



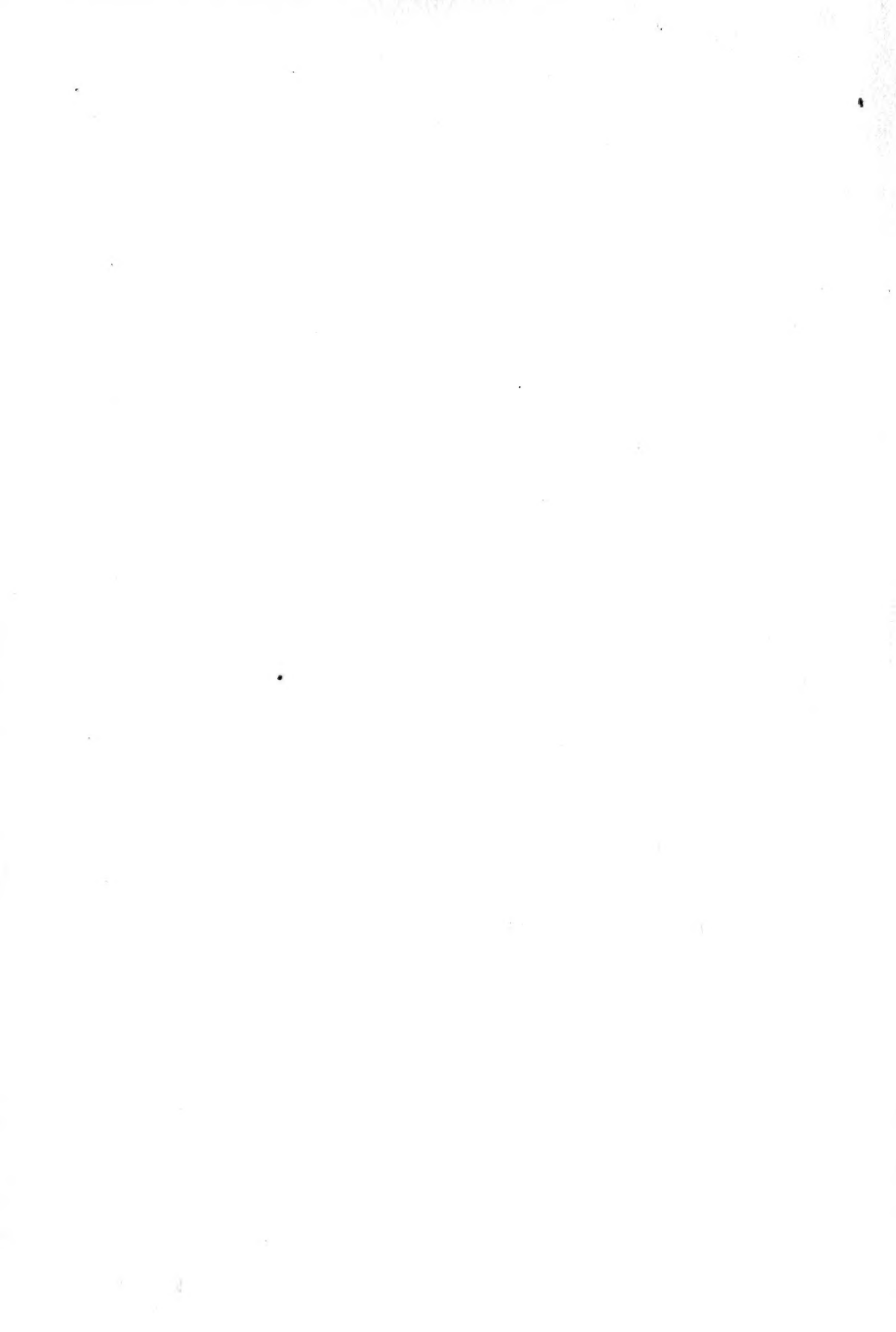
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SMITHSONIAN INSTITUTION

HARRIMAN ALASKA SERIES

VOLUME XIV

Monograph of the Shallow-water
Starfishes of the North Pacific Coast
from the Arctic Ocean to California

(WITH 110 PLATES)

BY

ADDISON EMERY VERRILL

Professor Emeritus of Yale University

PART 2. PLATES



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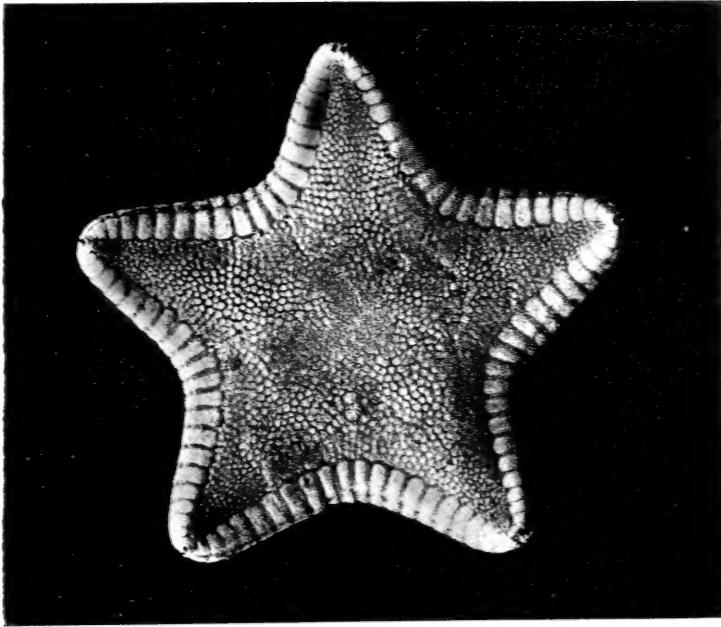
Shallow-water Starfishes of the North Pacific
Coast from the Arctic Ocean to California

PLATES I-CX WITH EXPLANATIONS

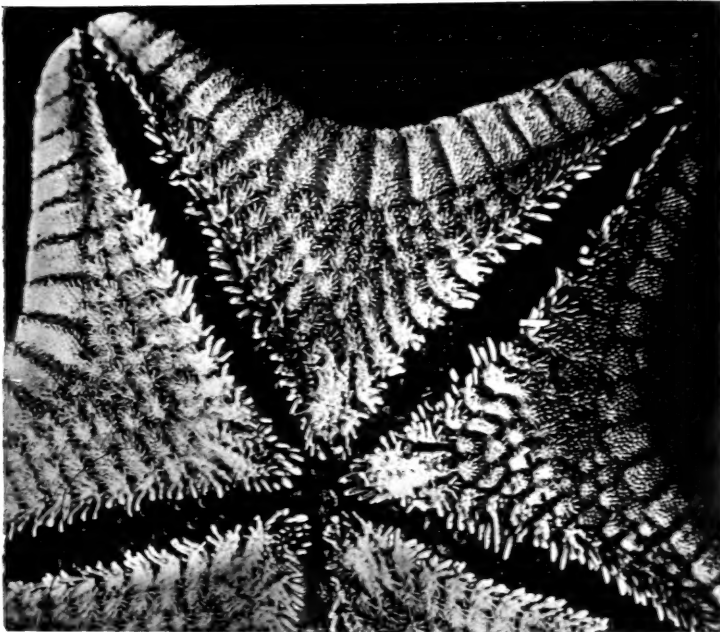
PLATE I.

- FIG. 1. *Glyphaster anomalus* (Fisher). Dorsal side; $\times 2$.
FIG. 2. The same specimen. Actinal side; $\times 4$. Alaska, Harriman Expedition.

1



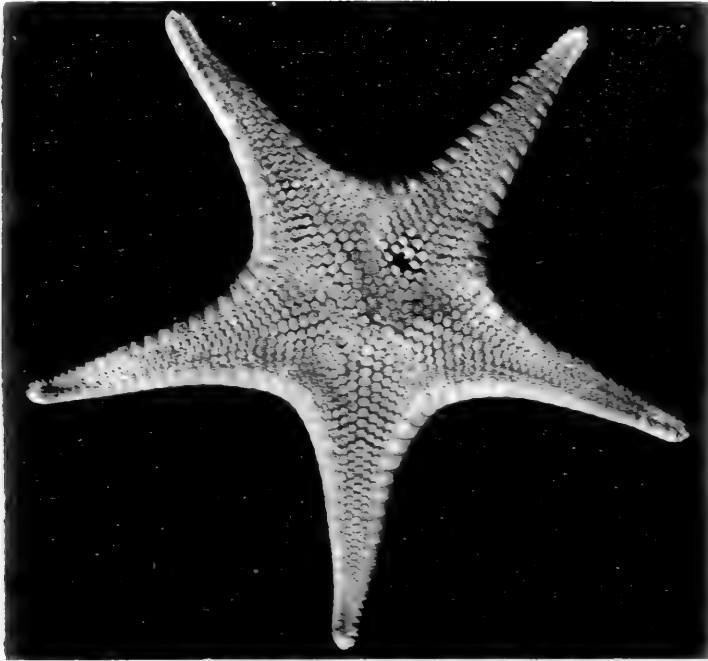
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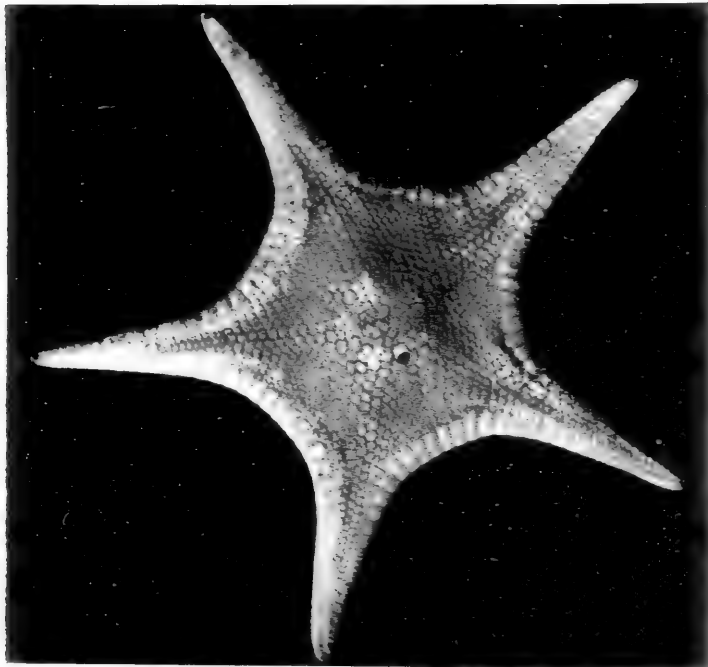
1, 2. GLYPHASTER ANOMALUS (Fisher)

PLATE II.

- FIG. 1. *Mediaster æqualis* Stimpson. Dorsal side; about natural size.
FIG. 2. *Mediaster bairdii* Verrill. Type. Dorsal side; about natural size.



2



1. *MEDIASTER ÆQUALIS* Stimpson
2. *MEDIASTER BAIRDII* Verrill. Type

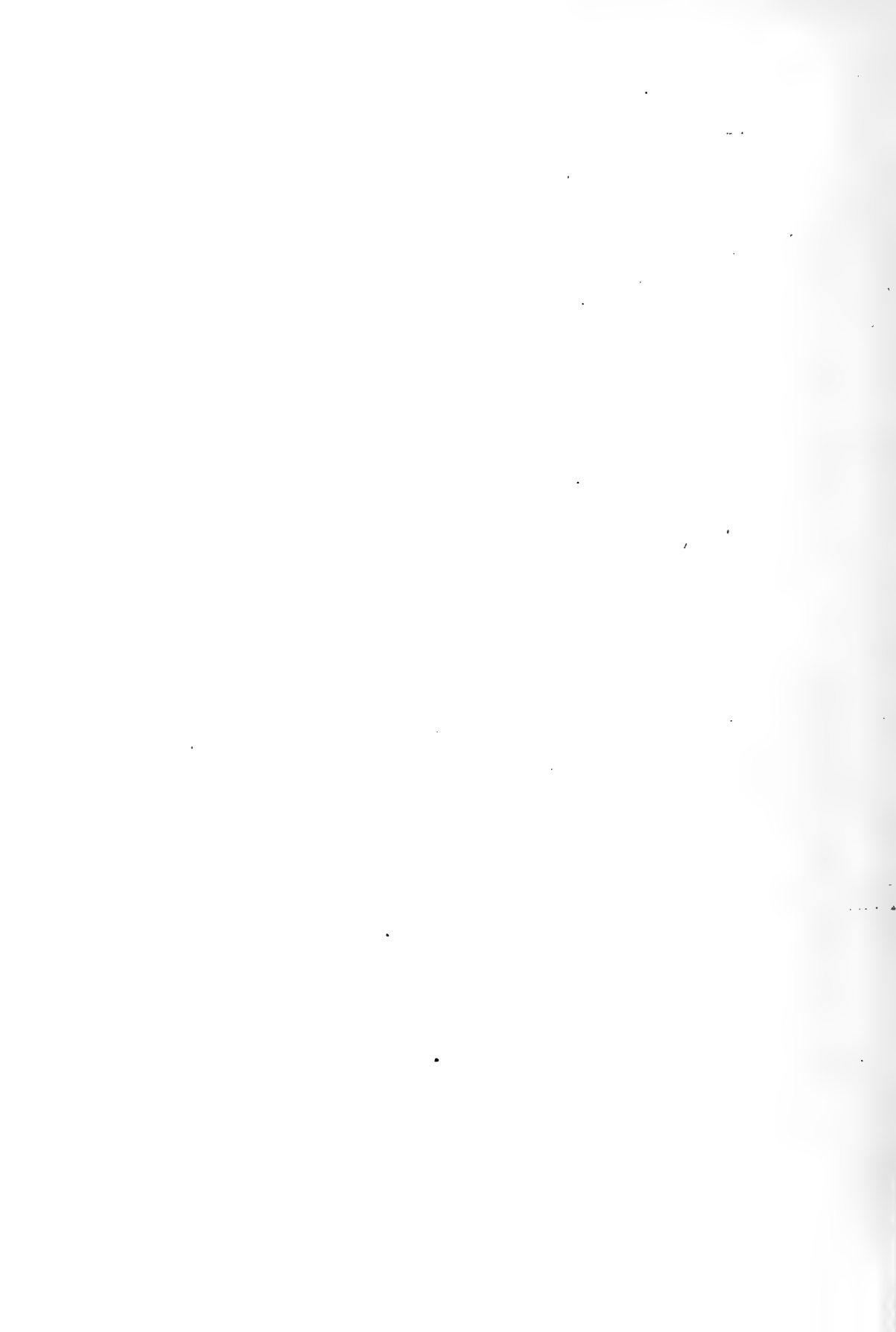


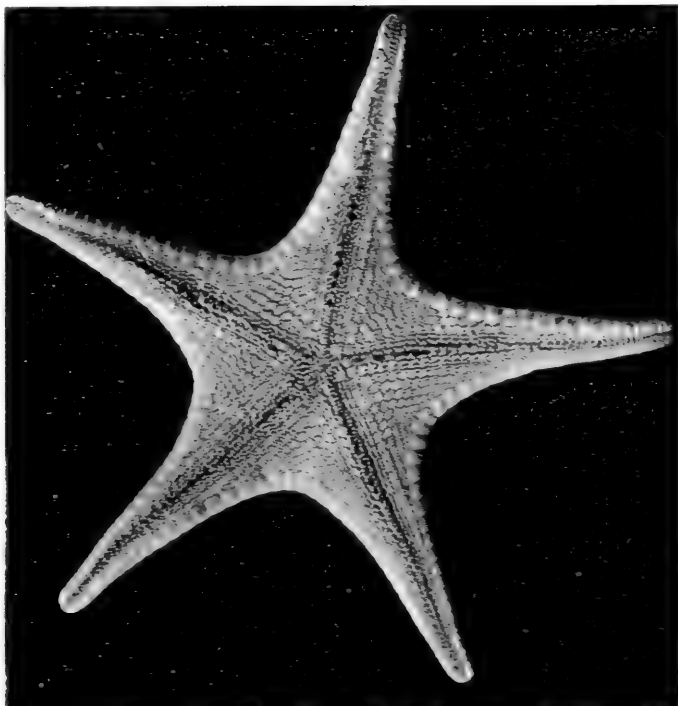


PLATE III.

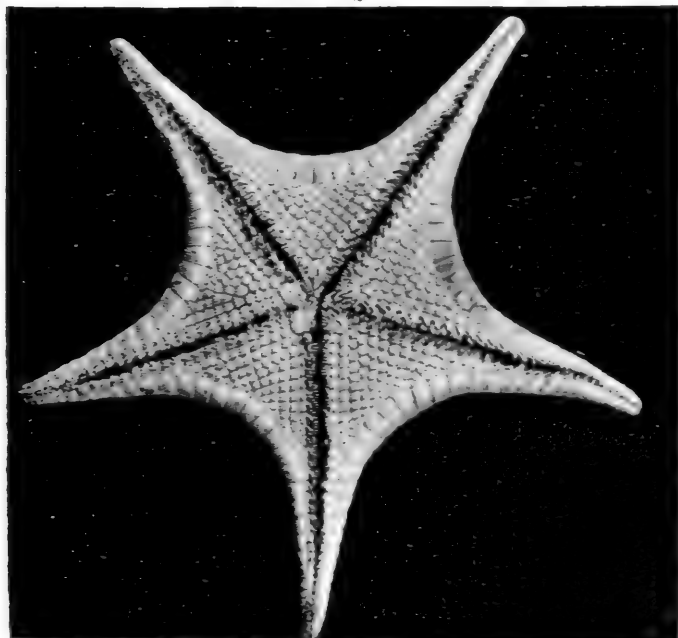
FIG. 1. *Mediaster æqualis* Stimpson. Ventral side; about natural size.

FIG. 2. *Mediaster bairdii* Verrill. Type. Ventral side; about natural size.

1



2

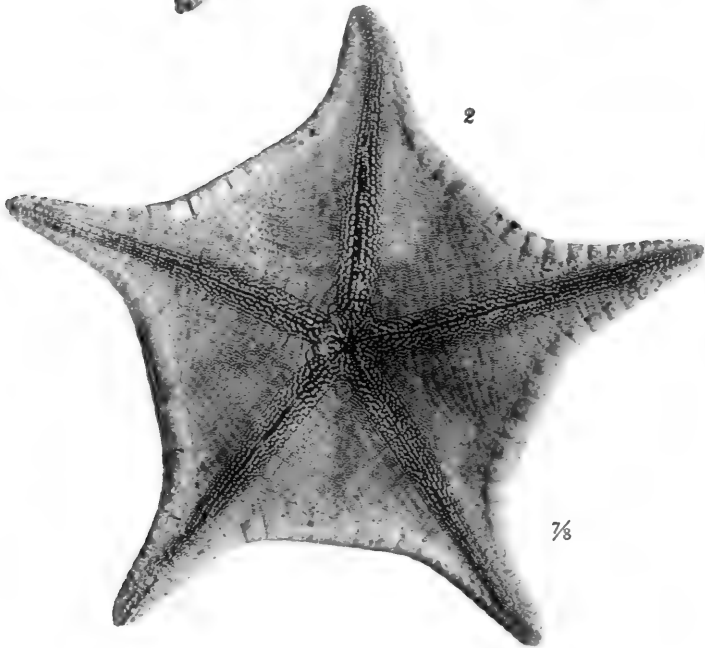
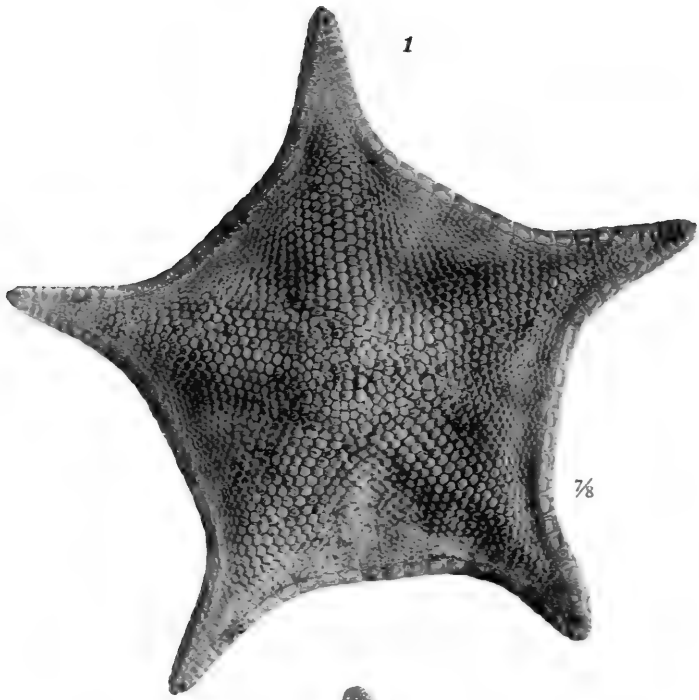


1. *MEDIASTER ÆQUALIS* Stimpson
2. *MEDIASTER BAIRDII* Verrill. Type



PLATE IV.

- FIG. 1. *Ceramaster granularis* (Retz.) Verrill. Dorsal side; about $\frac{7}{8}$ natural size. West Atlantic. Station 2506.
- FIG. 2. The same specimen. Ventral side; about $\frac{7}{8}$ natural size.



1, 2. CERAMASTER GRANULARIS (Retz.)

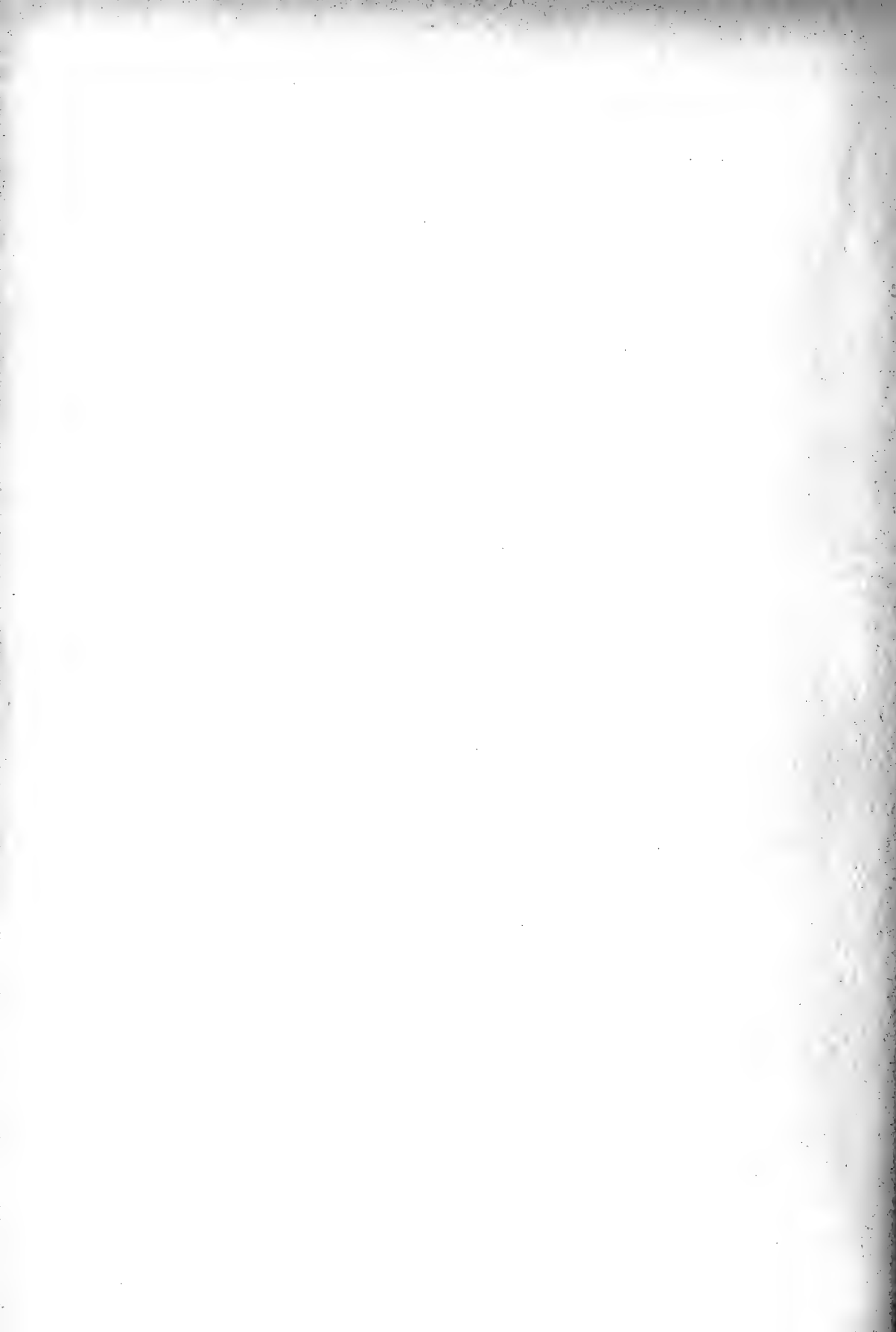
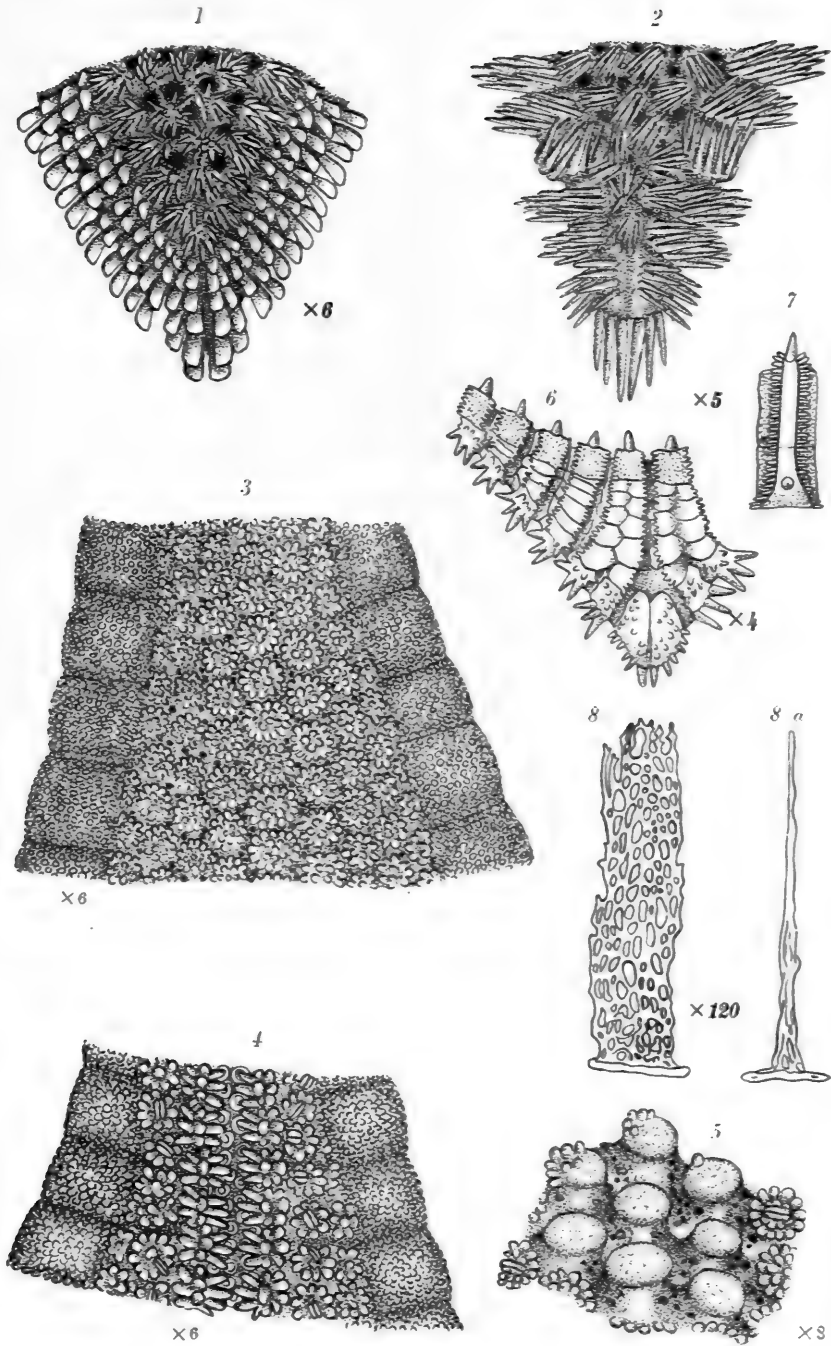




PLATE V.

- FIG. 1. *Henricia leviuscula*, var. *spatulifera* Verrill. Type. One of the actinal interradial areas, jaws, and proximal adambulacral spines; $\times 6$. Monterey. Yale Mus.
- FIG. 2. *Crossaster papposus* (Linn.) M. & Trosch. An interradial area and jaw; enlarged.
- FIGS. 3, 4. *Mediasia aequalis* Stimpson. Portions of dorsal and actinal sides of a ray; $\times 6$.
- FIG. 5. The same. Portion of dorsal side of a ray with spinules removed, showing plates and papular areas; $\times 8$.
- FIG. 6. *Ctenodiscus crispatus* (Retz.) D. & Kor. Portion of an interradial area, inferomarginal plates, and jaws; after Ludwig, from a Bering Sea specimen; $\times 4$.
- FIG. 7. The same. Front view of upper and under marginal plates; $\times 5$. From the same.
- FIGS. 8, 8a. The same. One of the fasciolar spinules, side and profile views; $\times 120$. From the same.



1. *HENRICIA LEVIUSCULA*, var. *SPATULIFERA* Verrill. Type
2. *CROSSASTER PAPPOSUS* (Linn.)
3, 4, 5. *MEDIASTER ÆQUALIS* Stimpson
6, 7, 8. *CTENODISCUS CRISPATUS* (Retz.)

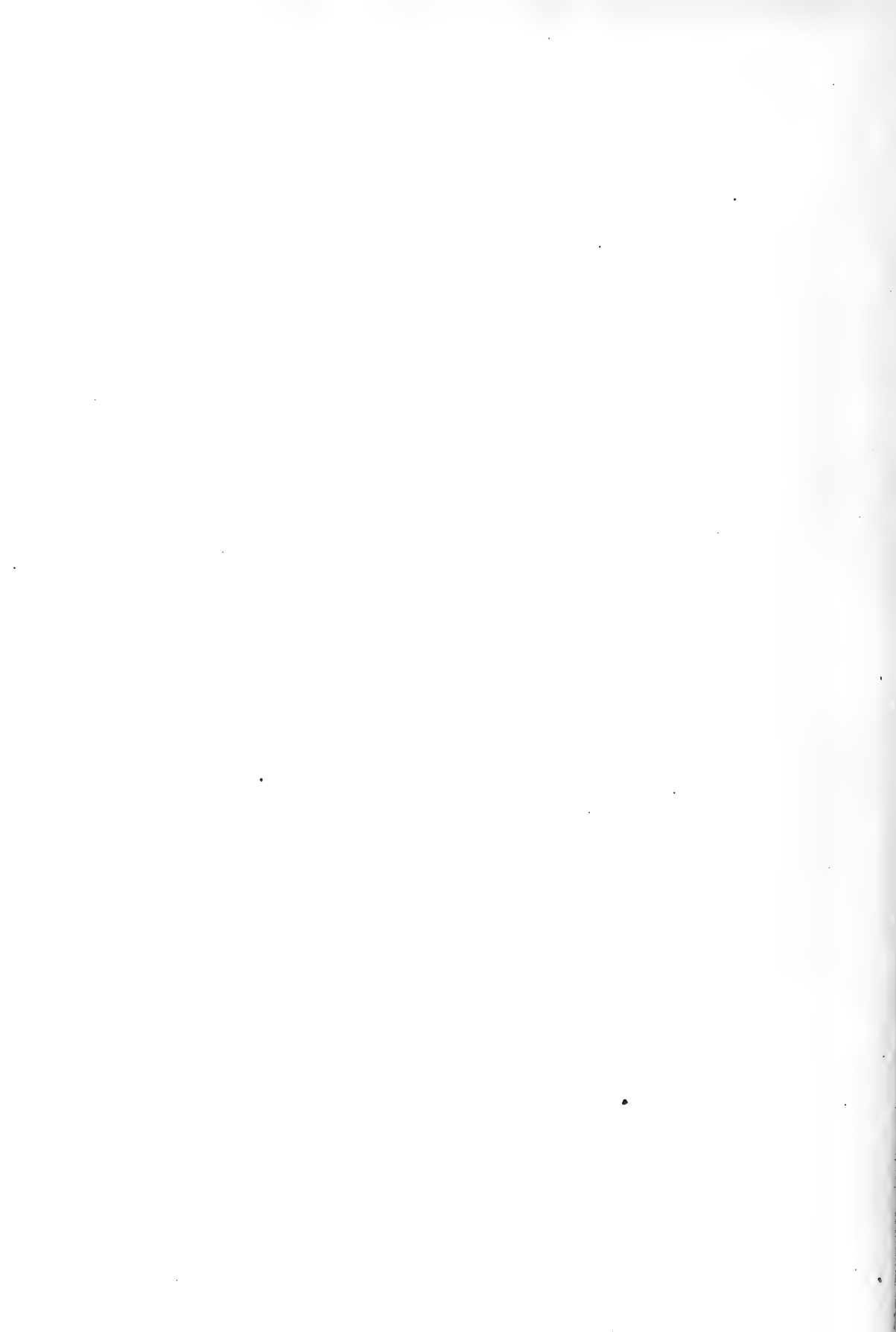
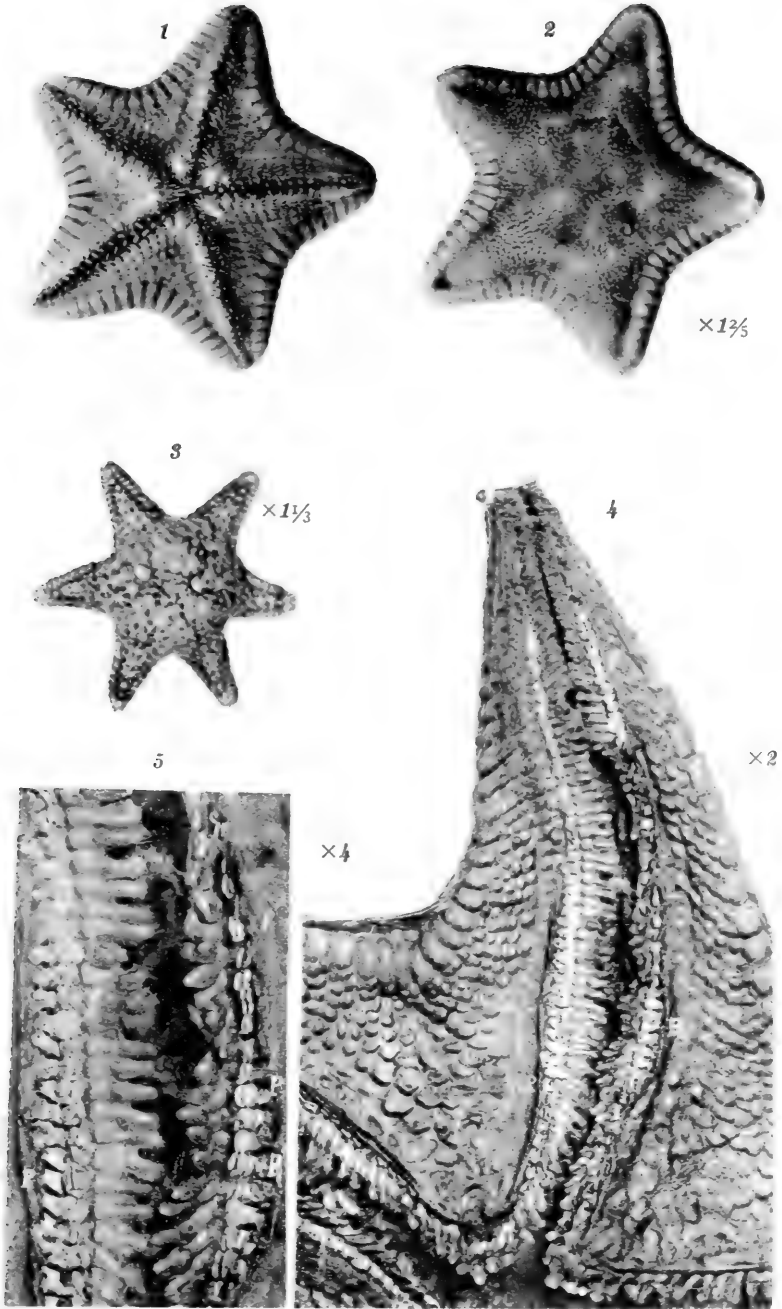


PLATE VI.

- FIG. 1. *Glyphaster anomalus* (Fisher) Verrill. Actinal side; $\times 1\frac{2}{5}$. British Columbia.
- FIG. 2. The same specimen. Dorsal side; $\times 1\frac{1}{2}$.
- FIG. 3. *Dermasterias imbricata* (Grube) Perrier. A young specimen, six-rayed. Dorsal side; $\times 1\frac{1}{3}$.
- FIG. 4. The same, adult. Details of ventral side; *P, P*, pedicellariæ; $\times 2$.
- FIG. 5. The same specimen. Portion more enlarged. *P, P*, bivalved pedicellariæ; *P', P'*, trivalved pedicellariæ; $\times 4$.



