godef.).
 * *Toxopneustes pileolus* Agass. ("Challenger").
Hipponoë variegata A. Ag.
Fibularia australis Desml.
 * *Echinanthus testudinarius* Gray (Breslau Mus.).
 * *Lovenia subcarinata* Gray (Stockholm Mus.).
Brissus carinatus Gray.
Metalia maculosa A. Ag.
 * *Metalia sternalis* Gray (M. C. Z.).
 * *Faorina chinensis* Gray (M. C. Z.).

Of these 25 species it will be seen that 13 were collected by the "Albatross" in 1902. This is in noticeable contrast to the Hawaiian collection of starfishes, of which Dr. Fisher reports that only one of the ten species formerly known from the islands was dredged by the "Albatross." The absence of 12 of the previously recorded Echini is not surprising, as the collections hitherto have been made, with few exceptions, from along shore, while the collections made by the "Albatross" in 1902 were from off the shores to deep water. The bathymetrical range of several species is greatly extended, and a few Indo-Pacific species are added to the Hawaiian fauna, which now includes 79 species of Echini.

As regards the geographical relations of the Echini collected, it is interesting to note that of the new species of Cidaridae two are related to the Panamic fauna, the others to the Pacific or Indo-Pacific. The Salenias are Panamic, while the Aspidodiadematidae and many of the Diademataidae are Indo-Pacific. In the Echinothuridae we find *Phormosoma*

bursarium, an East Indian form, and *Sperosoma*, Indo-Pacific and Atlantic. The occurrence of a new species of *Hemipedinia* is interesting, as well as that of *Temnopleuridae* of Indo-Pacific affinities, while none of the allied Australian genera have been collected. The number of interesting *Clypeastroids* collected is remarkable. Several of them are identical with or closely allied to, the *Clypeastroids* collected by the "Siboga" in the East Indian Archipelago, so that in this group the collection is typically Indo-Pacific. The peculiar *Laganidae* are East Indian and Japanese. A new genus of the closely circumscribed family of *Echinoneidae*, from shallow water, is an important addition to the Pacific Fauna.

A fair number of interesting *Spatangoids* were brought to light, though the dredgings did not extend to depths great enough to include the zone of the *Urechinidae*, *Cystechinidae*, and the like. Three genera of *Palaeopneustidae* were obtained, *Phrissoecystis*, *Meijerea*, and a new genus (*Pycnolampas*) allied to *Homolampas*. The first two show affinities with the Panamic and East Indian echinid faunae and *Pycnolampas* with a Pacific and Atlantic type. Among the *Spatangina* are two species of *Gymnopatagus*, suggesting East Indian affinities, and two *Loveniae*, the one with East Indian the other with Panamic relations. A new *Rhinobrissus* and several species of *Brissopsis* are allied to East Indian and Pacific types. We may also mention the existence in the collection of two species of *Aceste* thus far known only from the dredgings of the "Challenger" in the Atlantic and Pacific, and the "Siboga" among the East Indian islands, at depths of 620 to 2600 fathoms. The Hawaiian species range only from 238 to 284 fathoms. Finally there is a fragment of a species of *Periaster* which must have been of gigantic size among the species of the genus.

DESMOSTICHA HAECKEL

CIDARIDAE MÜLLER.

Cidaris metularia Bl.

Dorocidaris calacantha A. Ag. and Clark.

Chondrocidaris gigantea A. Ag.

Phyllacanthus Thomasii A. Ag. and Clark.

Stephanocidaris hawaiiensis A. Ag. and Clark.

Stereocidaris grandis Död.

Stereocidaris leucacantha A. Ag. and Clark.

Porocidaris variabilis A. Ag. and Clark.

Acanthocidaris hastigera A. Ag. and Clark.

Descriptions of the above species, with numerous plates, have appeared in "Hawaiian and Other Pacific Echini. The Cidaridae," Mem. M. C. Z., 34, No. 1, February, 1907. 42 pages, 44 plates.

SALENIDAE AGASS.

Salenia miliaris A. AG.

Salenia miliaris A. Agassiz, 1898. Bull. M. C. Z., **32**, No. 5, p. 74; Plate 2, Figs. 2-4.

Small specimens of this Panamic species were collected at the following stations.

- Station 4060. Off Alia Point Light, N. E. coast of Hawaii, 759-913 fathoms.
 " 4125. Off Kahuku Point, Oahu, 963-1124 fathoms.
 " 4181. Off Hanamaulu, Kauai, 671-811 fathoms.

Four specimens.

Salenia crassispina A. AG. and CLARK.

This species, although closely related to the preceding, is easily distinguished by the primary radioles which are remarkably stout, and although distinctly verticillate, are quite smooth. In *miliaris*, the greatest thickness of a radiole is much less than the diameter of its milled ring, while in *crassispina* the diameter of the spine is fully equal to, and may exceed that of its milled ring. The species is further remarkable for the comparatively slight depth at which it was taken.

- Station 4045. Off Kawaihae Light, W. coast of Hawaii, 147-198 fathoms.
 One specimen.

ARBACIADAE GRAY.

Habrocidaris A. AG. and CLARK.

This genus is established for *Podocidaris scutata* A. Ag. of the West Indies, and for the following closely related species from the Hawaiian Islands. Although quite similar to *Podocidaris* A. Ag., and even more so to *Pygmaecidaris* Död., it may be readily distinguished from both by the very thin and delicate test, the regular and very slightly indented actinal system, the close plating of the entire buccal membrane, and the distinctly triangular primary radioles.

Habrocidaris argentea A. AG. and CLARK.

This species is closely allied to *H. scutata* A. Ag. from Santa Cruz (580 fms.). It is at once distinguished by the much larger abactinal system, the different shape of the ocular plates, and the distinctly pentagonal actinal system. The single specimen taken is 11.5 mm. in diameter, with the abactinal system 7 mm., the anal system 2 mm., and the actinal system 6 mm. Unfortunately all the primary radioles are broken and only the basal portions of a few remain attached to the test. These radioles are triangular in cross-section and the three edges, though rounded, project conspicuously from the solid axis. The test is silvery, tinged with brown, while the primary radioles were evidently white.

- Station 3973. Near French Frigate Shoal; 23° 47' 10" N. — 166° 24' 55" W.; 395-397 fathoms.

ASPIDIADEMATIDÆ DUNCAN.

Aspidodiadema nicobaricum DÖD.

Aspidodiadema nicobaricum Döderlein, 1901. Zool. Anz. Bd. 24, p. 21.

This species was taken at many stations, and in considerable numbers. The specimens are much smaller than those described by Döderlein, as the largest is only 25 mm. in diameter, while his were 33-39 mm. There are also slight differences in color, the Hawaiian specimens being much paler.

Station 3892. Off Mokapu Islet, N. coast of Molokai, 328-414 fathoms.

" 3981. Off Nawiliwili Light, Kauai, 414-636 fathoms.

" 3988. Off Hanamaulu, Kauai, 165-469 fathoms.

" 3989. Off Hanamaulu, Kauai, 385-500 fathoms.

" 3994. Off Mokuacac Islet, Kauai, 330-382 fathoms.

" 4013. Off Hanamaulu, Kauai, 399-419 fathoms.

" 4014. Off Hanamaulu, Kauai, 362-399 fathoms.

" 4021. Off Hanamaulu, Kauai, 286-399 fathoms.

" 4022. Off Hanamaulu, Kauai, 374-399 fathoms.

" 4025. Off Mokuacac Point, Kauai, 275-368 fathoms.

" 4030. Off Ukula Point, Kauai, 423-438 fathoms.

" 4107. Off Lae-o Ka Laau Light, Molokai, 350-355 fathoms.

" 4110. Off Lae-o Ka Laau Light, Molokai, 449-460 fathoms.

" 4112. Off Lae-o Ka Laau Light, Molokai, 433-447 fathoms.

" 4131. Off Hanamaulu, Kauai, 257-309 fathoms.

" 4137. Off Hanamaulu, Kauai, 411-476 fathoms.

" 4140. Off Hanamaulu, Kauai, 339-437 fathoms.

" 4141. Off Hanamaulu, Kauai, 437-632 fathoms.

" 4166. Off Modu Manu, 293-800 fathoms.

" 4177. Off Kawahioa Point, Niihau, 319-451 fathoms.

" 4180. Off Kawahioa Point, Niihau, 417-426 fathoms.

" 4187. Off Hanamaulu, Kauai, 508-703 fathoms.

The average depth at these stations is 424 fathoms and there is no reason to believe that any specimens of this species were taken in less than 300 fathoms.

One hundred and sixty-nine specimens.

Aspidodiadema meijerei A. AG. and CLARK.

Aspidodiadema nicobaricum var. *meijerei* Döderlein, 1906. Echin. Deutsch. Tiefsee-Exp., p. 165.

