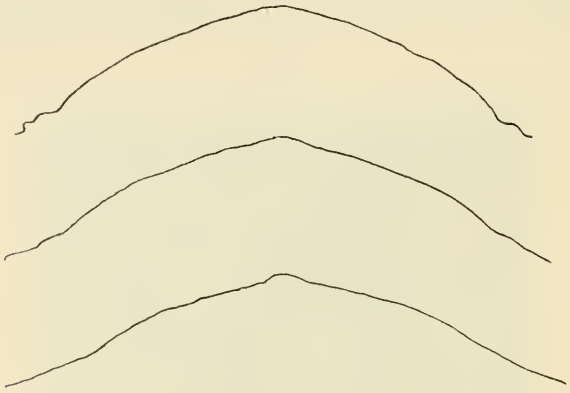
Es sind junge Exemplare, die mir vorliegen. Der Carapax hat bis zur hinteren Einkerbung eine Länge von 95 mm, der eine größte Breite von 93 mm gegenübersteht, die größte Höhe beträgt 22 mm, das gäbe ein Verhältnis von 100:98:23, das sich nirgends auf der von Stejneger gegebenen Tabelle findet.

Ich bilde das Tier von der Rücken- und Bauchseite[1] ab und gebe

Fig. 3.



3 Schnitte durch den Carapax. Die Lage der Schnitte ist, vom Vorderrand gemessen, bei I 31 mm, bei II 51 mm, bei III 64 mm. Man sieht, wie sich schon bei II der Kiel hebt und bei III mit deutlichen seitlichen Depressionen hervortritt.

Die Kurven sind genaue Nachzeichnungen der Schnittränder eines mit feinster Säge durchschnittenen Gipsabgusses des Carapax.

5. New Starfishes from the North Pacific. — II. Spinulosa.

By W. K. Fisher, Stanford University, California.

eingeg. 10. Januar 1910.

Echinasteridae.

Poraniopsis[2] *inflata flexilis* new subspecies.

Rays longer and slenderer than in *inflata*, very flexible and weak; R 72 mm; r 26 mm; R 2,8 r; breadth of ray at base, 30 mm. Abactinal surface very weak owing to the slenderer skeletal elements and the

[1] Der Fleck auf dem Hals ist ein Plattenfehler.

[2] *Poraniopsis* Perrier, Mission Scientif. Cap Horn, III, Stellerides, 1891. p. 105. Pl. X. fig. 2a 2b. Type, *P. echinaster* Perrier. The synonyms of this are: *Lahillea* de Loriol, 1904; *Alexandraster* Ludwig, 1905; *Ortmannia* de Loriol, 1906. *Poraniopsis inflata* was described by me as *Alexandraster inflatus* June 19, 1906. Zool. Anz. Bd. XXX. p. 300.

larger papular areas which frequently extend from the midradial line to the superomarginal plates without a break; meshes of actinal skeleton very wide. Spines slender, long and sharp; adambulacral spines also slender, tapering, and pointed, and without grooves. No calcareous grains and tiny plates in the integument of papular areas.

Off Santa Catalina Island, Cal., 334—600 fathoms. Bottom, rocks, shells, fine gray sand.

The two California forms may be contrasted as follows:

a. Adambulacral spines with a groove; rays rigid and skeleton stout; adradial row of intermediate ossicles always present . . . . . *inflata.*

aa. Adambulacral spines tapering, without a groove, rays weak and flexible; adradial series of intermediate ossicles sometimes absent . . . . . *flexilis.*

Henricia Gray.