1, 2. *GLYPHASTER ANOMALUS* (Fisher)
3. *DERMASTERIAS IMBRICATA* (Grube). A young six-rayed specimen
4, 5. The same, adult. Details of ventral side

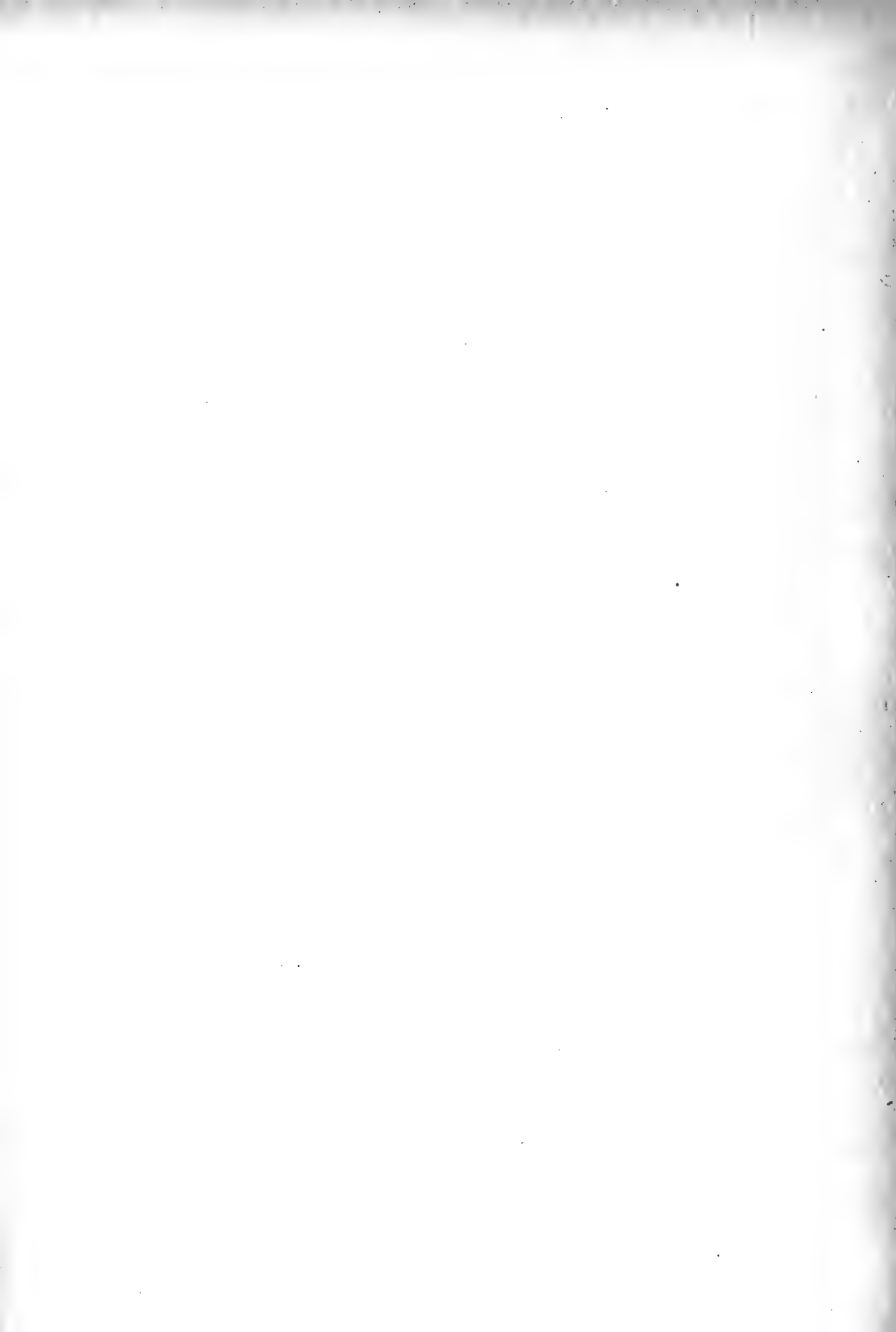
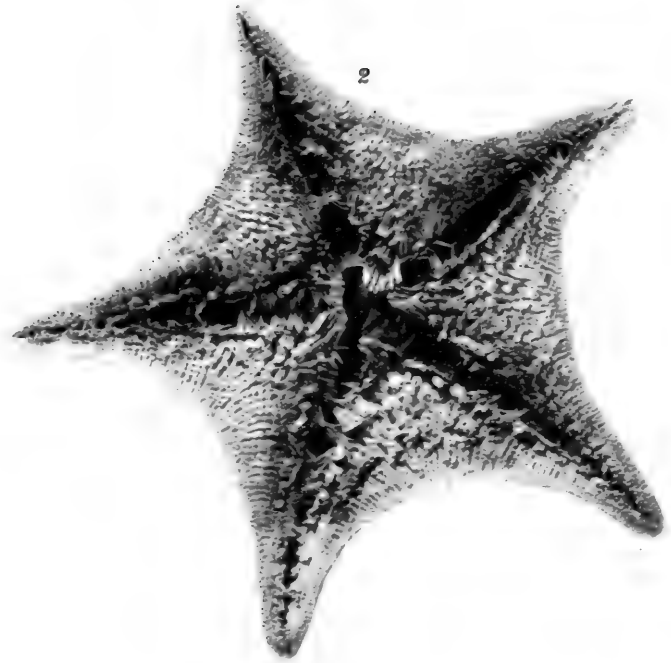
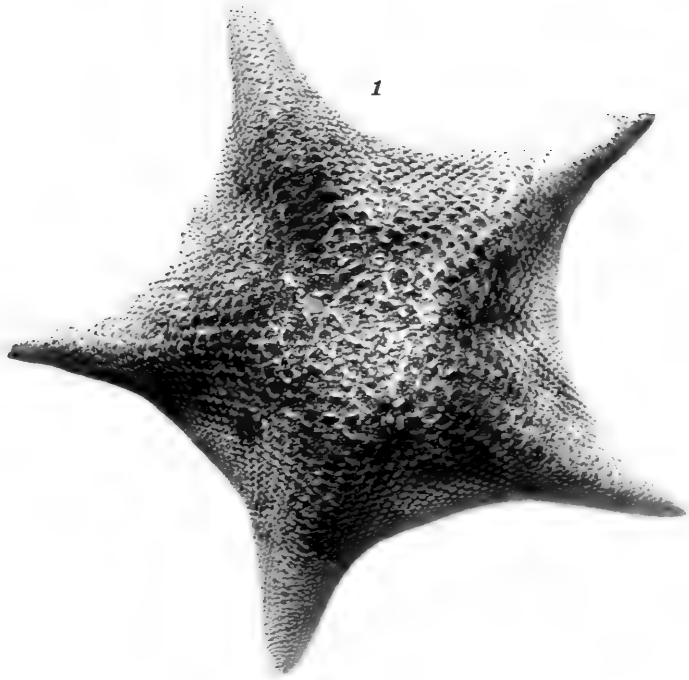




PLATE VII.

- FIG. 1. *Paliria miniata* (Brandt) Verrill. Dorsal side; about $\frac{3}{4}$ natural size.
FIG. 2. The same specimen. Ventral side. Yale Mus.



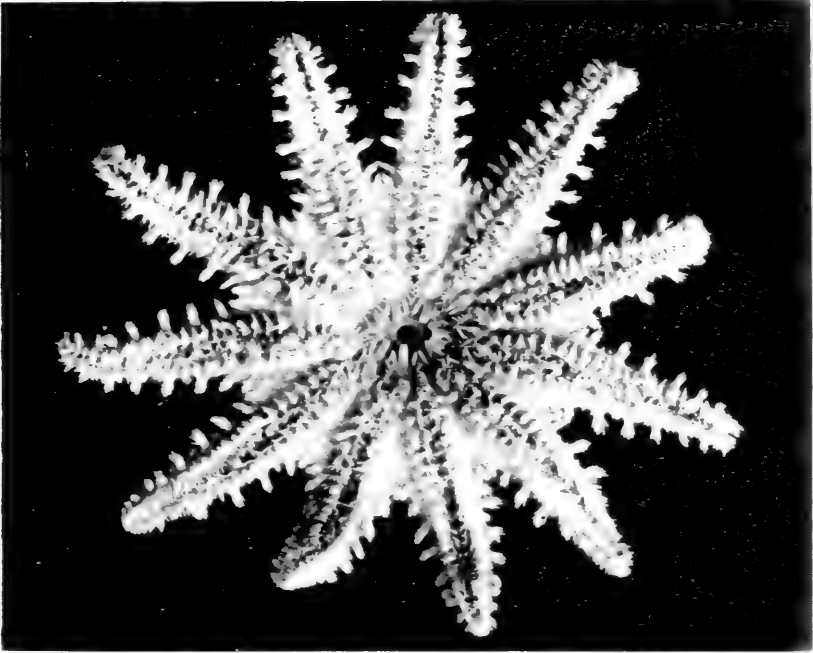
1, 2. PATIRIA MINIATA (Brandt)





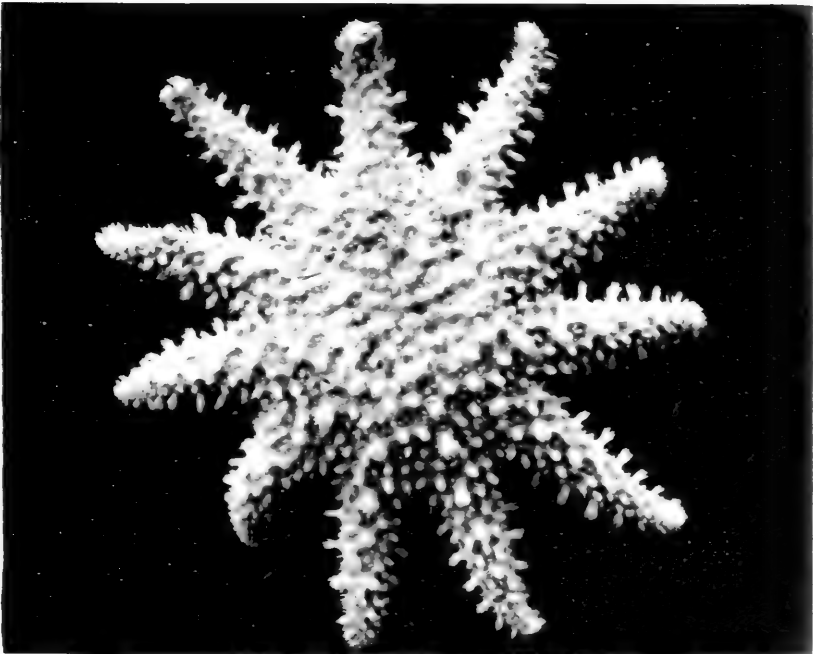
PLATE VIII.

- FIG. 1. *Crossaster papposus* (Linn.) M. & Troschel. A young specimen, in alcohol. Ventral side; $\times 13\frac{1}{4}$.
- FIG. 2. The same specimen. Dorsal side; $\times 17\frac{1}{2}$. Berg Bay. Yale Mus.



×134

2



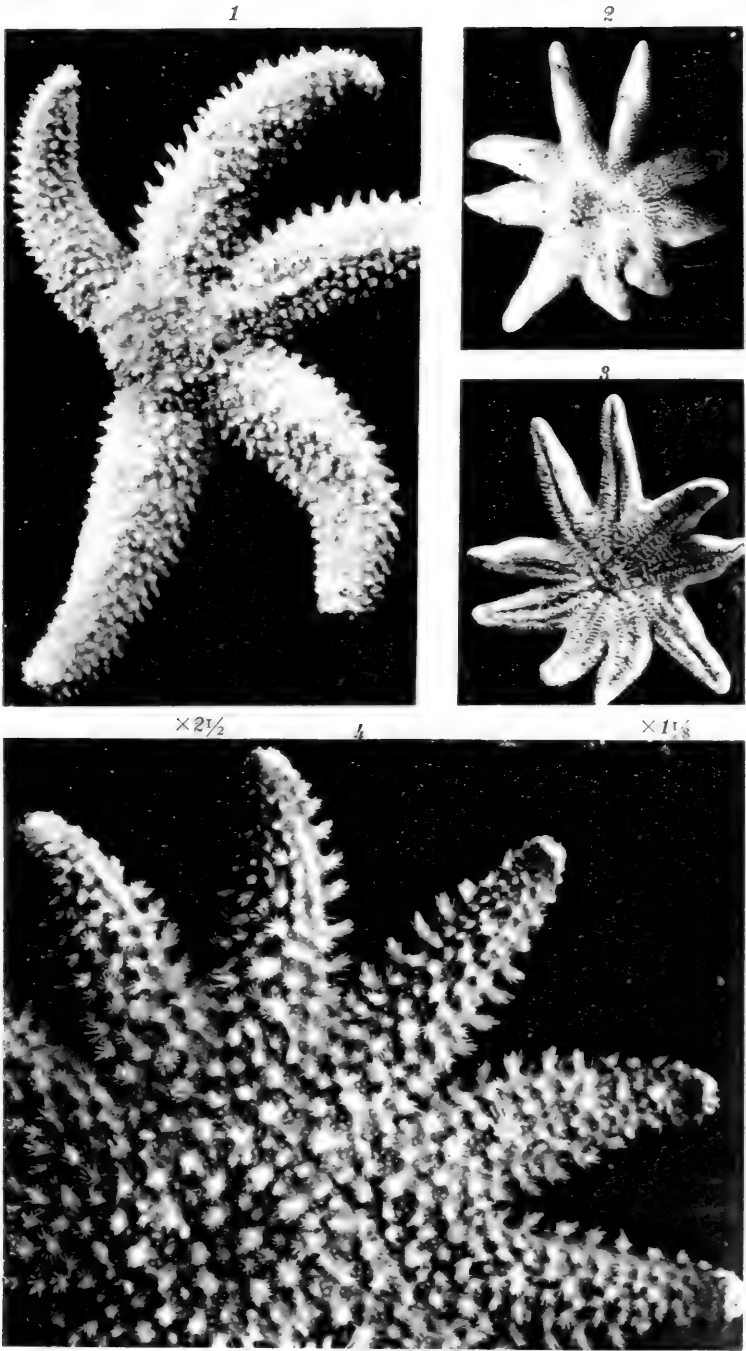
1, 2. *CROSSASTER PAPPOSUS* (Linn.)





PLATE IX.

- FIG. 1. *Leptasterias coei* Verrill. Type. In alcohol; $\times 2\frac{1}{2}$. Alaska, Harriman Expedition. Yale Mus.
- FIG. 2. *Solaster endeca* (Linn.) Forbes. Young. Dorsal side; $\times 1\frac{1}{8}$. Harriman Expedition.
- FIG. 3. The same specimen. Ventral side; $\times 1\frac{1}{8}$. Juneau, 20 fathoms.
- FIG. 4. *Crossaster papposus* (Linn.) M. & Troschel. Details of dorsal side of a young specimen in alcohol; $\times 2\frac{3}{8}$. Berg Bay, Harriman Expedition. Yale Mus.



1. LEPTASTERIAS COEI Verrill. Type
2, 3. SOLASTER ENDECA (Linn.)
4. CROSSASTER PAPPOSUS (Linn.)

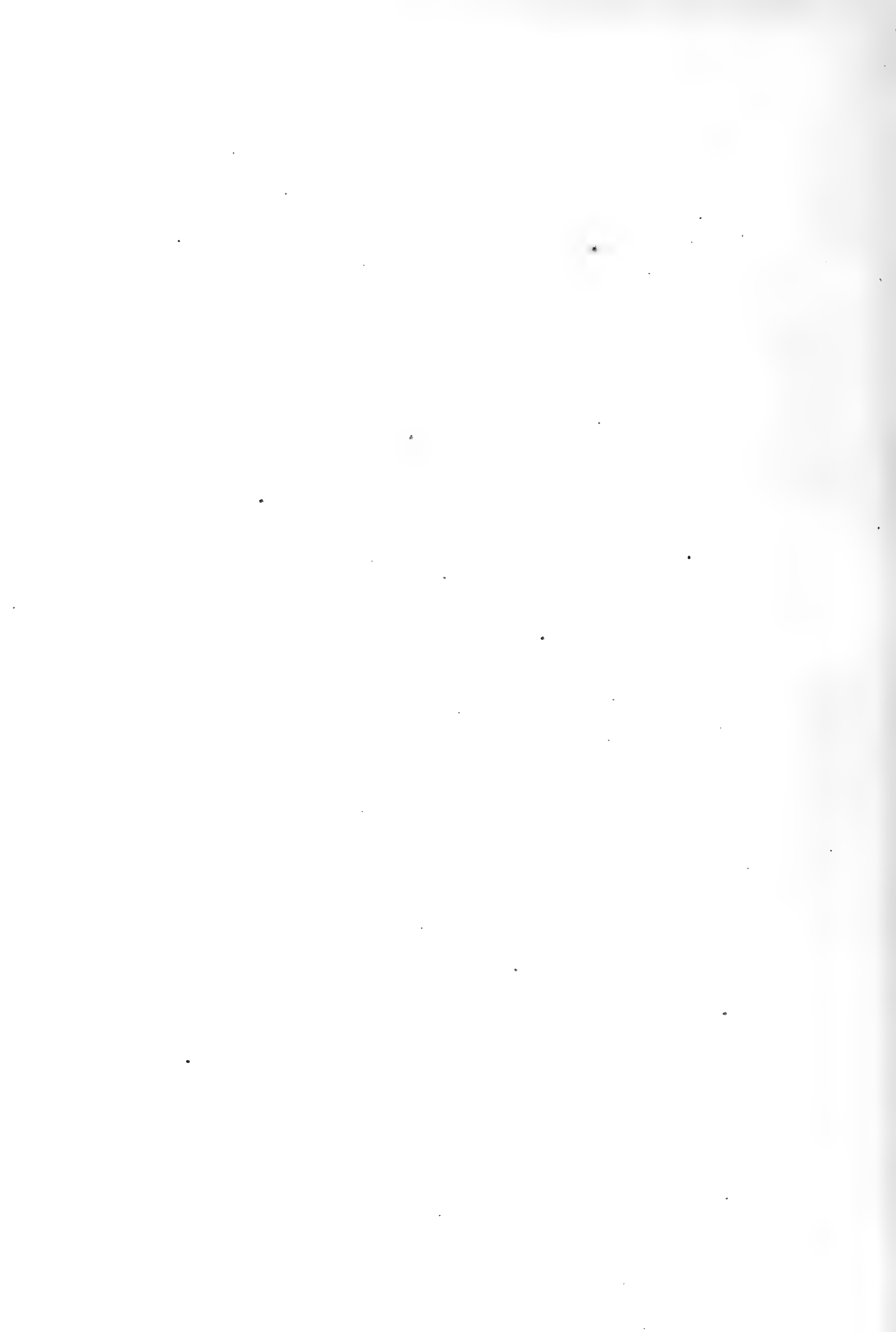
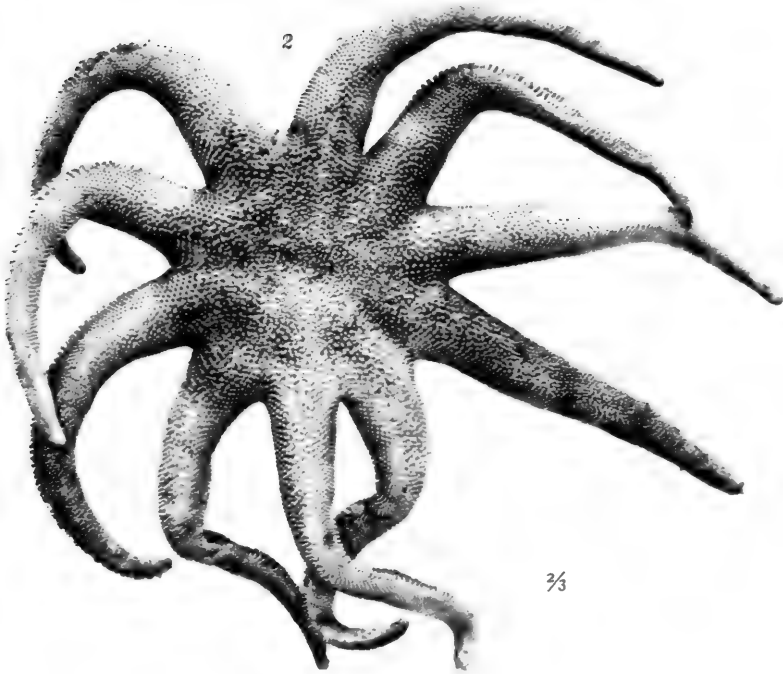
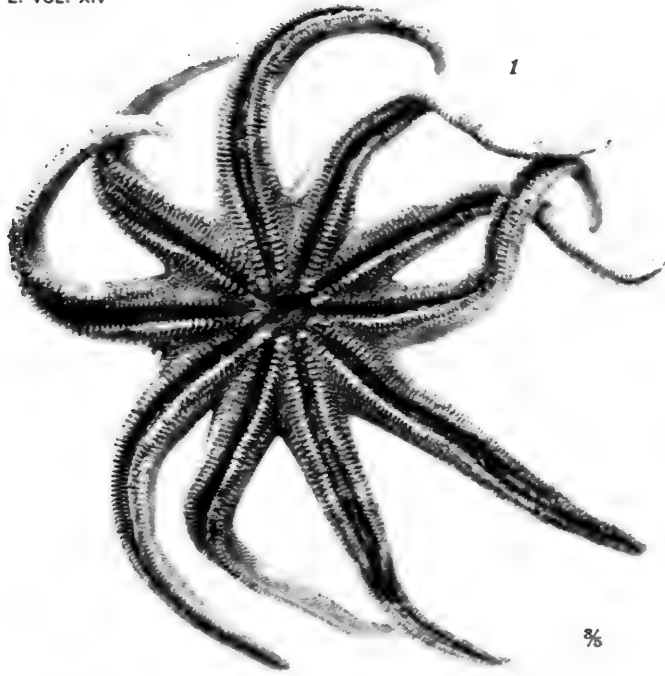


PLATE X.

- FIG. 1. *Solaster stimpsoni* Verrill. Type. Actinal side; about $\frac{3}{8}$ natural size.
British Columbia. No. 5136. Yale Mus.
- FIG. 2. The same specimen. Dorsal side; about $\frac{2}{3}$ natural size.



1, 2. SOLASTER STIMPSONI Verrill. Type. No. 5407, Yale Mus.

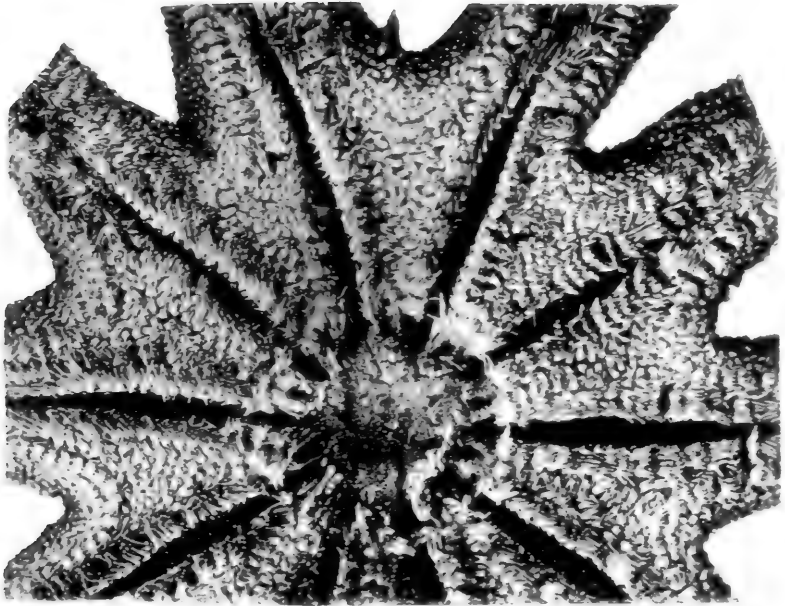




PLATE XI.

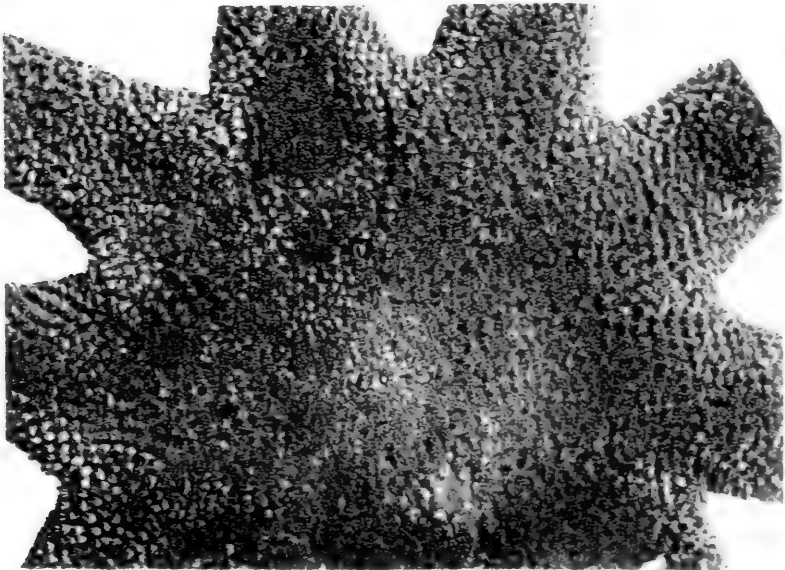
- FIG. 1. *Solaster simpsoni* Verrill. Cotype. Details of actinal side; $\times 14\frac{1}{2}$.
FIG. 2. The same specimen. Dorsal side; $\times 14\frac{1}{2}$.

1



$\times 14\frac{1}{2}$

2



1, 2. SOLASTER STIMPSONI Verrill. Cotype

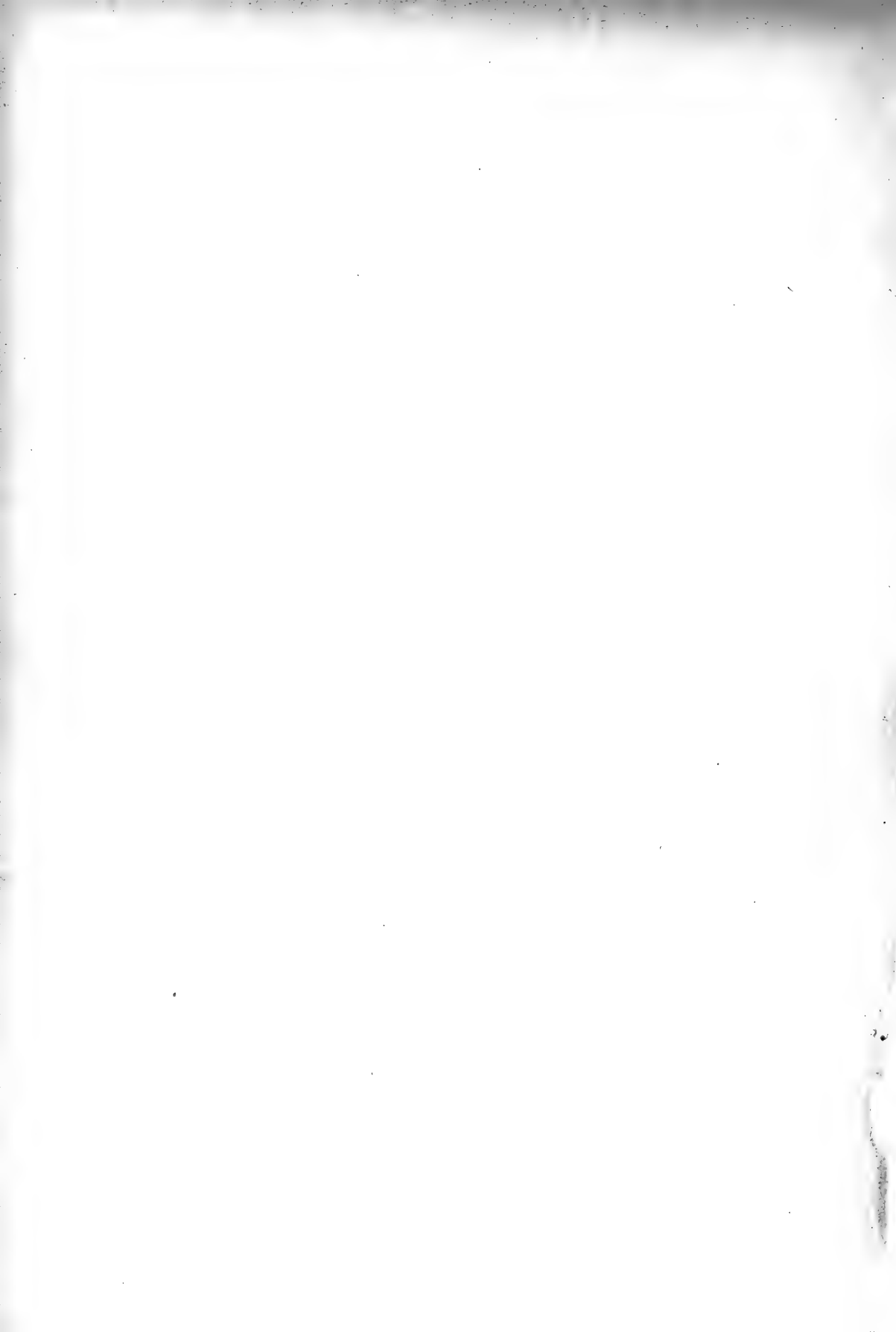
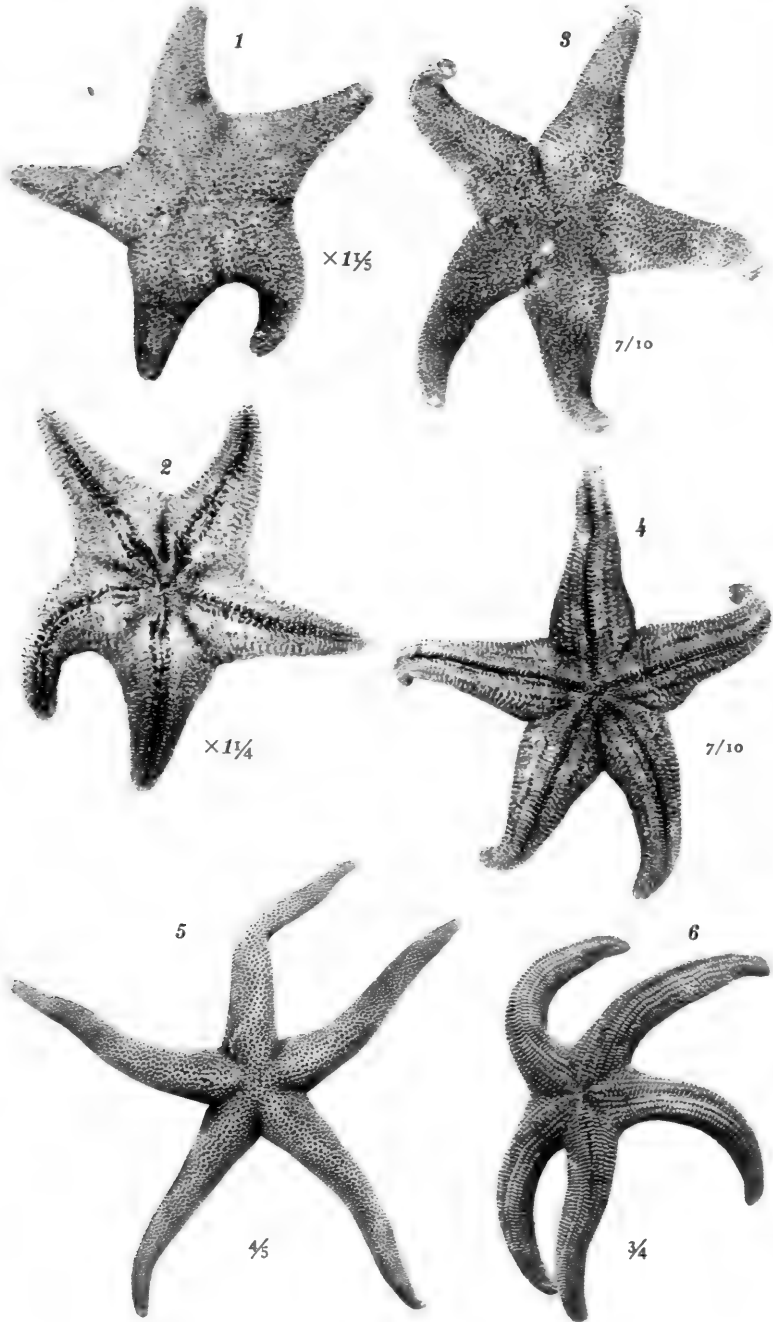




PLATE XII.

- FIG. 1. *Henricia tumida* Verrill. Type. Dorsal side; $\times 1\frac{1}{2}$. Yale Mus.
FIG. 2. The same specimen. Actinal side; $\times 1\frac{1}{4}$.
FIG. 3. *Henricia tumida borealis* Verrill. Type. Dorsal side; about $\frac{7}{10}$ natural size Dutch Harbor. Yale Mus.
FIG. 4. The same specimen. Actinal side; $\frac{7}{10}$ natural size.
FIG. 5. *Henricia leviuscula* (Stimpson). Typical form. Dorsal side; $\frac{2}{3}$ natural size.
FIG. 6. *Henricia leviuscula* (Stimpson), var. *dyscrita* Fisher. Actinal side; $\frac{3}{4}$ natural size.

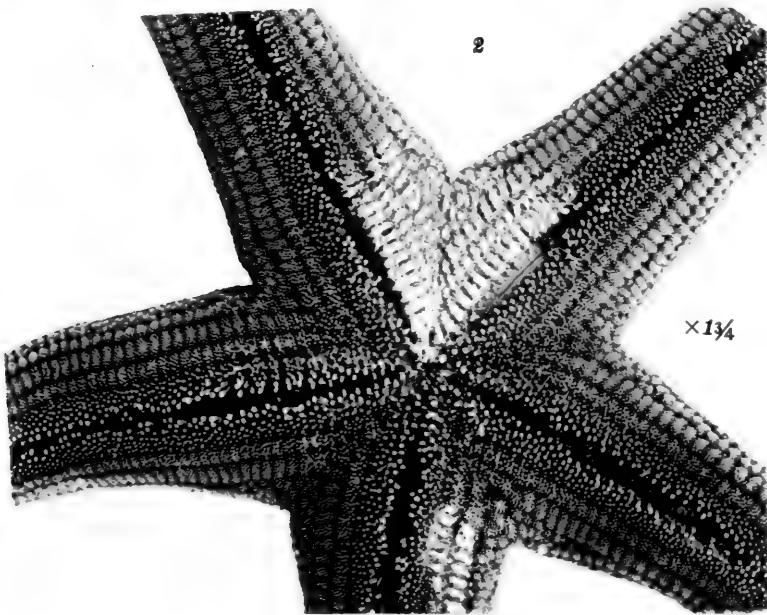
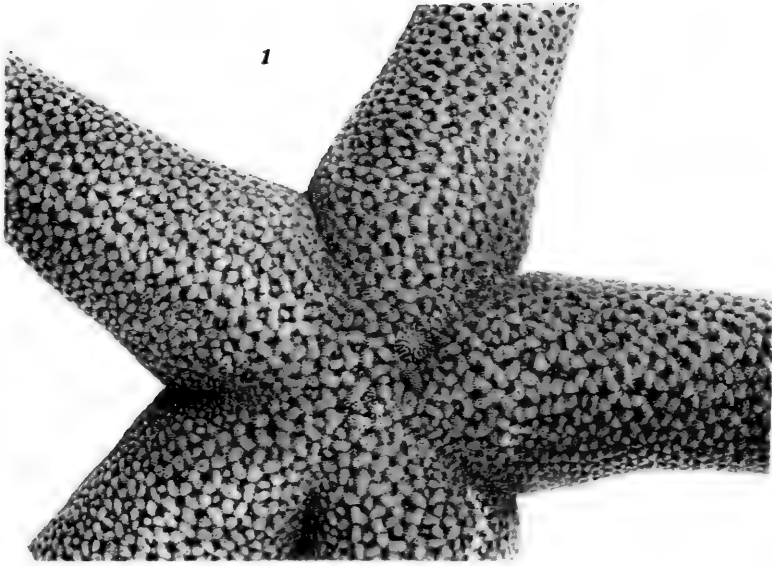


1, 2. *HENRICIA TUMIDA* Verrill. Type
3, 4. *HENRICIA TUMIDA BOREALIS* Verrill. Type
5. *HENRICIA LEVIUSCULA* (Stimpson)
6. *HENRICIA LEVIUSCULA* (Stimpson), var. *DYSCRITA* Fisher



PLATE XIII.

- FIG. 1. *Henricia leviuscula* (Stimpson). Details of dorsal side of the typical form; $\times 13\frac{1}{4}$. Yale Mus.
- FIG. 2. The same specimen. Ventral side; with spines partly removed; $\times 13\frac{1}{4}$. Yale Mus.

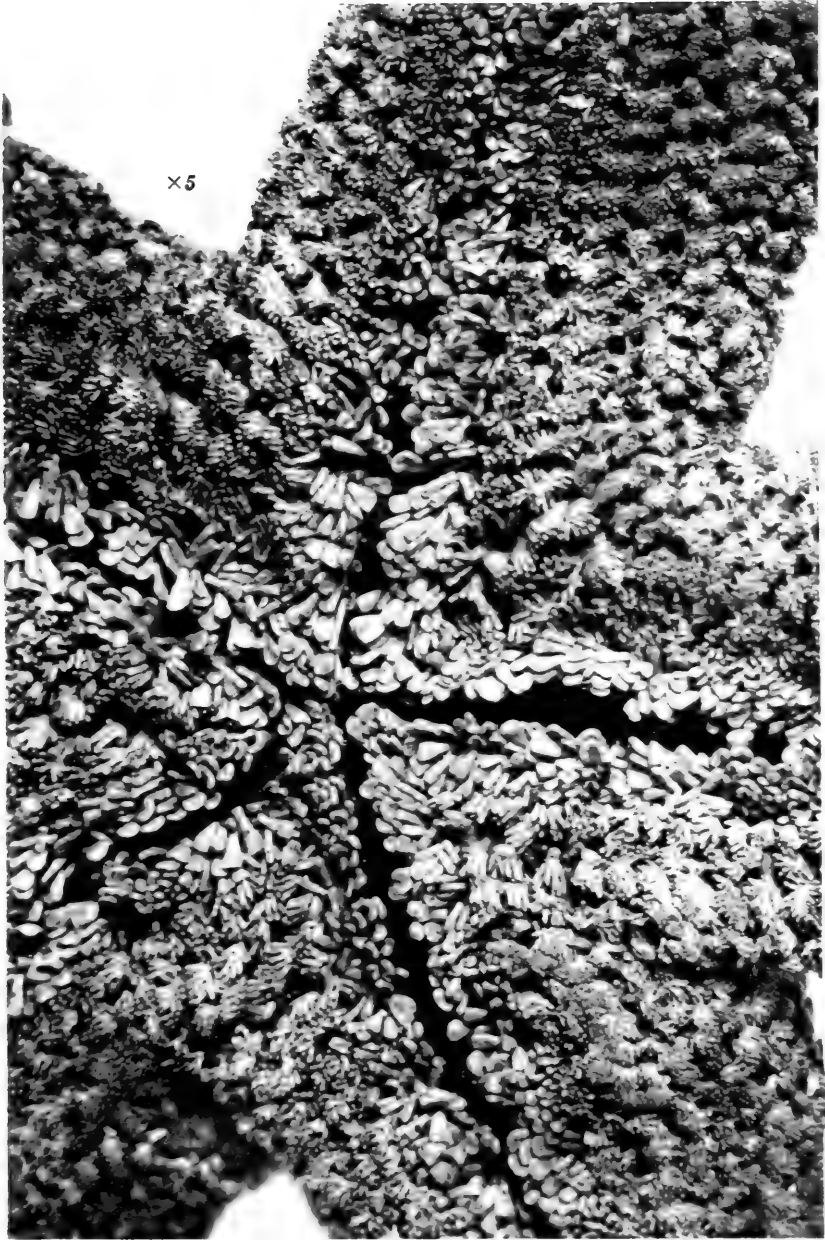


1, 2. *HENRICIA LEVIUSCULA* (Stimpson)



PLATE XIV.

FIG. 1. *Henricia leviuscula*, var. *spatulifera* Verrill. Type. Details of ventral side; $\times 5$. Monterey, Calif. Yale Mus., No. 2238.



1. *HENRICIA LEVIUSCULA*, var. *SPATULIFERA* Verrill. Type

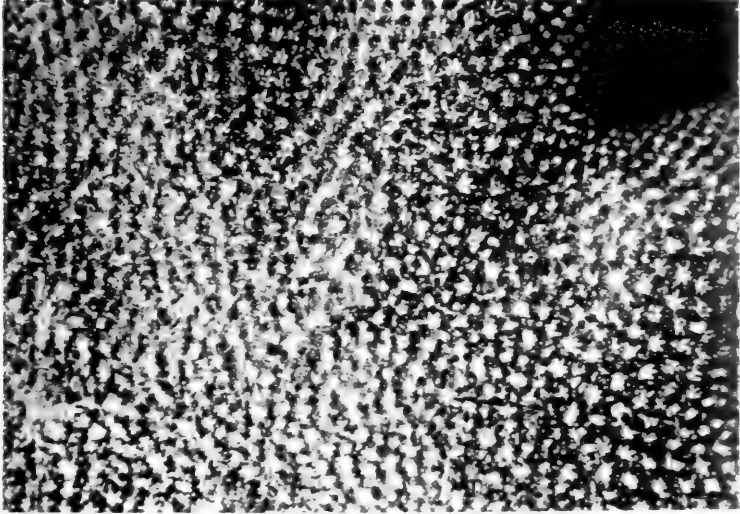




PLATE XV.