A large series of this form was taken by the "Albatross," and as it seems to show constant characters, we look upon it as a distinct species, although the features on which it is based are slight. Besides the striking difference in color of the primary spines, there is a slight difference in the relative size of the abactinal and anal systems. In the Hawaiian specimens of *nicobaricum*, the primary spines are very pale purplish, the actinal surface of the test tends to become deep purple,

the diameter of the abactinal system is rather more than half the diameter of the test, and the anal system is nearly three-fourths of the abactinal; while in the specimens of *meijerei*, the primary spines are bright green, the *abactinal* surface tends to become deep purple, the diameter of the abactinal system about equals one-half that of the test, and the anal system is about two-thirds of the abactinal. The specimens of *meijerei* are on the whole much larger than those of *nicobaricum*, some of them being over 30 mm. in diameter. They also come from more shallow water, and only from the vicinity of Molokai and southern Oahu, as the following list of stations shows.

- Station 3817. Off Diamond Head, Oahu, 320 fathoms.
 " 3818. Off Diamond Head, Oahu, 293-295 fathoms.
 " 3836. Off Lae-o Ka Laau Light, Molokai, 238-255 fathoms.
 " 3839. Off Lae-o Ka Laau Light, Molokai, 259-266 fathoms.
 " 3865. Off Mokuhooniki Islet, Pailolo Channel, 256 fathoms.
 " 3914. Off Diamond Head, Oahu, 289-292 fathoms.
 " 3918. Off Diamond Head, Oahu, 257-294 fathoms.
 " 3920. Off Diamond Head, Oahu, 265-280 fathoms.
 " 4096. Off Mokuhooniki Islet, Pailolo Channel, 272-286 fathoms.
 " 4097. Off Mokuhooniki Islet, Pailolo Channel, 286 fathoms.
 " 4105. Off Lae-o Ka Laau Light, Molokai, 314-335 fathoms.
 " 4116. Off Kahuku Point, Oahu, 241-282 fathoms.
 " 4122. Off Barber's Point Light, Oahu, 192-352 fathoms.
 " 4178 (?). Off Kawahioa Point, Niihau, 319-378 fathoms.

The average depth of these stations is 280 fathoms, and there is no reason to believe that any specimens of this species were taken in more than 320 fathoms.

One hundred and forty-four specimens.

DIADEMATIDAE PETERS.

Diadema paucispinum A. Ag.

Diadema paucispinum A. Agassiz, 1863, Bull. M. C. Z., 1, p. 19.

These specimens are certainly distinct from West Indian specimens and equally so from *mexicanum* and *savignyi*; it therefore seems advisable to recognize *paucispinum* once more.

Puako Bay, Hawaii.

Honolulu.

Station 3968. French Frigate Shoal, $14\frac{1}{2}$ - $16\frac{1}{2}$ fathoms

" 4169. Off Modu Mauu, 21-22 fathoms.

Nine specimens.

Echinothrix calamaris A. Ag.

Echinus calamaris Pallas, 1774. Spic. Zool. 1, fasc. 10, p. 31; Plate 2, Figs. 4-8.

Echinothrix calamaris A. Agassiz, 1872. Rev. Ech. Pt. 1, p. 119.

Only young specimens were collected, the largest being 30 mm. in diameter.

Puako Bay, Hawaii.

Station 4033. Penguin Bank, S. coast of Oahu, 28-29 fathoms.
Two specimens.

Echinothrix turcarum PET.

Diadema turcarum Schynvieu, 1711. Thes. Imag., p. 2; Plate 14, Fig. B.
Echinothrix turcarum Peters, 1853. Monatsb. Akad. Berlin, p. 484.

A good series of adults and young, ranging from 25 to 80 mm. in diameter, was taken at Puako Bay, Hawaii, and at Honolulu.
Twelve specimens.

Astropyga radiata GRAY.

Cidaris radiata Leske, 1778. Klein Nat. dis. Ech., p. 116; Plate 44, Fig. 1.
Astropyga radiata Gray, 1825. Ann. Phil. 10, p. 2.

Only a single very small specimen (diameter, 26 mm.) is in the collection.
Station 3875. Auau Channel, between Maui and Lanai, 34-65 fathoms.

Centrostephanus asteriscus A. AG. and CLARK.

This very pretty little species is easily distinguished from other members of the genus by the large number of coronal plates and the peculiar abactinal system. In a specimen only 3.5 mm. in diameter there are already eight coronal plates, while an individual 14 mm. in diameter has 13. The ocular plates are small and nearly or quite excluded from the medium-sized anal system, which is closely covered with very small plates. The oculars are more completely excluded in the larger specimen than in the smaller ones. The genital pores are conspicuous. The buccal plates carry spines as well as pedicellariæ. The color is light reddish, becoming reddish-white actually, and the primary radioles are prettily banded with red and whitish; from the end of each ambulacrum a conspicuous white line runs straight to the centre of the anal system, the five lines forming a conspicuous star on the red abactinal surface; the lines are broadest in the smallest specimen and become narrower (relatively) with age. The largest specimen taken has the test 14 mm. in diameter and 6.25 mm. high, the abactinal system 5.5 mm., and the actinal system 6 mm. The primary radioles, the longest of which measure 20 mm., are provided with rather widely spaced whorls of very minute, sharp spinelets.

- Station 4034. Penguin Bank, S. coast of Oahu, 14-28 fathoms.
" 4066. Off Ka Lae-o Ka Ilio Point, Maui, 49-176 fathoms.
" 4128. Off Hanamaulu, Kauai, 68-253 fathoms.
" 4161. Off Modu Manu, 39-183 fathoms.
" 4163. Off Modu Manu, 24-40 fathoms.

Five specimens.

Chaetodiadema pallidum A. AG. and CLARK.

Of this interesting genus, a handsome new species proves to be common in certain localities among the Hawaiian Islands. It is sharply distinguished from the

two species hitherto known by the coloration, which is pale buff above when dry, more or less tinged with purple when wet, becoming buffy-white beneath. The sides of the bare interambulacral areas on the abactinal surface are more or less distinctly yellow; in many specimens the ambulacral edge of this area is marked by a broad, dull red line extending from the ambitus to the genital plate, but these lines may be interrupted and in about half the specimens are entirely wanting. On the actinal side, some individuals have a deep brown line forming a more or less perfect pentagon around the actinostome, about one-third of the distance to the ambitus. The primary radioles are slender, of moderate but variable length, the longest equalling the diameter of the test, and are decidedly flattened. They are nearly white, but many have a purplish longitudinal stripe on the abactinal side, and not infrequently they are handsomely banded with purple. There is no blue anywhere on test or spines. The tuberculation of the test is more like that of *granulosum* than of *japonicum*, but there are only eight series of primary interambulacral tubercles at the ambitus even in the largest individuals. The specimens range in diameter from 42 to 70 mm. The test is very flat, the height being only .25-.30 of the diameter. The abactinal system is .30-.42 and the actinal only .17-.24 of the diameter, while the anal system is .60-.65 of the abactinal. The test is relatively higher and the abactinal and actinal systems larger in small than in large individuals.

Station 3856. Pailolo Channel, between Maui and Molokai, 127 fathoms.

“ 3857. Pailolo Channel, between Maui and Molokai, 127-128 fathoms.

“ 3957. Vicinity of Laysan Island, 173-220 fathoms.

“ 4103. Pailolo Channel, between Maui and Molokai, 132-141 fathoms.

“ 4104. Pailolo Channel, between Maui and Molokai, 123-141 fathoms.

Eighty-two specimens.

Leptodiadema A. AG. and CLARK.

This genus is established for a very small Diadematoïd, which is apparently quite different from any known genus. The size, form, and spines remind one of *Lissodiadema* and the abactinal system is not altogether unlike that genus, but the tuberculation is entirely different. Test flattened, both abactinally and actinally. Ambulacra narrow, with pores in single straight series, not becoming crowded at actinostome. Each ambulacrum carries a double series of primary tubercles, extending from abactinal system to actinostome. Coronal plates numerous (13-14 in specimen 9 mm. in diameter), each with a large primary tubercle, at outer end. Below the ambitus, these tubercles are increasingly nearer centre of plate, so that the two series of them converge and meet in a point at actinostome. Beginning with the fifth (from abactinal system), each coronal plate carries a second somewhat smaller tubercle, at inner end, and these two series terminate about four plates from actinostome. Secondary spines few; miliaries almost wanting. Primary tubercles, low, perforate, apparently finely crenulate, those of the ambulacra smaller than those of the interambulacra. Abactinal system moderate, with oculars on each side of madreporic plate excluded

from anal system; other oculars narrowly in contact with the single series of large anal plates. Genital openings of only moderate size. Anal papilla conspicuous. Actinostome somewhat larger than abactinal system; actinal cuts slight. Buccal membrane closely covered with plates as in young *Diadema*. Primaries delicate, glassy, slightly curved, blunt, with 5-7 prominent ridges, bearing few scattered, very slender teeth, about equal to half the diameter of the test; those of the ambulacra scarcely shorter or more slender than the others.

***Leptodiadema purpureum* A. AG. and CLARK.**

The single specimen is only 9 mm. in diameter. The color is dull purplish, becoming bright purple on the buccal membrane. The spines are nearly colorless. Station 3847. Off Lae-o Ka Laau Light, Molokai, 23-24 fathoms.