In the following key, most but not all the species of North Pacific *Henricia* are included in order to bring out the differences of the new forms.

a. One furrow spinelet, except sometimes on the distal portion of ray, where 2 may be present on the furrow face of the adambulacrals.

b. All the pseudopaxillae or groups of spinelets small, rather close-set, the abactinal skeleton not forming an open meshwork; pseudopaxillae with comparatively few (1—15) short spinelets; papulae few (1 to 3, less often 4 or 5) to an area. Rays moderately long and slender; marginal plates typically inconspicuous, and not normally forming regular series. . . *sanguinolenta* (Müller).

bb. Abactinal pseudopaxillae moderately to very large, close-set, with numerous small delicate, sometimes granuliform spinelets; papular areas small, typically smaller than the pseudopaxillae; marginal and actinal intermediate plates forming 3 very regular, conspicuous, juxtaposed series.

c. Abactinal pseudopaxillae typically with small granuliform or clavate spinelets; adambulacral spinelets few in about 2 transverse series. Typically 1 spinelet in furrow except at very tip of ray where 2 may be present.

d. Papular areas smaller than adjacent pseudopaxillae which have usually more than 20 spinelets; marginal plates squarish, large, not much wider than long, not

separated by prominent transverse grooves (as wide as the elevated ridge of plate); actinal intermediate series reaching quite or nearly to tip of ray . . *leviuscula* (Stimpson).

dd. Papular areas usually larger than pseudopaxillae, much sunken, the latter elongated with fewer than 20 spinelets arranged on the tabulate elevation in 2 or 3 rows; marginal plates much compressed, the thin spine-bearing tabula separated by fairly deep grooves; actinal intermediate plates not distinguishable much beyond middle of ray . . . . . *annectens* new subspecies.

cc. Abactinal pseudopaxillae with numerous slender often glassy spinelets ending in 3 to several sharp awns or points; adambulacral spinelets numerous (25 to 50); typically with 2 spinelets in furrow beyond middle of ray but only 1 proximally . . . . *multispina* new subspecies.

bbb. Abactinal skeleton open, with large often sunken papular areas containing numerous papulae: spinelets scattered along the ridges surrounding papular areas, or if clustered, never many to a cluster.

c. Spinelets scattered, often quite small; not in definite clusters or pseudopaxillae; adambulacral spinelets in a single, sometimes zigzag, transverse series.

d. Rays slender, long, and rigid, the skeleton forming an open mesh work with large sunken papular areas; abactinal spinelets minute, generally immersed in the integument and arranged along the trabecular ridges in 1 to 3 irregular series; adambulacral spinelets in zigzag transverse series, few, thick, stubby, and immersed in membrane; marginals regular with large intermarginal papular spaces. . . . . *aspera* Fisher.

dd. Rays weak; spinelets comparatively large (as long as the height of ridge bearing them) in a single series along the skeletal ridges, well spaced. Adambulacral spinelets slender, long, in a transverse series, webbed basally, but not impeded by thick investment. Marginals not always regular . . . . . *asthenactis* new species.

cc. Spinelets in definite pseudopaxillae or in fascicular groups.

d. Genre la form intermediate between *aspera* and *leviuscula*; papular areas usually small; pseudopaxillae oblong with 2 or 3 rows of upwards to 20 very short spinelets; prominent wide and short (compressed)

marginals; no intermarginals; adambulacral spinelets short, usually in 2 transverse series . *annectens* new subspecies.

dd. Papular areas fairly large; spinelets unusually long, in spaced fascicular groups; a long series of intermarginals; marginals not wider than long armed with a cluster of comparatively long spinelets; adambulacral spinelets unusually long in a zigzag transverse series. *longispina* new species.

aa. Regularly 2 or more spinelets on the furrow face of the adambulacral plates; adambulacral spinelets numerous; rays flexible.

b. Abactinal and lateral pseudopaxillae small, evenly spaced; papulae single, arranged in fairly regular oblique transverse series on either side of the median radial line (at least when viewed internally) *polyacantha* Fisher.

bb. Plates small forming a sinuous irregular meswork enclosing smaller, lower plates also more or less joined in a close mesh between which emerge single papulae, which do not form transverse oblique rows . *clarki* new species.

Henricia leviuscula multispina new subspecies.

General form very similar to that of *H. leviuscula* but the abactinal plates more compactly placed, smaller, and more numerous; the papular areas smaller; the spinelets very numerous, delicate, longer than in *leviuscula*, and ending typically in 3 or 4 (sometimes more), slender very sharp points or awns; adambulacral plates with numerous (25—50) spinelets, and typically with 2 spinelets on the furrow face, beyond middle of ray; proximally only 1. Rays 5; R 88 mm; r 15 mm; R 5,8 r; breadth of ray at base 18 mm.