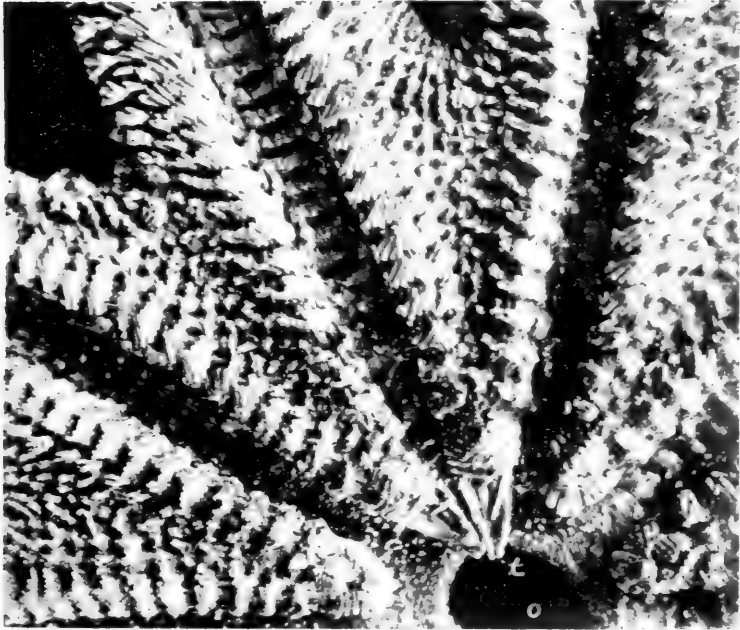
- FIG. 1. *Solaster stimpsoni* Verrill. Type. Same specimen as on pl. x (No. 5407, Yale Mus.). Details of dorsal side of disk; $\times 3$. Yale Mus.
- FIG. 2. The same specimen. Details of actinal side; *O*, mouth; *t*, peroral spines; $\times 3$.

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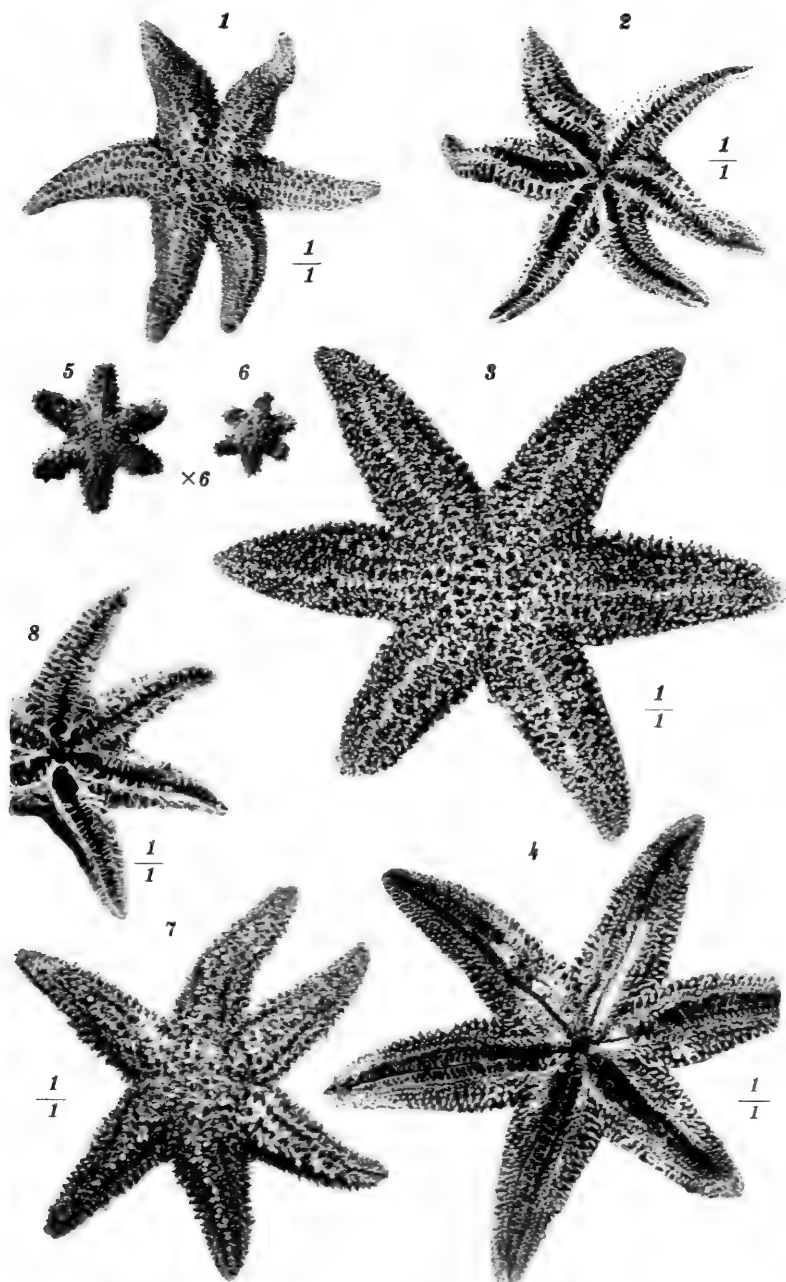
1, 2. SOLASTER STIMPSONI Verrill. Type. No. 5407, Yale Mus.





PLATE XVI.

- FIG. 1. *Leptasterias epichlora alaskensis*, var. *carinella* Verrill. Young. Dorsal side; natural size.
- FIG. 2. The same specimen. Actinal side; natural size. Yale Mus.
- FIG. 3. The same, var. *siderea* Verrill. Type. Dorsal side; about natural size.
- FIG. 4. The same specimen. Actinal side; about natural size. Yale Mus.
- FIGS. 5-6. The same. Very young stages; much enlarged (\times about 6). Yale Mus.
- FIG. 7. *Leptasterias dispar* Verrill. Type. Dorsal side; about natural size. Yale Mus.
- FIG. 8. *Leptasterias aequalis* (Stimpson), var. Ventral side; about natural size.



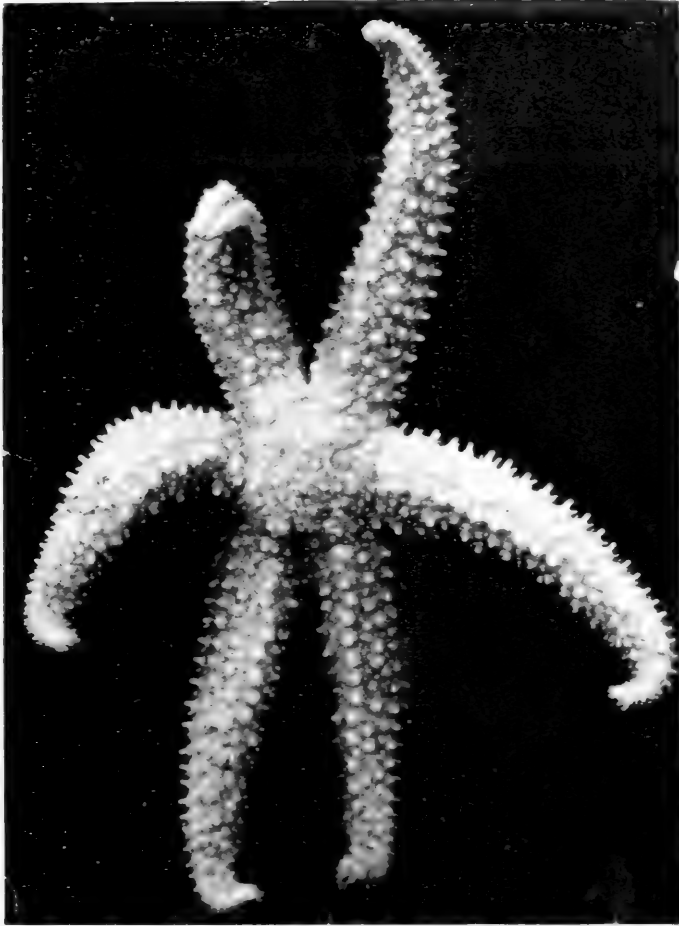
1, 2. LEPTASTERIAS EPICHLORA ALASKENSIS, var. CARINELLA Verrill
 3-6. The same, var. SIDEREA Verrill. Type
 7. LEPTASTERIAS DISPAR Verrill. Type
 8. LEPTASTERIAS ÆQUALIS (Stimpson), var.





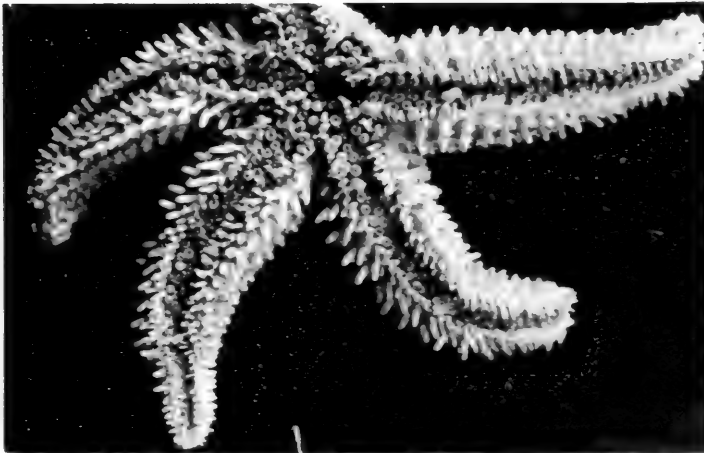
PLATE XVII.

- FIG. 1. *Leptasterias coei* Verrill. Type. In alcohol. Dorsal side; $\times 2\frac{1}{4}$.
Berg Bay. Yale Mus.
- FIG. 2. The same. Cotype. Specimen with shorter rays from Berg Bay.
Actinal view; $\times 2\frac{1}{4}$. Yale Mus.



×2¼

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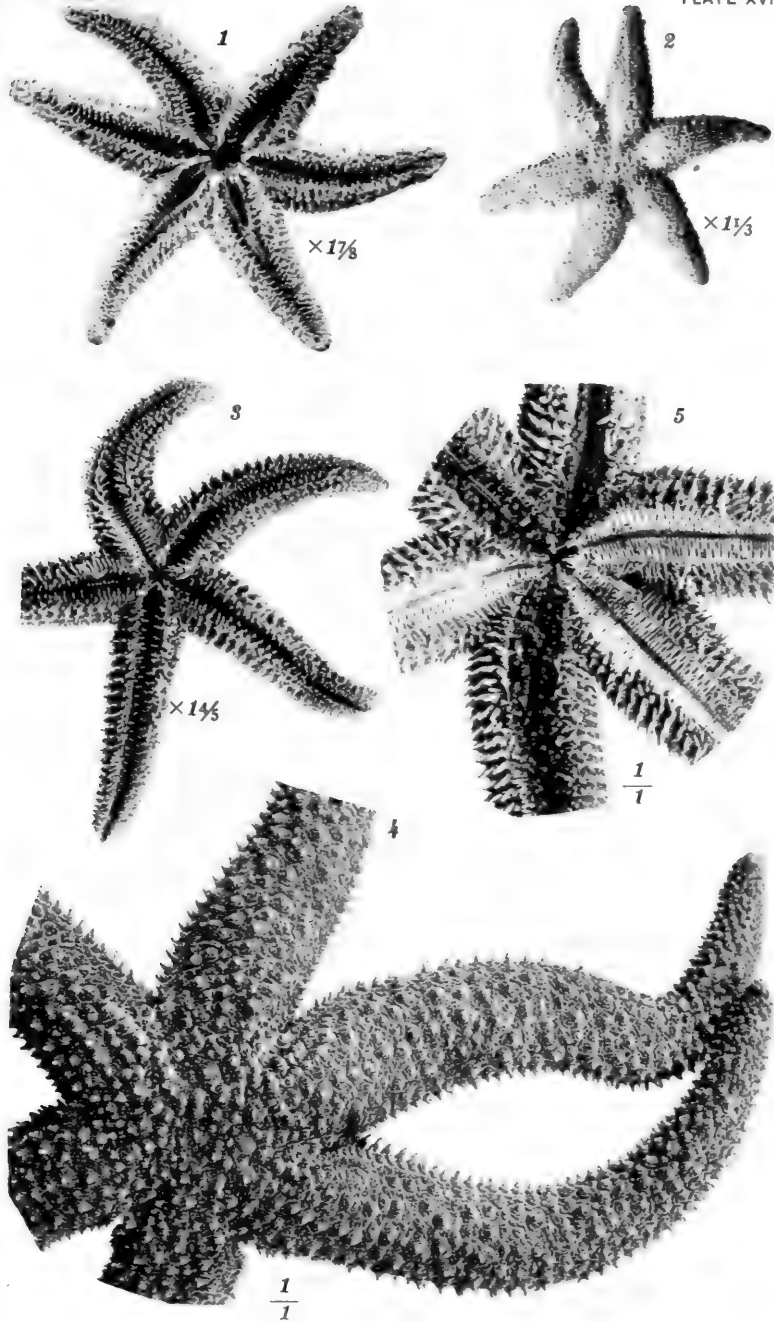


×2¼

1, 2. LEPTASTERIAS COEI Verrill. Type. Berg Bay. Yale Mus.

PLATE XVIII.

- FIG. 1. *Leptasterias equalis* (Stimpson). Typical form, from Monterey Bay. Actinal side; $\times 1\frac{7}{8}$.
- FIG. 2. The same specimen. Dorsal side; $\times 1\frac{1}{2}$.
- FIG. 3. *Leptasterias leptalea* Verrill. Type. Ventral side; $\times 1\frac{1}{2}$. Sitka. Yale Mus.
- FIG. 4. *Orthasterias merriami* Verrill, sp. nov. Type. Dorsal side; about natural size.
- FIG. 5. The same specimen. Details. Actinal side; natural size. Juneau. Univ. of Calif.



1, 2. LEPTASTERIAS ÆQUALIS (Stimpson)
3. LEPTASTERIAS LEPTALEA Verrill. Type
4, 5. ORTHASTERIAS MERRIAMII Verrill. Type

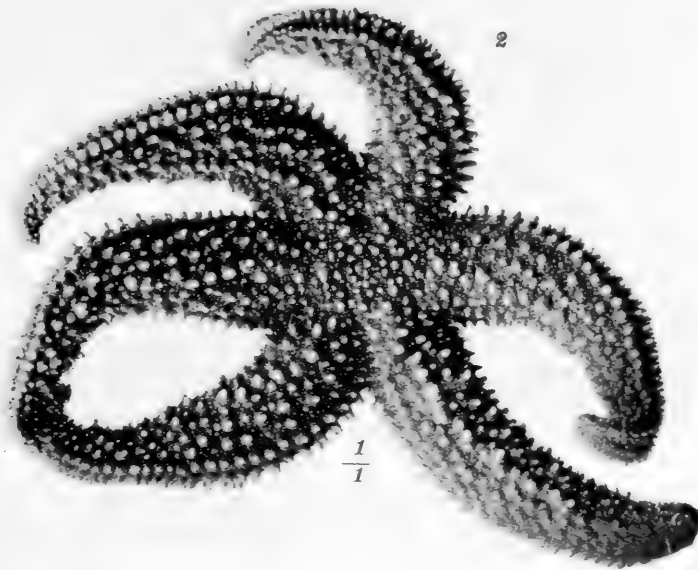
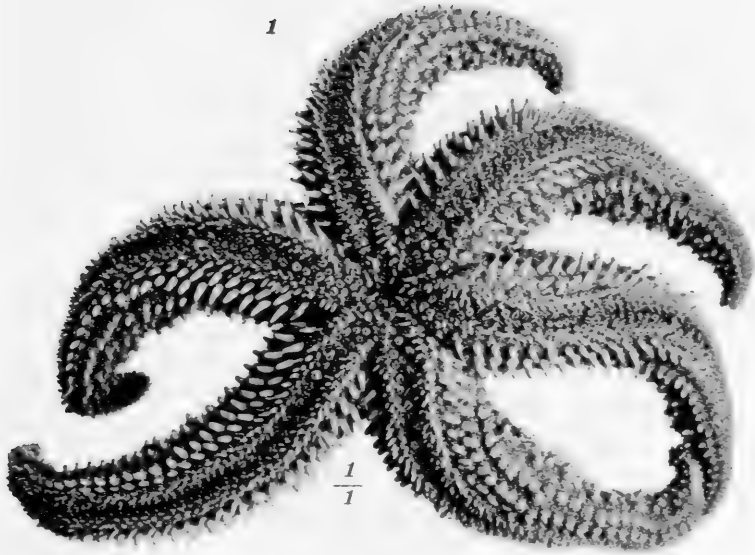




PLATE XIX.

FIG. 1. *Orthasterias merriami* Verrill. Type. In alcohol. Actinal side;
natural size. Glacier Bay.

FIG. 2. The same specimen. Dorsal side. Yale Mus.



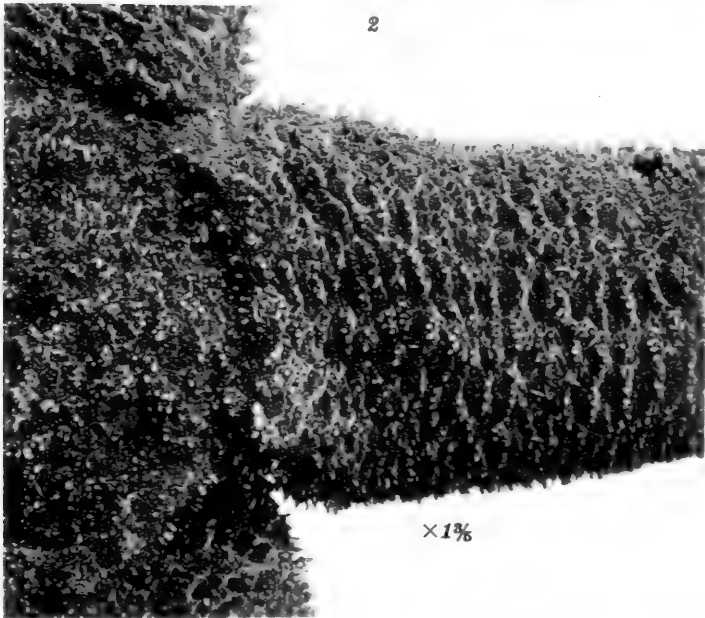
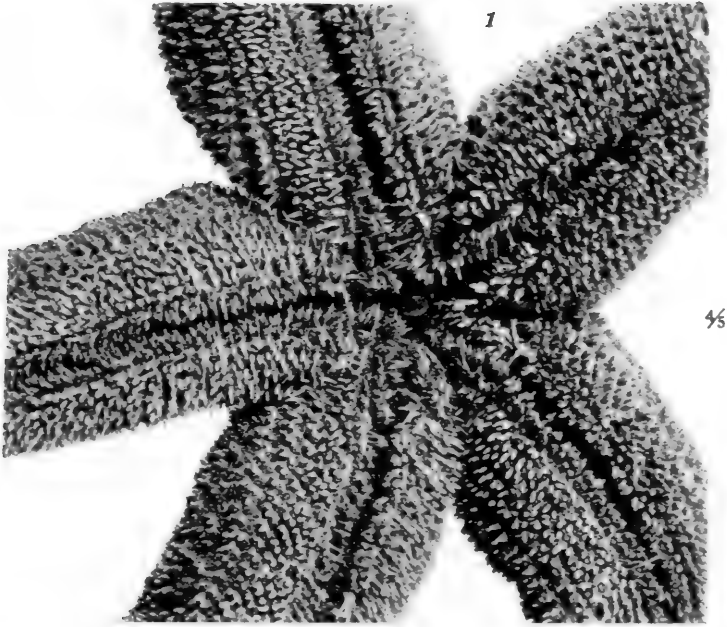
1, 2. ORTHASTERIAS MERRIAMII Verrill. Cotype





PLATE XX.

- FIG. 1. *Evasterias acanthostoma* Verrill. Type. Actinal side; $\frac{1}{2}$ natural size.
FIG. 2. The same specimen. Portion of dorsal side; $\times 19\frac{1}{2}$. Popof Is.,
Alaska. Professor Ritter. Univ. Calif.



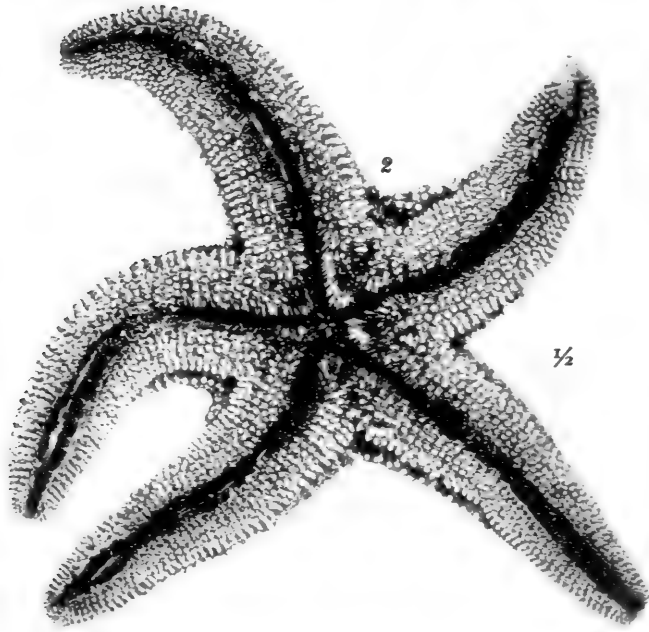
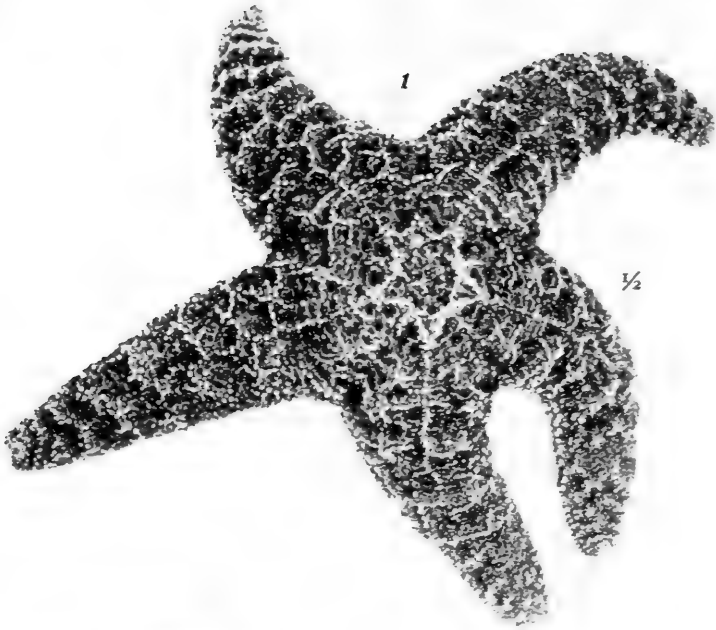
1, 2. EVASTERIAS ACANTHOSTOMA Verrill. Type





PLATE XXI.

- FIG. 1. *Pisaster ochraceus* (Brandt). Dorsal side; about $\frac{1}{2}$ natural size.
FIG. 2. The same. Actinal side; $\frac{1}{2}$ natural size.



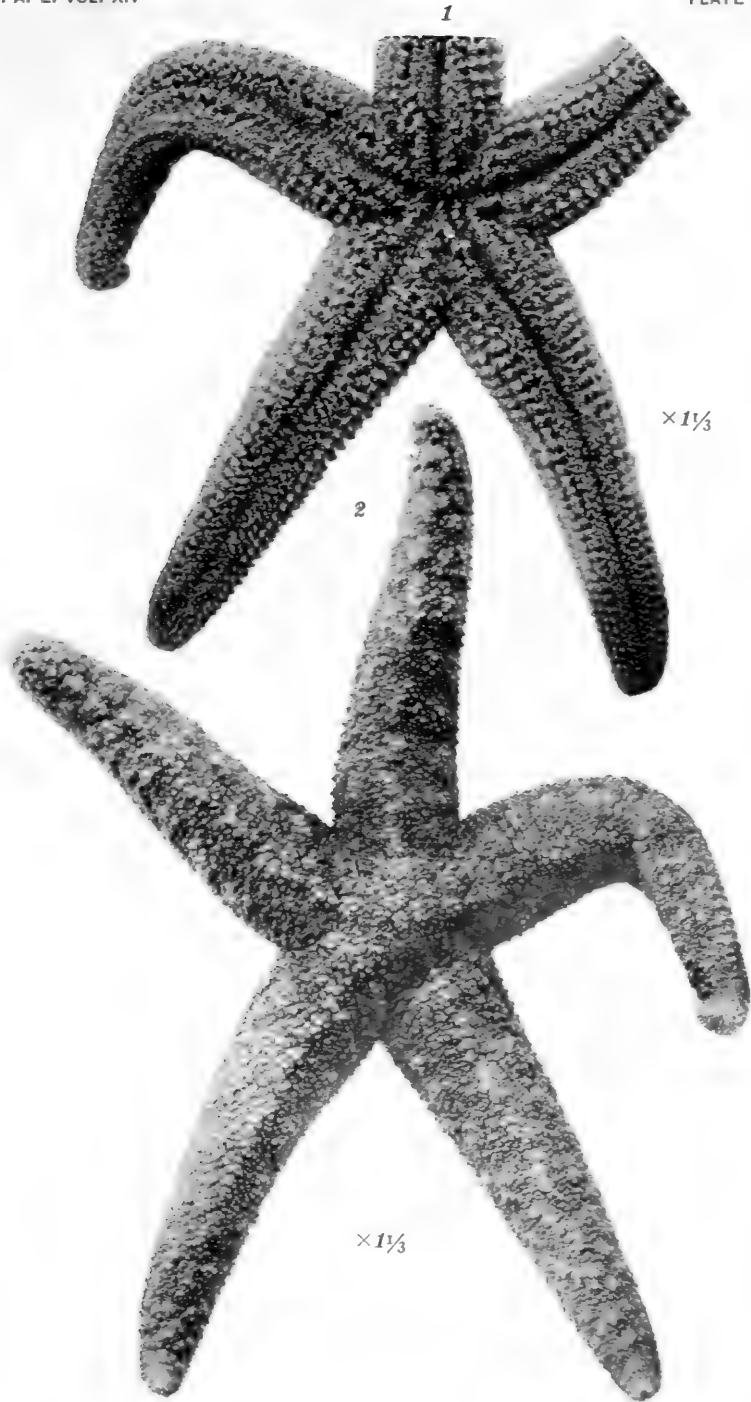
1, 2. PISASTER OCHRACEUS (Brandt)



PLATE XXII.

FIG. 1. *Evasterias troschelii* (Stimpson). Typical form, in alcohol. Actinal side; $\times 1\frac{1}{3}$.

FIG. 2. The same specimen. Dorsal side; $\times 1\frac{1}{3}$. Sitka. Yale Mus.



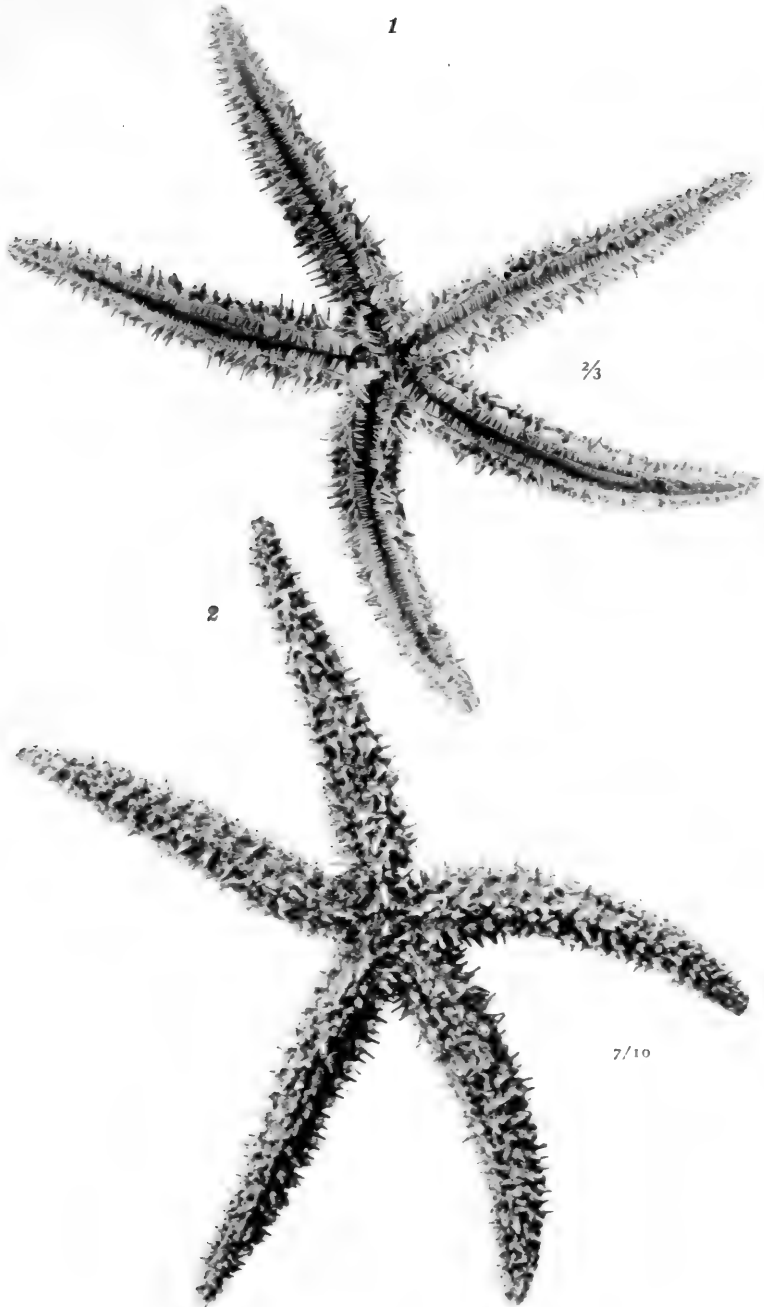
1, 2. *EVASTERIAS TROSCHELII* (Stimpson)





PLATE XXIII.

- FIG. 1. *Orthasterias dawsoni* Verrill. Type. Ventral side; $\frac{2}{3}$ natural size.
FIG. 2. The same specimen. Dorsal side; $\frac{7}{10}$ natural size. British Columbia,
Canadian Geol. Survey.



1, 2. *ORTHASTERIAS DAWSONI* Verrill. Type

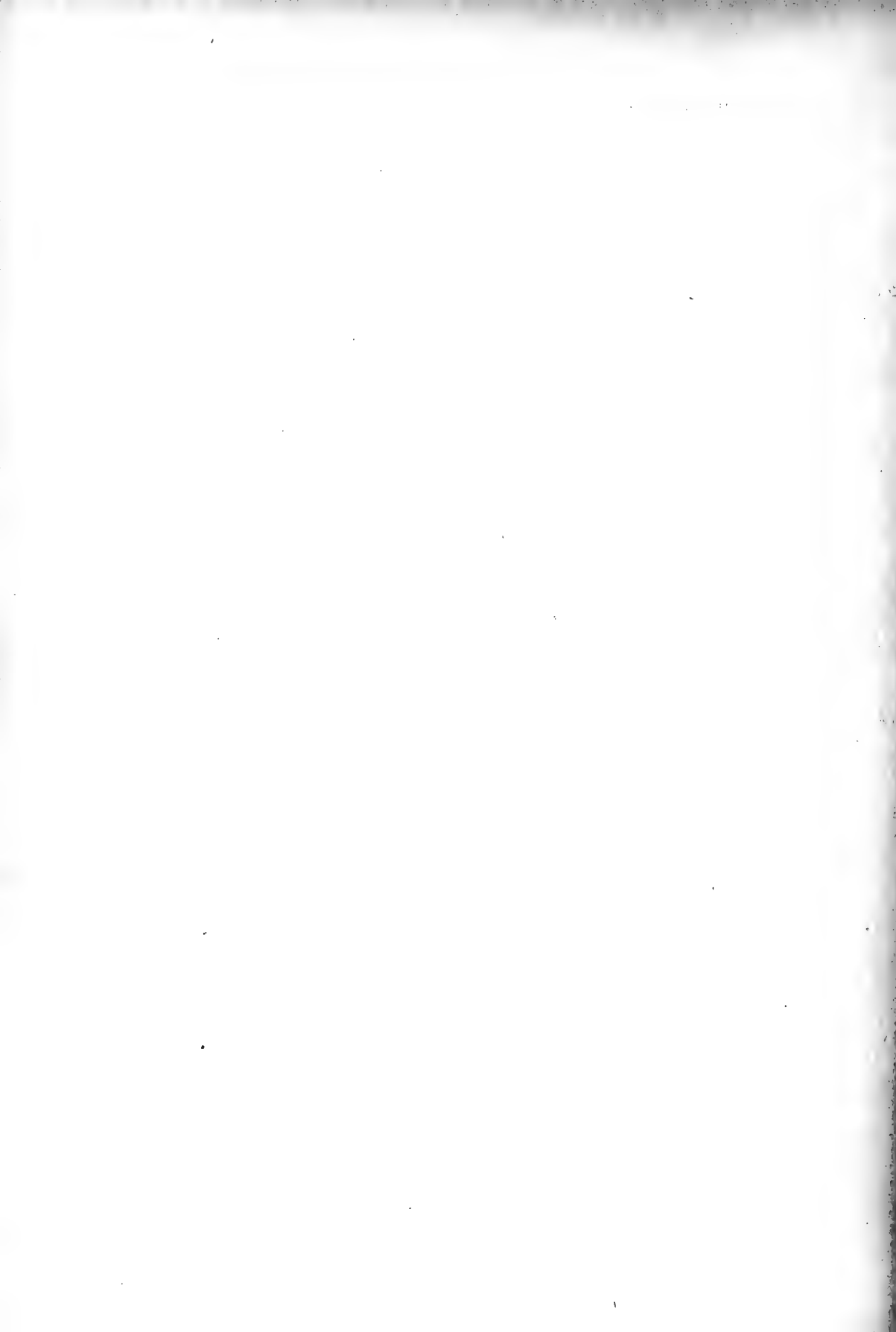
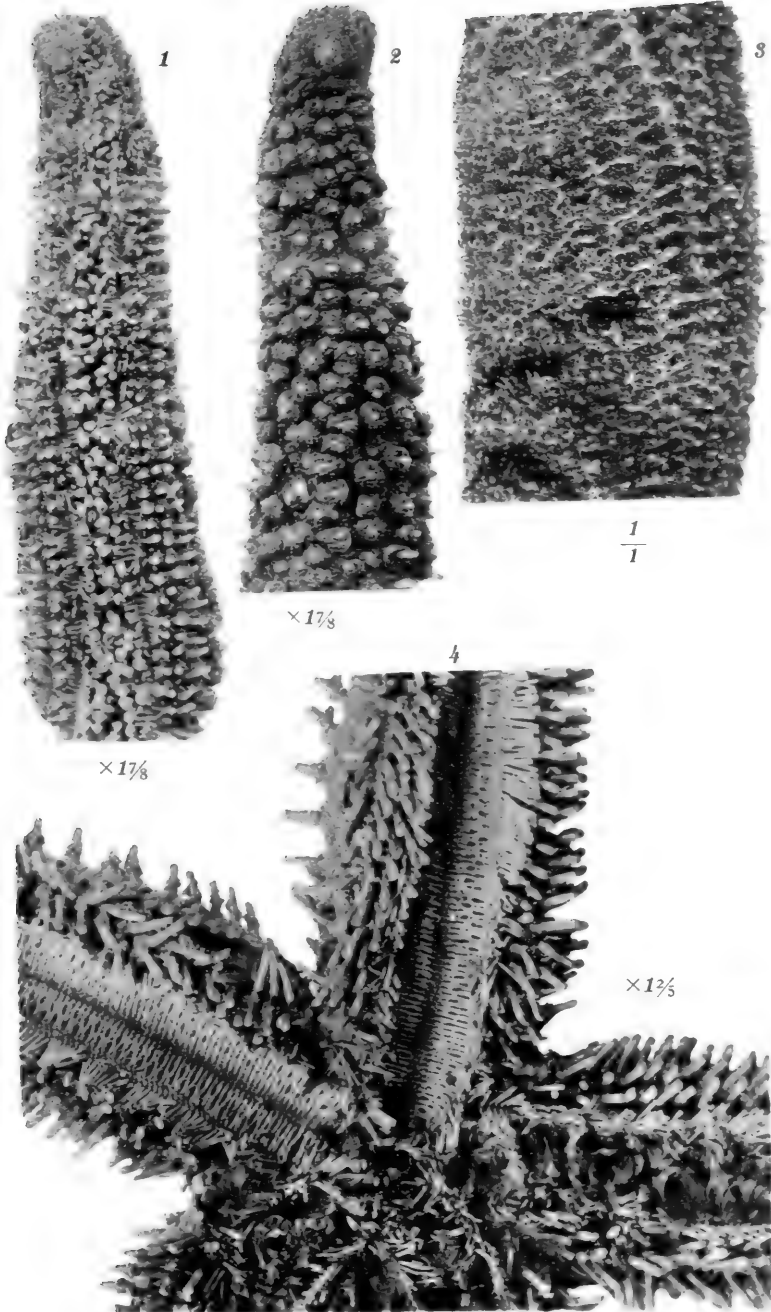


PLATE XXIV.

- FIG. 1. *Orthasterias columbiana* Verrill. Type. In alcohol. Actinal side of a ray; $\times 1\frac{7}{8}$.
- FIG. 2. The same specimen. Dorsal side of a ray; $\times 1\frac{7}{8}$. Yale Mus. Same specimen as pl. XIX.
- FIG. 3. *Evasterias acanthostoma* Verrill. Type. Part of a ray (dry), side view; about natural size. Univ. Calif.
- FIG. 4. *Orthasterias columbiana* Verrill. Details of actinal side; $\times 1\frac{7}{8}$. Yakutat, Alaska. Yale Mus.



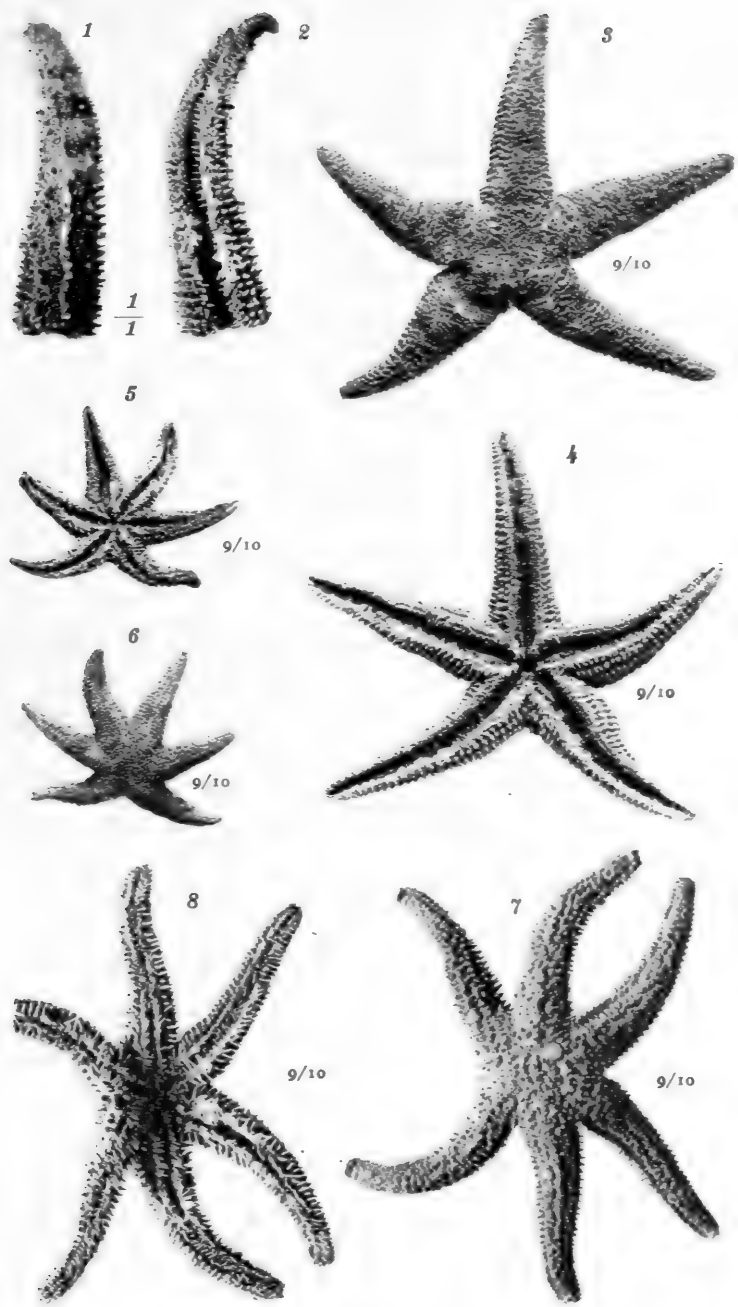
1, 2. ORTHASTERIAS COLUMBIANA Verrill. Type
3. EVASTERIAS ACANTHOSTOMA Verrill. Type
4. ORTHASTERIAS COLUMBIANA Verrill





PLATE XXV.