ECHINOTHURIDAE WYV. THOMS.

***Phormosoma bursarium* A. AG.**

Phormosoma bursarium A. Agassiz, 1881. Rep. Chall. Ech. p. 99; Plate 10 b.

An excellent series of this species, ranging from 23 to 110 mm. in diameter, was taken at the following stations.

- Station 3884. Pailolo Channel, between Maui and Molokai, 284-290 fathoms.
 " 3892. Off Mokapu Islet, N. coast of Molokai, 325-414 fathoms.
 " 3904. Off Mokapu Islet, N. coast of Molokai, 295 fathoms.
 " 3957. Off Laysan Island, 173-220 fathoms.
 " 3988. Off Hanamaulu, Kauai, 165-469 fathoms.
 " 3994. Off Mokuacae Islet, Kauai, 330-382 fathoms.
 " 3997. Off Ukula Point, Kauai, 418-429 fathoms.
 " 4019. Off Hanamaulu, Kauai, 409-550 fathoms.
 " 4022. Off Hanamaulu, Kauai, 374-399 fathoms.
 " 4025. Off Mokuacae Point, Kauai, 275-368 fathoms.
 " 4087. Off Mokuhooniki Islet, Pailolo Channel, 306-308 fathoms.
 " 4089. Off Mokuhooniki Islet, Pailolo Channel, 297-304 fathoms.
 " 4091. Off Mokuhooniki Islet, Pailolo Channel, 306-308 fathoms.
 " 4110. Off Lae-o Ka Laau Light, Molokai, 449-460 fathoms.
 " 4111. Off Lae-o Ka Laau Light, Molokai, 460-470 fathoms.
 " 4112. Off Lae-o Ka Laau Light, Molokai, 433-447 fathoms.
 " 4113. Off Lae-o Ka Laau Light, Molokai, 395-433 fathoms.
 " 4141. Off Hanamaulu, Kauai, 437-632 fathoms.

One hundred and fifty-four specimens.

***Sperosoma obscurum* A. AG. and CLARK.**

The large series of *Sperosomas* collected cannot be referred to any of the previously known species. The coloration is somewhat variable, for while most of the specimens are more or less decidedly violet or purple, some large ones are distinctly gray or yellowish-brown. The plates are not outlined in white (as in the

other species) but are frequently quite plainly outlined in some shade *darker* than the test, though they are often very indistinct. The ambulacral and interambulacral areas are nearly equal in width at the ambitus but the interambulacra may be somewhat broader. The pores on the abactinal surface are arranged in a double series on each side of the ambulacrum but the *outer* series contains fifty per cent more pores than the inner, and a quincunx arrangement is seldom visible. There are very few large tubercles on the abactinal surface (about 35 in the largest specimen), and relatively few actinally; the latter are confined to the plates near the ambitus. The greater part of the actinal surface, especially about the actinostome, is closely covered with small tubercles of more or less uniform size, giving an appearance not wholly unlike *Chaetodiadema*; this is most marked in large individuals. The specimens taken range from 20 to 220 mm. in diameter.

- Station 3824. Off Lae-o Ka Laau Light, Molokai, 222-498 fathoms.
 " 3865. Pailolo Channel, between Maui and Molokai, 256-283 fathoms.
 " 3979. Off Modu Manu, 222-387 fathoms.
 " 3988. Off Hanamaulu, Kauai, 165-469 fathoms.
 " 4015. Off Hanamaulu, Kauai, 318-362 fathoms.
 " 4021. Off Hanamaulu, Kauai, 286-399 fathoms.
 " 4025. Off Mokuaae Point, Kauai, 275-368 fathoms.
 " 4036. Off Kawaihae Light, W. coast of Hawaii, 637-692 fathoms.
 " 4089. Off Mokuhooniki Islet, Pailolo Channel, 297-306 fathoms.
 " 4096. Off Mokuhooniki Islet, Pailolo Channel, 272-286 fathoms.
 " 4112. Off Lae-o Ka Laau Light, Molokai, 433-447 fathoms.
 " 4117. Off Kahuku Point, Oahu, 253-282 fathoms.
 " 4130. Off Hanamaulu, Kauai, 283-309 fathoms.
 " 4131. Off Hanamaulu, Kauai, 257-309 fathoms.
 " 4134. Off Hanamaulu, Kauai, 225-324 fathoms.
 " 4136. Off Hanamaulu, Kauai, 294-352 fathoms.
 " 4137. Off Hanamaulu, Kauai, 411-476 fathoms.

Thirty-nine specimens.

ECHINOMETRIDAE GRAY.

Heterocentrotus mammillatus Br.

Cidaris mammillata Klein, 1734. Nat. disp. Ech. p. 19; Plate 6, Figs. A, B.

Heterocentrotus mammillatus Brandt, 1835. Prod. Desc. Anim., p. 266.

All the specimens of *Heterocentrotus* in the collection are referable to this species.

Laysan Island, and Puako Bay, Hawaii.

Twenty-four specimens.

Colobocentrotus Quoyi Br.

Echinus Quoy de Blainville, 1825. Dict. Sci. Nat. 37, p. 96.

Colobocentrotus Quoyi Brandt, 1835. Prod. Desc. Anim., p. 267.

A large series of *Colobocentrotus* was taken but all are referable to this single species, and show little variation.

Necker Island.
 Lanai Island.
 Puako Bay, Hawaii.
 Kamalino Bay, Niuhau.
 Napeli, Maui.
 One hundred and three specimens.

Echinometra Mathaei Bl.

Echinus Mathaei de Blainville, 1825. Dict. Sci. Nat., **37**, p. 94.

Echinometra Mathaei de Blainville, 1834. Man. d'Actin., p. 225.

The series of Echinometras is quite easily divisible into two sets, one of which consists of individuals with high, usually elongated tests, large tubercles, stout spines and relatively small (.17-.23 of long diameter) abactinal system. These are evidently the wide-ranging and common *Mathaei* (formerly called *lucunter*).

Honolulu reefs.
 Kamalino Bay, Niuhau.
 Laysan Island.
 Station 3959. Off Laysan Island, 10 fathoms.
 Thirteen specimens.

Echinometra picta A. AG. and CLARK.

The other set of Echinometras has the test much flatter, the height rarely over .50 of the long diameter, the abactinal system larger (.24-.30 of the long diameter), the tubercles smaller, giving the abactinal surface a much more bare appearance than in *Mathaei*, and the spines longer and more slender. These two forms are not sharply set off from each other, but there are few individuals which cannot be distinguished at a glance, and it seems desirable to give the flat individuals a name. Similar specimens are in the Museum collection from the Society Islands, but not from the East Indies, or west thereof. This species seems to bear the same relation to *Mathaei* that *viridis* of the West Indies does to *lucunter* (formerly called *subangularis*).

Honolulu reefs.
 Puako Bay, Hawaii.
 Necker Island.
 Kamalino Bay, Niuhau.
 Napeli, Maui.
 Station 3975. Off Necker Island Shoal, 16-171 fathoms.
 Twenty-nine specimens.

Echinometra oblonga Bl.

Echinus oblongus de Blainville, 1825. Dict. Sci. Nat., **37**, p. 95.

Echinometra oblonga de Blainville, 1834. Man. d'Actin., p. 225.

A good series of this species was taken, none of which show the least approach to *mathaei* or afford the slightest difficulty in identification, without referuce to the spicules in the pedicels! (vide de Meijere, 1904, and Döderlein, 1906).

Pnako Bay, Hawaii.
 Honolulu reefs.
 Lanai Island.
 Necker Island.
 Hanalei, Kauai.
 Kamalino Bay, Niihau.
 Laysan Island.
 Thirty-eight specimens.

Echinostrephus molare A. Ag.

Echinus molaris de Blainville, 1825. Dict. Sci. Nat. **37**, p. 88.

Echinostrephus molare A. Agassiz, 1872. Rev. Ech. Plate 1, p. 119.

A good series of this species is in the collection.

Laysan Island.

- Station 3959. Off Laysan Island, 10 fathoms.
 " 3960. Off Laysan Island, 10-19 fathoms.
 " 3968. French Frigate shoal, 14½-16½ fathoms.
 " 3969. French Frigate Shoal, 15-16 fathoms.
 " 3970. French Frigate Shoal, 17-17½ fathoms.
 " 3975. Off Necker Island Shoal, 16-171 fathoms.
 " 4147. Off Modu Manu, 26 fathoms.

Twenty specimens.

TEMNOPLEURIDAE DESOR.

Trigonocidaris albidoides A. AG. and CLARK

This is the Pacific representative of *T. albida* of the West Indies, and is closely allied to that species. It differs in having the test less clearly and deeply sculptured, especially abactinally, and in having more spines on the abactinal system. But the most obvious differences are in coloration: adult West Indian specimens have the abactinal system, especially the genital plates, and many of the primary tubercles very decidedly reddish, while the primary spines are pure white; the Hawaiian specimens have no trace of red on the test or tubercles, but some or all of the primaries, especially actinally, are distinctly banded or tipped with red. Of course young specimens (under 4 mm.) do not show these differences, but in adults they are quite evident. The specimen in the "Siboga" collection which had orange-banded spines, referred by de Meijere with some hesitation to *albida*, is evidently the Pacific form.