Near Semisopochnoi Island, Aleutian Islands, 54 fathoms. Bottom, broken shells, pebbles, sand.

The most evident characters by which this form may be distinguished from *leviuscula* are the delicate abactinal and lateral spinelets which end in several sharp points or awns, and the numerous adambulacral spinelets, there being 3 or 4 on the furrow margin, sometimes slightly to markedly compressed and spatulate, the rest decreasing in size toward the outer part of plate. The plates are more closely placed than in *leviuscula*, the papular areas being much smaller than the plates. The latter have a convex surface, bristling with delicate glassy spinelets (40—60 or more) reminding one of *Chaetaster*. Marginal plates compactly placed, conspicuous, in 2 regular series, the inferomarginals the larger, and wider than long. A series of actinal intermediate plates

smaller than exposed surface of adambulacrals and extending nearly to end of ray (about $^4/_5$). Intermarginal plates present, but variable sometimes confined to base of ray, sometimes extending in 1 or 2 series half the length of ray. There is evidence that this form intergrades with *leviuscula*.

Henricia leviuscula annectens new subspecies.

Intermediate in general appearance between *H. leviuscula* and *H. aspera*, but superficially more like *aspera*; rays slender, disk small; abactinal skeleton less open than in *aspera*, with smaller, deeply sunken papular areas; ridges enclosing papular areas not undivided as in *aspera* but subdivided by spine-bearing tabulae; latter with comparatively few (5 to 10) short tapering stubby spinelets in 2 or 3 rows; 1 to 3 papular pores to an area; marginal plates shorter and much more compressed than in *leviuscula*, with comparatively few spinelets, the spine bearing ridge of the 2 series being sometimes confluent; successive ridges separated by a prominent transverse groove; no intermarginals beyond first 2 or 3 marginals; actinal intermediate series extending only part way along ray ($^1/_2$ to $^2/_3$) as in *aspera*, not the whole length as in *leviuscula*; adambulacral plates with 10 to 12 spinelets in 2 transverse rows, and deep in the furrow 1 spinelet except near tip of ray where there are two.

Off Oregon, 42 fathoms. Bottom, rocks stones.

Henricia asthenactis new species.

General appearance somewhat like that of young *aspera*, but the abactinal and lateral skeleton more open and weaker, the papular areas being proportionately much larger and the spinelets scattered, few, and conspicuously longer; adambulacral spinelets long, and in a single transverse series (4 to 6 in number counting the spinelet in furrow); 2 regular series of plates adjacent to adambulacrals separated by a row of single papulae. R 22 mm; r 5 mm; R 4,4 r.

Between Santa Barbara and San Nicholas Islands, California, 339 to 216 fathoms. Bottom, green sand, shells.

Henricia longispina new species.

Rays 5, moderately robust, constricted at base, cylindrical, tapering gradually to a very blunt, recurved extremity; disk small, slightly inflated: skeleton forming fairly coarse meshwork with stout plates and irregular mostly quadrate or roundish, though often irregular papular areas; with rather numerous papulae to an area; spinelets in well defined, spaced, fasciculate groups of 2 to 9 (usually 5 to 7) and 1 to 1,5 mm

long; extensive intermarginal series of plates; adambulacral armature consisting of a zigzag series of 6 or 7 long bristling spinelets decreasing in size from furrow edge, and in addition 1 spinelet deep in furrow; actinal intermediate plates extending only about half length of ray. R 47 mm; r 9 mm; R 5,2 to 4,5 r; rays unequal.

Queen Charlotte Sound, off Ft. Rupert Vancouver Island, 107 to 68 fathoms; bottom, soft green mud.

This species is notable for the prominent fasciculate spinulation and the conspicuous adambulacral spinelets. The spinelets are much longer and sharper than in *sanguinolenta,* the groups much more spaced on account of the open character of the skeleton, and the adambulacral spinelets much longer.

Henricia clarki new species.