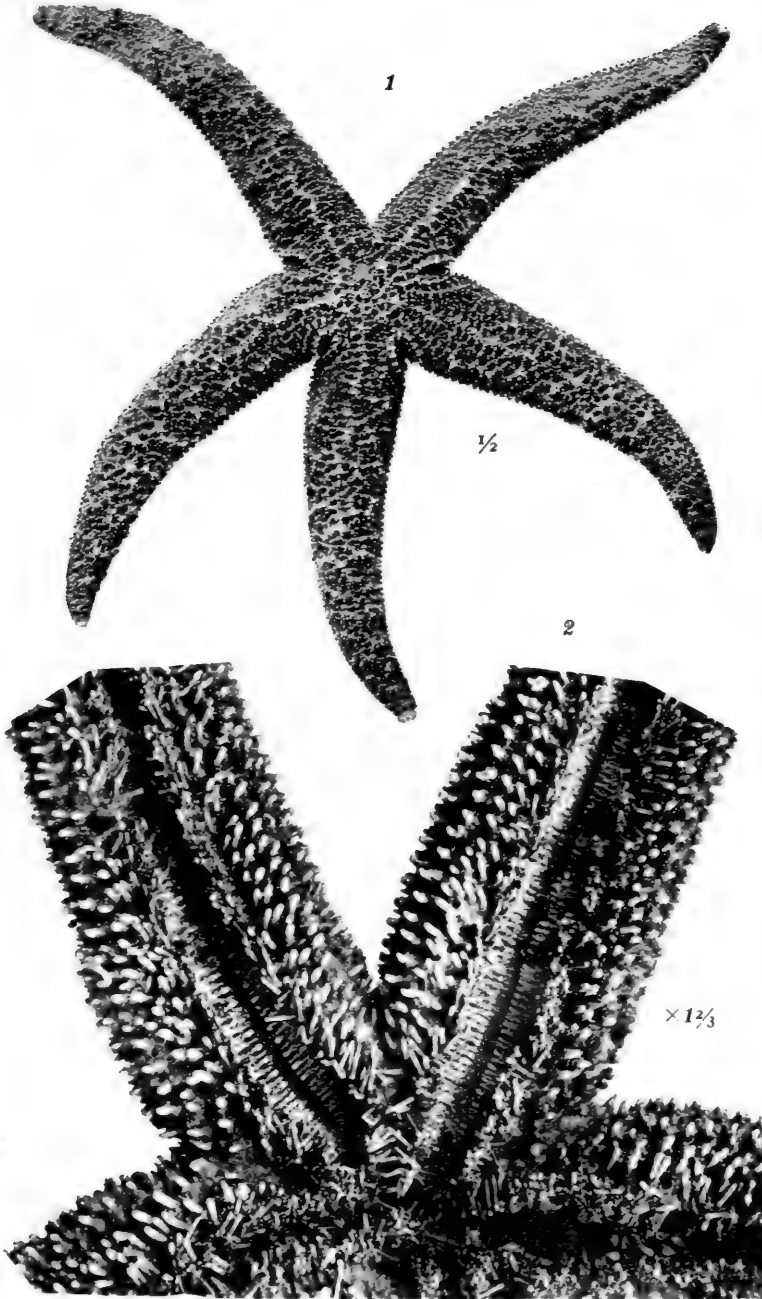
- FIG. 1. *Evasterias troschelii*. Type of Stimpson. Part of a ray, dorsal side; about 9/10 natural size.
- FIG. 2. The same specimen. Ventral side. U. S. Nat. Mus.
- FIGS. 3, 4. *Ctenasterias cribraria* (Stimpson). Type of Stimpson. Dorsal and ventral sides; about 9/10 natural size.
- FIGS. 5, 6. *Leptasterias aequalis* (Stimpson). Type of Stimpson. Ventral side; about 9/10 natural size. U. S. Nat. Mus.
- FIGS. 7, 8. *Leptasterias hexactis* (Stimpson). Type of Stimpson. Ventral side; about 9/10 natural size. U. S. Nat. Mus.



1, 2. *EVASTERIAS TROSCHELII* (Stimpson). Type of Stimpson
 3, 4. *CTENASTERIAS CRIBRARIA* (Stimpson). Type of Stimpson
 5, 6. *LEPTASTERIAS ÆQUALIS* (Stimpson). Type of Stimpson
 7, 8. *LEPTASTERIAS HEXACTIS* (Stimpson). Type of Stimpson

PLATE XXVI.

- FIG. 1. *Evasterias troschelii* Stimpson. Typical form from Sitka. Dorsal side; about $\frac{1}{2}$ natural size.
- FIG. 2. The same specimen. Details of actinal side; $\times 1\frac{2}{3}$. Yakutat. Yale Mus.



1. 2. EVASTERIAS TROSCHELII (Stimpson)

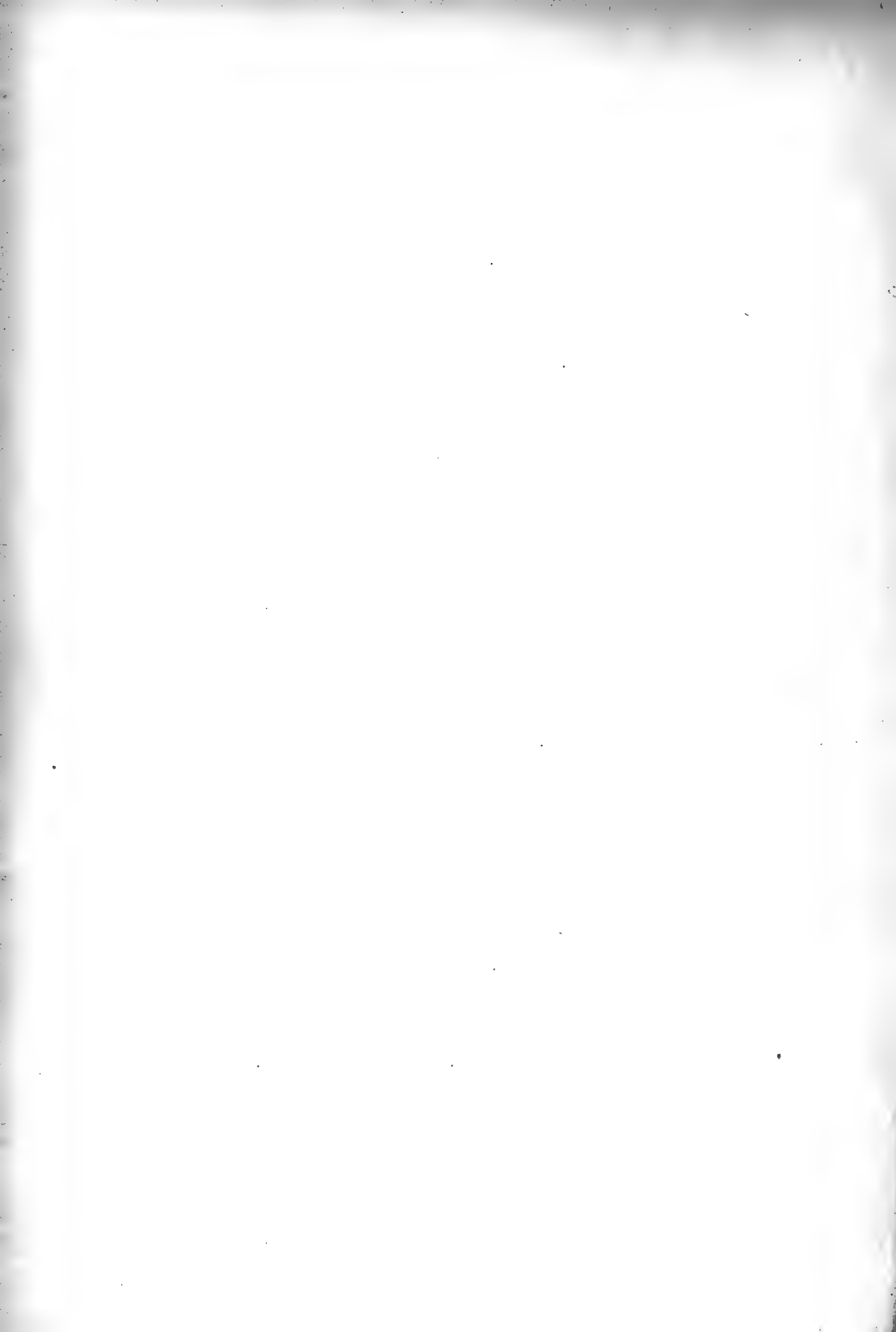


PLATE XXVII.

- FIG. 1. *Asterias acervata* Stimpson. Type. Dorsal side; about $\frac{1}{2}$ natural size.
U. S. Nat. Mus.
- FIG. 2. The same specimen. Ventral side; about $\frac{1}{2}$ natural size.

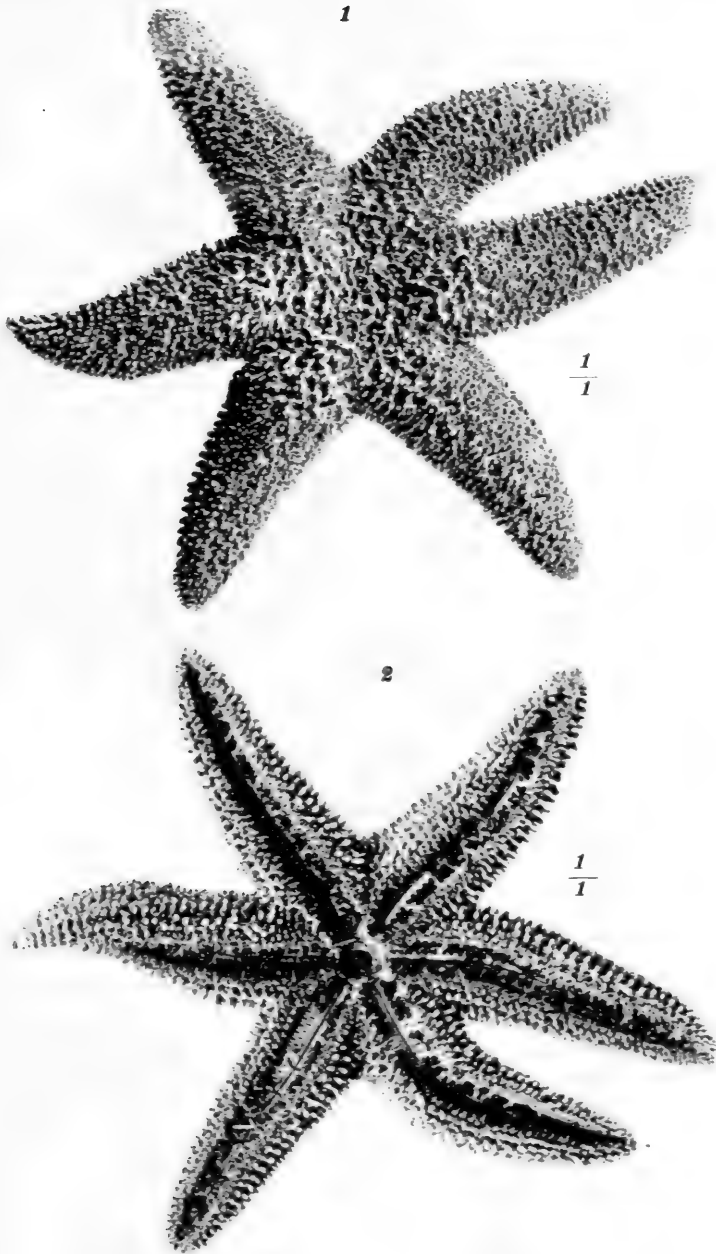


I. *ASTERIAS ACERVATA* Stimpson. Type



PLATE XXVIII.

- FIG. 1. *Leptasterias epichlora alaskensis* Verrill. Type. Dorsal side;
natural size.
- FIG. 2. The same specimen. Ventral side; natural size. Yale Mus.



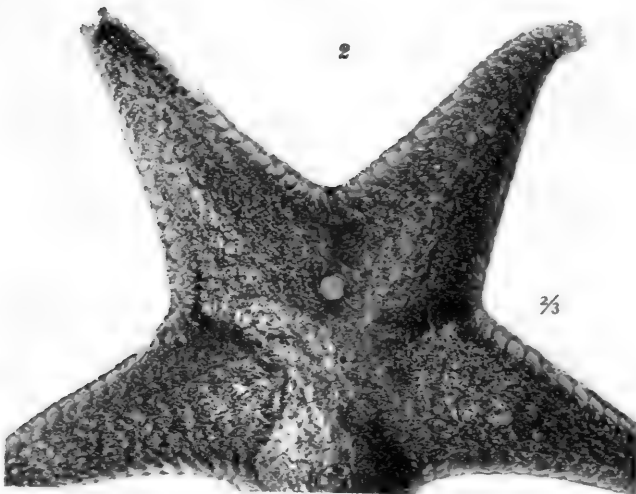
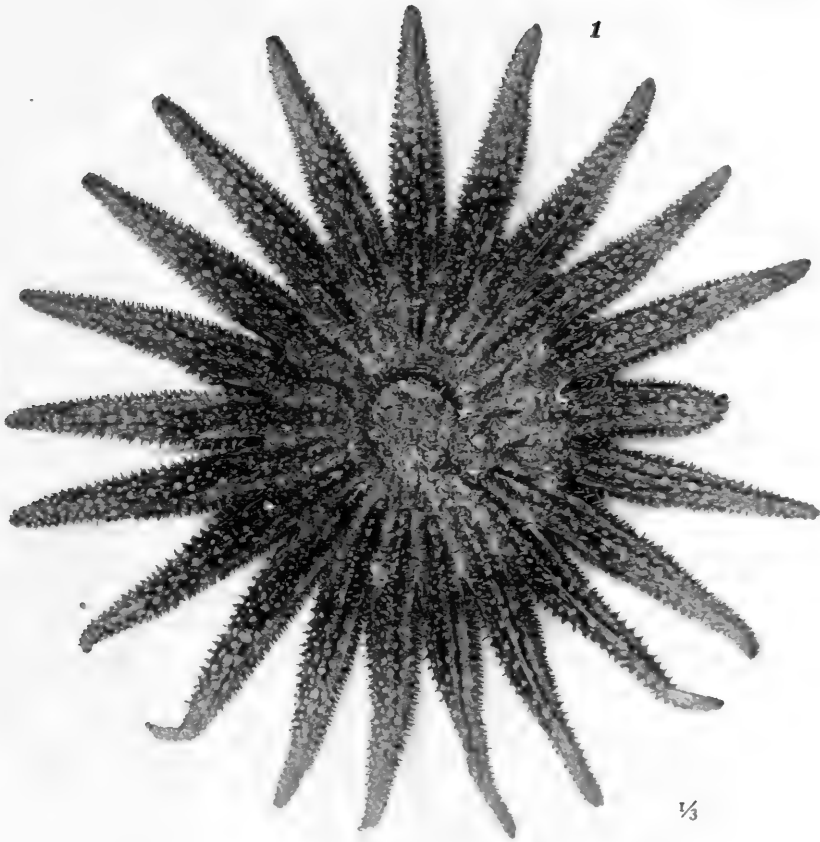
1, 2. LEPTASTERIAS EPICHLORA ALASKENSIS Verrill. Type





PLATE XXIX.

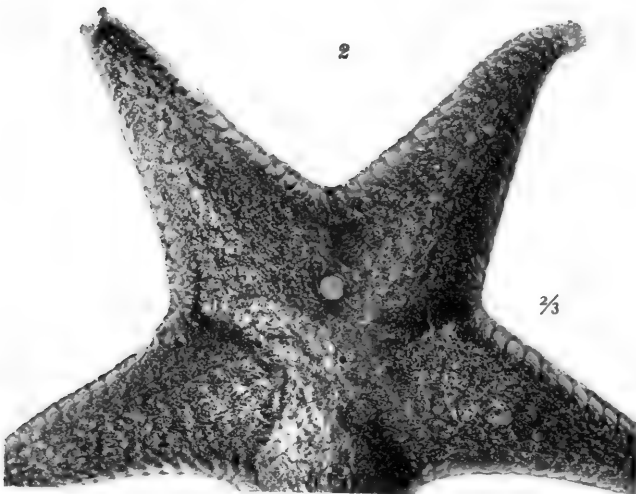
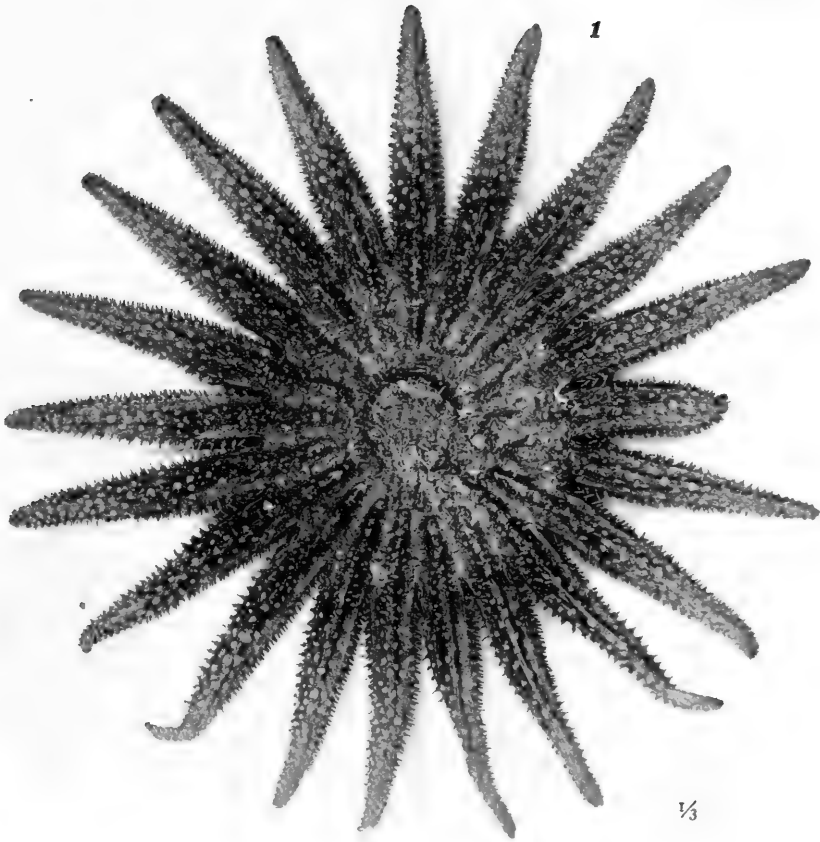
- FIG. 1. *Pycnopodia helianthoides* (Brandt) Stimpson. Actinal side; about $\frac{1}{3}$ natural size. Yale Mus.
- FIG. 2. *Dermasterias imbricata* (Grube) Perrier. Dorsal side; $\frac{2}{3}$ natural size. Yale Mus.



1. PYCNOPODIA HELIANTHOIDES (Brandt)
2. DERMATERIAS IMBRICATA (Grube)

PLATE XXIX.

- FIG. 1. *Pycnopodia helianthoides* (Brandt) Stimpson. Actinal side; about $\frac{1}{3}$ natural size. Yale Mus.
- FIG. 2. *Dermasterias imbricata* (Grube) Perrier. Dorsal side; $\frac{2}{3}$ natural size. Yale Mus.



1. PYCNOPIA HELIANTHOIDES (Brandt)
2. DERMASTERIAS IMBRICATA (Grube)

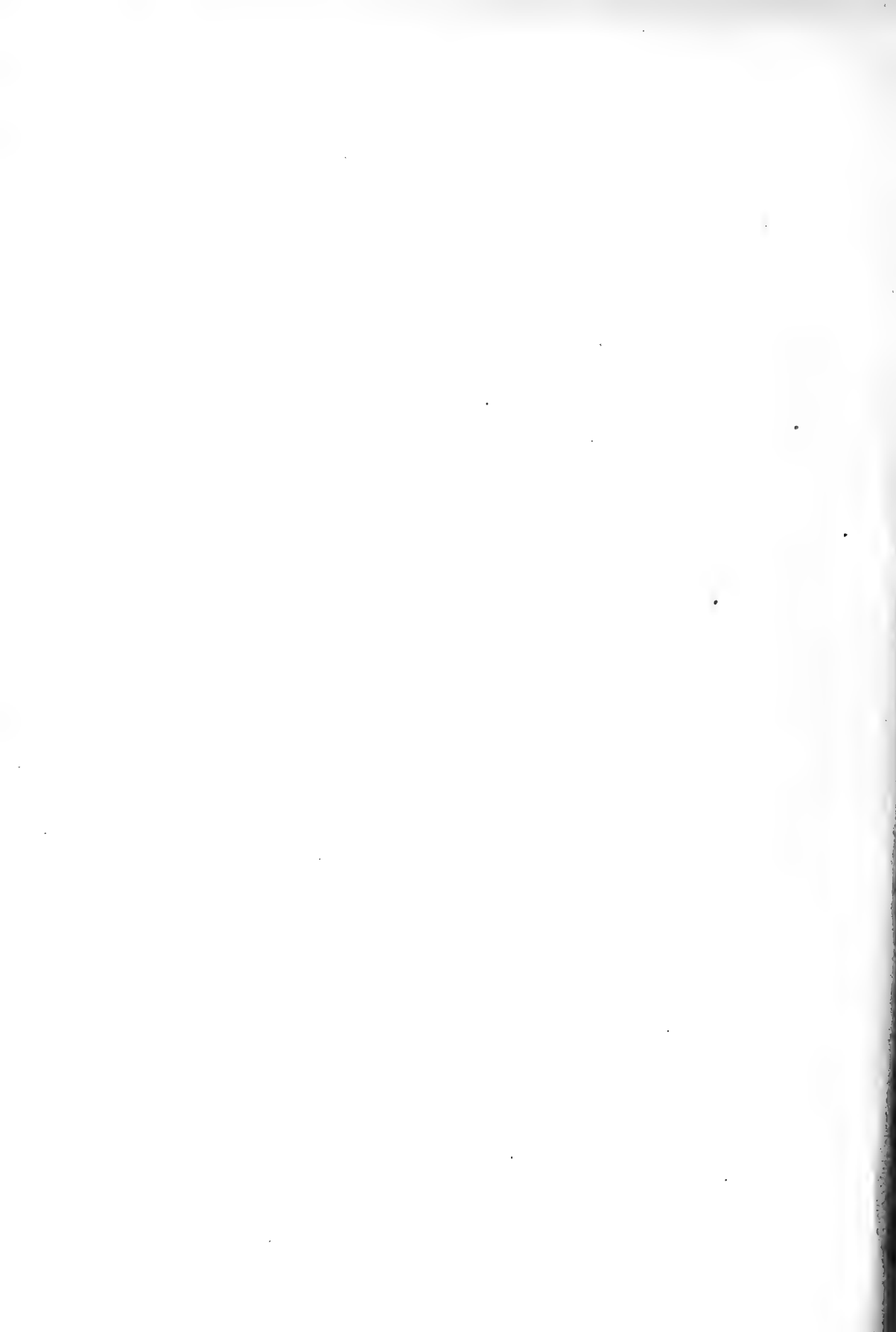
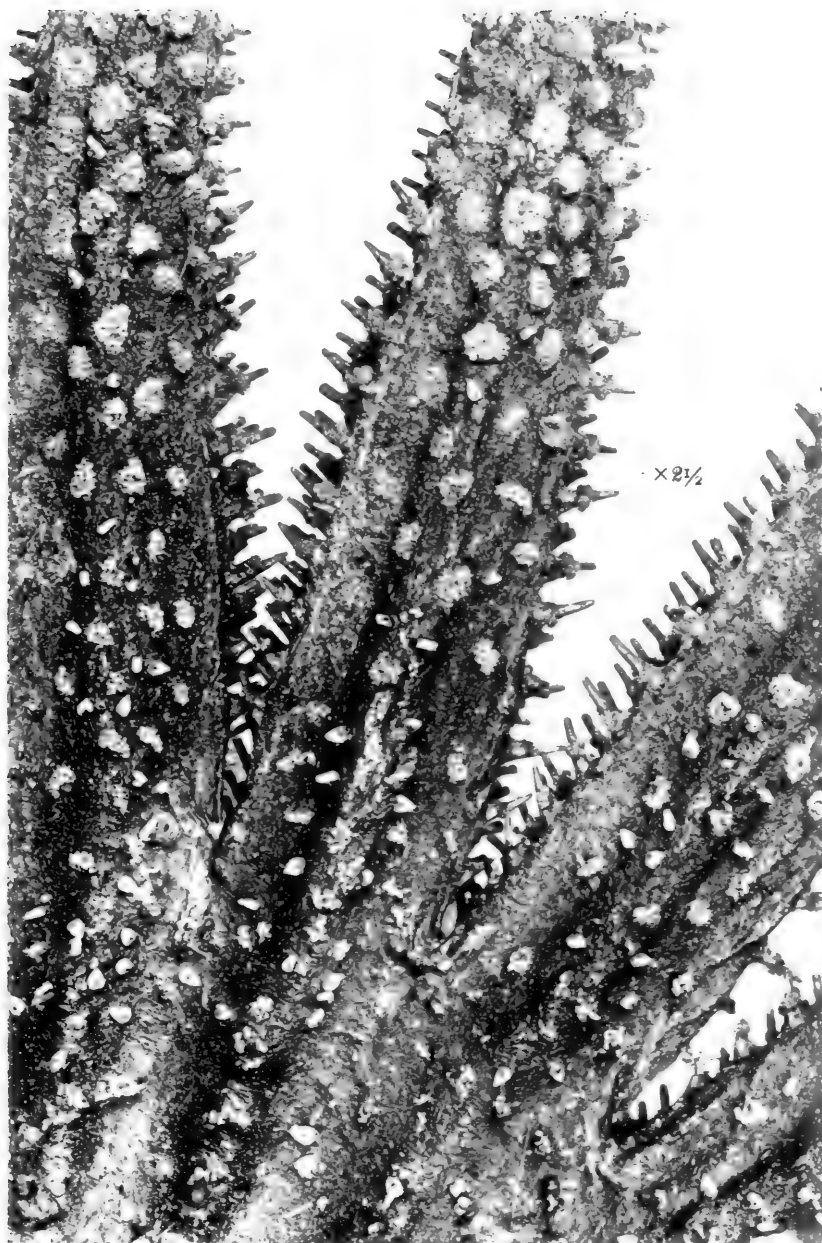


PLATE XXX.

FIG. 1. *Pycnopia helianthoides* (Brandt) Stimpson. Same specimen as pl. xxix, fig. 1. Details of dorsal side; $\times 2\frac{1}{2}$.



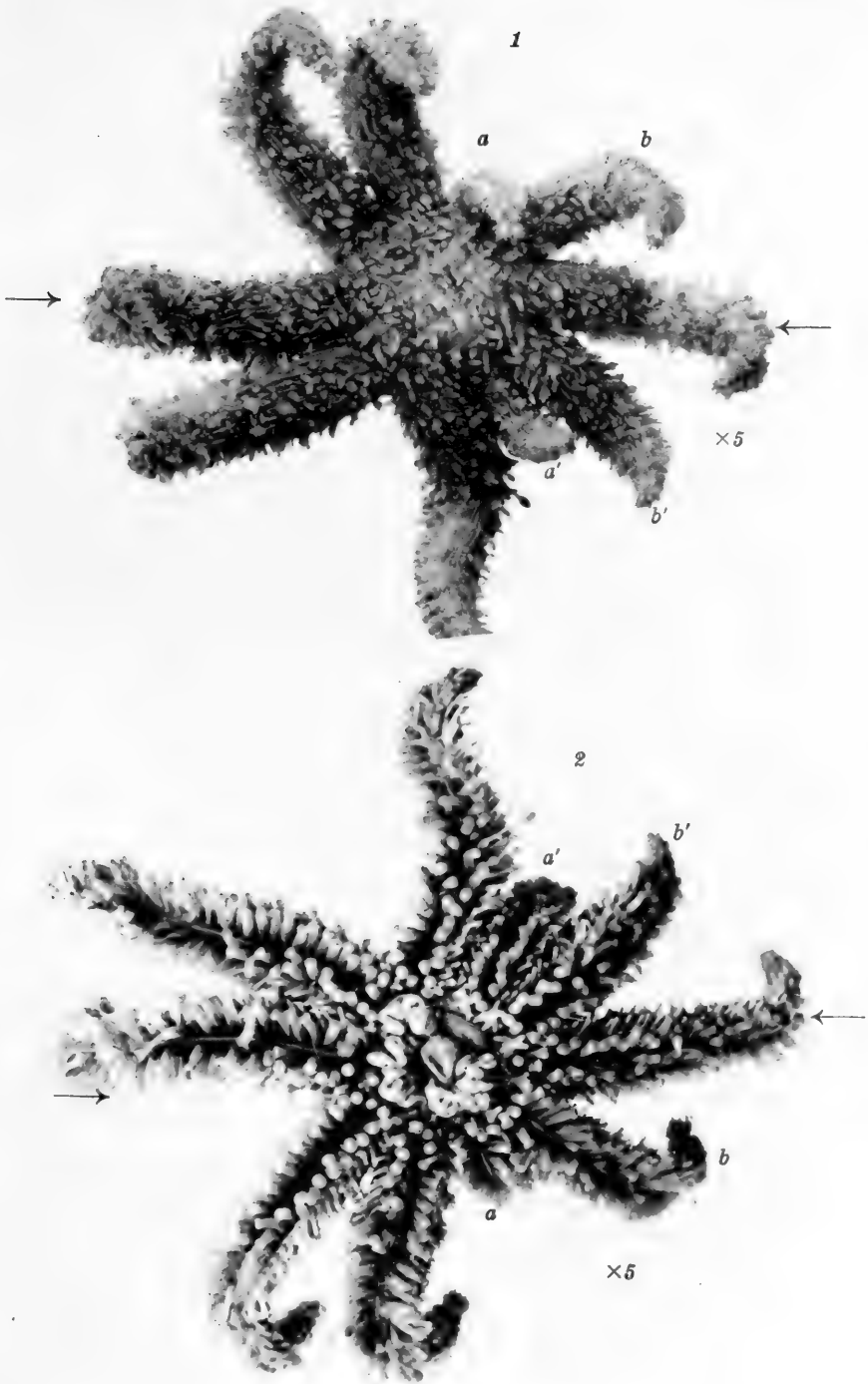
PYCNOPODIA HELIANTHOIDES (Brandt)



PLATE XXXI.

FIG. 1. *Pycnopodia helianthoides* (Brandt). Young, in alcohol. Dorsal side; \times about 5.

FIG. 2. The same specimen. Actinal side. These figures show the inter-budding of new rays, symmetrically to a median plane indicated by the arrows; *a, a'*, last-formed rays; *b, b'*, previous or first pair of interpolated rays, one on either side of a primary odd ray.



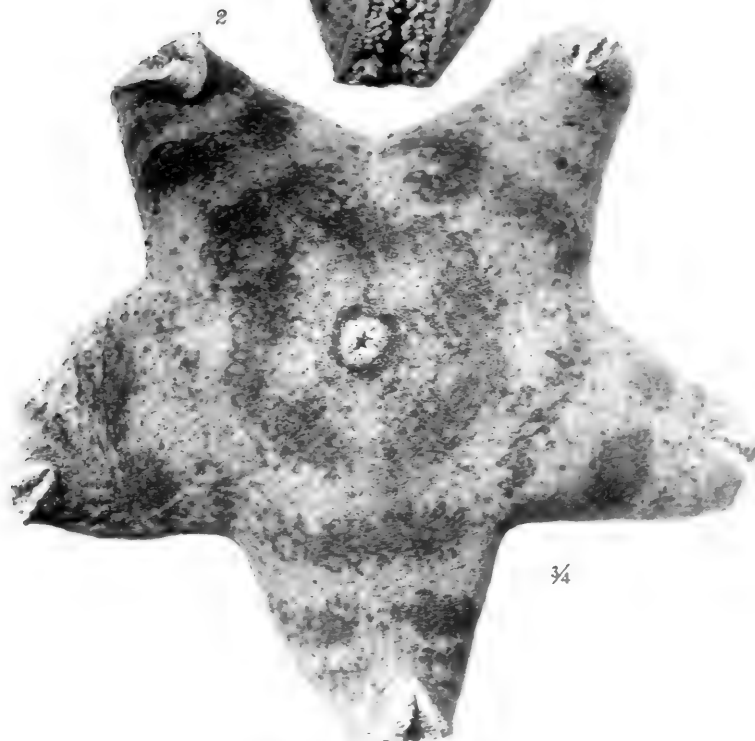
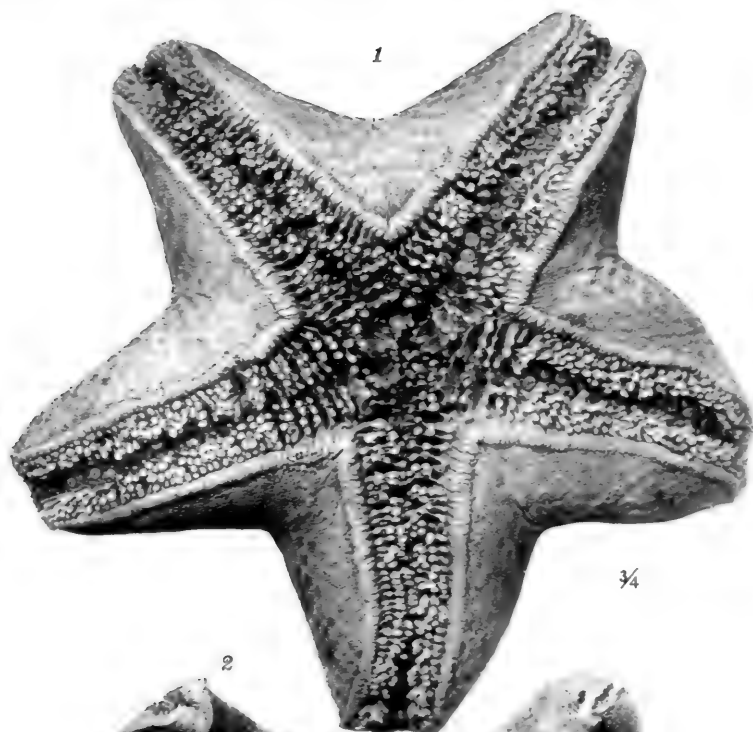
1, 2. PYCNOPODIA HELIANTHOIDES (Brandt). Young, in alcohol



PLATE XXXII.

FIG. 1. *Pteraster tessellatus* Ives. Ventral side of an alcoholic specimen;
about $\frac{3}{4}$ natural size.

FIG. 2. The same specimen. Dorsal side. Yale Mus.



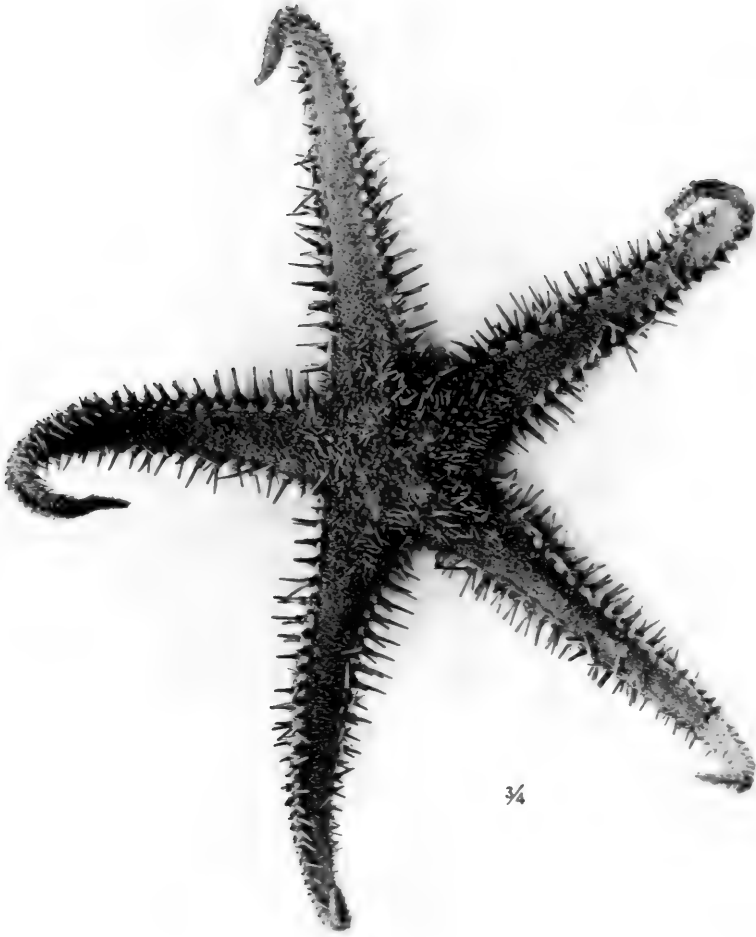
PTERASTER TESSELATUS Ives





PLATE XXXIII.

FIG. 1. *Luidiaster dawsoni* (Verrill) Ludwig. Type. Dorsal side; about $\frac{3}{4}$ natural size. Canadian Geol. Survey.



34

LUIDIASTER DAWSONI (Verrill) Ludwig. Type



PLATE XXXIV.

FIG. 1. The same specimen as pl. xxxiii. Details of lower side of disk;
P, P, P, pectinate or fasciolated pedicellariæ; \times about 6.