- Station 3859. Off Mokuhooniki Islet, Pailolo Channel, 138-140 fathoms
 " 3863. Off Mokuhooniki Islet, Pailolo Channel, 127-154 fathoms.
 " 3892. Off Mokuhooniki Islet, N. coast of Molokai, 328-414 fathoms.
 " 4045. Off Kawaihae Light, W. coast of Hawaii, 147-198 fathoms.

Five specimens.

Orechinus monolini DÖD.

Trigonocidaris monolini A. Agassiz, 1879. Proc. Amer. Acad., **14**, p. 203.

Orechinus monolini Döderlein, 1905. Zool. Anz., **28**, p. 622.

An excellent series of this rare and interesting species was taken by the "Albatross." It is notable for the large size of many of the specimens, which range from 6 to 22 mm. in diameter.

- Station 3839. Off Lae-o Ka Laau Light, Molokai, 259-266 fathoms.
- " 3865. Off Mokuhooniki Islet, Pailolo Channel, 256-283 fathoms.
- " 3914. Off Diamond Head, Oahu, 239-292 fathoms.
- " 3918. Off Diamond Head, Oahu, 257-294 fathoms.
- " 4085. Off Puniawa Point, Maui, 267-283 fathoms.
- " 4117. Off Kahuku Point, Oahu, 253-282 fathoms.
- " 4125. Off Kahuku Point, Oahu, 963-1124 fathoms.
- " 4126. Off Kahuku Point, Oahu, 743-1278 fathoms.
- " 4131. Off Hanamaulu, Kauai, 257-309 fathoms.

Twenty-nine specimens.

Prionechinus chuni DÖD.

Prionechinus chuni Döderlein, 1906. Ech. Deuts. Tiefsee Exp., p. 192; Plate 24, Fig. 3.

A small, but very good, series of this interesting little urchin, ranging from 2.5 to 11 mm. in diameter, was taken at the following station. Döderlein's admirable description, coupled with the photographs he gives, leaves no doubt as to the identity of these specimens.

- Station 4126. Off Kahuku Point, Oahu, 743-1278 fathoms.

Seven specimens.

Prionechinus sculptus A. AG. AND CLARK.

This species is distinguished from the four previously known species of the genus, as limited by Döderlein (1906), by the very small and distinct buccal plates, with five pairs of buccal feet, the smooth, longitudinally striated primary spines, and the handsomely sculptured and ornamented abactinal system. The genital opening is near the centre of the plate. The test is not so high as in the preceding species and the anal plates, are much less numerous, with one evidently larger than the rest. The color is dull purplish-red, very pale in the smaller specimens. The primaries are white, but the longitudinal striations are purplish. The specimens range from 2 to 10 mm. in diameter.

- Station 3818. Off Diamond Head, Oahu, 293-295 fathoms.
- " 4028. Off Ukula Point, Kauai, 444-478 fathoms.
- " 4039. Off Kawaihae Light, Hawaii, 670-697 fathoms.
- " 4083. Off Puniawa Point, Maui, 238-253 fathoms.
- " 4086. Off Puniawa Point, Maui, 283-308 fathoms.
- " 4087. Off Mokuhooniki Islet, Pailolo Channel, 306-308 fathoms.
- " 4088. Off Mokuhooniki Islet, Pailolo Channel, 297-306 fathoms.
- " 4115. Off Kahuku Point, Oahu, 195-241 fathoms.

Sixty-seven specimens.

Prionechinus depressus A. AG. and CLARK.

The specimens to which we have given this name were taken with the preceding, but the larger individuals (those over 4 mm. in diameter) are so obviously different that the two are easily separated. In this species, the test is very flat and the bare, interambulacral grooves are very conspicuous. The abactinal system is entirely different from that of *P. sculptus*, as there is very little sculpturing, and the genital openings are situated at the extreme distal tip of the plates, in a groove which is continuous with the interambulacral groove. The spines, color and size are as in *sculptus*. While it is not impossible that this species and the preceding are simply the two sexes of one species, such sexual dimorphism is not at present known among the regular Echini.

Station 3818. Off Diamond Head, Oahu, 293-295 fathoms.

" 4028. Off Ukula Point, Kauai, 444-478 fathoms.

" 4083. Off Puniawa Point, Maui, 238-253 fathoms.

" 4086. Off Puniawa Point, Maui, 283-308 fathoms.

" 4088. Off Mokuhooniki Islet, Pailolo Channel, 306-308 fathoms.

Forty-five specimens.

Pleurechinus hawaiiensis A. AG. and CLARK.

Although this species is closely allied to *P. siamensis* Mortensen, it differs decidedly in color and in one or two details of structure. The abactinal interambulacral space is not at all bare, but on the other hand there are only half as many secondary and miliary tubercles on the ambulacral and interambulacral plates near the ambitus, as in the specimen of *siamensis* figured in detail by Mortensen (1904). The anal system is covered by several large plates and a few small ones, and the anus is subcentral. The color of the test is prevailingly green, with the abactinal interambulacra lighter and often pure white in striking contrast. The primaries are whitish with more or less red. The tendency towards a bright red coloration is noticeable and two specimens are almost uniformly bright red, test as well as spines. Around the actinostome the test often becomes whitish, while abactinally it is frequently marked with purplish-brown. While the color is thus very variable, there is no tendency to approach the coloration of *siamensis*, except as each species has a bright red variety.

Station 3823. Off Lae-o Ka Laau Light, Molokai, 78-222 fathoms.

" 3847. Off Lae-o Ka Laau Light, Molokai, 23-24 fathoms.

" 3871. Off Mokuhooniki Islet, Auau Channel, 13-43 fathoms.

" 3872. Off Mokuhooniki Islet, Auau Channel, 32-43 fathoms.

" 3876. Off Lahaina Light, Maui, 28-43 fathoms.

" 3962. Off Laysan Island, 16 fathoms.

" 3978. Off Modu Manu, 32-46 fathoms.

" 4148. Off Modu Manu, 26-33 fathoms.

" 4150. Off Modu Manu, 71-160 fathoms.

Sixteen specimens.

TRIPLECHINIDAE A. AG.

Hemipedina indica DE MEIJ.

Hemipedina indica de Meijere, 1903. Tijds. Ned. Dierk. Vereen. (2) 3, p. 3.

The small series of this Oriental species, taken by the "Albatross," is of particular interest from the large size of most of the specimens, which range from 15 to 37 mm. They agree well with de Meijere's description, even in coloration, which shows little variation except in depth. The larger specimens have the test more flattened than the young ones, and its color is distinctly purple, while the actinostome is relatively smaller. It seems to us very unlikely that *mirabile* is a synonym of *indica*, as Döderlein now supposes.

Station 3865. Pailolo Channel, between Mani and Molokai, 256-283 fathoms.

" 3879. Off Molokini Islet, south of Lanai, 923-1081 fathoms.

" 3914. Off Diamond Head, Oahu, 289-292 fathoms.

" 4178. Off Kawahioa Point, Niihau, 319-378 fathoms.

" 4179. Off Kawahioa Point, Niihau, 378-426 fathoms.

Eleven specimens.

Hemipedina pulchella A. AG. and CLARK.

This beautiful little Echinoid may be recognized at once by the remarkable interambulacral primary radioles and the showy coloration. The test is white, becoming rosy abactinally (the ocular and genital plates of the larger specimen are quite red); the anal system is contrastingly white. The ambulacral primaries and the very few secondary spines are pure white, while the interambulacral primaries are bright yellowish-green at the base, pink in the middle, and whitish or pure white at the tip; the colors are not sharply separated, but shade into each other. The primaries of the abactinal coronal plates are one and a half times as long as the diameter of the test, or less; they are very stout (the thickness 8-10 per cent of the length) and closely resemble those of *Echinometra*. In the larger specimen the test is 14 mm. in diameter, and the abactinal and actinal systems each about one half as much. The anal system is remarkably small, decidedly smaller than a single genital plate, and is covered by a few (20) rounded plates. The genital opening is near the centre of the plate.

Station 3991. Off Mokuacae Islet, Kanai, 272-296 fathoms.

Two specimens.

Psammechinus verruculatus LTK.

Psammechinus verruculatus Lütken, 1864. Vid. Med., p. 166.

All the specimens are small, the largest being only 12 mm. in diameter, but they correspond well to de Loriol's (1883) figures and description, with the exception that the poriferous zones, on the bare test, are red or reddish, instead of greenish.

- Station 3847. Off Lae-o Ka Laau Light, Molokai, 23-24 fathoms.
 " 3871. Off Mokuhooniki Islet, Auau Channel, 13-43 fathoms.
 " 3872. Off Mokuhooniki Islet, Auau Channel, 32-43 fathoms.
 " 3955. Off Laysan Island, 20-30 fathoms.
 " 3970. French Frigate Shoal, 17-17½ fathoms.
 " 4031. Off Diamond Head, Oahu, 27-28 fathoms.
 " 4032. Off Diamond Head, Oahu, 27-29 fathoms.
 " 4149. Off Modu Manu, 33-71 fathoms.
 " 4162. Off Modu Manu, 21-24 fathoms.
 " 4168. Off Modu Manu, 20-21 fathoms.