Rays long, very slender, and flexible, tapering from a narrow base to an attenuate, blunt, extremity; rays subcylindrical; abactinal surface depressed; interbrachial angles abrupt, about 90°, not rounded; disk very small; plates delicate, forming a sinuous meshwork enclosing smaller, lower, secondary plates (also more or less joined in a close mesh) between which emerge single papulae; adambulacral plates with 35 to 40 spinelets (on proximal part of ray) and in the furrow 2 spinelets, except on the proximal 6 or 8 plates where there are 3 to 5 in a vertical series. R 54 mm; r 7 mm; R 7,7 r; breadth of ray at base, 7 to 9 mm.

Off Santa Cruz Island Cal., 475 to 510 fathoms. Bottom, black mud.

Named for Mr Austin Hobart Clark.

Solasteridae.

Solaster exiguus new species.

Rays 7. R 25 mm: r 8 mm; R 3 r. Similar in general appearance to *S. paxillatus* Sladen, but disk smaller, paxillae smaller, inferomarginal plates more widely spaced and much narrower, with fewer longer spinules, actinal interradial areas smaller (despite the fewer rays): furrow spinelets 2 or 1, long; actinal adambulacral spinelets 3 to 5, the comb slightly curved aborad at inner end, and middle spinelets longest. Mouth plates small with 6 to 8 marginal and 2 to 5 superoral spinelets, the former webbed basally, and the inner 2 or 3 enlarged into teeth.

Off Anacapa Island, California, 603 fathoms. Bottom, green mud.

The paxillae of this species are not so small as those of *S. endeca* or *S. borealis.* They are spaced farther than their width, and are arranged in definite longitudinal and oblique transverse rows. Each paxilla has 5

to 8 slender spinelets considerably longer than the height of tabulum. Papulae single. Inferomarginal paxillae, subcircular, only very slightly compressed, two to every three adambulacral plates, and crowned by 5 to 12 delicate spinelets, longer than the pedicel and denticulate at tip.

Solaster hypothrissus new species.

Similar in general appearance and structure to *S. borealis*, but differing in having a row of 5 to 7 prominent superoral spines parallel to the median suture, in having a maximum of 6 long actinal adambulacral spines instead of 4 or less, and in having the abactinal pseudopaxillae slightly higher, with 7 to 11 (instead of 3 or 4) spinelets which are blunter than in *borealis* and end in several points, not in an attenuate denticulate tip. Rays 10 or 11; R 3 + r.

South of Shumagin Islands, Alaska, 625 fathoms. Bottom, green mud.

Lophaster furcilliger vexator new subspecies.

Similar to *L. furcilliger* Fisher but with larger disk, thicker rays, much stouter paxillae, both abactinal and marginal, and with stouter abactinal spinelets (having 6 to 10 little prongs instead of 2 to 4), heavier adambulacral spines and more closely placed adambulacral plates. Perhaps intermediate between *L. furcifer* and *L. furcilliger*. R 89 mm; r 27 mm; R 3,3 r; breadth of ray at base 30 mm.

Off Pt. Arena, northern California, 75 fathoms. Bottom, fine sand.

This curious form may ultimately be found to intergrade with *L. furcifer* of the Arctic Ocean and North Atlantic. *Vexator* differs from typical *furcifer* (which apparently does not occur in the North Pacific, or Bering Sea) in having a more open abactinal skeleton with consequently more widely spaced paxillae, higher paxillae with longer spinelets, much smaller actinal intermediate areas with fewer actinal paxillae (about as in *furcilliger*) and longer adambulacral spines. If equal sized specimens of the 2 forms are compared *L. furcifer* is seen to have wide, rounded, interbrachial arcs which merge gradually into the ray. *Vexator* has a smaller disk, never rounded interbrachial arcs, but acute angles, the rays being sometimes swollen at the base so that the marginal and adjacent abactinal paxillae of the 2 rays interlock. The difference in the abactinal skeleton is parallel to that of *Solaster* (*Crossaster*) *squamatus* and *S. papposus*.

Sarkaster Ludwig is not separable from *Lophaster*, the type *S. validus* being doubtfully distinct from my *L. furcilliger*. Besides, *Lophaster* has actinal intermediate plates on the ray. *L. vexator* forms a perfect link between the extremes *L. furcilliger* and *L. furcifer*.