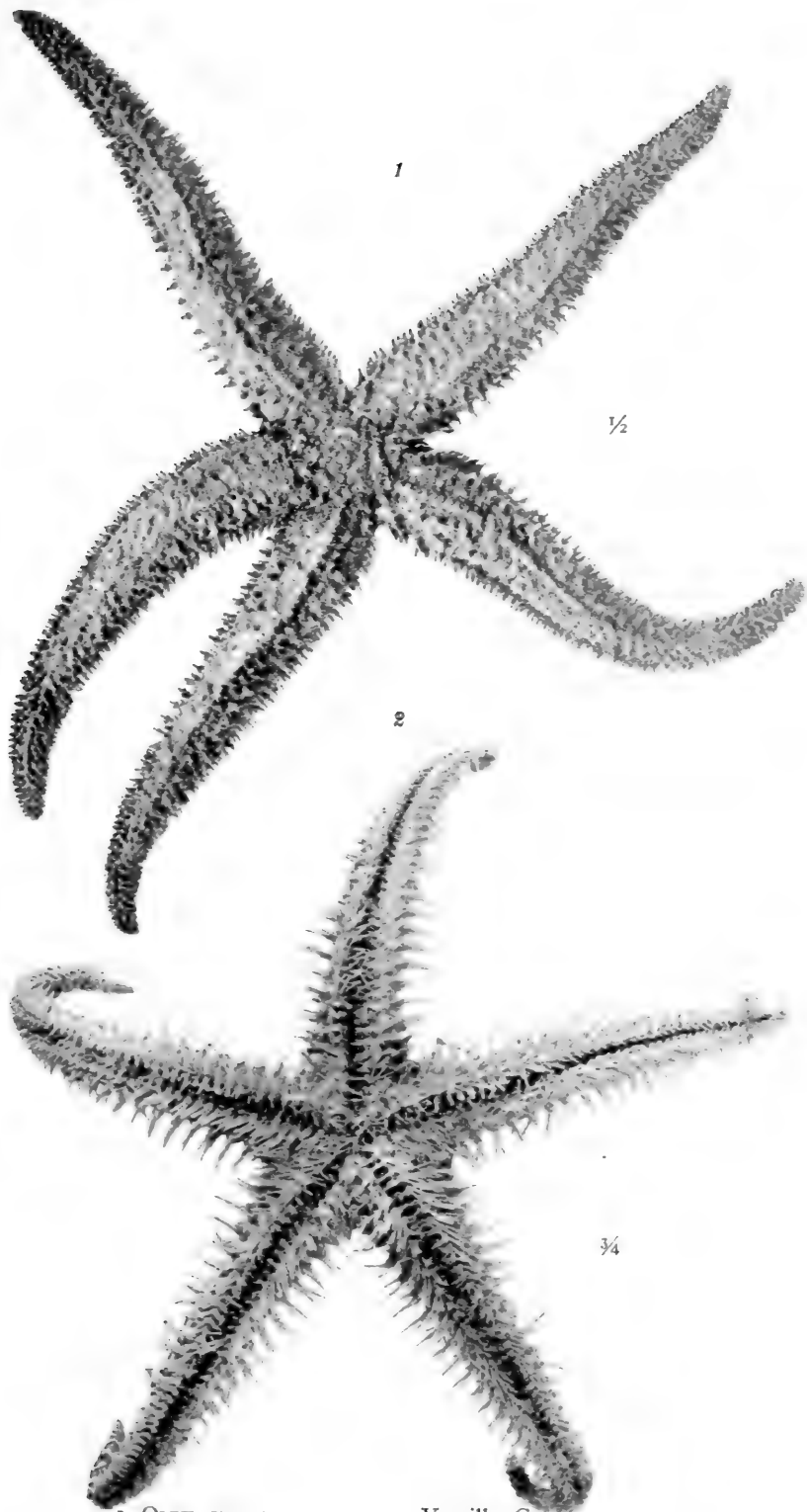
LUIDIASTER DAWSONI (Verrill) Ludwig. Type. Details





PLATE XXXV.

- FIG. 1. *Orthasterias columbiana* Verrill. Type. Same specimen as pl. xxiv, fig. 4. Dorsal side; $\frac{1}{2}$ natural size. Yakutat. Yale Mus.
- FIG. 2. *Luidiaster dawsoni* (Verrill) Ludwig. Type. Same specimen as pls. xxxiii and xxxiv. About $\frac{3}{4}$ natural size. Geol. Surv. Canada.



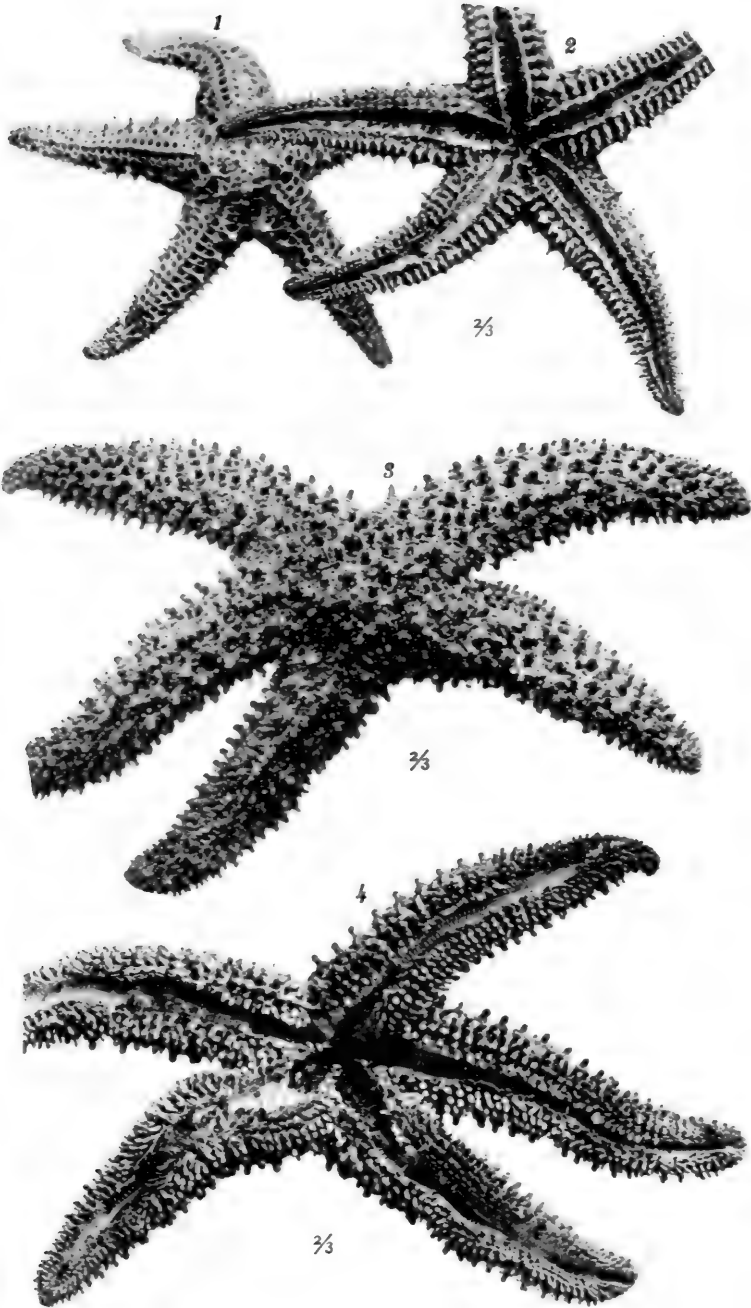
1. ORTHASTERIAS COLUMBIANA Verrill. Cotype
2. LUIDIASTER DAWSONI (Verrill) Ludwig. Type





PLATE XXXVI.

- FIG. 1. *Pisaster paucispinus* (Stimpson) Verrill. Type of Stimpson. Dorsal view; about $\frac{2}{3}$ natural size.
- FIG. 2. The same. Actinal view; about $\frac{2}{3}$ natural size. U. S. Nat. Mus.
- FIG. 3. *Pisaster capitatus* (Stimpson) Verrill. Type of Stimpson. Dorsal view; $\frac{2}{3}$ natural size.
- FIG. 4. The same specimen. Actinal view; $\frac{2}{3}$ natural size.



1, 2. *PISASTER PAUCISPINUS* (Stimpson) Verrill. Type of Stimpson
3, 4. *PISASTER CAPITATUS* (Stimpson) Verrill. Type of Stimpson

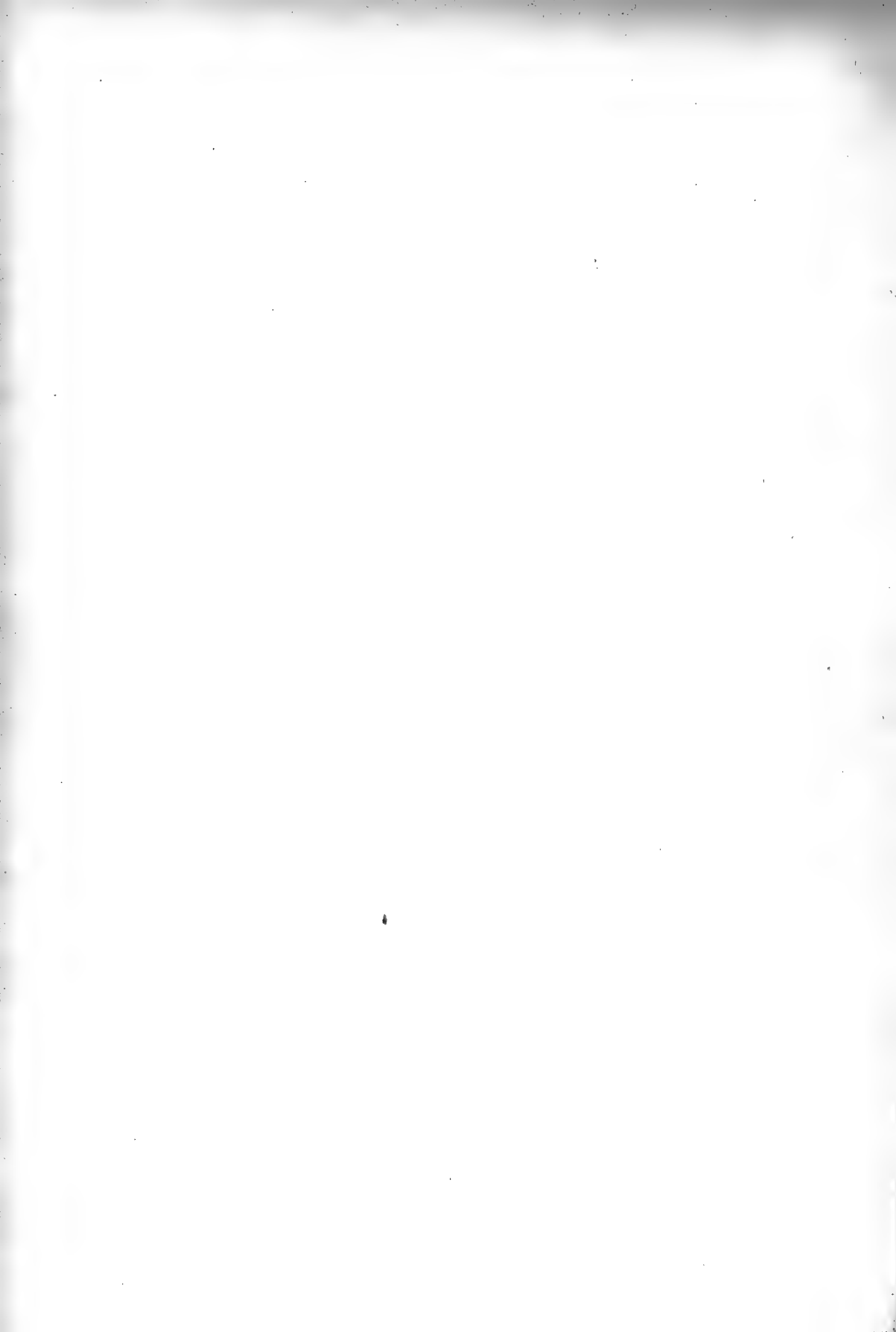
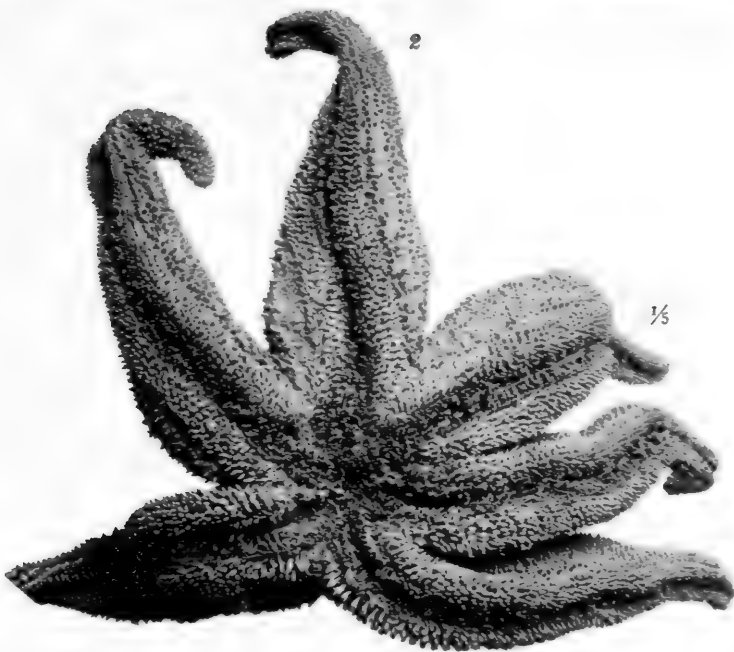




PLATE XXXVII.

- FIG. 1. *Pisaster giganteus* (Stimpson) Verrill. Type of Stimpson. Dorsal view; about $\frac{1}{2}$ natural size.
- FIG. 2. The same specimen. Actinal view. U. S. Nat. Mus.



1, 2. *PISASTER GIGANTEUS* (Stimpson) Verrill. Type of Stimpson

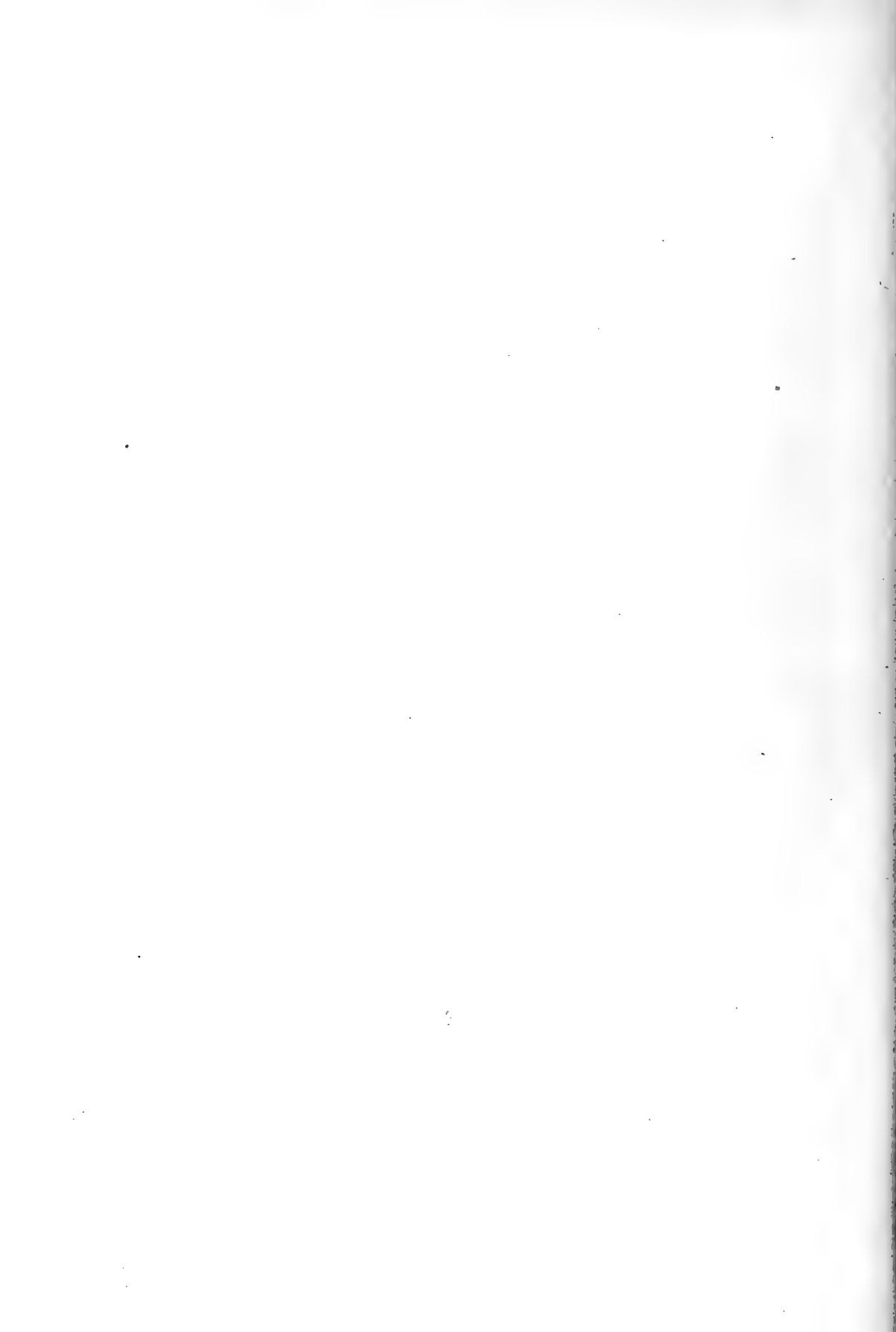
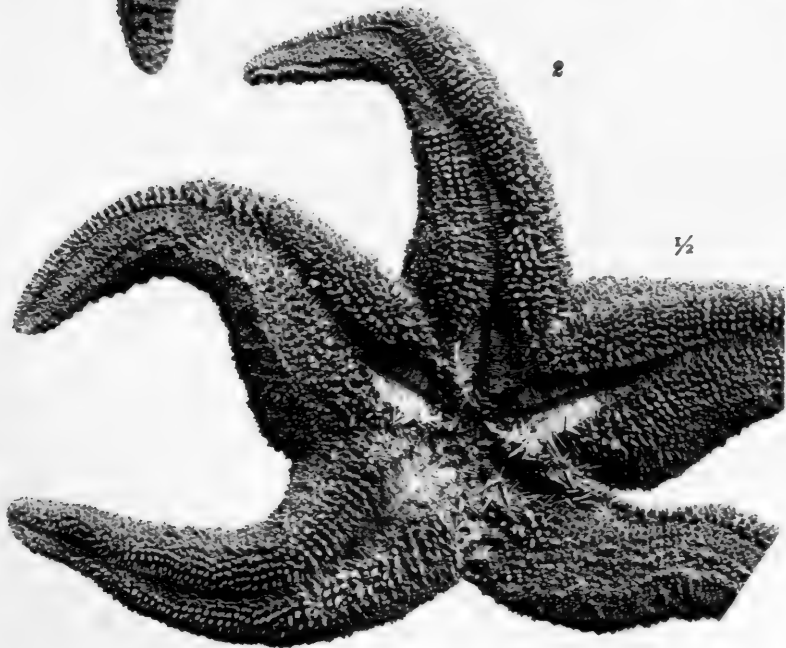


PLATE XXXVIII.

- FIG. 1. *Pisaster confertus* (Stimpson) Verrill. Type. Dorsal view; about
 $\frac{1}{2}$ natural size.
- FIG. 2. The same specimen. Actinal view. U. S. Nat. Mus.



1, 2. *PISASTER CONFERTUS* (Stimpson) Verrill. Type

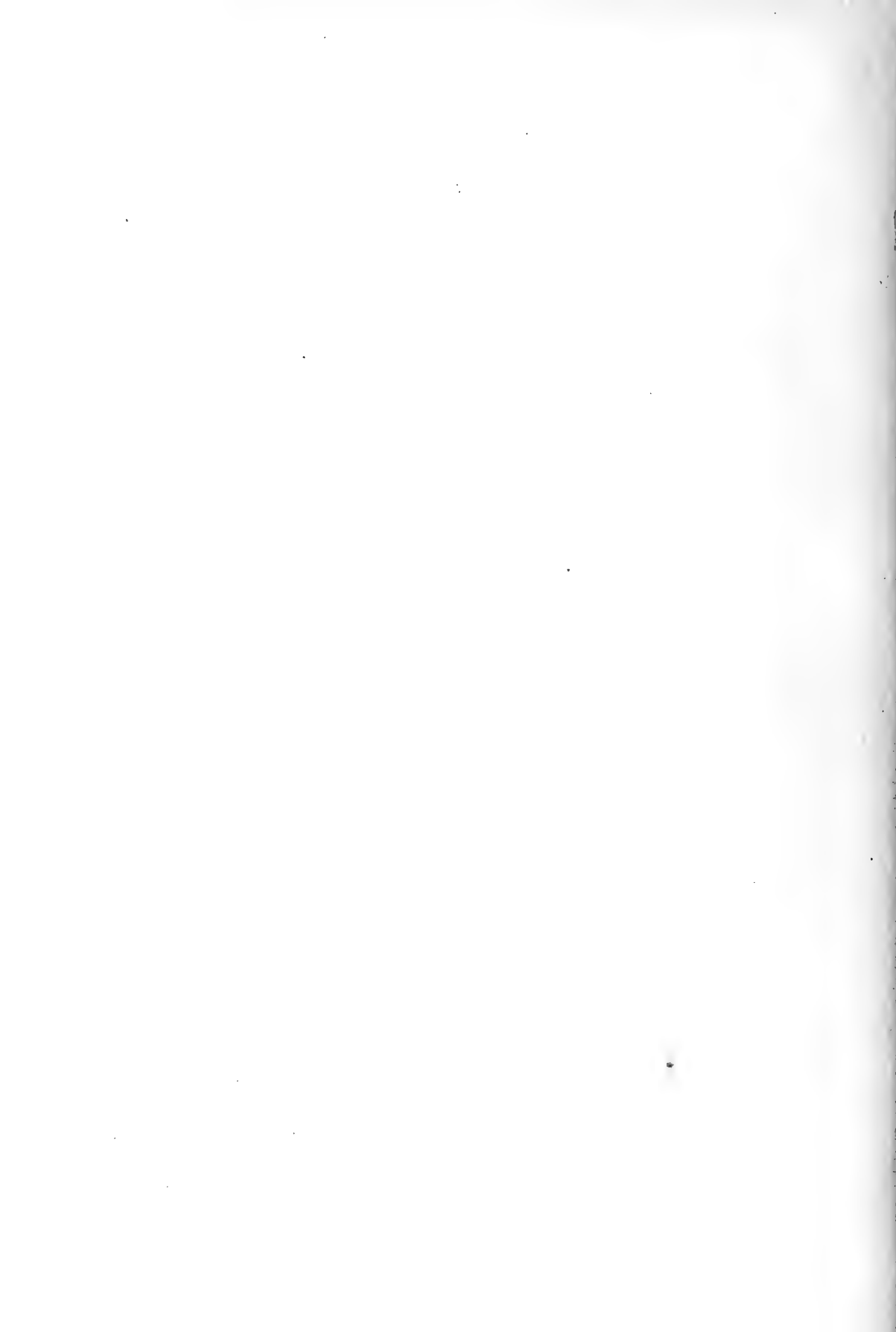
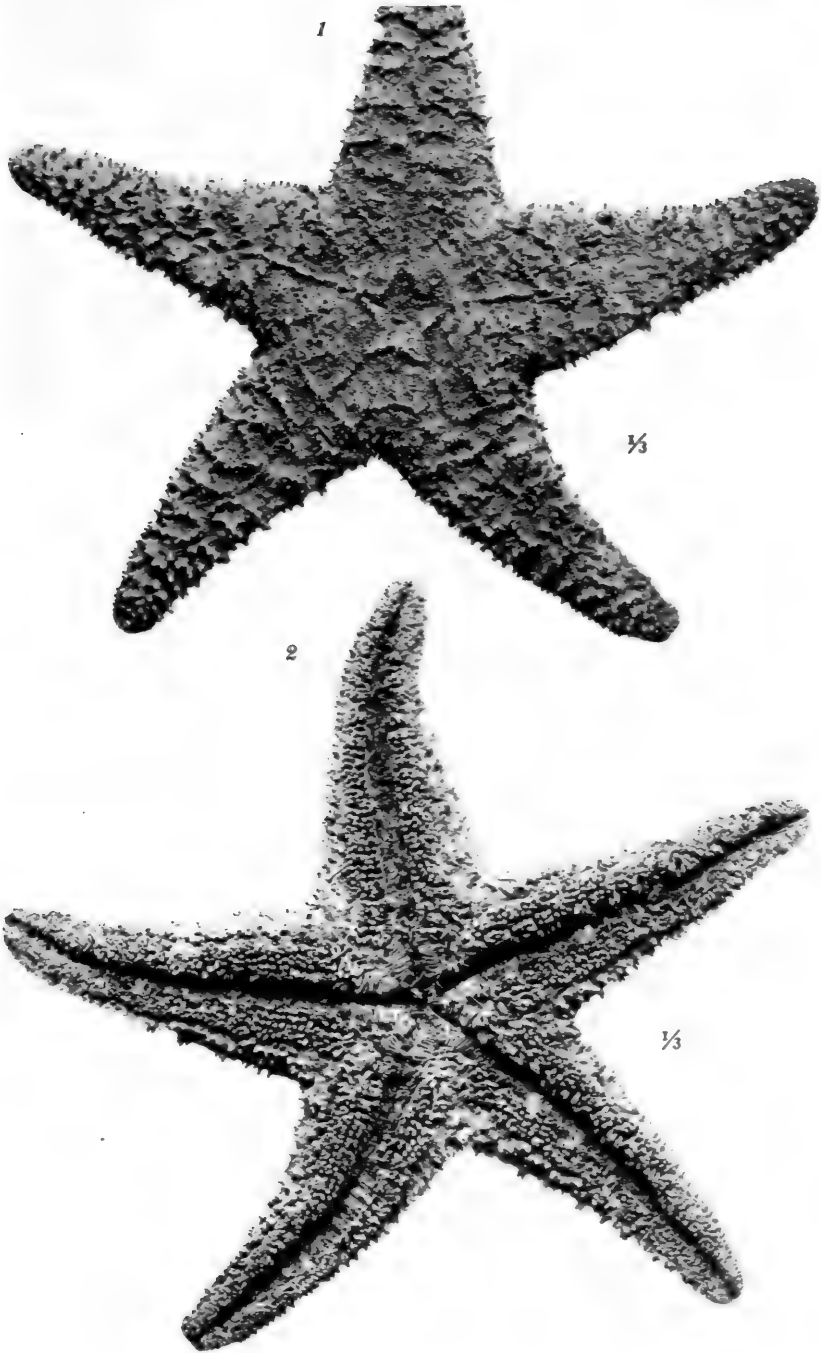




PLATE XXXIX.

- FIG. 1. *Pisaster fissispinus* (Stimpson) Verrill. Type. Dorsal view; about
 $\frac{1}{3}$ natural size.
- FIG. 2. The same specimen. Actinal view. U. S. Nat. Mus.



1, 2. *PISASTER FISSISPINUS* (Stimpson) Verrill. Type

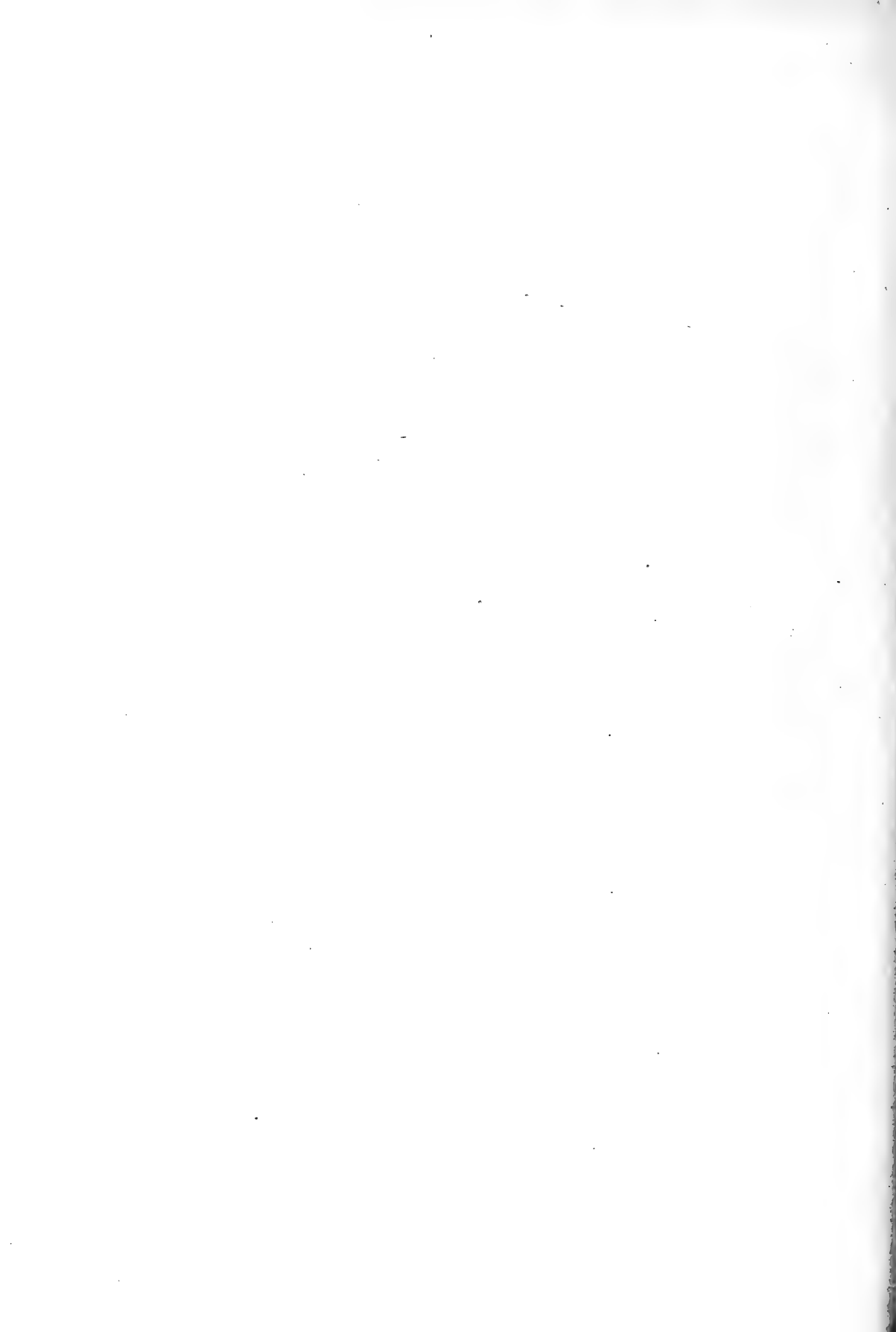
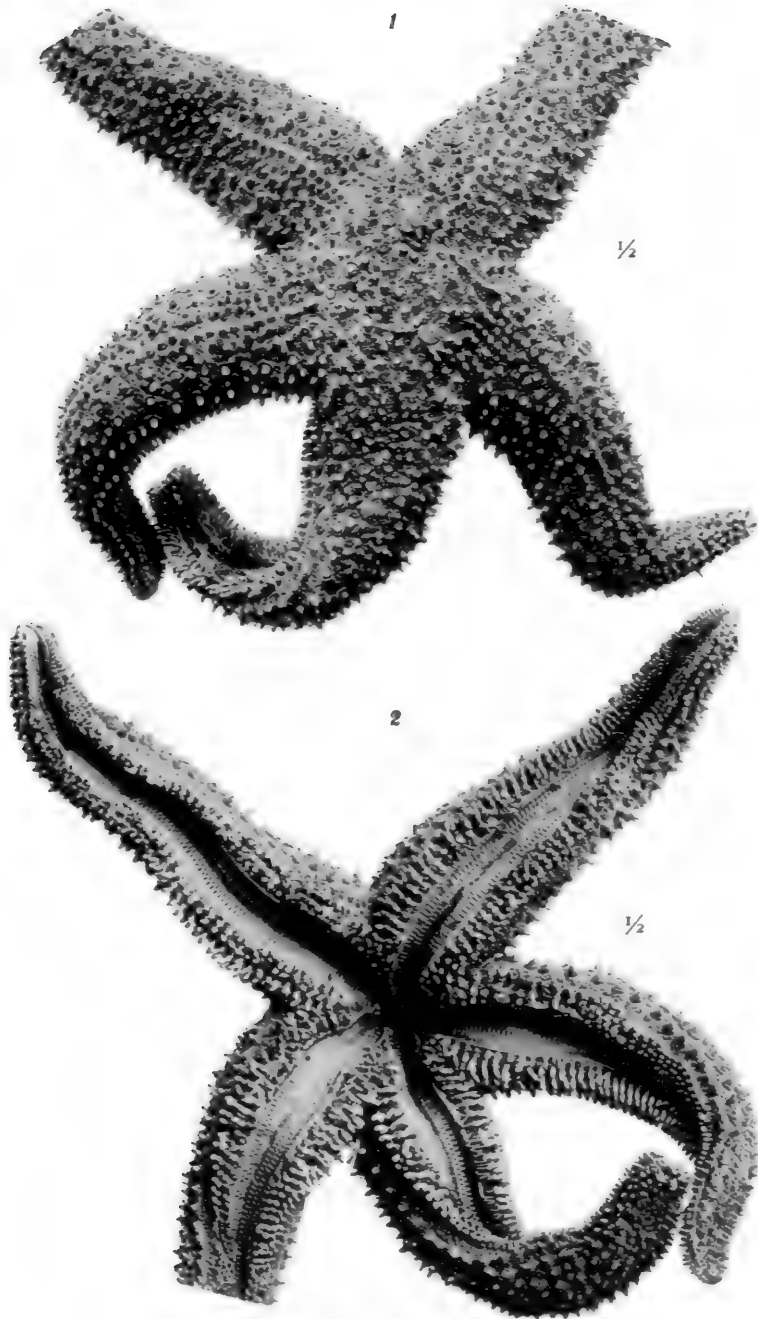


PLATE XL.

FIG. 1. *Pisaster lütkenii* (Stimpson) Verrill. Type. Dorsal view; about $\frac{1}{2}$ natural size.

FIG. 2. The same specimen. Actinal view. U. S. Nat. Mus.



1, 2. *PISASTER LÜTKENII* (Stimpson) Verrill. Type

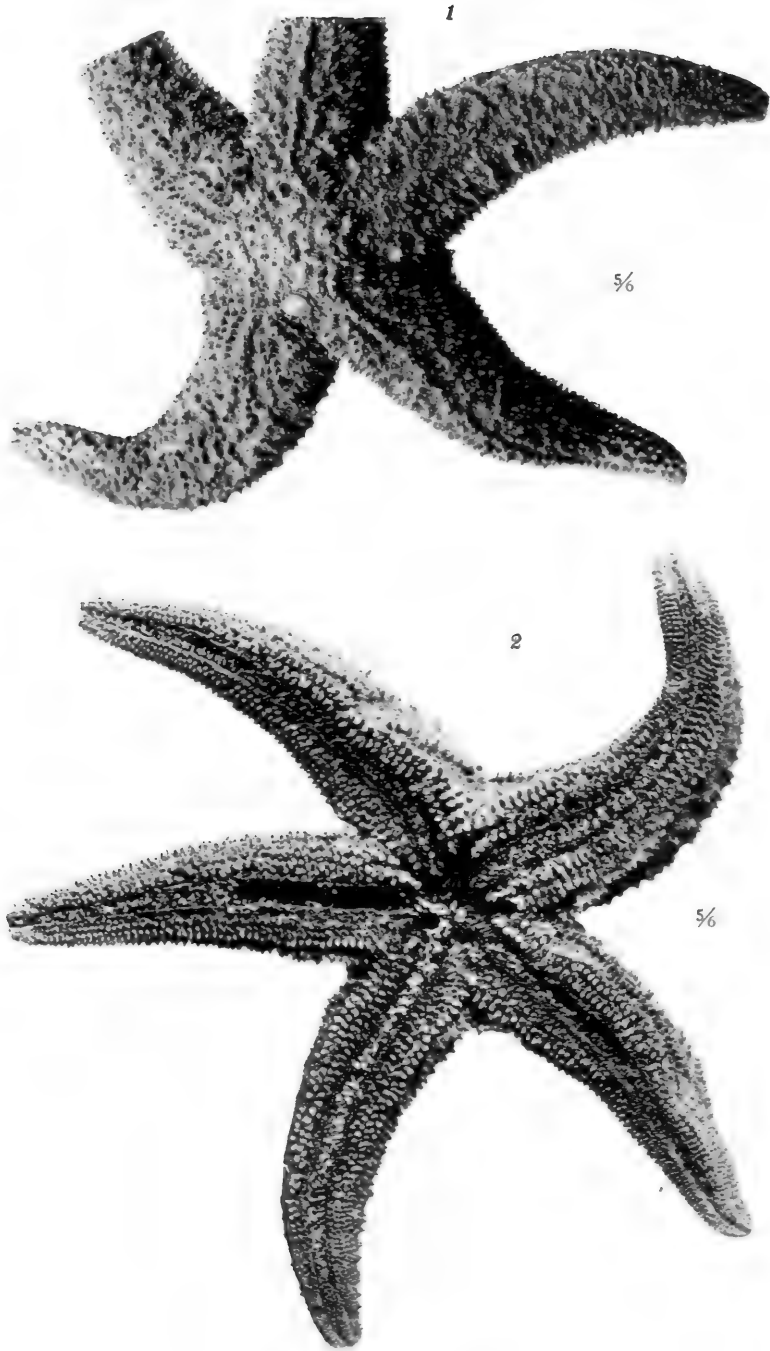




PLATE XLI.

FIG. 1. *Pisaster brevispinus* (Stimpson) Verrill. Type. Dorsal view; about
 $\frac{5}{6}$ natural size. U. S. Nat. Mus.

FIG. 2. The same specimen. Actinal view; $\frac{5}{6}$ natural size.



1, 2. *PISASTER BREVISPINUS* (Stimpson) Verrill. Type



PLATE XLII.

Pisaster papulosus Verrill. Type. Dorsal view; about 7/10 natural size.



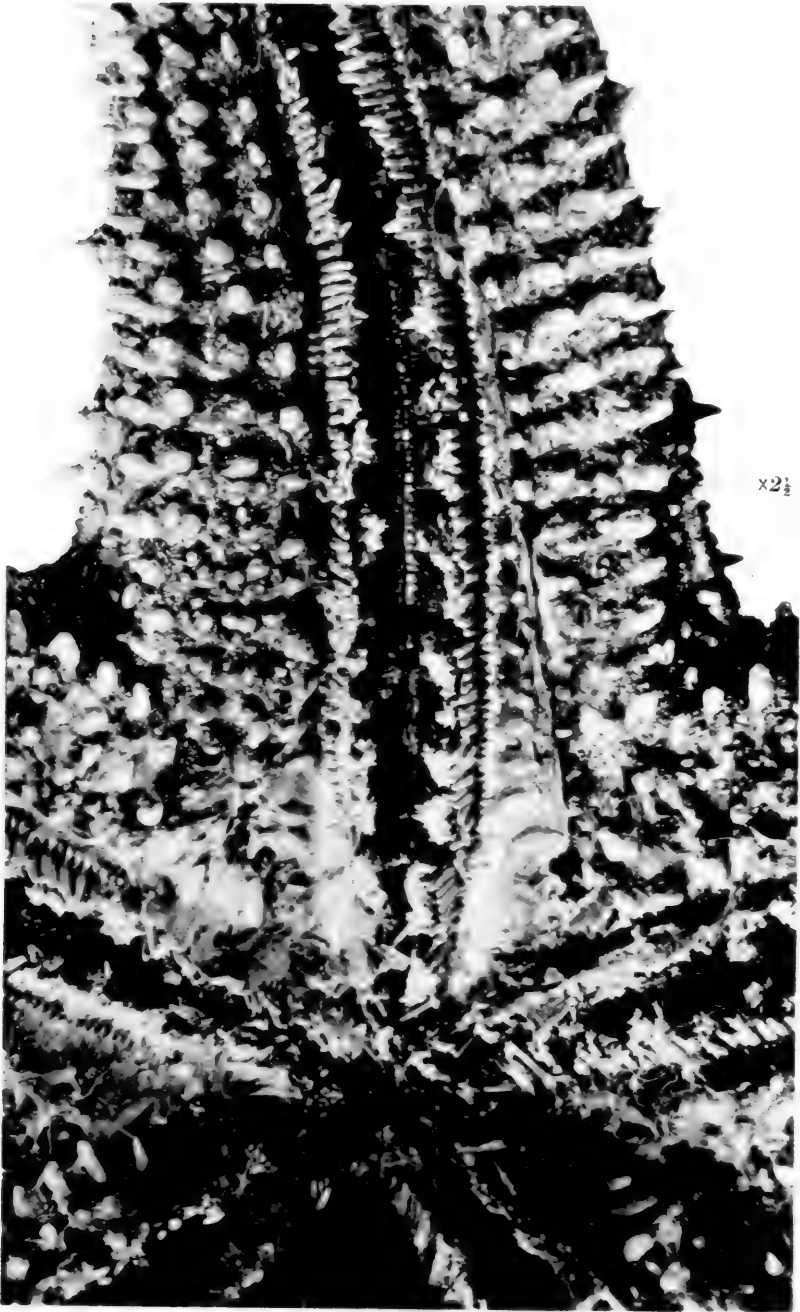
HELIOTYPE CO., BOSTON

PISASTER PAPULOSUS VER. Type



PLATE XLIII.