Sixteen specimens.

Psammechinus paucispinus A. Ag. and CLARK.

This species differs very decidedly from the preceding, and from other allied forms, in the small number of secondary and miliary spines and tubercles, and yet the abactinal interambulacra are not bare, as in *Toxopneustes semituberculatus*. The vertical sutures, especially in the interambulacra, are abactinally very distinct and somewhat depressed. There is one large primary tubercle on each ambulacral and interambulacral plate. Each ambulacral plate near the ambitus bears one secondary and two miliary tubercles and each interambulacral plate has a large secondary (or small primary) tubercle at each end and carries five or six small miliaries. The pore-pairs are in arcs of four. The abactinal system is about .33 of the diameter of the test, and only one ocular plate reaches the somewhat eccentric anal system. The actinal system is more than .50 of the diameter. The test is whitish with a more or less pronounced green tinge when cleaned, while the spines vary from white to deep pink; four of the five specimens appear decidedly pink.

- Station 3872. Off Mokuhooniki Islet, Auau Channel, 32-43 fathoms.
 " 3876. Off Lahaina Light, Maui, 28-43 fathoms.
 " 4033. Off Diamond Head, Oahu, 28-29 fathoms.
 " 4164. Off Modu Manu, 40-56 fathoms.

Five specimens.

Hipponoë variegata A. Ag.

Cidaris variegata Leske, 1778. Kleins Nat. disp. Ech., p. 85.

Hipponoë variegata A. Agassiz, 1872. Rev. Ech. Plate 1, p. 135.

A good series of this variable species was obtained; the largest is 145 mm. in diameter and wholly white.

Honolulu.

Puako Bay, Hawaii.

Station 3876. Off Lahaina Light, Maui, 28-43 fathoms.

Twenty-seven specimens.

CLYPEASTRIDAE AGASS.

FIBULARINA GRAY.

Echinocyamus scaber DE MEIJ.

Echinocyamus scaber de Meijere, 1903. Tijds. Ned. Dierk. Ver. (2) 8, p. 5.

With one exception the specimens are bare tests, but all agree well with de Meijere's description and figures.

Station 3839. Off Lae-o Ka Laau Light, Molokai, 259-266 fathoms.

" 3908. Off Diamond Head, Oahu, 304-308 fathoms.

" 3914. Off Diamond Head, Oahu, 289-292 fathoms.

Five specimens.

Fibularia australis DESML.

Fibularia australis Desmoulins, 1837. Tabl. Syn., p. 240.

With two exceptions the specimens are bare tests, and all are very small.

Station 3846. Off Lae-o Ka Laau Light, Molokai, 60-64 fathoms.

" 4045. Off Kawaihae Light, Hawaii, 147-198 fathoms.

" 4064. Off Kauhola Light, Hawaii, 63-107 fathoms.

" 4148. Off Modu Manu,, 26-33 fathoms.

Seven specimens.

ECHINANTHIDAE A. AG.

Clypeaster scutiformis LAMK.

Echinus scutiformis Gmelin, 1788. Linn. Sys. Nat., p. 3184.

Clypeaster scutiformis Lamarek, 1816. Anim. s. Vert. 3, p. 14.

An excellent series, ranging from 10 to 48 mm. in length, is in the collection from the following stations, and only twenty-three are bare tests.

Station 3846. Off Lae-o Ka Laau Light, Molokai, 60-64 fathoms.

" 3847. Off Lae-o Ka Laau Light, Molokai, 23-24 fathoms.

" 3848. Off Lae-o Ka Laau Light, Molokai, 44-73 fathoms.

" 3849. Off Lae-o Ka Laau Light, Molokai, 43-73 fathoms.

" 3850. Off Lae-o Ka Laau Light, Molokai, 43-66 fathoms.

" 3863. Off Mokuhooniki Islet, Pailolo Channel, 127-154 fathoms.

" 3871. Off Mokuhooniki Islet, Pailolo Channel, 13-43 fathoms.

" 3872. Off Mokuhooniki Islet, Pailolo Channel, 32-43 fathoms.

" 3874. Off Mokuhooniki Islet, Pailolo Channel, 21-28 fathoms.

" 3876. Off Lahaina Light, Maui, 28-43 fathoms.

" 3962. Off Laysan Island, 16 fathoms.

" 3982. Off Nawiliwili Light, Kauai, 233-400 (?) fathoms.

" 3987. Off Hananaulu, Kauai, 50-55 fathoms.

- Station 4031. Off Diamond Head, Oahu, 27-28 fathoms.
 " 4032. Off Diamond Head, Oahu, 27-29 fathoms.
 " 4033. Off Diamond Head, Oahu, 28-29 fathoms.
 " 4034. Off Diamond Head, Oahu, 14-28 fathoms.
 " 4061. Off Kauhola Light, Hawaii, 24-83 fathoms.
 " 4128. Off Hanamaulu, Kauai, 68-253 fathoms.
 " 4146. Off Modu Manu, 23-26 fathoms.
 " 4148. Off Modu Manu, 26-33 fathoms.
 " 4150. Off Modu Manu, 71-160 fathoms.
 " 4158. Off Modu Manu, 20-30 fathoms.
 " 4164. Off Modu Manu, 40-56 fathoms.

One hundred and seventy-three specimens.

Clypeaster lytopetalus A. AG. and CLARK.

This species may be recognized at once by its small size and general resemblance to *scutiformis*, combined with short, broadly obovate petals, the anterior one widely open, and with a deep groove in each ambulacrum along the median suture, extending from the abactinal system nearly to the actinostome. The tubercles are less numerous than in *scutiformis* and the primary tubercles contrast decidedly with the miliaries. The poriferous zones are exceedingly narrow (less than one millimeter in width), and are of unequal length in the lateral petals. The sutures between the abactinal plates are quite distinct. The genital openings are very small. The test is very thin and the internal structure is remarkable for the great scarcity of pillars, of which there are one or two stout ones and one or two slender ones in each interradius, nearer the actinostome than the margin of the test; there are no needle-like internal projections such as are abundant in *scutiformis*. The larger specimen (St. 3962) is 33 mm. long, 26 mm. wide and 10 mm. high. The test is decidedly arched, with a deeply sunken actinostome, and is 5 mm. thick at the margin. The odd and the posterior petals are about 11 mm. long and 5-6 mm. broad near the tip, while the anterior lateral petals are equally broad, but only 8 mm. long. The odd petal has the poriferous zones 3 mm. apart at their distal ends. The color is dark yellowish-brown. The smaller specimen is about half as large and is bright reddish-brown. It is not impossible that this species will prove to be the young of *C. excelsior* Döderlein, from Japan, but the remarkable appearance of the petals distinguishes it from the only specimen of that species yet known.

Station 3936. Off Laysan Island, 79-130 fathoms.

" 3962. Off Laysan Island, 16 fathoms.

Two specimens.

Clypeaster leptostracon A. AG. and CLARK.

This species is nearly allied to *C. virescens* Döderlein from Japan, but differs in the outline of the test, the very narrow poriferous zones, the arrangement of the

internal pillars, and the color. It also resembles somewhat, young specimens of *C. humilis*, but is readily distinguished by the narrow poriferous zones, wide open petals, and very narrow interambulaera. The test is ovate, very flat and thin, with the actinostome little sunken and the petaliferous area abruptly, but slightly, elevated. The petals are short, broadly ovate, widely open distally and with very narrow poriferous zones. There are five genital openings. The primary spines are rather long and their tubercles contrast decidedly with the not very numerous miliaries. The walls of the test are thin and there are three or four concentric series of very flat, thin vertical pillars forming interrupted walls, occupying the distal fourth of the interior, much as in *Laganum*. But there is also, in each interradius, as in most true *Clypeasters*, a group of four or five pillars near the actinostome, and there are numerous, though minute, needle-like projections on the actinal floor. The specimens range from 6 to 38 mm. in length. The largest is 31 mm. broad and 7.5 mm. high; the test is only a little more than 3 mm. thick at the margin. The petals are subequal, 9 mm. long and a trifle over 5 mm. broad, but the poriferous zones are considerably less than a millimeter in width. The posterior lateral interambulaera are less than half as wide at the ambitus as the ambulaera on either side of them, though in smaller specimens they may be three-fourths as wide. In color the specimens vary from bright yellow, or reddish-yellow, to dirty purplish-white. The yellow specimens have a large number of rather indistinct, dusky blotches on the abactinal surface. These are arranged in pairs, four pairs in each ambulacrum and interambulacrum, and form four concentric circles around the petals, parallel to the margin of the test. In all the specimens there is more or less contrast in color between the ambulaera and interambulaera on the actinal surface.

Station 3823. Off Lae-o Ka Laau Light, Molokai, 78-222 fathoms.

" 3987. Off Hanamaulu, Kauai, 50-55 fathoms.