Pisaster papulosus Verrill. Actinal side of type; $\times 2\frac{1}{2}$.



x2 1/2

HELIOTYPE CO., BOSTON

PISASTER PAPULOSUS VER. Type



PLATE XLIV.

- FIG. 1. *Pisaster brevispinus* (Stimpson) Verrill. Dorsal view; about $\frac{1}{2}$ natural size. No. 1820, Mus. Comp. Zoöl.
- FIG. 2. The same specimen. Dorsal view of a part of the disk, including the madreporic plate; $\times 2\frac{1}{2}$.



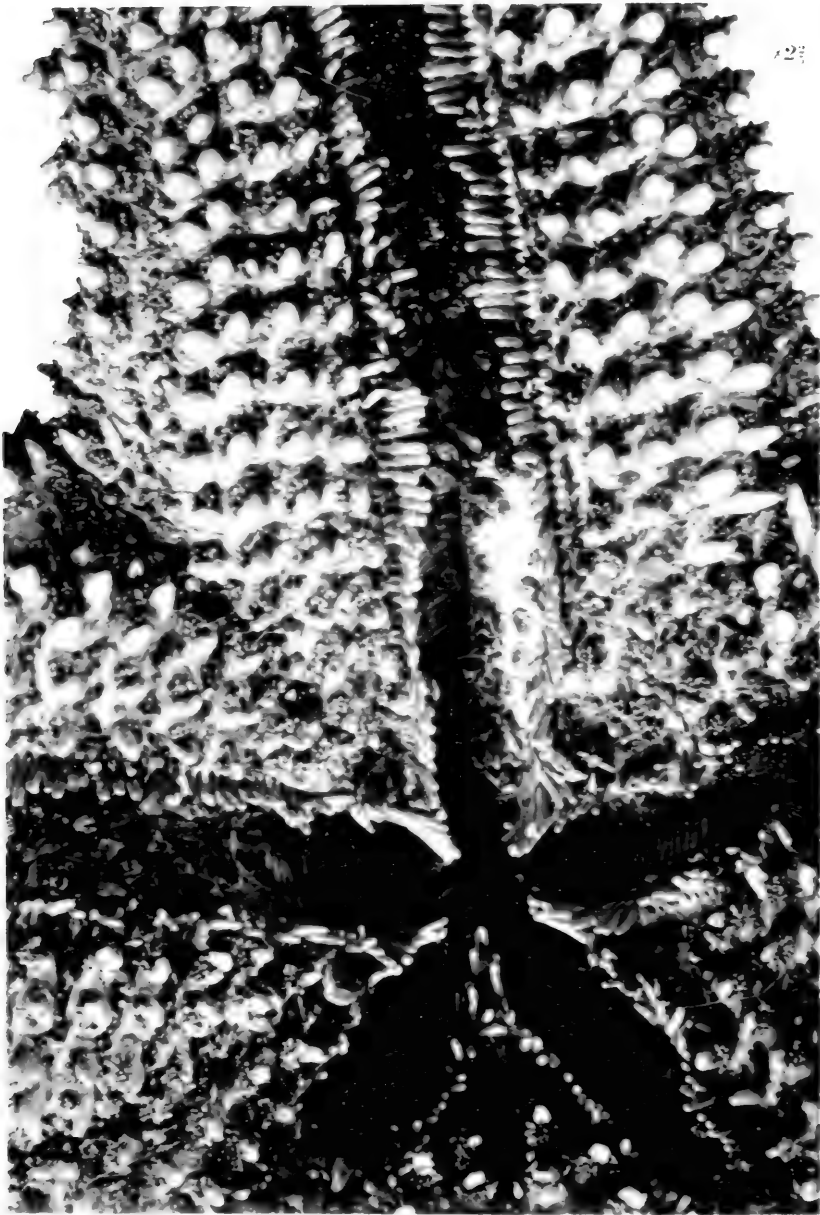
HELIOTYPE CO., BOSTON

1.2. *PISASTER BREVISPINUS* (ST.) VER.



PLATE XLV.

Pisaster brevispinus (Stimpson) Verrill. Actinal side; $\times 2\frac{3}{4}$. No. 1820, Mus.
Comp. Zoölogy.



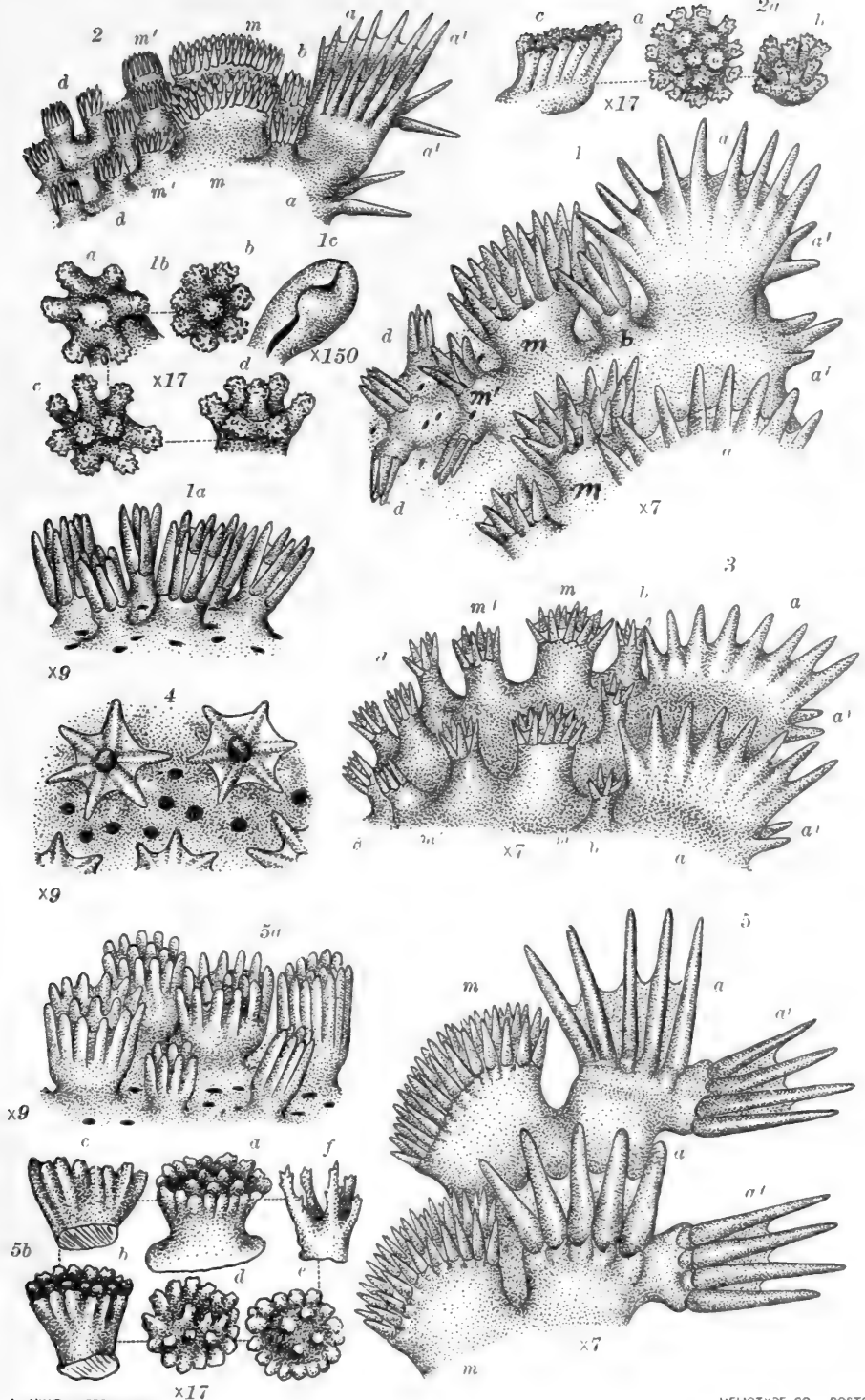
HELIOTYPE CO., BOSTON

PISASTER BREVISPINUS (ST.) VER.



PLATE XLVI.

- FIG. 1. *Solaster stimpsoni* Verrill. Profile view of adambulacral, marginal, and adjacent spines; *a, a*, adambulacral spines, actinal series; *a', a'*, furrow series; *b*, peractinals; *m, m*, inferomarginals; *m'*, supramarginals; *d*, dorso-lateral spines and plates.
- FIG. 1a. The same specimen. A group of dorsal pseudopaxillæ and papular pores; \times about 9.
- FIG. 1b. The same specimen. Dorsal pseudopaxillæ from base of ray, vertical and side views; \times 17.
- FIG. 1c. The same specimen. A dorsal, dermal, bivalve pedicellaria from near the edge of a papular pore; \times 150.
- FIG. 2. *Solaster galaxides* Verrill. Type. Profile view of actinal side; *a, a*, plates; \times about 7. Lettering as in fig. 1.
- FIG. 2a. The same. A group of dorsal pseudopaxillæ from another specimen; \times about 17. No. 1897, Mus. Comp. Zoöl.
- FIG. 3. *Solaster constellatus* Verrill. Type. \times about 7. Lettering as in fig. 1.
- FIG. 4. The same specimen. A group of dorsal pseudopaxillæ and papular pores, seen from above; \times about 9.
- FIG. 5. *Solaster dawsoni* Verrill. Type. Profile view of adambulacral and inferomarginal plates and spines from middle part of a ray. Lettering as in fig. 1.
- FIG. 5a. The same specimen. A group of dorsal pseudopaxillæ and papular pores; \times 9.
- FIG. 5b. The same. Dorsal pseudopaxillæ from the type specimen, vertical and side views; \times 17.



A HYATT VERRILL DEL.

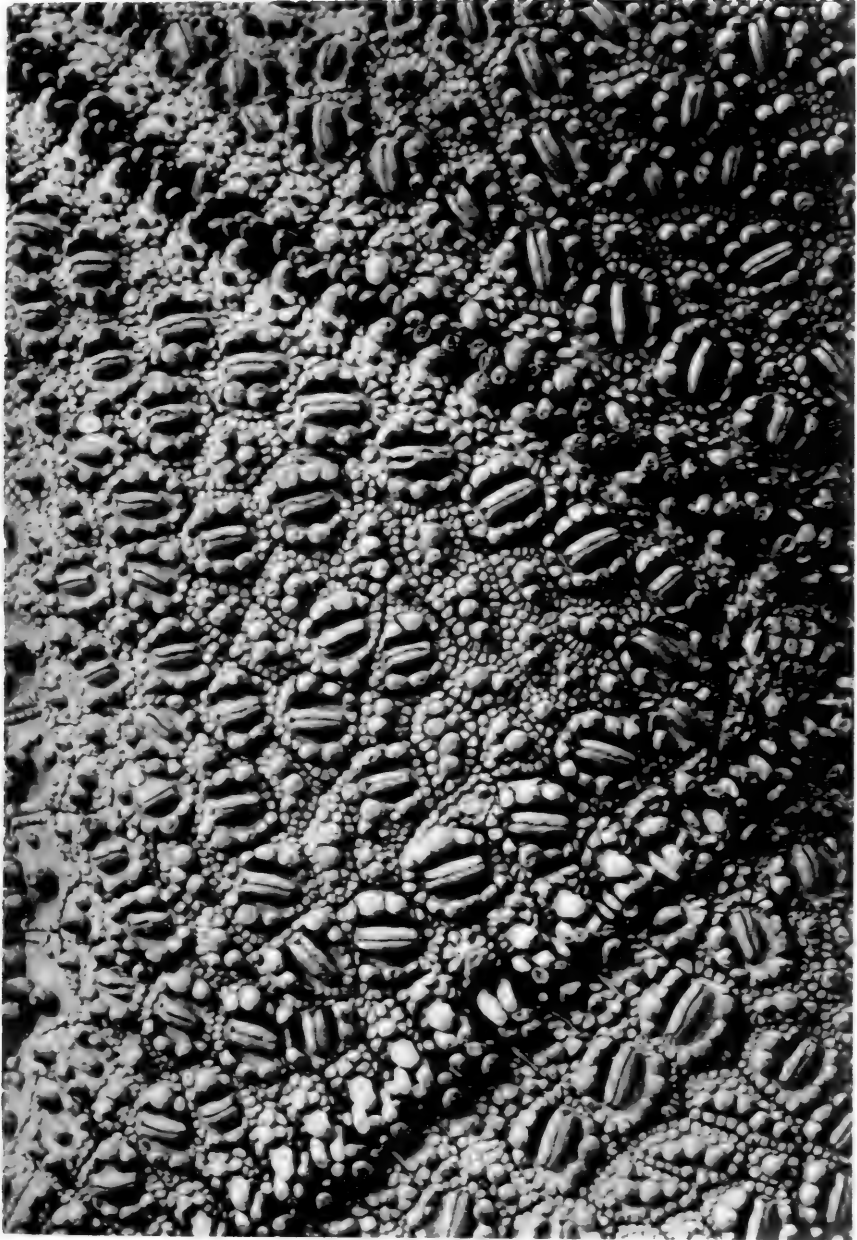
HELIOTYPE CO., BOSTON

1-1c. SOLASTER STIMPSONI VER. Details
 2. 2a. S. GALAXIDES VER. Details. Type
 3-4. S. CONSTELLATUS VER. Details. Type
 5-5b. S. DAWSONI VER. Details



PLATE XLVII.

FIG. 1. *Hippasteria phrygiana* (Parel.) Agassiz. Photograph of under side of an Atlantic specimen; enlarged.

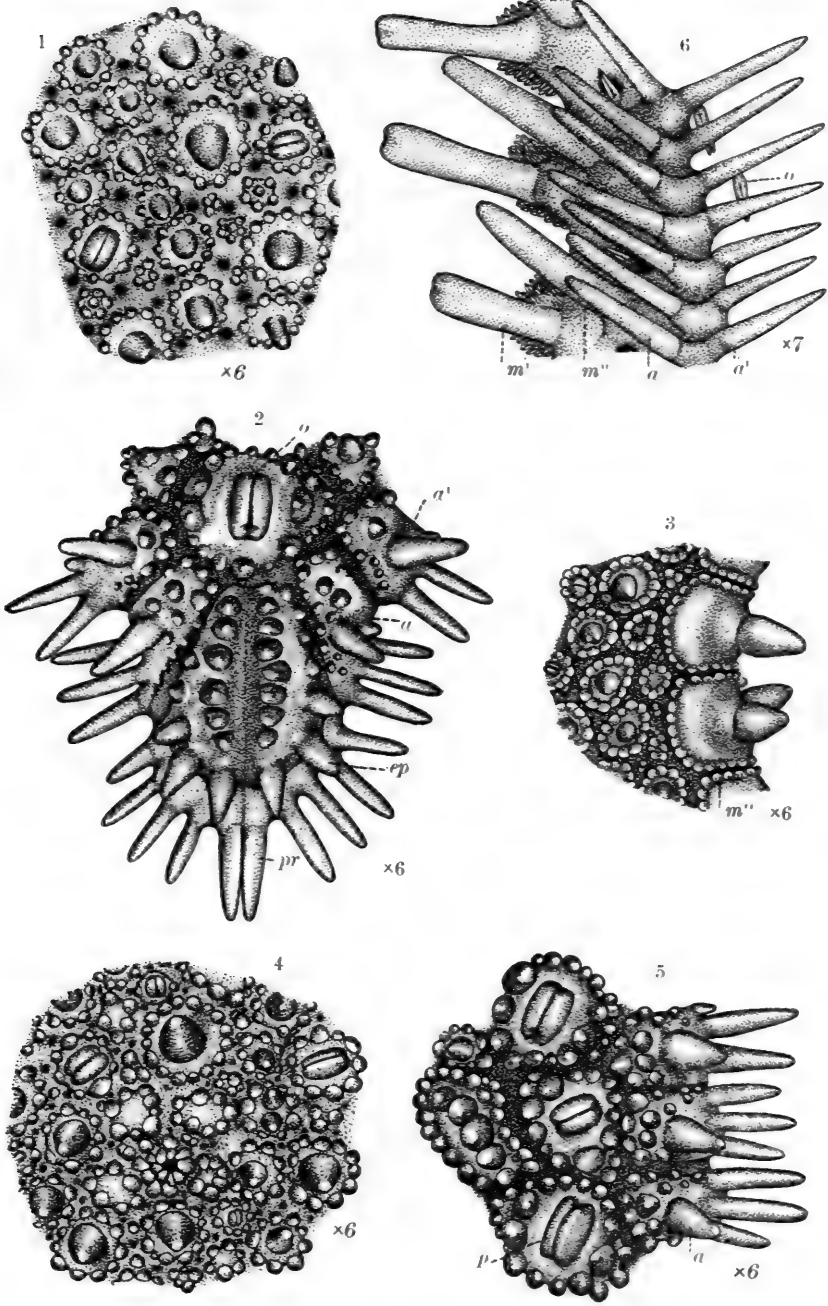


HIPPASTERIA PHRYGIANA (Parel.) Agassiz photograph of under side of an Atlantic specimen enlarged



PLATE XLVIII.

- FIG. 1. *Hippasteria phrygiana* (Parel.) Agassiz. Part of the dorsal surface of a New England specimen (314); $\times 6$.
- FIG. 2. The same. One of the jaws and adoral plates; *a*, *a'*, first and second adambulacral plates; *ep*, epioral spines; *pr*, apical peroral spines; *o*, large valvular pedicellaria on first actinal interradial plate; $\times 6$.
- FIG. 3. The same. Two inferomarginal plates (*m''*) and adjacent interactinals; $\times 6$.
- FIG. 4. The same. Central part of disk, showing dorsal "anal" or nephridial pore; $\times 6$.
- FIG. 5. The same. Three adambulacral plates and spines (*a*) and adjacent interactinal plates, each bearing a large valvular pedicellaria; $\times 6$.
- FIG. 6. *Orthasterias tanneri* Verrill. *a*, outer, and *a'*, inner adambulacral spines; *m'*, supramarginals, and *m''*, inferomarginals; *o*, one of the large, acute major pedicellariæ; $\times 7$. From off the Atlantic coast. No. 5524. Yale Mus.



A. H. VERRILL, FROM NATURE.

HELIOTYPE CO.

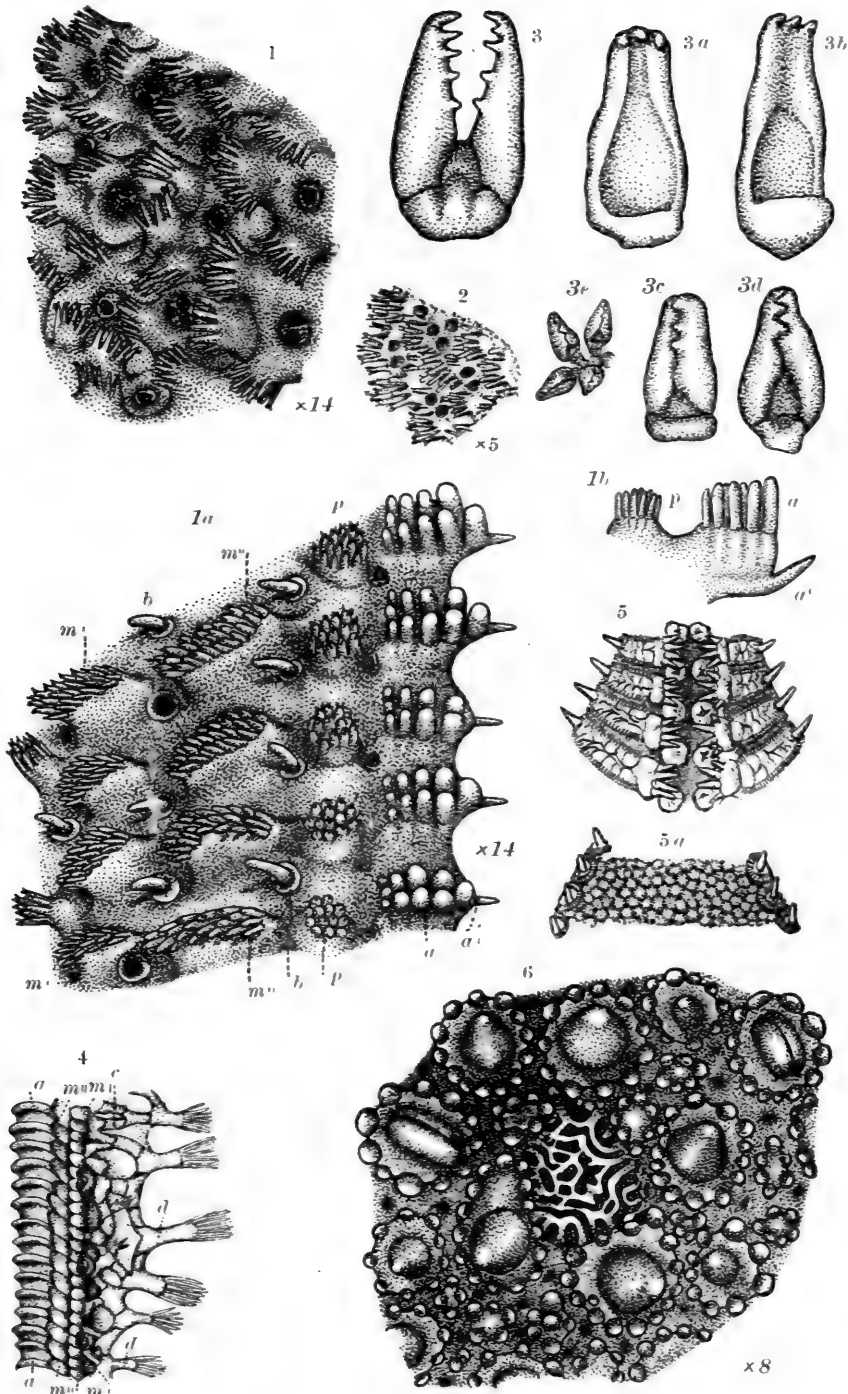
1-5. *HIPPASTERIA PHRYGIANA* (Parel.) Agassiz
 6. *ORTHASTERIAS TANNERI* Verrill





PLATE XLIX.

- FIG. 1. *Henricia sanguinolenta*, var. *pectinata* Verrill. Type. From an Atlantic specimen. Part of the dorsal surface; $\times 14$.
- FIG. 1a. The same specimen. Part of under surface and side of a ray; *a*, adambulacral spines; *a'*, inner or groove-spine; *p*, *p*, peractinal row of pseudopaxillæ; *m'*, *m'*, supramarginals; *m''*, *m''*, inferomarginals; *b*, *b*, papulæ; $\times 14$.
- FIG. 1b. The same. Profile view of one interambulacral and one peractinal group of spines; $\times 14$.
- FIG. 2. *Henricia sanguinolenta* (Müll.) Bell. Young. Atlantic specimen. Altered from Duncan and Sladen, $\times 5$.
- FIGS. 3-3e. Major or forficulate pedicellariæ of *Pisaster ochraceus*, much enlarged; 3, profile view of one of the larger erect, unguiculate, lateral kind; 3a, 3b, interior surface of valves; 3c, 3d, two of the smaller forms; 3e, a small group of the small pedicellate forms found on the margin of the adambulacral plates.
- FIG. 4. *Crossaster papposus* (Linn.) M. & Tr. Part of the skeleton of a ray, of an Arctic specimen, after Danielssen and Koren; *a*, *a*, adambulacral plates; *m'*, *m'*, superomarginals; *m''*, *m''*, inferomarginals; *c*, connective ossicle; *d*, dorsal plates and pseudopaxillæ; enlarged.
- FIG. 5. *Ctenodiscus crispatus* (Retz.) D. & Kor. From an Atlantic specimen, after Müller and Troschel. Under side of base of a ray.
- FIG. 5a. The same. Part of the dorsal surface. \times about 2.
- FIG. 6. *Hippasteria phrygiana*. Part of disk, showing madreporic plate; $\times 8$.



A. H. VERRILL, FROM NATURE.

HELIOTYPE CO

- 1-1a. HENRICIA SANGUOLENTA, var. PECTINATA Verrill
 2. HENRICIA SANGUOLENTA (Müll.) Bell
 3-3e. PISASTER OCHRACEUS (Brandt)
 4. CROSSASTER PAPPOSUS (Linn.) M. & Tr.
 5-5a. CTENODISCUS CRISPATUS (Retz.) D. & Kor.
 6. HIPPIASTERIA PHRYGIANA (Parel) Agassiz

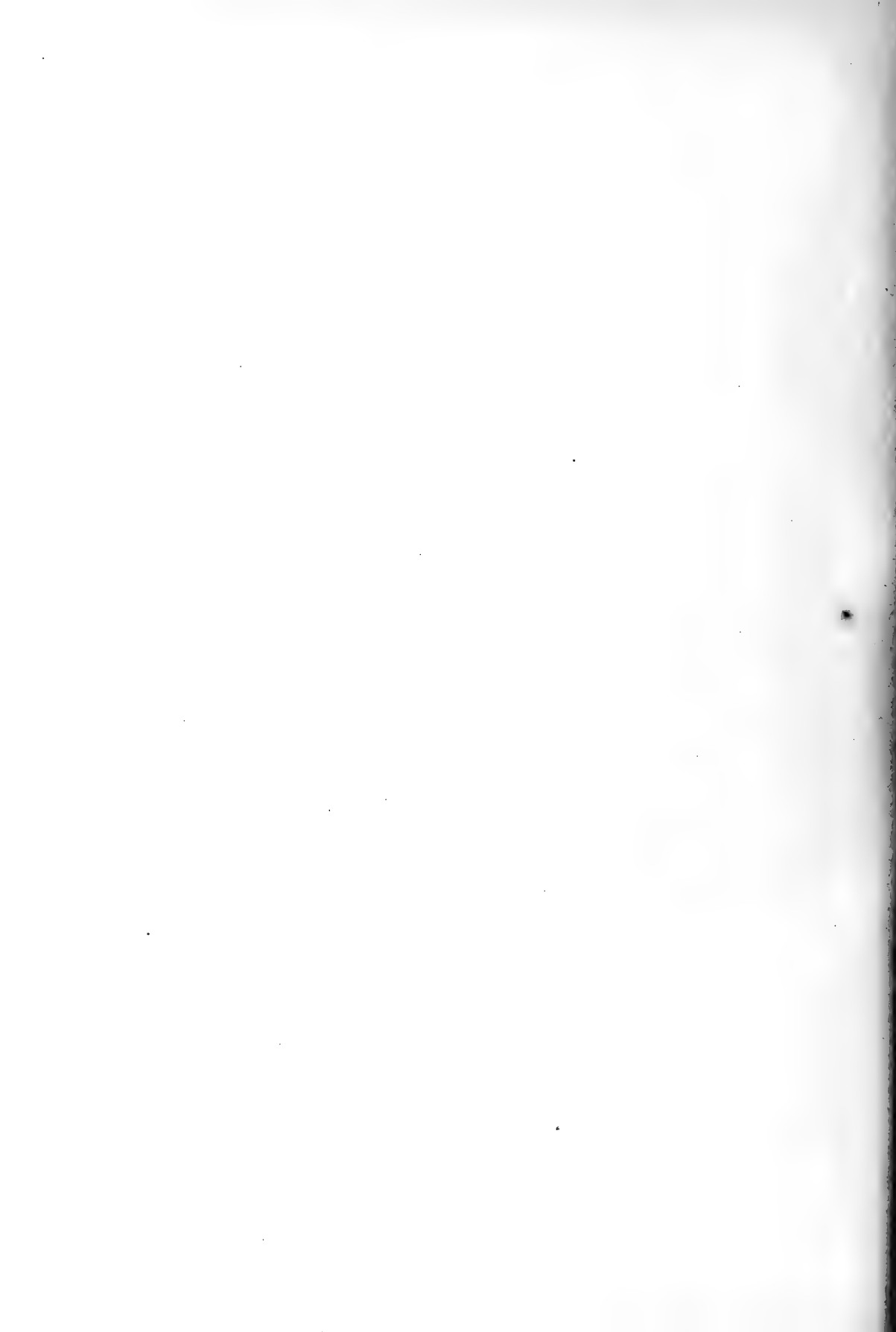
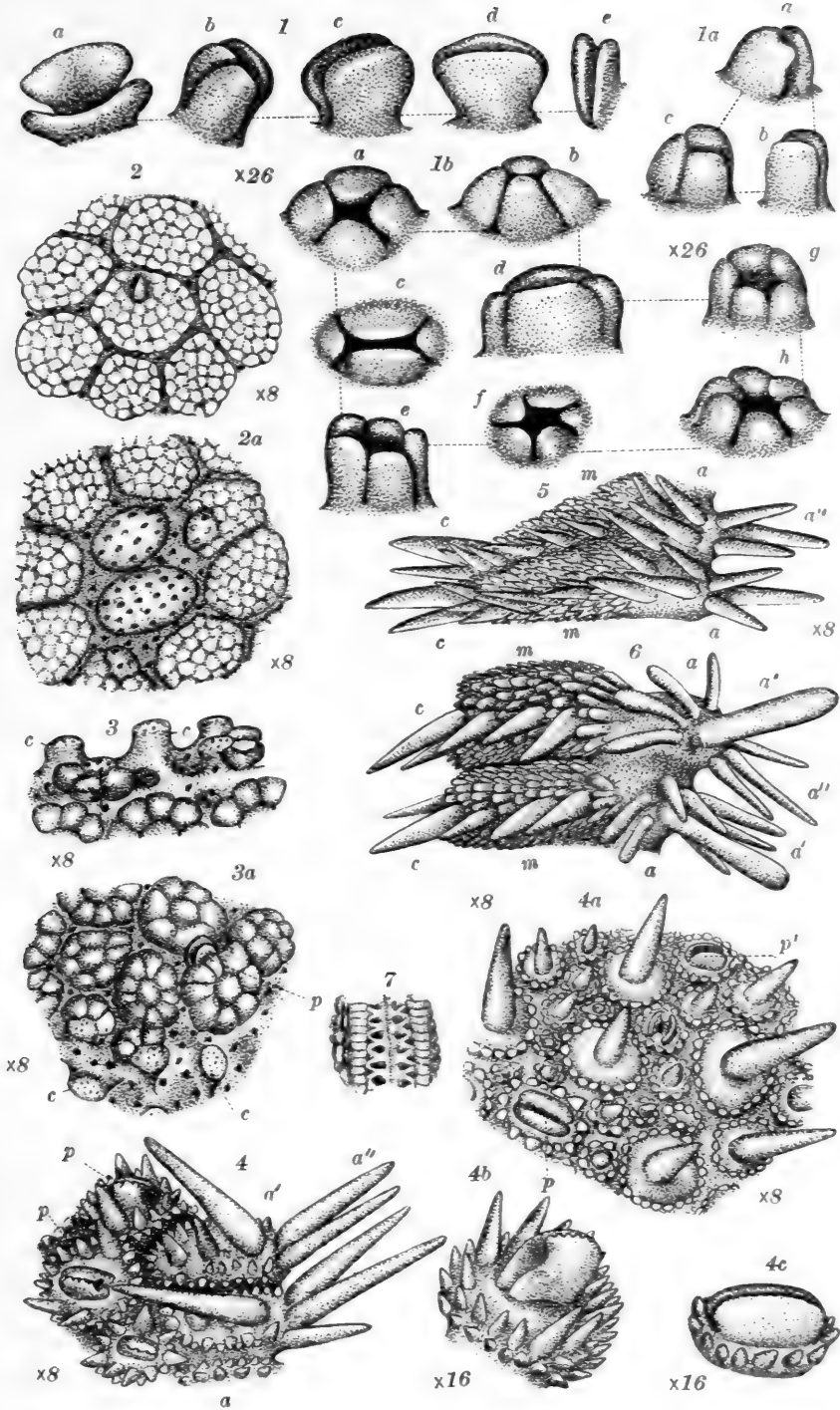


PLATE I.

- FIG. 1. *Dermasterias imbricata* (Grube) Perrier. *a, c*, pedicellariæ, mostly bivalved, from actinal side; $\times 26$.
- FIG. 1a. The same specimen. *a-c*, bivalved and trivalved pedicellariæ from the actinal side; $\times 26$.
- FIG. 1b. The same specimen. *a-f*, four-valved and five-valved pedicellariæ from the dorsal side; $\times 26$.
- FIG. 2. *Ceramaster granularis* (Retz.) Verrill. Plates of the dorsal side covered with granules; the central one bears a bivalved pedicellaria; $\times 8$.
- FIG. 2a. The same specimen, with the granules removed from two of the plates; $\times 8$.
- FIG. 3. *Tosiaster arcticus* Verrill. Type. A group of dorsal plates, partially in profile; some of them (*c, c*) with the large granules removed; also showing papular pores; $\times 8$.
- FIG. 3a. The same specimen. A group of dorsal plates, some of them (*c, c*) with the granules removed; *p*, bivalved pedicellariæ; $\times 8$.
- FIG. 4. *Hippasteria spinosa* Verrill. Type. *a', a'* inner, and *a*, outer adambulacral spines; *p, p'*, pedicellariæ of actinal plates; $\times 8$.
- FIG. 4a. The same specimen. A group of dorsal plates and spines; *p, p*, pedicellariæ; $\times 8$.
- FIG. 4b. The same specimen. One of the dorsal plates with a pedicellaria; \times about 16.
- FIG. 4c. The same. A dorsal pedicellaria of the broad form; \times about 16.
- FIG. 5. *Astropecten californicus* Fisher. Actinal side; *a', a'*, inner, and *a, a*, outer adambulacral spines; *m, m*, inferomarginal plates; *c, c*, inferomarginal spines; $\times 8$.
- FIG. 6. *Astropecten siderealis* Verrill. Actinal side; *a, a*, outer adambulacral spines; *a'*, central spine of the adambulacral plate; *a''*, furrow spines; *c, c*, inferomarginal spines; *m, m*, inferomarginal plates; $\times 8$.
- FIG. 7. *Stenasterias macropora* Verrill. Type. Portion of the actinal side of a ray, with the spines removed; $\times 5$.



1-1b. *DERMASTERIAS IMBRICATA* (GRUBE)

2.2a. *CERAMASTER GRANULARIS* (M.)

3.3a. *TOSIASTER ARCTICUS* VER.

4-4c. *HIPPASTERIA SPINOSA* VER.

5. *ASTROPECTEN CALIFORNICUS* F. 6. *A. SIDEREALIS* VER.

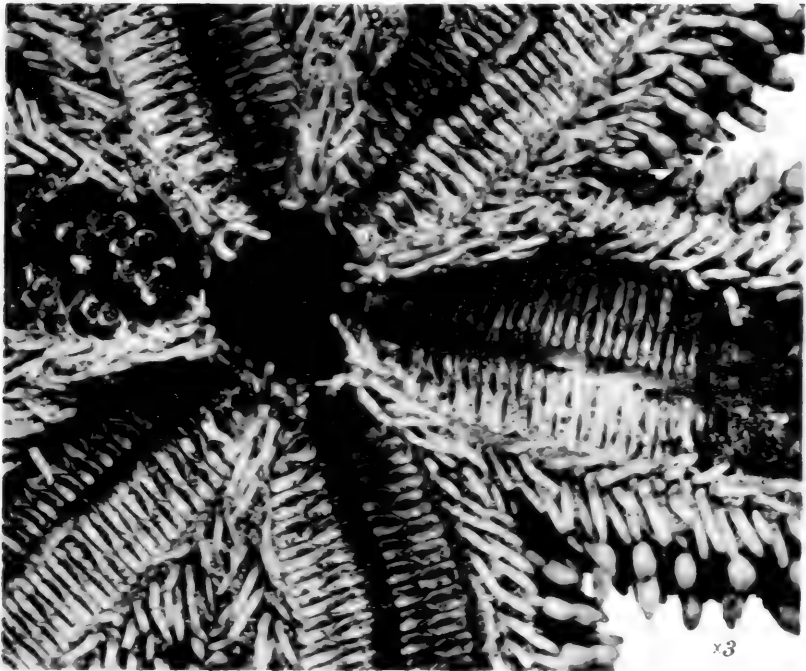
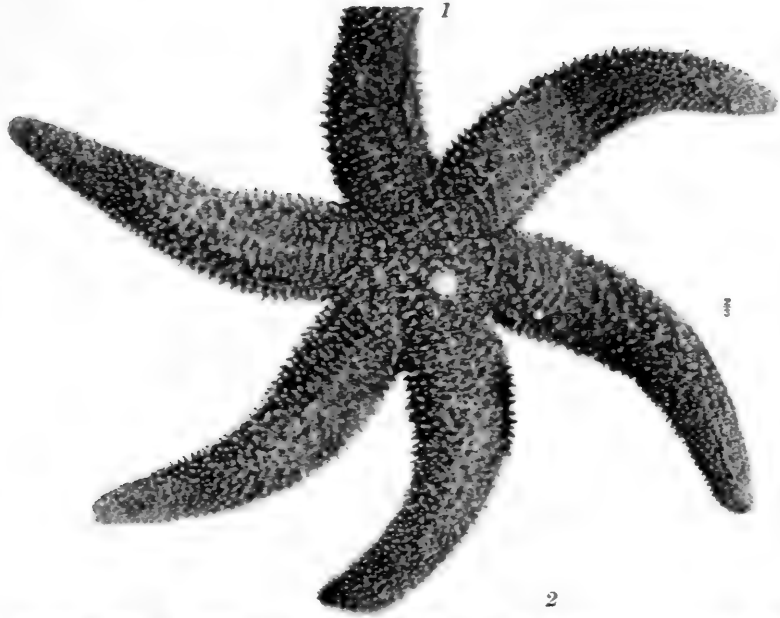
7. *STENASTERIAS MACROPORA* VER.





PLATE LI.

- FIG. 1. *Asterias katherina* Gray. Dorsal view of No. 1181, Mus. Comp. Zoöl.;
2/3 natural size. Gulf of Georgia.
- FIG. 2. The same specimen. Actinal side; $\times 3$.