" 4046. Off Kawaihae Light, Hawaii, 71-147 fathoms.

" 4064. Off Kauhola Light, Hawaii, 63-107 fathoms.

" 4066. Off Ka Lae-o Ka Ilio Point, Maui, 49-176 fathoms.

Fifty-seven specimens.

LAGANIDAE Des. (Emended).

Laganum fudsiyama Döderlein.

Laganum fudsiyama Döderlein, 1885. Arch. f. Naturg. Jahrg. 51, Bd. 1, p. 104.

A large series of this species was collected. Most of them have the superficial appearance in miniature of specimens of *Clypeaster Ravenellii* A. Ag., the centre of the test is so considerably and abruptly elevated. The amount of elevation is, however, quite variable, ranging from 25 to 40 per cent of the long diameter. The smallest specimen measures 8 × 8 mm. and the largest 50 × 46. The color is usually green, but ranges from grayish-yellow to rich, deep green. Oftentimes the ambulaera, on the actinal side, are more or less colored with dark purplish-brown.

- Station 3811. Off Honolulu Light, Oahu, 52-238 fathoms.
 " 3838. Off Lae-o Ka Laau Light, Molokai, 92-212 fathoms.
 " 4079. Off Puniawa Point, Maui, 143-178 fathoms.
 " 4080. Off Puniawa Point, Maui, 178-202 fathoms.
 " 4081. Off Puniawa Point, Maui, 202-220 fathoms.
 " 4115. Off Kahuku Point, Oahu, 195-241 fathoms.
 " 4122. Off Barber's Point Light, Oahu, 192-352 fathoms.
- Four hundred and seven specimens.

Laganum solidum DE MEIJ.

Laganum solidum de Meijere, 1904. Ech. Siboga-Exp., p. 121; Plate 1, Figs. 64, 66.

A number of bare tests, collected at several localities, differ from both the preceding and following species, in the far more numerous primary tubercles of the abactinal surface. They answer very nearly to the description and figures of *solidum*, and may, for the present at least, be referred to that species.

- Station 3811. Off Honolulu Light, Oahu, 52-238 fathoms.
 " 3859. Off Mokuhooniki Islet, Pailolo Channel, 138-140 fathoms.
 " 3984. Off Nawiliwili Light, Kauai, 164-237 fathoms.
 " 4101. Off Mokuhooniki Islet, Pailolo Channel, 122-143 fathoms.
 " 4132. Off Hanamaulu, Kauai, 257-312 fathoms.

Sixteen specimens.

Laganum strigatum A. AG. and CLARK.

This species resembles *fudsiyama* in the short, narrow, open petals, the very narrow poriferous zones, and the moderately coarse tuberculation of the test. But it is easily distinguished from that species by the flatness of the test, the height of which rarely exceeds .20 of the long diameter; the distinctly visible sutures between the plates abactinally as well as actinally; and the color, which is purplish-gray or dull brown, with the sutures more or less plainly indicated by darker lines. There are usually five, but sometimes only four, genital pores. The anal opening is near the posterior margin of the test. A typical example is 30×29 mm. and only 6 mm. high.

- Station 3811. Off Honolulu Light, Oahu, 52-238 fathoms.
 " 3814. Off Diamond Head, Oahu, 42-284 fathoms.
 " 3859. Off Mokuhooniki Islet, Pailolo Channel, 138-140 fathoms.
 " 3863. Off Mokuhooniki Islet, Pailolo Channel, 127-154 fathoms.
 " 3876. Off Lahaina Light, Maui, 23-43 fathoms.
 " 4099. Off Puniawa Point, Maui, 152-153 fathoms.

Nine specimens.

PETALOSTICHA HAECKEL.

CASSIDULIDAE AGASS.

ECHINONEIDAE AGASS.

Micropetalon A. AG. and CLARK.

This genus is related to *Echinoneus*, which it resembles quite closely superficially. It is at once distinguished from that genus by the fact that the poriferous zones are flush with the test and the pores extend only from the abactinal system about half way to the ambitus. The anterior ambulacrum has about a dozen pairs of pores in each zone; the zones of the lateral ambulacra have about 15 pairs each; and the zones of the posterior pair have about 20. The zones are very narrow, close together at the abactinal system, diverge widely to below the ambitus and then converge somewhat to the actinostome. The primary tubercles are few in number, not at all sunken into the test, and are arranged in regular vertical series. Abactinally they have definite scrobicular circles of small secondaries, but these are more or less imperfect actinally. Glassy tubercles are minute and infrequent. Abactinal system as in *Echinoneus*. Genital openings four. Actinostome very oblique. Anal system very large and oblique. Primary spines rather long, nearly equal to width of anal system, slender and finely striated.

Micropetalon purpureum A. AG. and CLARK.

The single specimen collected is oval, flattened both above and beneath; it is 17 mm. long, 15 mm. broad, and 8 mm. high. The actinostome is little sunken and is 6×3 mm. The anal system is 6.75×3.75 mm. The genital openings are conspicuous. On each side of each ambulacrum, close to the poriferous zone, is a vertical series of about 14 primary tubercles, which extends nearly to the actinostome, but stops several millimeters from the abactinal system. Between these two series, are two other series running from just above the ambitus nearly to the actinostome, and in the posterior ambulacra there are two more rows between the ambitus and the mouth. In each interambulacrum, there is a series of 14 or 15 tubercles on each side, extending from abactinal system to actinostome, and from two to four others extend greater or less distances above and below the ambitus. The color of the test is dirty-whitish above, becoming purple actinally; the abactinal system, poriferous zones, anal system, and actinostome are rich purple; the spines and tubercles are white.

Station 3847. Off Lae-o Ka Laau Light, Molokai, 23-24 fathoms.

SPATANGIDAE AGASS.

PALEOPNEUSTIDAE A. AG.

Phrissocystis multispina A. AG. and CLARK.

From an unknown station there are a large number of fragments of at least two, and possibly three, individuals of a species of *Phrissocystis*, which must have been of very large size, probably from 100–150 mm. in length. They are of a rich red-brown color and carry long spines with a reddish tinge. This species resembles *P. aculeata* A. Ag. in having no subanal fasciole and in the arrangement of the abactinal system and the ambulacra. It appears to differ from that species, not only in color, but in the much larger number of primary tubercles on the abactinal plates (8–12 instead of 4–8) and in the very large actinostome, which in one individual is 35×16 mm.

Meijerea excentrica A. AG. and CLARK.

This species is very similar to *Phrissocystis*, but has a well-developed subanal fasciole. As Döderlein (1906) has suggested, this difference necessitates a new genus which he has called *Meijerea*, with *Phrissocystis humilis* de Meijere as the type species. The Hawaiian specimen is evidently not *humilis*, as it is much flatter and more heart-shaped, with the abactinal system considerably posterior to the middle of the test. The subanal fasciole is also different; it encloses an open rectangular area, 4.5 mm. wide, with the base 24 mm., and the sides 10 mm. in length. The test is 74 mm. long, 60 mm. wide and only 17 mm. high, and the abactinal system is 39 mm. from the anterior edge. The color is light brown, with whitish primary spines.

Station 4039. Off Kawaihae Light, Hawaii, 670–697 fathoms.

One specimen.

Pycnolampas A. AG. and CLARK.

This genus is established for some delicate little Spatangoids, which, although apparently immature, do not appear to be the young of any known species, and seem to require a new genus for their reception. It is most nearly allied to *Homolampas*, but differs from that genus in the entire absence of any anterior furrow or depression, and in the subpetaloid character of the posterior ambulacra. The test is ovate, rather flat anteriorly, higher posteriorly, and is thin and fragile. There are a very few large primary spines in the anterior and lateral interambulacra, abactinally, but neither they, nor those of the actinal surface, have sunken scrobicular circles or show any pits (as in *Lovenia*) on the interior of the test. Abactinal system compact. Ocular plates conspicuous. Anterior ambulacrum indistinct, not at all depressed, and with few, minute pores. Poriferous zones of the other ambulacra evident, those of the posterior ambulacra especially, tending to become petaloid. Subanal and peripetalous fascioles present, distinct but narrow. No genital openings are visible.

***Pycnolampas oviformis* A. AG. and CLARK.**

The specimens collected range from 15 to 22 mm. in longitudinal diameter. The largest is 17 mm. wide, 9 mm. high anteriorly, and 10 mm. high posteriorly. The peripetalous fasciole is nearly circular, somewhat pointed behind, 14×12 mm. The color is pearly white with a purplish tint on the abactinal system; the fascioles are brown and the spines are yellowish-white.

Station 3838. Off Lae-o Ka Laau Light, Molokai, 92-212 fathoms.

" 3890. Off Mokapu Islet, Molokai, 71-283 fathoms.

" 4044. Off Kawaihae Light, Hawaii, 198-233 fathoms.

Five specimens.

SPATANGINA GRAY.***Spatangus paucituberculatus* A. AG. and CLARK.**

This species is most nearly related to *S. Lütkeni* A. Ag., but is quite different from that species. The test is very broad and flat and obliquely truncated posteriorly, sloping towards the actinostome. The groove of the anterior ambulacrum is very deep. On each side of it are a number of primary tubercles; in the lateral interambulacra the number of primary tubercles is 2, 1, or 0, and in the posterior interambulacrum there are not more than 9 or 10. The anal system is small and nearly circular. The actinal surface is much as in *Lütkeni*. The largest specimen is 78 mm. long, 74 mm. wide, and only 40 mm. high; the anterior furrow is 5 mm. deep and 13 mm. wide, at the ambitus. The color is purple, with white tubercles; primaries and secondaries silvery-white becoming purple at the base; miliary spines purple.

Station 3863. Off Mokuhooniki Islet, Pailolo Channel, 127-154 fathoms.

" 3865. Off Mokuhooniki Islet, Pailolo Channel, 256-283 fathoms.

" 4096. Off Mokuhooniki Islet, Pailolo Channel, 272-286 fathoms.

" 4097. Off Mokuhooniki Islet, Pailolo Channel, 286 fathoms.

" 4116. Off Kahuku Point, Oahu, 241-282 fathoms.

Twelve specimens.

***Gymnopatagus* DÖD.**

Gymnopatagus Döderlein 1901. Zool. Anz. Bd. 23, p. 22.

This genus was established by Döderlein for an interesting Spatangoid, taken by the "Valdivia" off the east coast of Africa, related to *Eupatagus* but having a decided furrow for the anterior ambulacrum. The "Albatross" has collected among the Hawaiian Islands two species of large Spatangoids, which are of special interest because they are evidently connecting links between these two genera. In one of them the anterior furrow is quite distinct, while in the other it is barely indicated, and yet the two are obviously congeneric. In both species the anterior poriferous zones of the lateral ambulacra are much narrower than the posterior zones, and are almost rudimentary near the abactinal system; a condition not

noted in either *Eupatagus* or *Gymnopatagus*. As the general appearance of these Hawaiian *Spatangoids* is decidedly more like *Gymnopatagus* than like any known species of *Eupatagus*, we place them for the present in the former genus, but it is an open question whether the two genera can be separated.

The Hawaiian species are of further interest from the remarkable diversity exhibited by the peripetalous fasciole, which is seldom a single, simple band. In one specimen there are several narrow but distinct fascioles across the anterior ambulacrum, within and parallel to the peripetalous fasciole. In another individual, a conspicuous branch arises from the posterior part of the fasciole and runs for several centimeters beside but slightly diverging from the main band, and finally ends abruptly. In other individuals, the lateral portions of the fasciole consist of two parallel bands, more or less connected with each other. Although the complexity of the arrangement is never as great as in *Macropneustes spatangoides* A. Ag., these fascioles at once suggest that West Indian species.

***Gymnopatagus pulchellus* A. Ag. and CLARK.**

The specimens range from 57 to 90 mm. in length. The largest is 70 mm. wide and 33 mm. high; it is widest and highest just back of the abactinal system. The anterior ambulacrum is apetaloid and scarcely sunken. There are no primary tubercles in the posterior interambulacrum but there are 35-40 in the lateral interambulacra, within the fasciole, arranged in four or five rows parallel to it; there are also about 20 similar tubercles in each of the anterior interambulacra. These tubercles carry long, slender, brownish-white spines, some of which are 30 mm. in length. The posterior petals are very long, about .40 of the length of the test. The smallest specimen is bright rose color above and nearly pure white beneath, though the spines all have a brownish cast. Larger specimens are less rosy and more fawn-color. The test of the largest is nearly uniform fawn-color, with the long spines almost white.

Station 3810. Off Honolulu Light, Oahu, 53-211 fathoms.

“ 3811. Off Honolulu Light, Oahu, 52-238 fathoms.

“ 4045. Off Kawaihae Light, Hawaii, 147-198 fathoms.

Six specimens.

***Gymnopatagus obscurus* A. Ag. and CLARK.**

This species differs from the preceding in the conspicuous groove for the anterior ambulacrum, the presence of 6-9 primary tubercles in the posterior interambulacrum, the higher and more ovate test, and fewer tubercles in the lateral interambulacra. The specimens are all of about the same size and measure 85 mm. in length, by 70 mm. in width and 35 mm. in height. The test is widest at about the middle of the posterior pair of petals, which are nearly as long as in the preceding species. The primary spines are only about 20 mm. long. The color is dull brown, the spines somewhat lighter.

Station 3912. Off Diamond Head Light, Oahu, 310-334 fathoms.

“ 4081. Off Puniawa Point, Maui, 202-220 fathoms.

Eight specimens.

Lovenia grisea A. AG. and CLARK.

This species is near *L. gregalis* Alcock, but is much more heart-shaped, flatter, and decidedly narrower posteriorly. The test is densely covered with spines, and the lateral ambulacra are quite different from those of *gregalis*. On the actinal surface, the bare posterior ambulacra are not nearly so wide as in de Meijere's (1904) figure of *gregalis*. Unfortunately the single specimen is so badly injured that there is no trace of the abactinal system and internal fasciole; the subanal fasciole is also injured. There is no anterior lateral fasciole. The petals are well-developed, nearly closed and pointed, with the poriferous zones almost straight and scarcely sunken. The specimen is 81 mm. wide and only 26 mm. high; it must have been about 90 mm. in length. The anterior lateral ambulacra are only 4 mm. wide at a distance of 15 mm. from the ambitus, but at the ambitus they are 12 mm. The color is light olive gray.

Station 4080. Off Puniawa Point, Maui, 178-202 fathoms.

Pseudolovenia A. AG. and CLARK.

This genus resembles *Lovenia* very closely when the specimens are covered with spines, but when the abactinal surface is denuded the difference in the posterior ambulacra is very striking. These ambulacra are not petaloid, the poriferous zones are flush with the surface of the test, and, though slightly converging at first, diverge towards the ambitus, the petals becoming more and more open, while the pores of a pair come closer together until, below the ambitus, there are only single pores. The anterior lateral ambulacra are subpetaloid with the poriferous zones flush. Fascioles, tubercles, and spines much as in *Lovenia*.

Pseudolovenia hirsuta A. AG. and CLARK.

The test is distinctly heart-shaped with an evident groove for the anterior ambulacrum. It is densely covered, especially in the young, with slender miliary spines 2-4 mm. long. The abactinal system is only about one-third of the length, from the anterior extremity, and is more anterior still in very young individuals. The test is highest at or behind the abactinal system. The number of large primaries increases with size; there are 2 or 3 in each anterior interradius and from 3 to 8 in each lateral interradius, in specimens under 50 mm. in length. In larger specimens there may be as many as 6 in front and 12 on the side. The largest specimen is badly damaged at the posterior extremity, but is 54 mm. wide and must have been nearly 65 mm. long; it is a trifle over 22 mm. high. Smaller specimens are relatively higher and narrower. In the best preserved specimen, which is 60 x 51 mm., the posterior ambulacra from the internal fasciole to the margin measure 33 mm.; the interporiferous area is 3 mm. wide at the fasciole, 2.25 mm. wide 13 mm. from the fasciole, and 5 mm. wide at the ambitus. The color is gray, becoming dirty white in the largest specimen. Young specimens are more nearly cream-color. The primary spines are white, and in the largest specimen are from 30 to 37 mm. long.

- Station 3836. Off Lae-o Ka Laau Light, Molokai, 238-255 fathoms.
 " 3839. Off Lae-o Ka Laau Light, Molokai, 259-266 fathoms.
 " 3865. Off Mokuhooniki Islet, Pailolo Channel, 256-283 fathoms.
 " 3920. Off Diamond Head Light, Oahu, 265-280 fathoms.
 " 4028. Off Ukula Point, Kauai, 444-478 fathoms.
 " 4036. Off Kawaihae Light, Hawaii, 687-692 fathoms.
 " 4083. Off Puniawa Point, Maui, 238-253 fathoms.
 " 4122. Off Barber's Point Light, Oahu, 192-352 fathoms.

Eighteen specimens.

BRISSINA GRAY.

Rhinobrissus placopetalus A. AG. and CLARK.

The specimens are small and immature, but the shape of the test and the large petals flush with the test distinguish this species from any previously known. The test of the largest is 14 mm. long and 12 mm. wide, lowest anteriorly and sloping steadily upward to the posterior extremity, where it is highest. It is widest at the abactinal system, which is just over the mouth. At this point the vertical height is 8 mm., while at the posterior end it is 10 mm. The anterior ambulacrum is flush, with few very minute pores. The other ambulacra are distinctly petaloid, scarcely sunken, and are subequal, 4 mm. long with 13 or 14 pairs of pores. The peripetalous, anal, and subanal fascioles are all well developed. The color is light yellowish-brown.

Station 4146. Vicinity of Modu Mann, 23-26 fathoms.

" 4160. Vicinity of Modu Manu, 31-39 fathoms.

Three specimens.

Brissopsis luzonica A. AG.

Kleinia luzonica Gray, 1851. Ann. Mag. Nat. Hist. (2) 1, p. 133.