HELIOTYPE CO., BOSTON

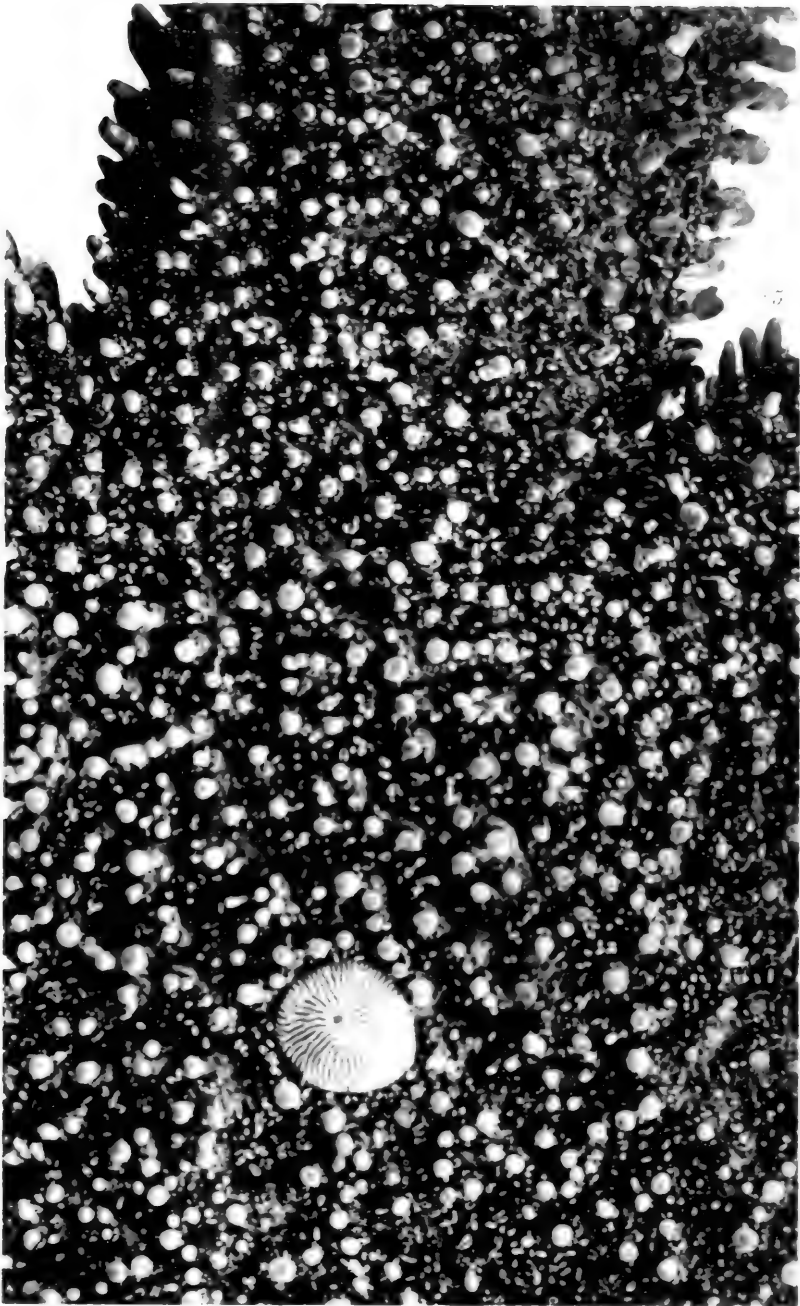
1.2. ASTERIAS KATHERINAE GRAY





PLATE LII.

Asterias katherina Gray. Dorsal side of the same specimen shown on pl. LI;
× 4¾. Gulf of Georgia. No. 1181, Mus. Comp. Zoöl.



HELIOTYPE CO., BOSTON

ASTERIAS KATHERINAE GRAY

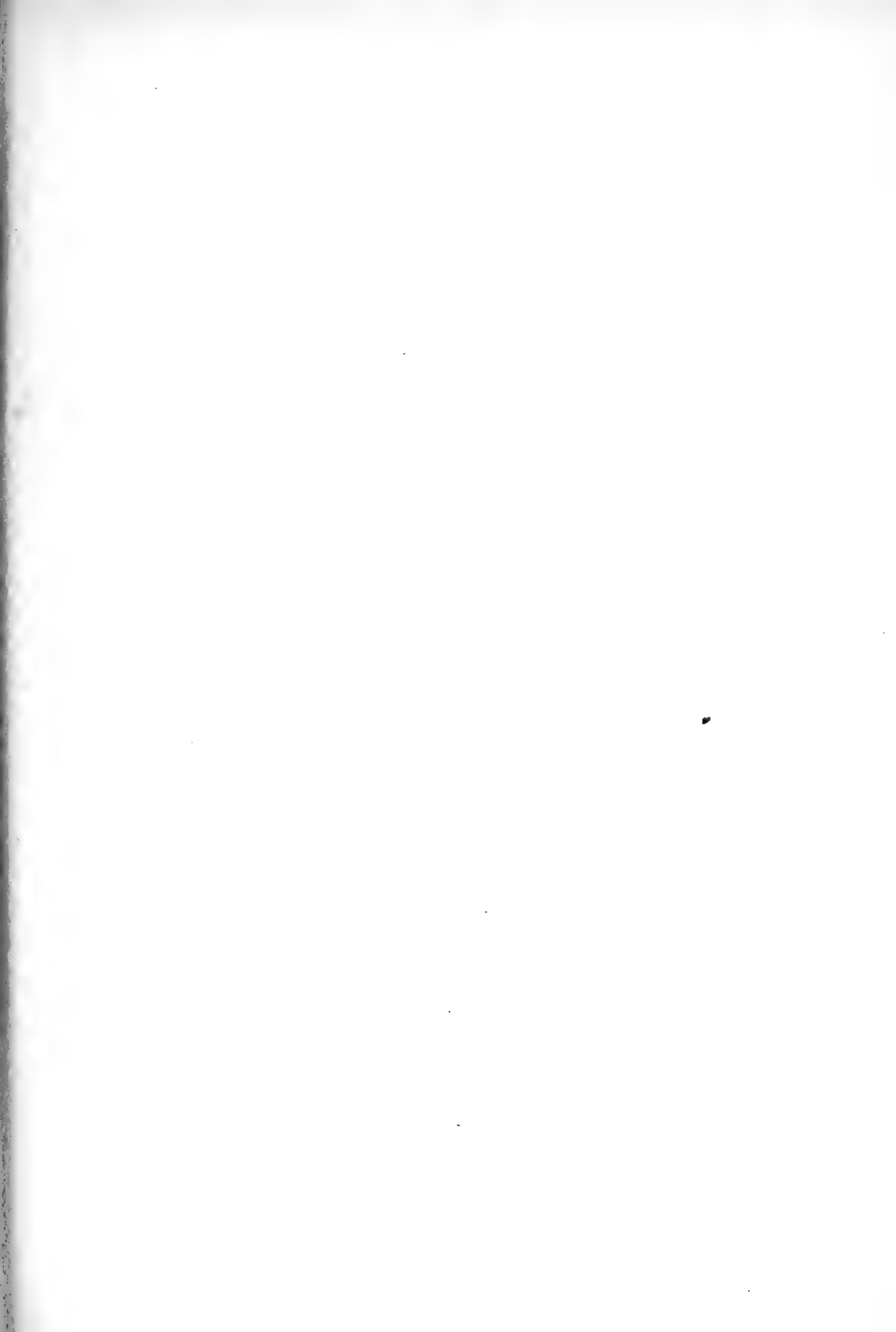
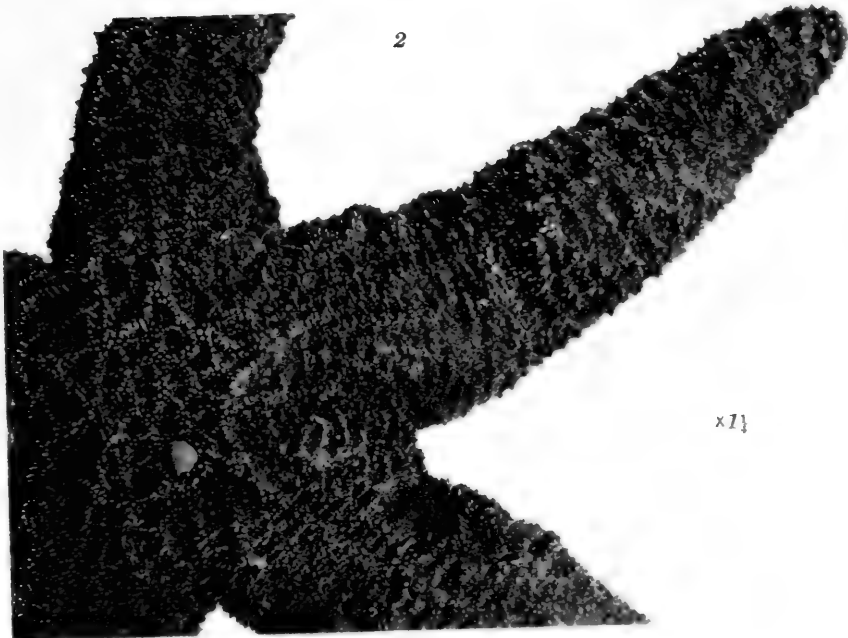


PLATE LIII.

- FIG. 1. *Asterias victoriana* Verrill. Type. Dorsal view; $\frac{3}{4}$ natural size.
FIG. 2. *Pisaster confertus* (Stimpson) Verrill. \times about $1\frac{1}{8}$.



HELIOTYPE CO., BOSTON

1. *ASTERIAS VICTORIANA* VER. Type
2. *PISASTER CONFERTUS* (ST.)

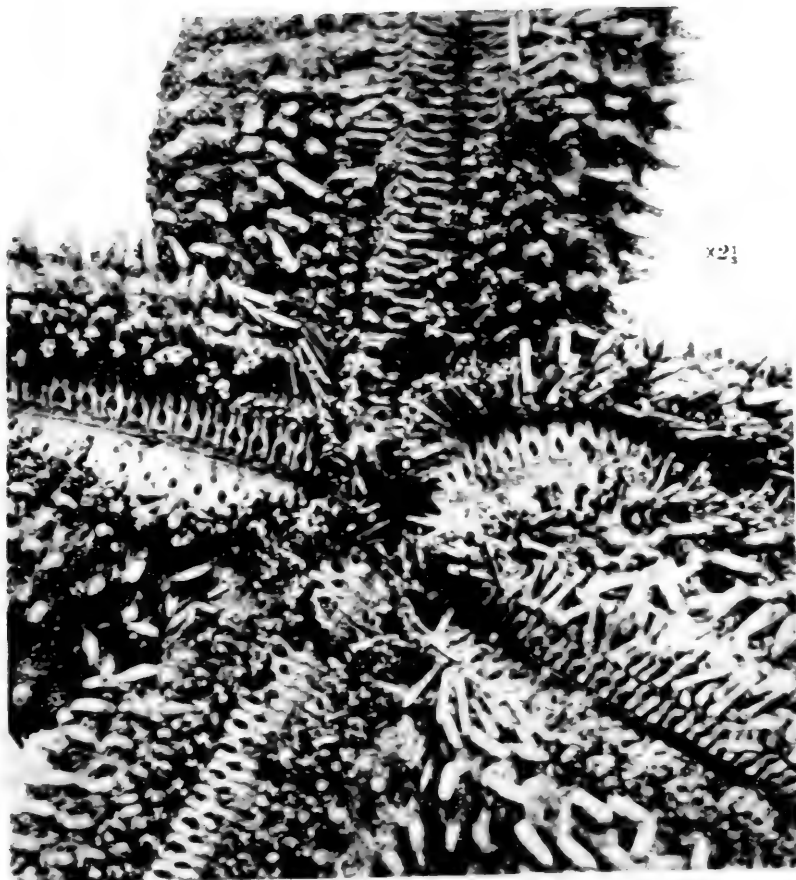


PLATE LIV.

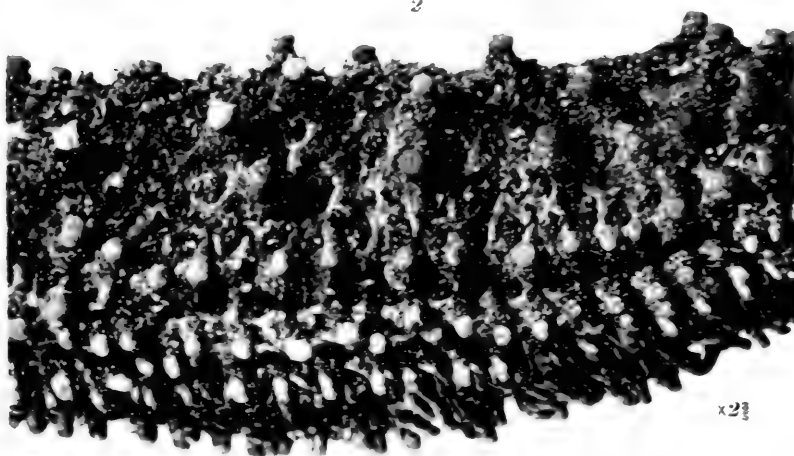
FIG. 1. *Asterias victoriana* Verrill. Type. Actinal side; $\times 2\frac{1}{2}$.

FIG. 2. The same specimen. Side view of a ray; $\times 2\frac{1}{2}$. Vancouver I.

1



2



HELICTYPE COLL. BOSTON

1.2. ASTERIAS VICTORIANA VER Type

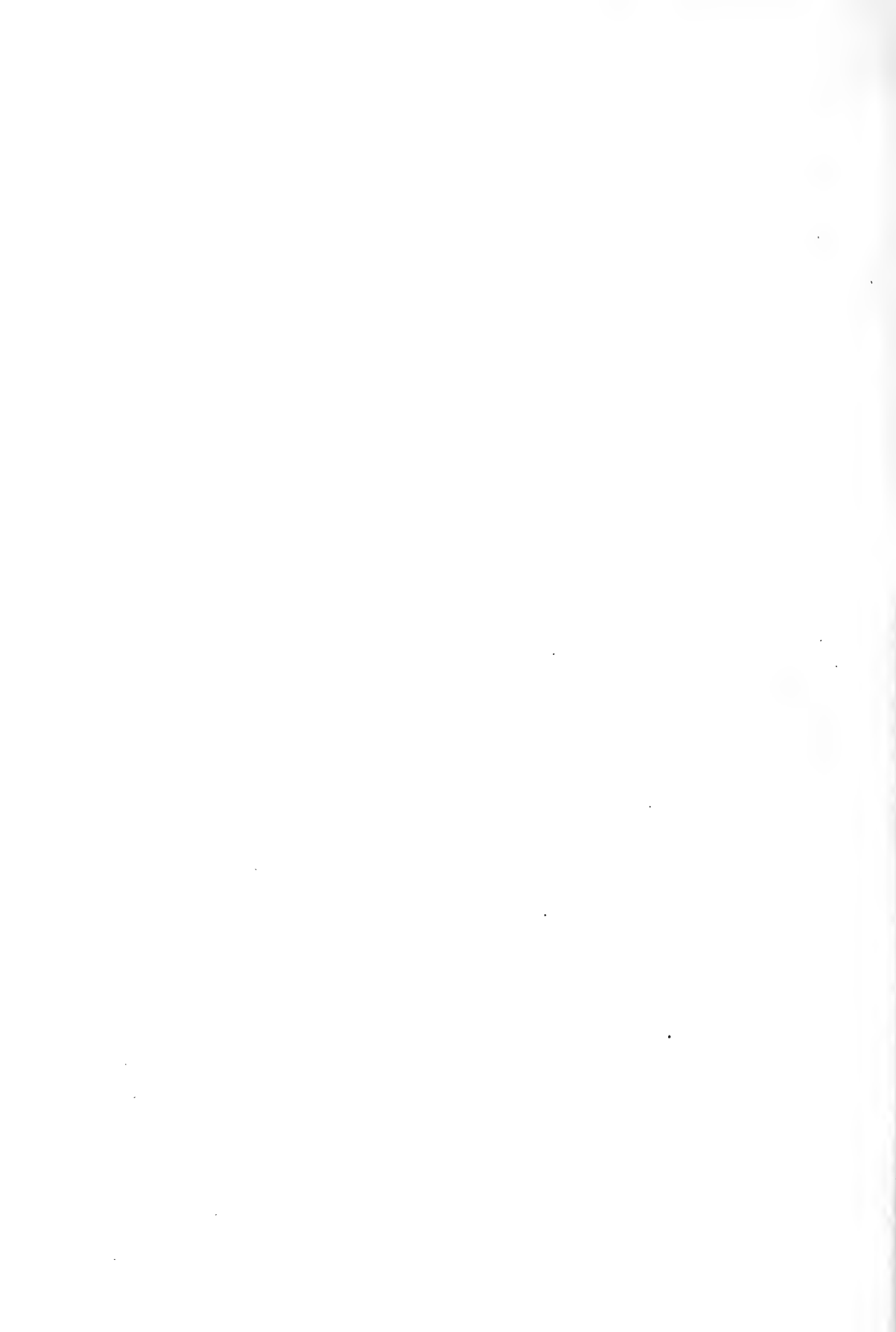




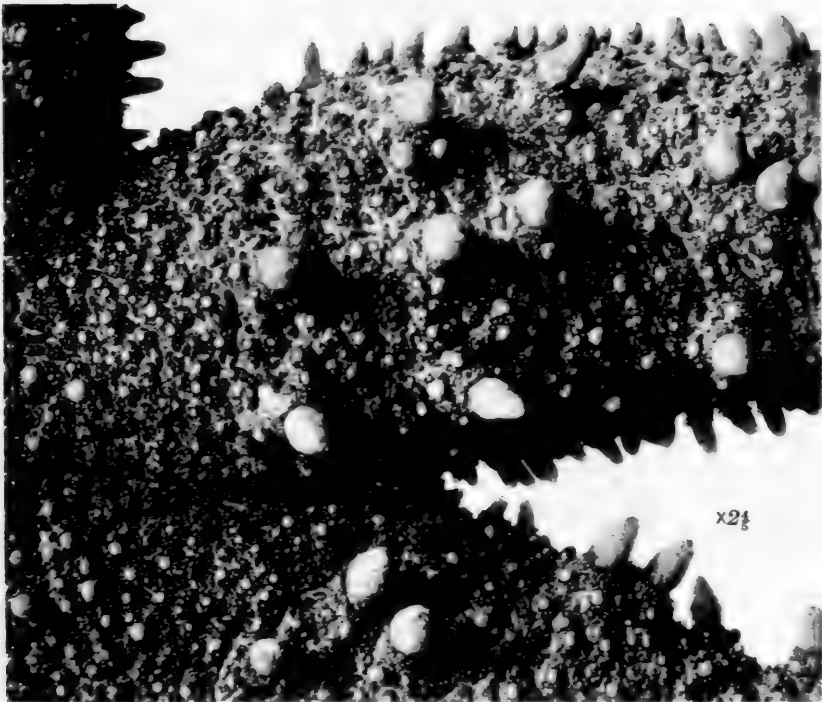
PLATE LV.

- FIG. 1. *Asterias polythela* Verrill. Type. Dorsal side; about $\frac{2}{3}$ natural size.
FIG. 2. The same specimen. Part of dorsal side; $\times 2\frac{1}{2}$. No. 5820.

1



2



x2 1/2

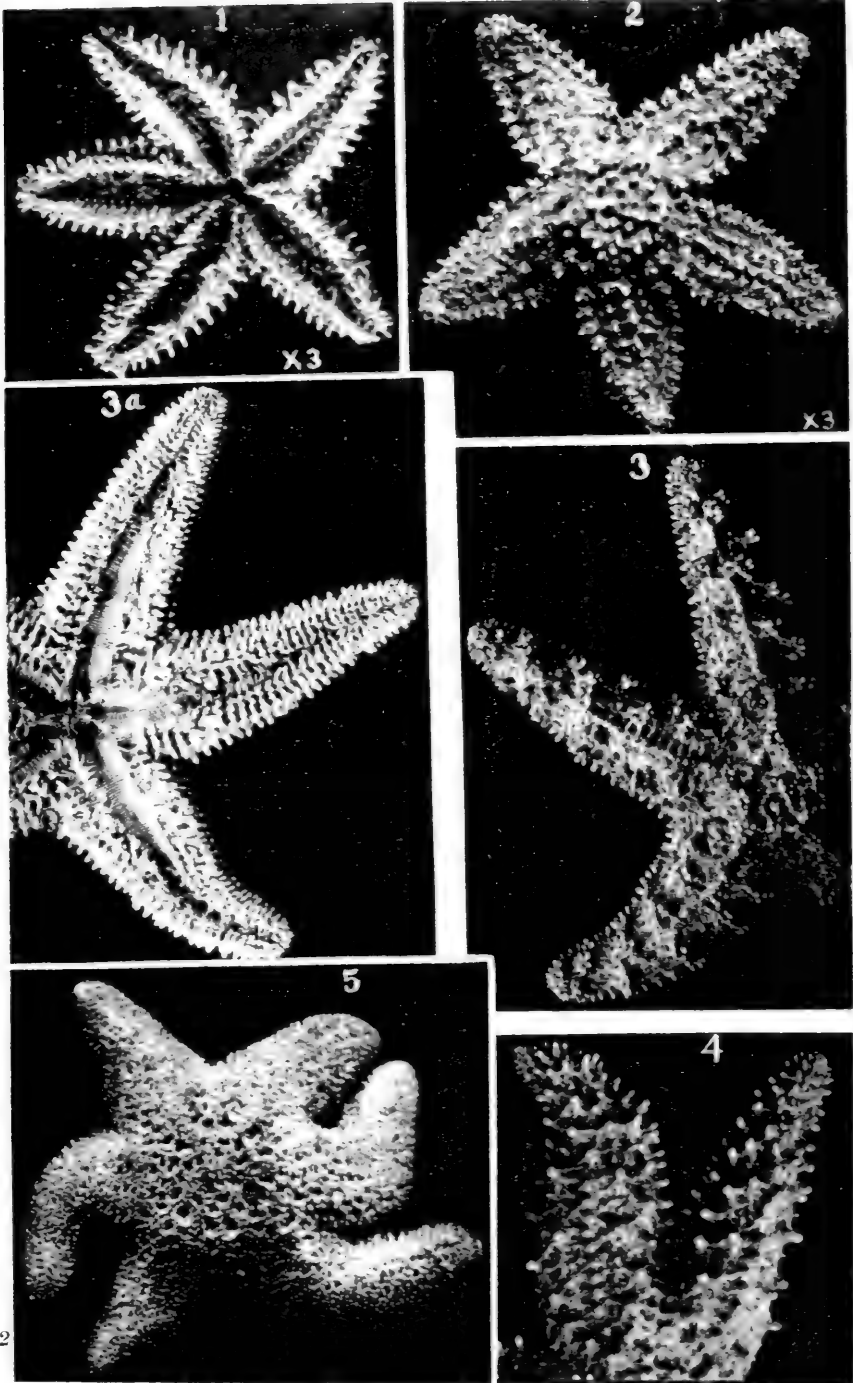
HELIOTYPE CO., BOSTON

1.2. ARTERIAS POLYTHELA VER. Type



PLATE LVI.

- FIGS. 1, 2. *Leptasterias arctica* (Murdoch) (?). Young. Actinal and dorsal views of specimens from Bering Sea; $\times 3$. No. 16591, U. S. Nat. Mus.
- FIGS. 3, 3a. *Pisaster ochraceus*, var. *nodiferus* Verrill. Dorsal and actinal views; about $\frac{2}{3}$ natural size (*nodosus* on plate incorrect).
- FIG. 4. *P. capitatus* (Stimpson) Verrill. Dorsal side of two rays; about $\frac{2}{3}$ natural size.
- FIG. 5. *Leptasterias æqualis* (Stimpson), var. *compacta* Verrill. Type. Dorsal side; $\times 2$. Yale Mus.



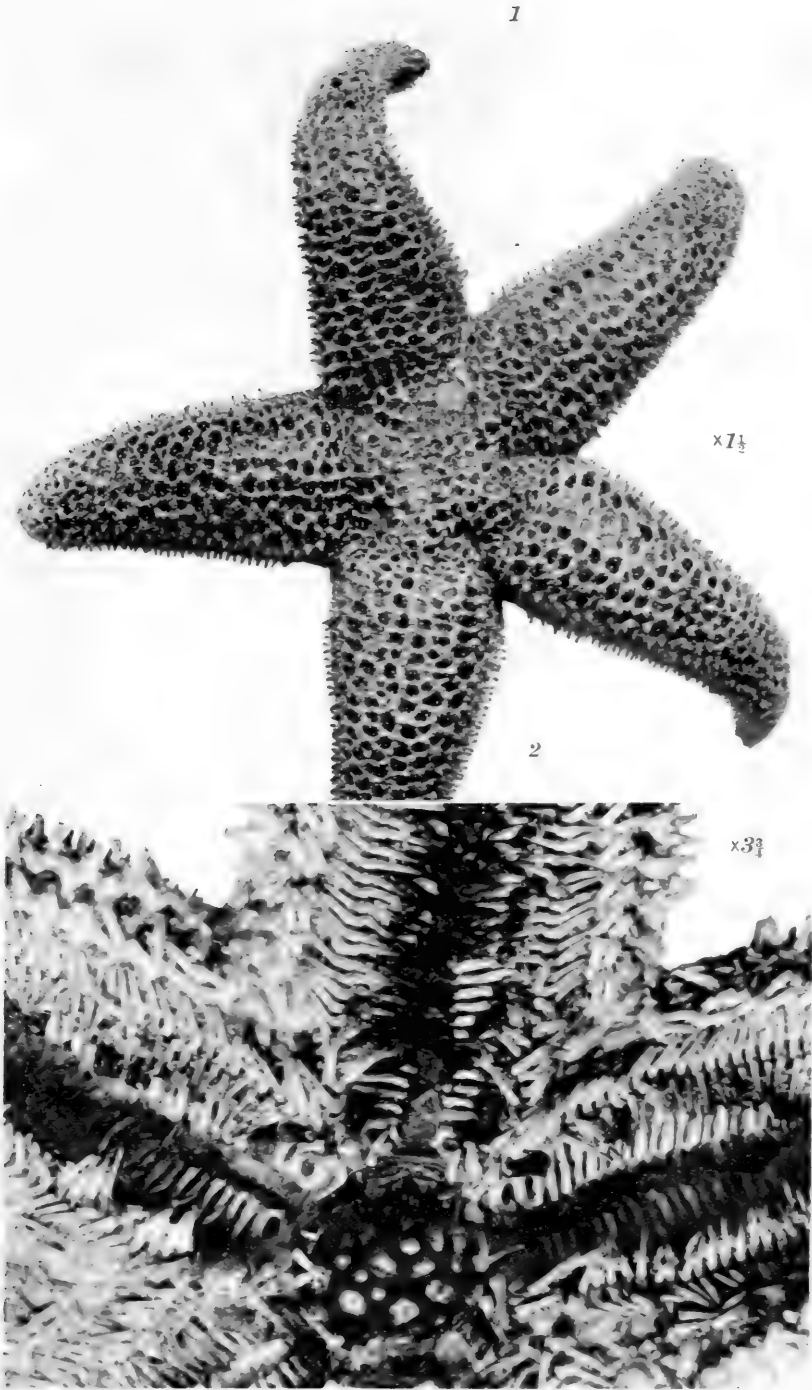
HELIOTYPE CO., BOSTON

- 1.2. *LEPTASTERIAS ARCTICA* (MUR.) YOUNG
- 3.3a. *PISASTER OCHRACEUS NODOSUS* VER.
- 4. *PISASTER CAPITATUS* (ST.)
- 5. *LEPTASTERIAS AEQUALIS COMPACTA* VER.



PLATE LVII.

- FIG. 1. *Parasterias albertensis* Verrill. Type. Dorsal side; $\times 1\frac{1}{2}$.
FIG. 2. The same specimen. Actinal side; $\times 3\frac{3}{4}$.



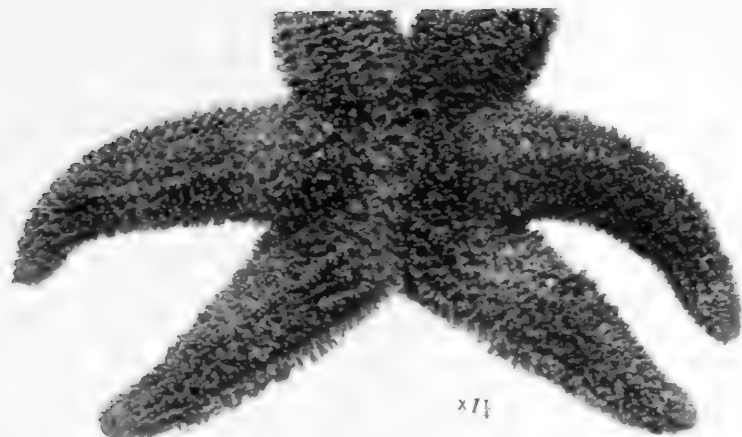
1.2. PARASTERIAS ALBERTENSIS VER. Type



PLATE LVIII.

- FIG. 1. *Leptasterias epichlora*, var. *plena* Verrill. Type. Dorsal view;
× 1¼. Vancouver I.
- FIG. 2. *Asterias multiclava* Verrill. Type. About ⅔ natural size.

1



x1 1/2

2



G.M.C.

HELIOTYPE CO., BOSTON

1. LEPTASTERIAS EPICHLORA PLENA VER. Type
2. ASTERIAS MULTICLAVA VER. Type

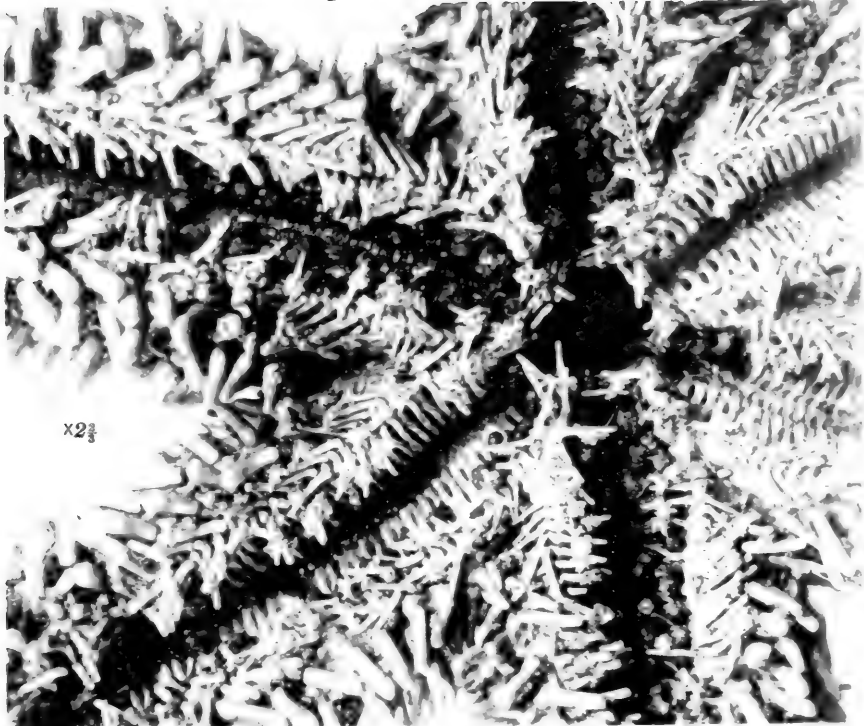




PLATE LIX.

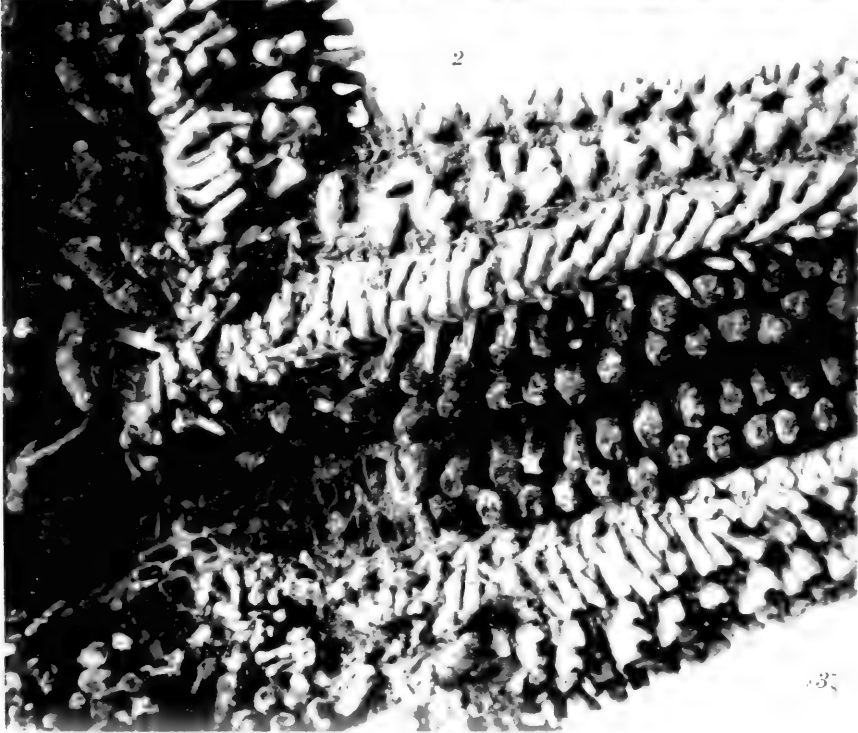
- FIG. 1. *Asterias multiclava* Verrill. Type. Actinal side; $\times 2\frac{2}{3}$. Bering I.
No. 15841, U. S. Nat. Mus.
- FIG. 2. *Allasterias anomala* Verrill. Type. Actinal side; $\times 3\frac{7}{8}$. Arctic
Alaska (L. M. Turner, 1874). No. 3821, U. S. Nat. Mus.

1



x2 $\frac{2}{3}$

2



x3

HELIOTYPE CO., BOSTON

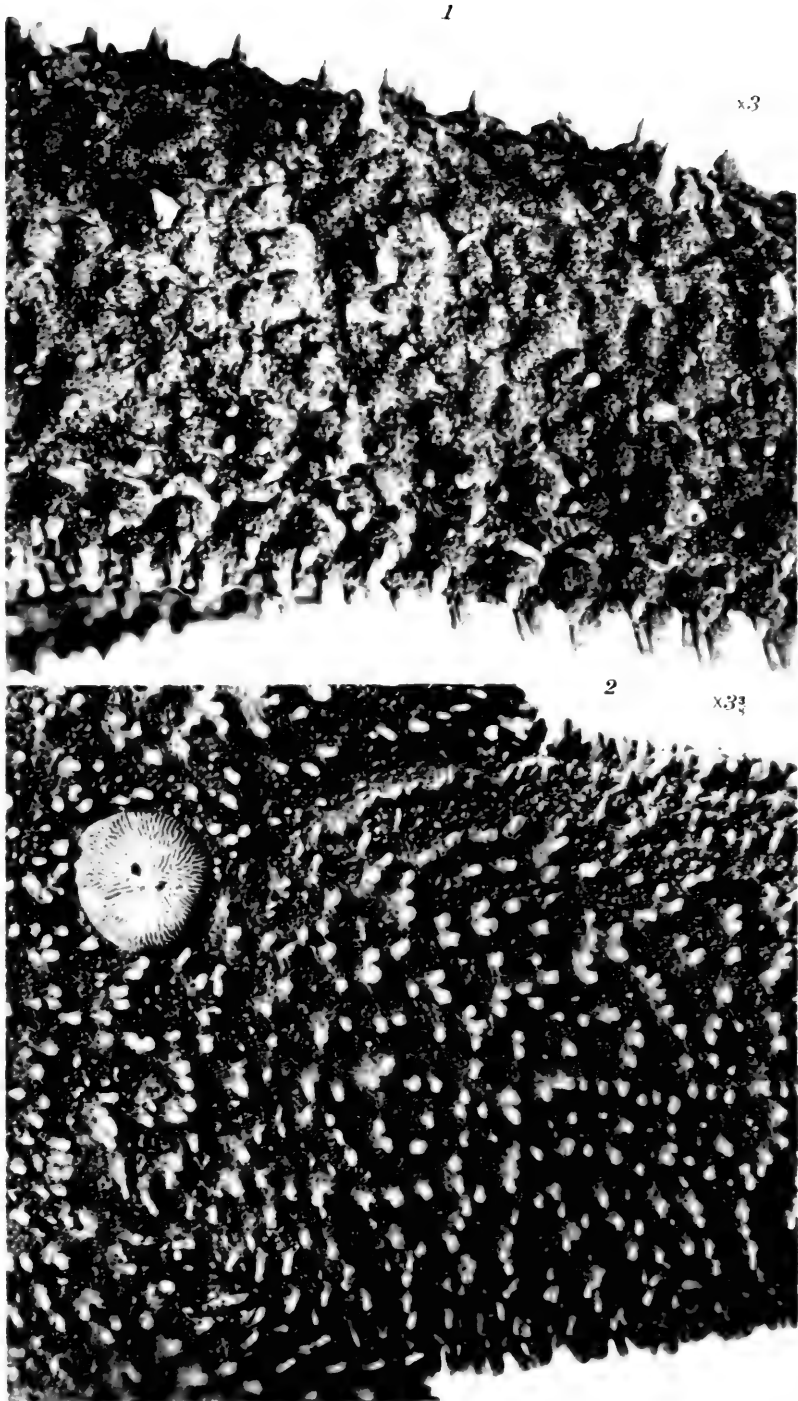
- 1. *ASTERIAS MULTICLAVA* VER. Type
- 2. *ALLASTERIAS ANOMALA* VER. Type





PLATE LX.

- FIG. 1. *Pisaster papulosus* Verrill. Cotype. Side view of a ray, near base;
× about 3. Vancouver I.
- FIG. 2. *Allasterias anomala* Verrill. Type. Dorsal view; × 3½. St.
Michael's I., Arctic Alaska (L. M. Turner). No. 3821, U. S. Nat.
Mus.



HELIOTYPE CO., BOSTON

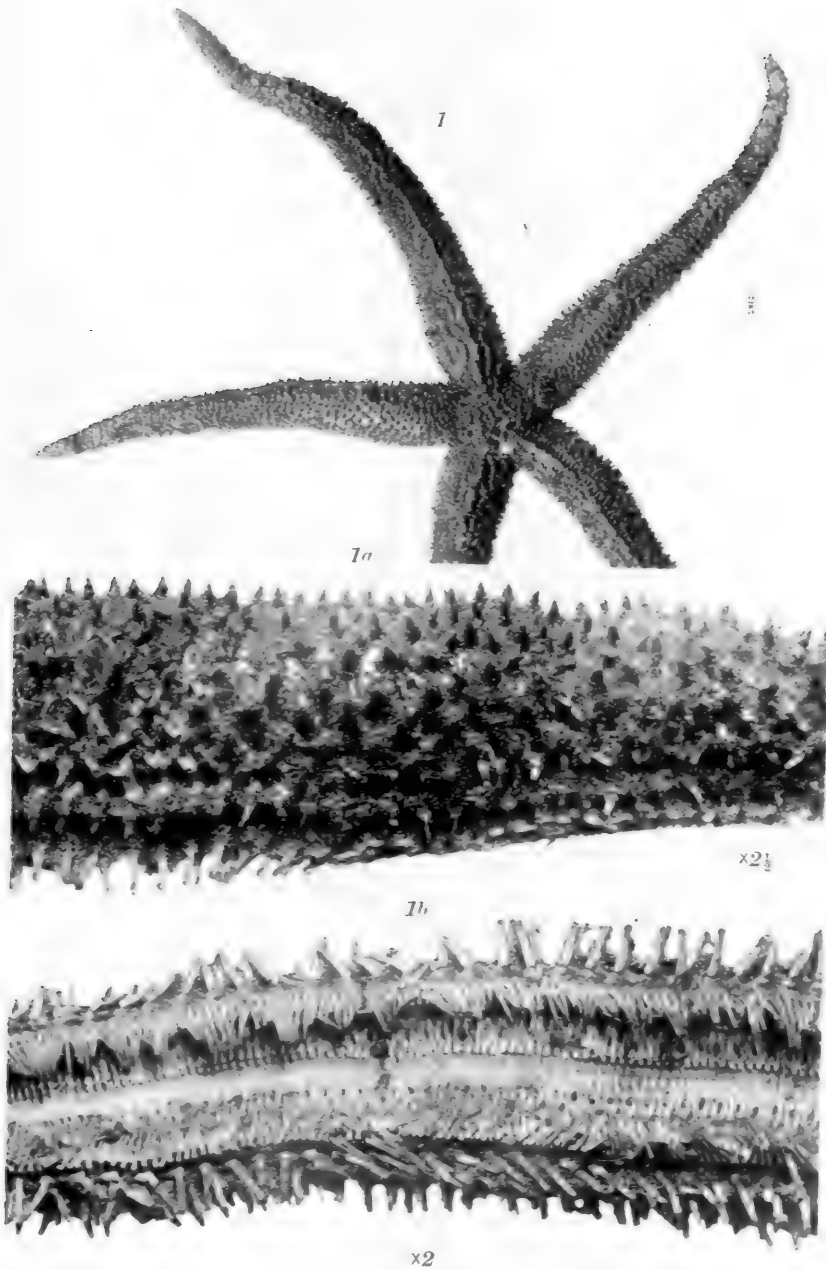
1. *PISASTER PAPULOSUS* VER.
2. *ALLASTERIAS ANOMALA* VER. Type





PLATE LXI.