Brissopsis luzonica A. Agassiz, 1872. Rev. Ech. Pt. 1, p. 95.

A good series of this species is found in the collection, but owing to the fragility of the test (see Döderlein, 1906) most of them are more or less badly broken.

Station 3836. Off Lae-o Ka Laau Light, Molokai, 238-255 fathoms.

" 3839. Off Lae-o Ka Laau Light, Molokai, 259-266 fathoms.

" 4044. Off Kawaihae Light, Hawaii, 198-233 fathoms.

" 4083. Off Puniawa Point, Maui, 238-253 fathoms.

" 4131. Off Hanamaulu, Kauai, 257-309 fathoms.

" 4132. Off Hanamaulu, Kauai, 257-312 fathoms.

Twenty-four specimens.

Brissopsis Oldhami ALCOCK.

Brissopsis Oldhami Alcock, 1893. Jour. Asiat. Soc. Bengal, 62, Pt. 2, No. 4, p. 6 (174).

Our specimens agree exactly with Alcock's description, but as he gives no measurements and his figures are of a small specimen, it is not easy to see why he

did not regard the Indian form as *luzonica*. Comparison of the Hawaiian specimens of *Oldhami* and *luzonica* reveals several apparently constant differences which warrant their separation. In *luzonica*, the breadth of the test is usually .80-.85 of the length, though it may be more; in *Oldhami* it is over .90. In *luzonica* the width of the area enclosed by the peripetalous fasciole is about .50 of its length, rarely more than .55; in *Oldhami* it is .60-.70. In *luzonica* the height of the subanal fasciole is about .50 of its horizontal breadth; in *Oldhami* it is rarely over .40. The actinostome is more deeply sunken and the labrum is more prominent and more nearly pointed in *Oldhami* than in *luzonica*. The petals are slightly broader and the lateral petals are a little longer, and are more noticeably depressed below the fasciole, in *Oldhami*. It is evident therefore that this species is nearer *lyrifera* than *luzonica* is, but it agrees closely with the latter in color and fragility of the test. The largest specimens are about 50 × 45 mm.

- Station 3824. Off Lae-o Ka Laau Light, Molokai, 222-498 fathoms.
 " 3826. Off Lae-o Ka Laau Light, Molokai, 371-430 fathoms.
 " 3839. Off Lae-o Ka Laau Light, Molokai, 259-266 fathoms.
 " 3842. Off Lae-o Ka Laau Light, Molokai, 495-506 fathoms.
 " 3863. Off Mokuhooniki Islet, Pailolo Channel, 127-154 fathoms.
 " 3892. Off Mokuhooniki Islet, Molokai, 328-414 fathoms.
 " 3908. Off Diamond Head Light, Oahu, 304-308 fathoms.
 " 3912. Off Diamond Head Light, Oahu, 310-334 fathoms.
 " 3916. Off Diamond Head Light, Oahu, 299-330 fathoms.
 " 3917. Off Diamond Head Light, Oahu, 294-330 fathoms.
 " 3918. Off Diamond Head Light, Oahu, 257-294 fathoms.
 " 3992. Off Mokuhaeae Islet, Kauai, 523 fathoms.
 " 3997. Off Ukula Point, Kauai, 418-429 fathoms.
 " 4028. Off Ukula Point, Kauai, 444-478 fathoms.
 " 4132. Off Hanamaulu, Kauai, 257-312 fathoms.

Thirty-seven specimens.

Brissopsis circosemita A. AG. and CLARK.

We have given this name to a small Spatangoid, of which there is only a single specimen, and that a bare test 17 mm. long, 14 mm. wide, and 11 mm. high. The posterior extremity is truncate vertically. The plastron is slightly keeled posteriorly. The labrum is nearly straight, and the actinostome is scarcely sunken. The peripetalous fasciole and the petals are similar to those of a young *luzonica*, but the subanal fasciole is unique. It is quite small and nearly circular, 5 mm. in transverse diameter and 5.25 mm. vertically. A conspicuous branch arises from the upper portion, on each side of the anal system, and runs to the posterior portion of the peripetalous fasciole, which it joins in the posterior ambulacrum. The two branches thus enclose the anal system, but are not very near to it. While such anal fasciolar branches are not uncommon in *Brissopsis*, they are particularly distinct and complete in this specimen. Only three ambulacral plates enter the subanal fasciole on each side. The abactinal system is very compact

and the genital opening in the right anterior plate is much smaller than the other three.

Station 4070. Off Puniawa Point, Maui, 45-52 fathoms.

Brissus carinatus GRAY.

Spatangus carinatus Lamarck, 1816. Anim. s. Ver. **3**, p. 30.

Brissus carinatus Gray, 1825. Ann. Phil. **10**, p. 9.

There is a bare test, 55×42 mm., from Laysan Island, which is undoubtedly this species. We also refer to *Brissus*, and probably *carinatus*, a young Spatangoid about 10 mm. long, in which the petals are not quite perfect and are little sunken, while the subanal fasciole is disproportionately large. It was taken at Station 4147, vicinity of Modu Manu, in 26 fathoms.

Metalia maculosa A. AG.

Echinus maculosus Gmelin, 1788. Linn. Sys. Nat., p. 3199.

Metalia maculosa A. Agassiz, 1872. Rev. Eeh., Pt. 1, p. 144.

A small fragment of the right posterior ambulacrum and part of the posterior interambulacrum of a large Spatangoid from Station 4149 is evidently from the test of one of this species.

Station 4149. Off Modu Manu, 33-71 fathoms.

Aceste WYV. THOM.

Aceste Wyville Thomson, 1877. Voy. Chall. Atlantic, **1**, p. 376.

There are a few good specimens, and fragments of several others, of this genus, but none of them seem to be *bellidifera*, the only species hitherto known. They all agree in having the posterior extremity nearly vertical and the anterior furrow deep and with nearly vertical sides. The actinal plastron is perfectly flat and does not project either in front of or below the mouth. In these particulars the specimens are evidently different from *bellidifera*, and the difference is emphasized when the relative length of the plastron is noted. In *bellidifera* the plastron measures from the posterior edge of the tuberculated portion to the mouth, only about .65 of the length of the test, while in the Hawaiian specimens it is considerably more than .75. Not only do these specimens differ from *bellidifera*, but those from the west end of Molokai are obviously different from those taken off the west coast of Hawaii, and we are accordingly obliged to recognize two new species of *Aceste*.

Aceste ovata A. AG. and CLARK.

The points in which this species differs from *bellidifera* have already been stated. The largest specimen is 19×15 mm. and the others are nearly as large. The test is broadly ovate, rounded behind. It slopes backward slightly from the posterior edge of the fasciole for a very short distance, and is then vertically truncated. The fasciole is nearly oval and not angular, though it is somewhat pointed behind. The color of these specimens is light brown, with the fasciole a somewhat darker brown.

Station 3836. Off Lae-o Ka Laau Light, Molokai, 238-255 fathoms.

“ 3839. Off Lae-o Ka Laau Light, Molokai, 259-266 fathoms.

Six specimens.

Aceste purpurea A. AG. and CLARK.

This species differs from the preceding in the shape of the fasciole and in color. The fasciole is somewhat angular, though the angles are rounded, and the enclosed area is abruptly widened just behind the middle of its course. The general color is pale purple, with the fasciole a very deep purple. A small specimen, only 13 mm. long, from St. 3898, has this same coloration, and, although the fasciole has no prominent angles, is evidently this species. The largest specimen is nearly 22 mm. long.

Station 3898. Off Mokuhooniki Islet, Pailolo Channel, 258-284 fathoms.

“ 4041. Off Kawaihae Light, Hawaii, 253-382 fathoms.

Three specimens.

Schizaster japonicus A. AG.

Schizaster japonicus A. Agassiz, 1879. Proc. Amer. Acad., 14, p. 212.

A very small Spatangoid, only a trifle over 8 mm. in length, is evidently a *Schizaster*, and in the appearance of the petals is more like *japonica* than it is like any other described species.

Station 4064. Off Kauhola Light, Hawaii, 63-107 fathoms.

Periaster maximus A. AG. and CLARK.

Although there is in the collection only a single fragment of this Spatangoid, it shows such great size for a *Periaster* and such unique features, we feel justified in giving it a name. The fragment is the posterior left-hand quarter, approximately, of the abactinal part of the test and includes the left posterior petal and most of the right one too. The anal system is also present, but no part of the test below it. A perfectly bare band, two millimeters wide, runs from the posterior part of the peripetalous fasciole, in the median line, straight to the anal system. This band is nearly 50 mm. long. The petals are 18 mm. long by 6 mm. wide. The anal system is 11 mm. across horizontally. The shape of this species was apparently more like *limicola* than like *tenuis*, and if we calculate its dimensions by proportion, comparing it with a specimen of *limicola* 65 mm. long, we find that, unless the shape was very different from that species, this individual must have been about 110 mm. long, 105 mm. wide, and 95 mm. high. The color is very light brown. There are some large primary tubercles in the interambulacra, within the fasciole.

Station 4130. Off Hanamaulu, Kauai, 283-309 fathoms.