- FIG. 1. *Asterias nanimensis* Verrill. Type. Dorsal side; about $\frac{2}{3}$ natural size. Vancouver I. Canadian Geol. Survey.
- FIG. 1a. The same specimen. Side view of a ray; $\times 2\frac{1}{2}$.
- FIG. 1b. The same specimen. Actinal side of a ray; $\times 2$.



HELIOTYPE CO., BOSTON

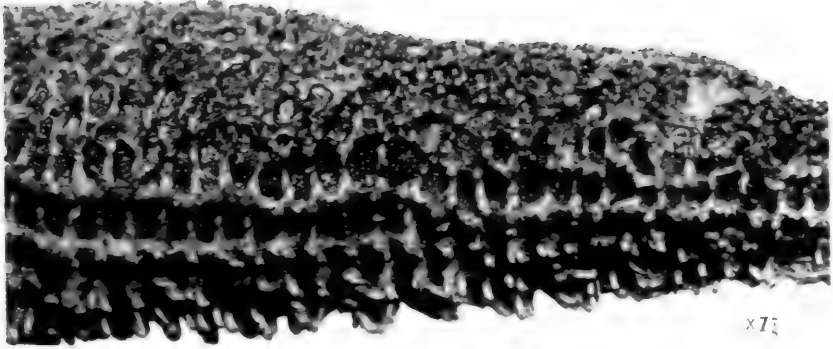
1.1b. ASTERIAS MANIMENSIS VER. Type



PLATE LXII.

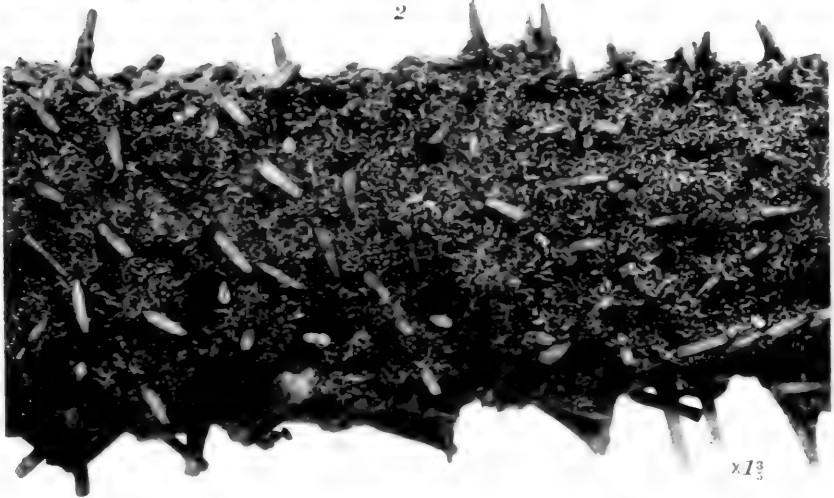
- FIG. 1. *Evasterias troschelii*, var. *alveolata* Verrill. Type. Side view of a ray; $\times 17\%$.
- FIG. 2. *Orthasterias forreri forcipulata* Verrill. Type. Dorsal view of a ray; $\times 1\%$. Vancouver I.
- FIG. 3. The same specimen. Actinal side of a ray; $\times 1\%$.

7



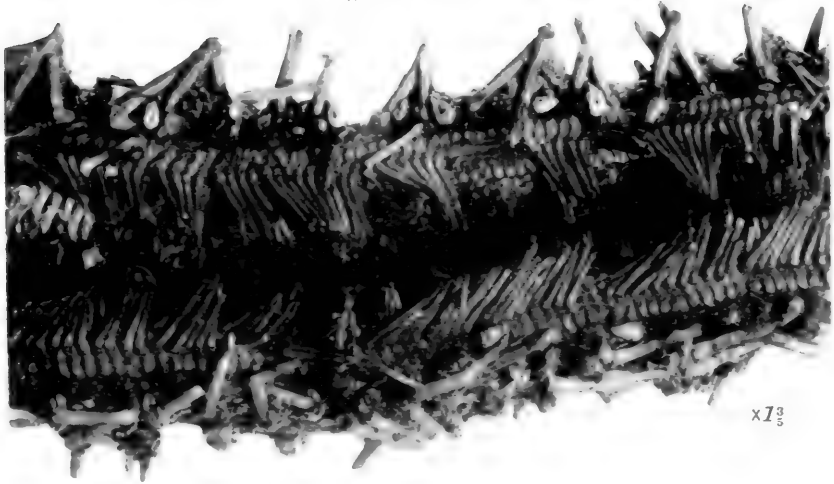
x17

2



x13

3



x13

HELIOTYPE CO., BOSTON

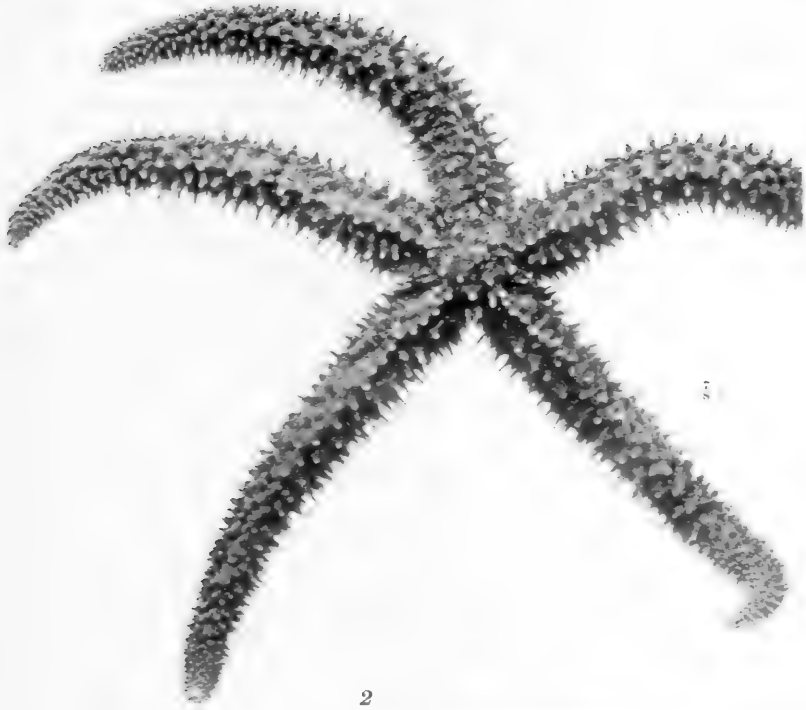
1. *EVASTERIAS TROSCHELII ALVEOLATA* VER. Type
2,3. *ORTHASTERIAS FORRERI FORCIPULATA* VER. Type



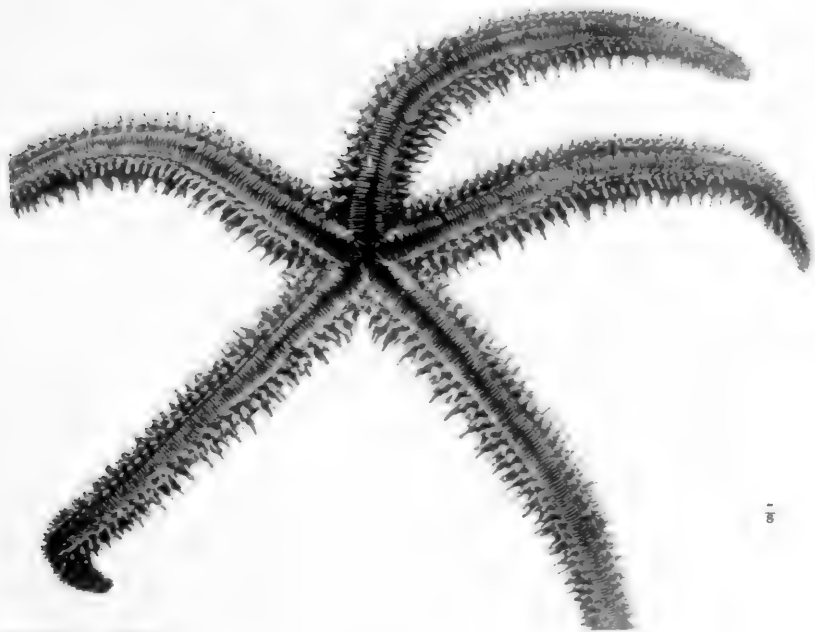
PLATE LXIII.

- FIG. 1. *Orthasterias biordinata* Verrill. Type. About $\frac{7}{8}$ natural size.
FIG. 2. The same specimen. Actinal side; $\frac{7}{8}$ natural size.

1



2



HELIOTYPE CO., BOSTON

1,2. ORTHASTERIAS BIORDINATA VER. Type



PLATE LXIV.

- FIG. 1. *Orthasterias leptolena* Verrill. Type. Actinal side; about $\frac{7}{8}$ natural size. Canadian Geol. Survey.
- FIG. 1a. The same specimen. Dorsal side; $\frac{7}{8}$ natural size.
- FIG. 2. The same. A young specimen. Actinal side; $\frac{9}{10}$ natural size.
- FIG. 2a. The same specimen. Dorsal side; $\frac{9}{10}$ natural size. One ray is lost.





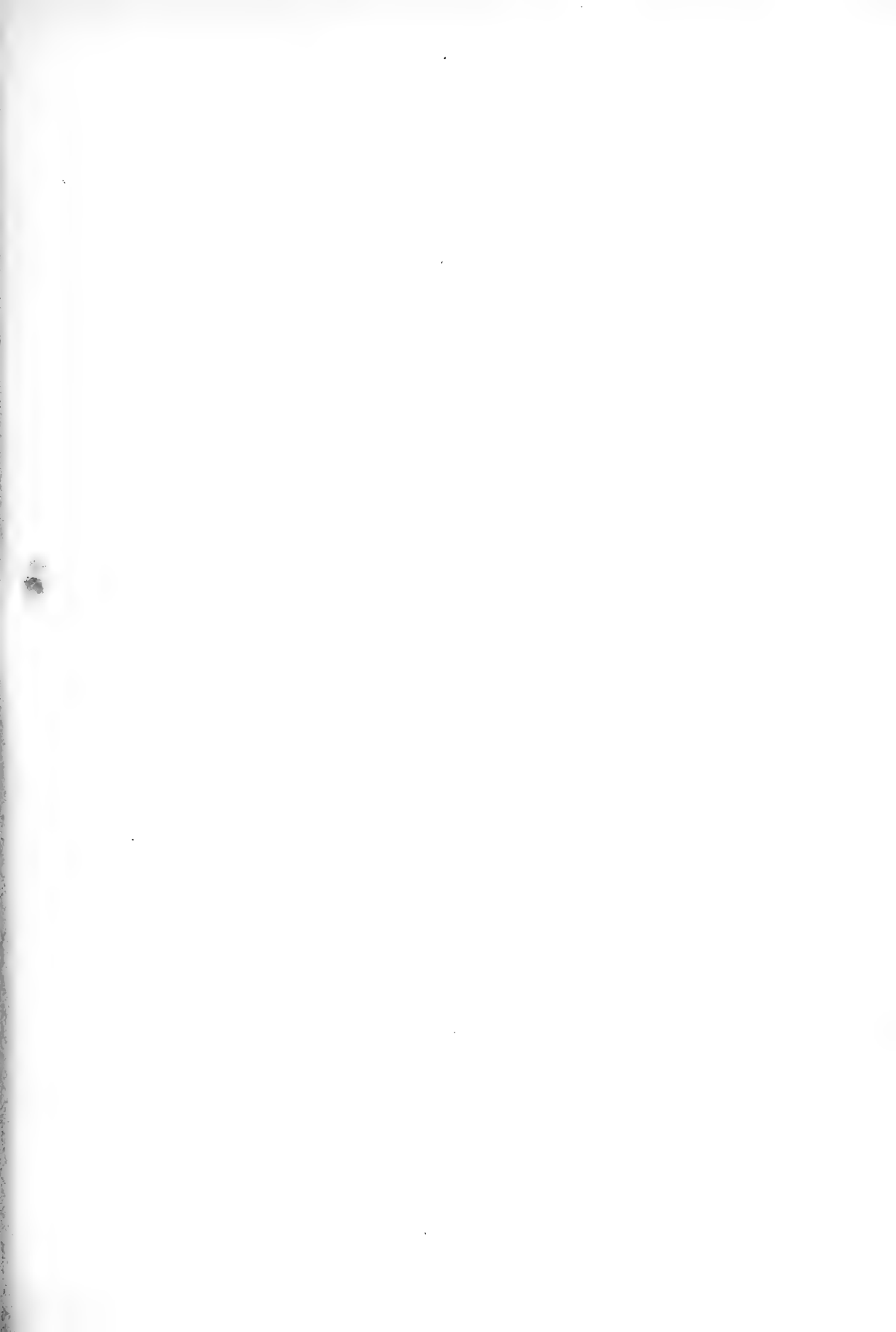


PLATE LXV.

- FIG. 1. *Orthasterias forreri* (de Loriol) Verrill. Dorsal side; about $\frac{4}{5}$ natural size. No. 1823, Mus. Comp. Zoölogy.
- FIG. 2. *Orthasterias columbiana* Verrill. Young. Dorsal side; about natural size.



HELIOTYPE CO., BOSTON

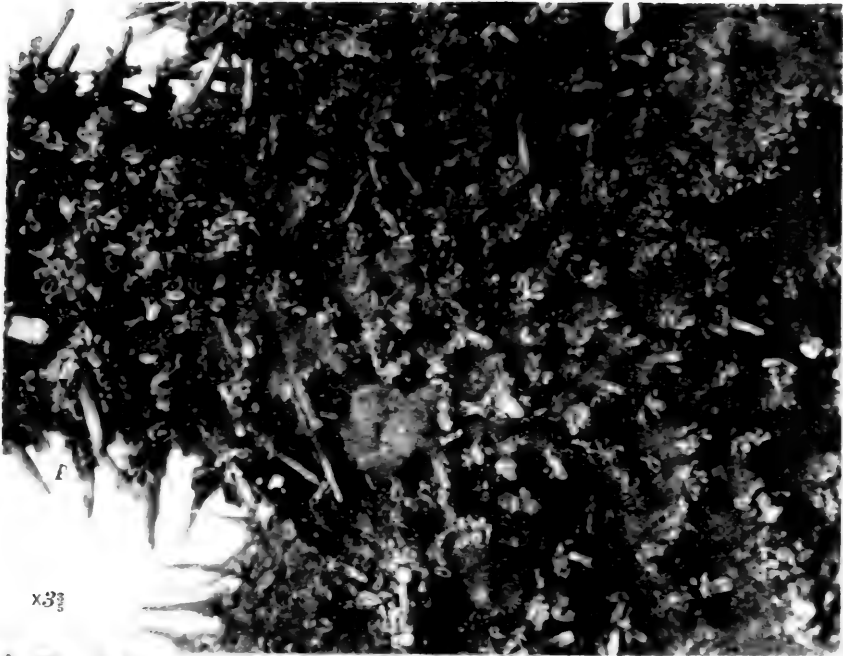
1. *ORTHASTERIAS FORRERI* (LOR.)
2. *O. COLUMBIANA* VER. YOUNG



PLATE LXVI.

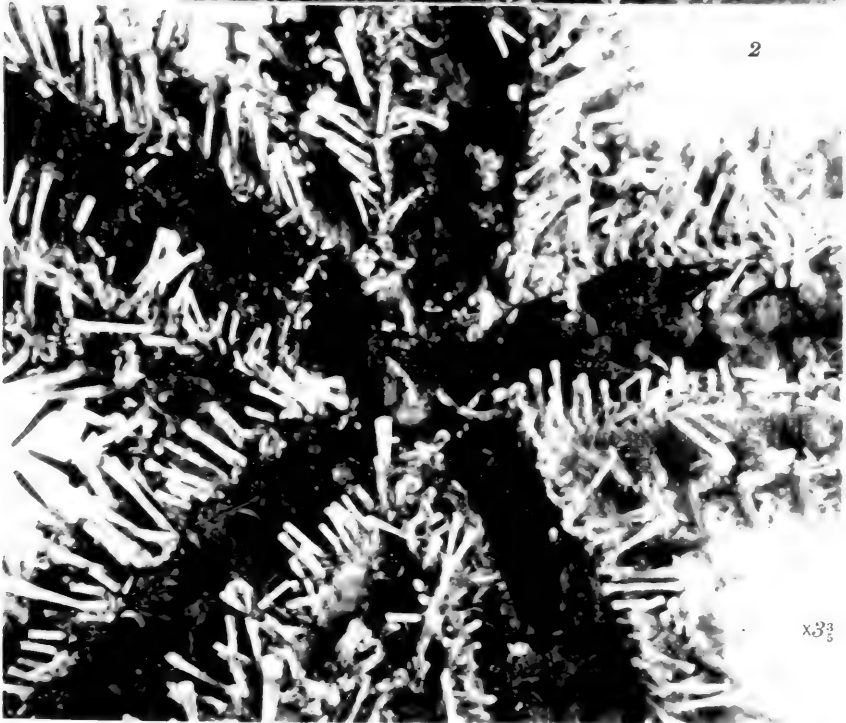
- FIG. 1. *Orthasterias forreri* (Loriol) Verrill. Dorsal view of disk and base of ray; *P*, major pedicellaria; $\times 3\frac{1}{2}$. No. 1823.
- FIG. 2. The same specimen. Actinal side; $\times 3\frac{1}{2}$. No. 1823, Mus. Comp. Zoöl.

7



x33

2



x33

HELIOTYPE CO., BOSTON

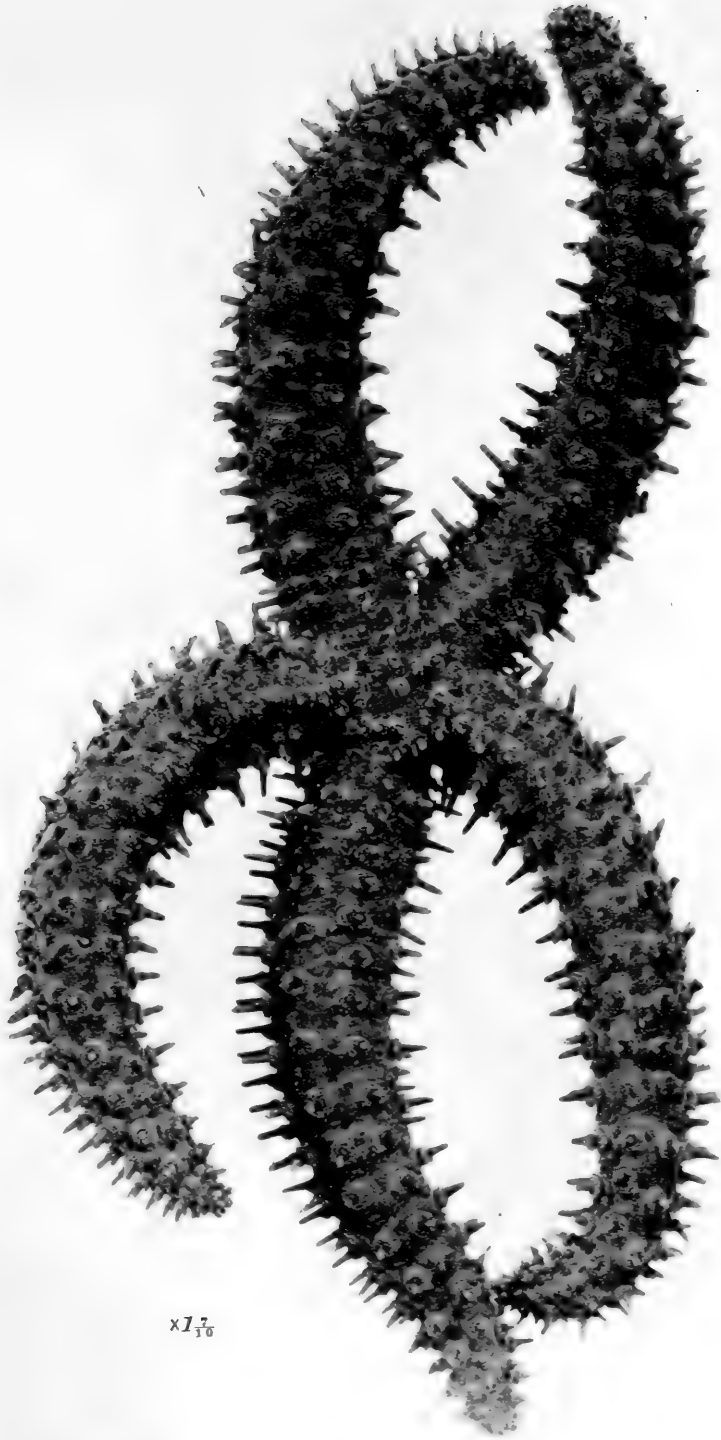
1.2. ORTHASTERIAS FORRERI (LOR.)





PLATE LXVII.

Orthasterias gonolena Verrill. Dorsal view; $\times 1\frac{1}{2}$. Off San Francisco. Yale
Mus.



$\times 1\frac{7}{10}$

HEJOTYPE CO., BOSTON.

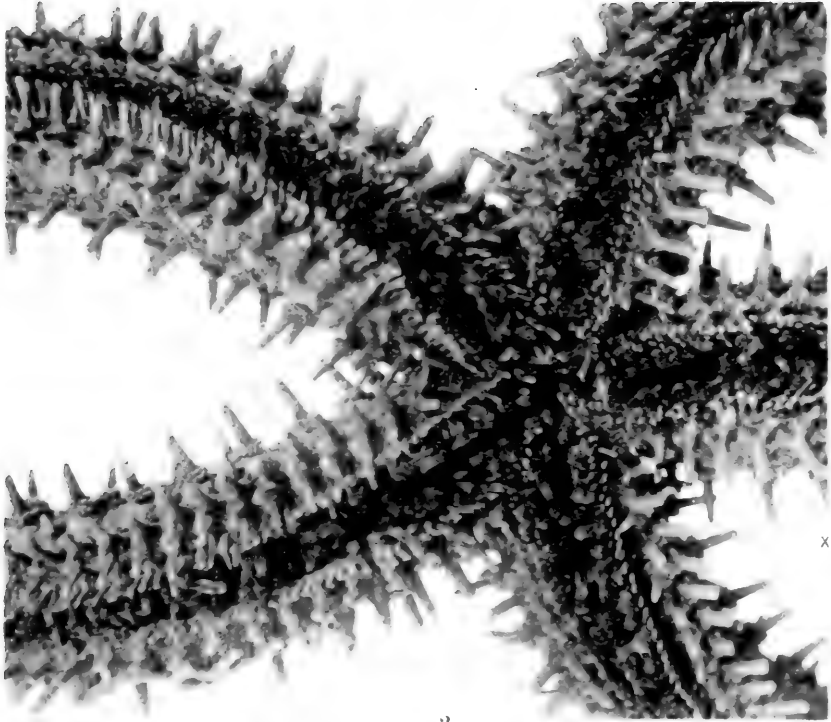
ORTHASTERIAS GONOLENA VER.





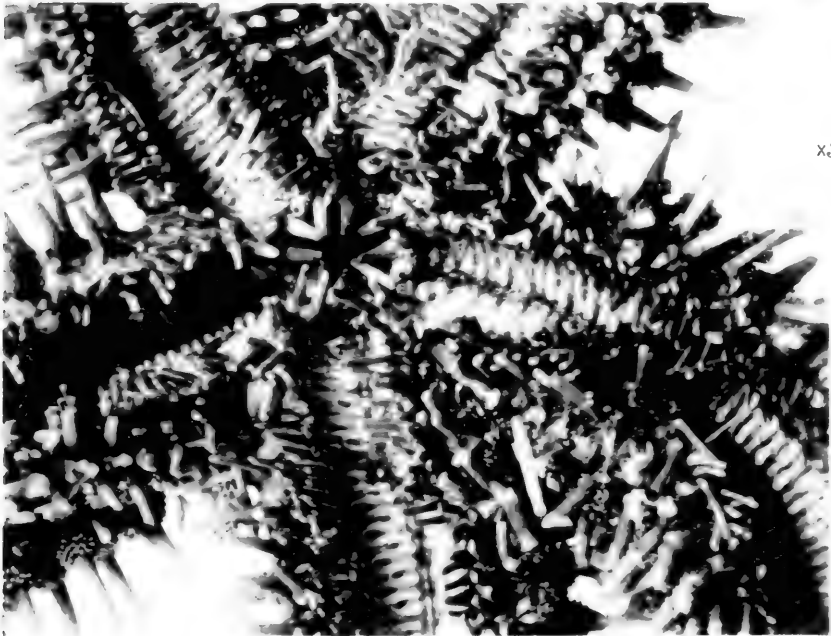
PLATE LXVIII.

- FIG. 1. *Orthasterias gonolena* Verrill. Ventral view of the same specimen as in pl. LXVII; $\times 2\frac{1}{2}$.
- FIG. 2. *Orthasterias californica* Verrill. Type. Actinal side; $\times 3\frac{3}{8}$.



x2½

1



x3½

HELIOTYPE CO., BOSTON

1. *ORTHASTERIAS GONOLENA* VER.
2. *O. CALIFORNICA* VER. Type





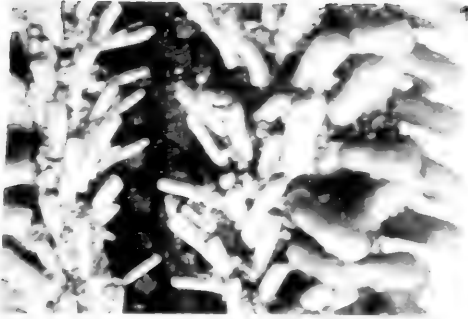
PLATE LXIX.

- FIG. 1. *Asterias multiclava* Verrill. Type. Portion of the actinal side of a ray; \times about $4\frac{1}{2}$.
- FIG. 2. *Orthasterias gonolena* Verrill. Portion of the actinal side of a ray; $\times 4$.
- FIG. 3. *Pisaster brevispinus* (Stimpson) Verrill. Portion of actinal side of a ray; $\times 3$.
- FIG. 4. *Asterias victoriana* Verrill. Type. Portion of the actinal side of a ray; $\times 2\frac{2}{3}$.
- FIG. 5. *Allasterias anomala* Verrill. Type. Portion of the actinal side of a ray; $\times 5\frac{1}{6}$. St. Michael, Alaska (L. M. Turner, 1874).

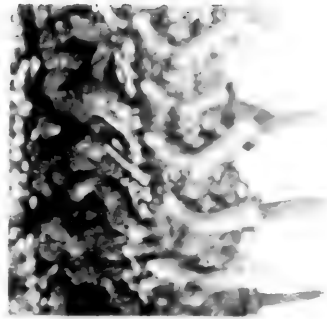
1

2

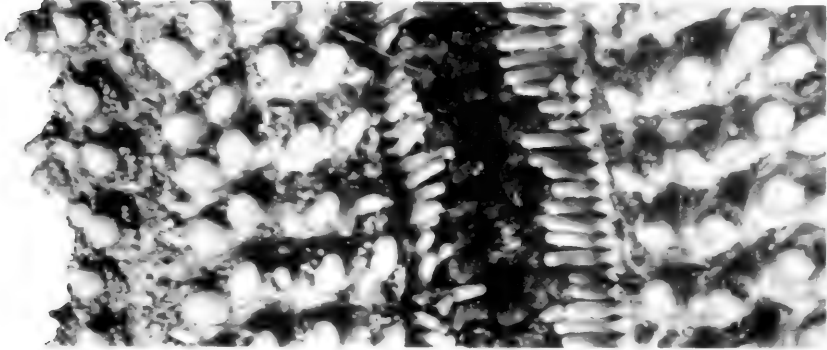
x4½



x4

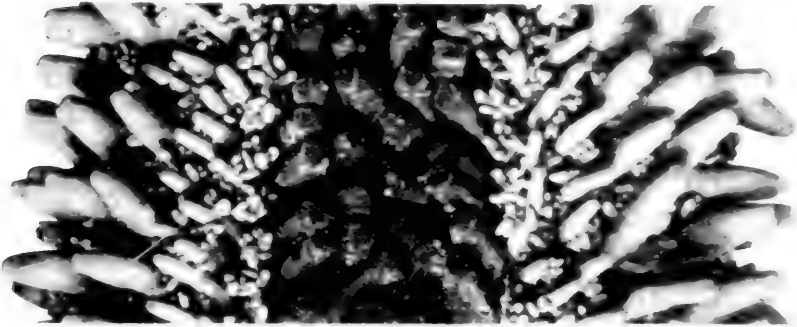


3



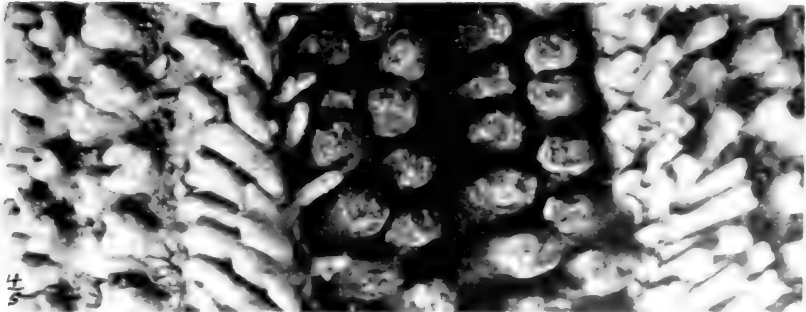
x3

4



x2⅓

5



x1

4
5

HELIOTYPE CO., BOSTON

- 1. *ASTERIAS MULTICLAVA* VER. Type
- 2. *ORTHASTERIAS GONOLENA* VER.
- 3. *PISASTER BREVISPINUS* (ST.)
- 4. *ASTERIAS VICTORIANA* VER.
- 5. *ALLASTERIAS ANOMALA* VER. Type

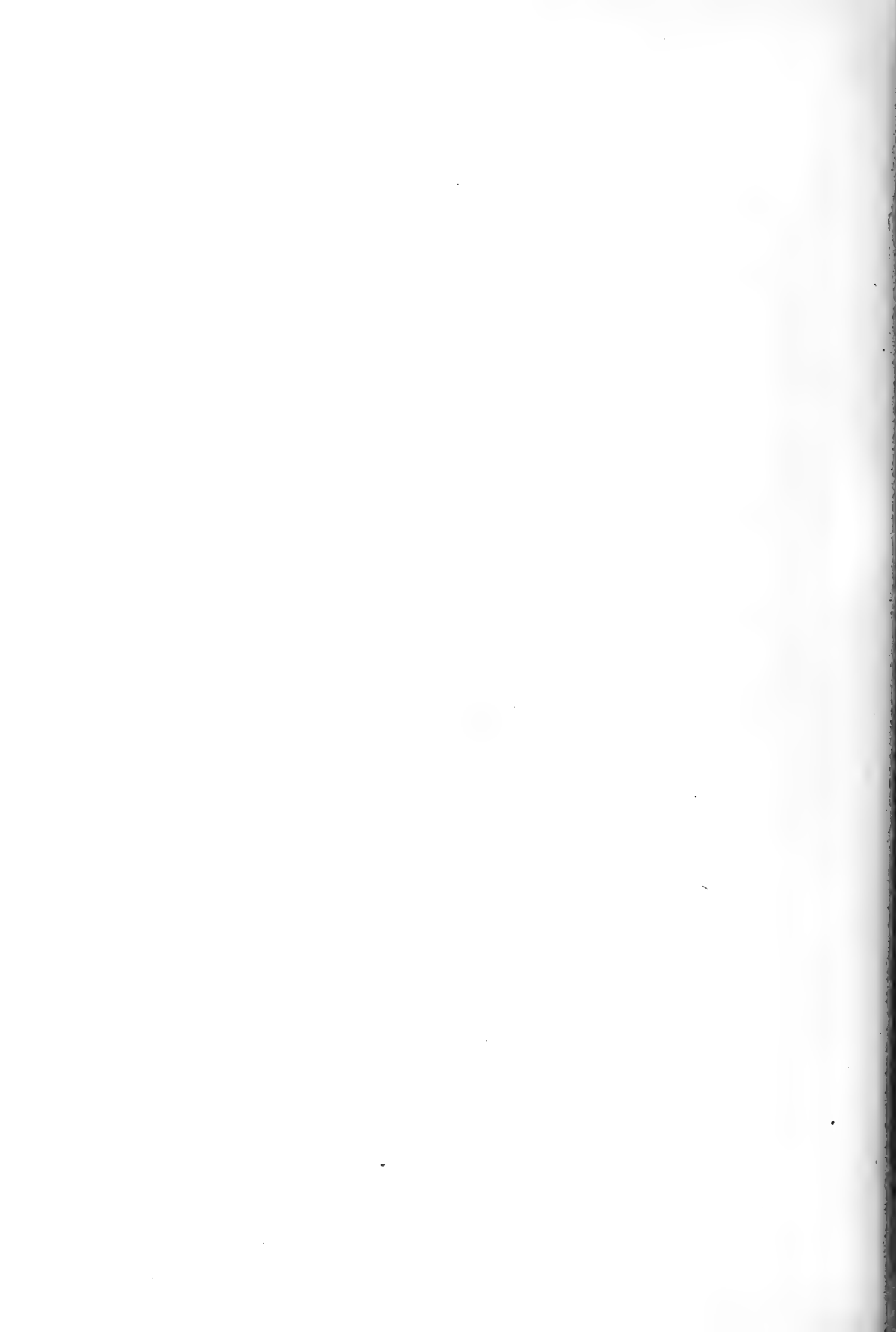
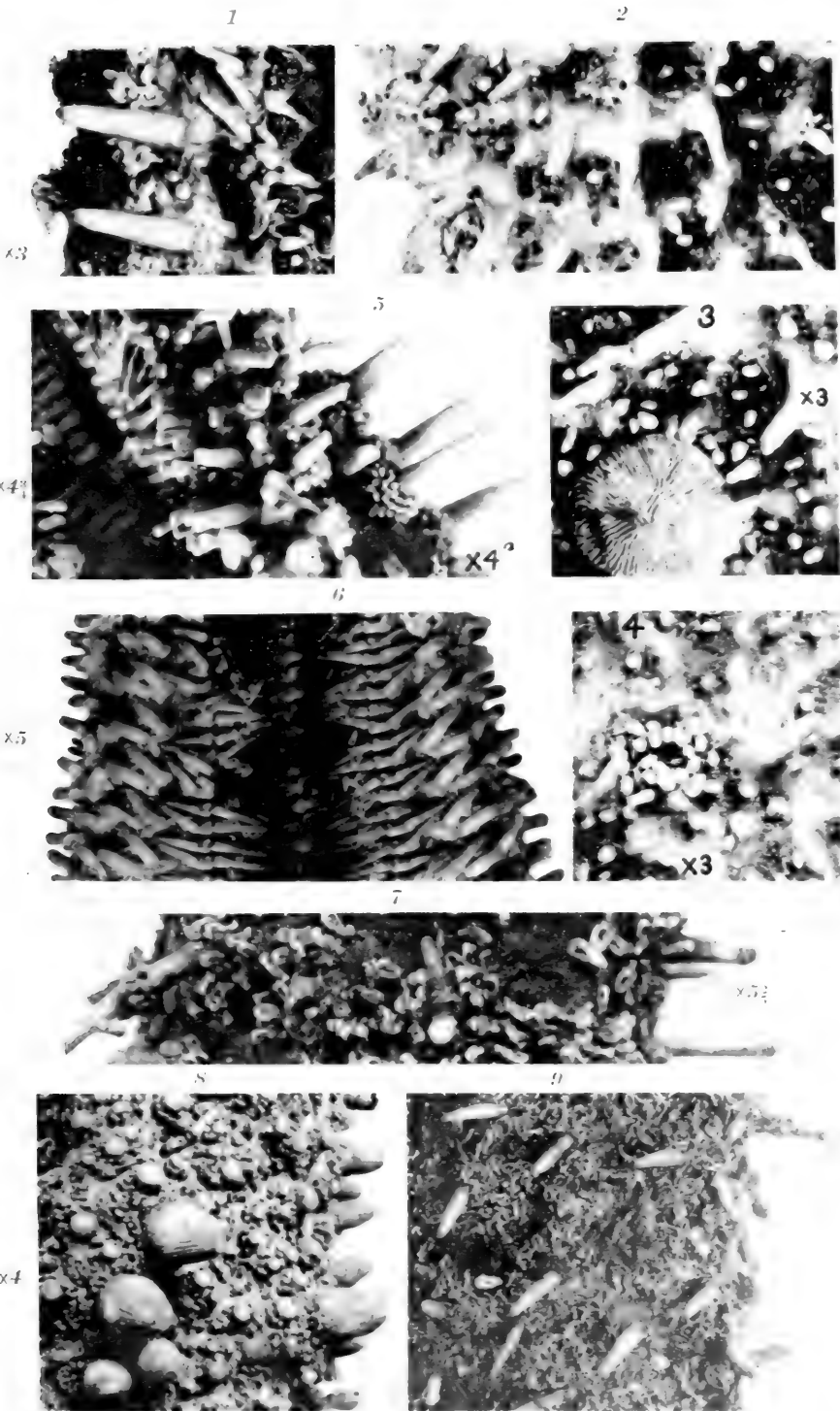


PLATE LXX.

- FIG. 1. *Urasterias linckii* (Müller and Troschel) Verrill. Portion of the actinal side of a ray of a North Atlantic specimen; $\times 3$.
- FIG. 2. The same specimen. Portion of the dorsal side of a ray; $\times 3$.
- FIG. 3. The same specimen. Madreporite with surrounding pedicellariæ and spines; $\times 3$.
- FIG. 4. The same specimen. Nephridial pore or so-called "anal pore" and surrounding pedicellariæ; $\times 3$.
- FIG. 5. *Orthasterias californica* Verrill. Type. Portion of the actinal side of a ray; $\times 4\frac{3}{4}$.
- FIG. 6. *Parasterias albertensis* Verrill. Type. Portion of the actinal side of a ray; $\times 5$. British Columbia. Yale Mus.
- FIG. 7. *Orthasterias forreri* (Loriol) Verrill. Type. Portion of the dorsal side of a ray, showing the very large minor pedicellariæ; $\times 5\frac{1}{2}$.
- FIG. 8. *Asterias polythela* Verrill. Type. Portion of the dorsal side of a ray; $\times 4$. Arctic America; Steamer Corwin. No. 15820.
- FIG. 9. *Orthasterias forreri forcipulata* Verrill. Type. Portion of the side of a ray; $\times 2$.



MELIOTYPE CO., BOSTON

- 1-4. URASTERIAS LINCKII (M. & TR.) ATLANTIC
- 5. ORTHASTERIAS CALIFORNICA VER. Type
- 6. PARASTERIAS ALBERTENSIS VER. Type
- 7. ORTHASTERIAS FORRERI (LOR.)
- 8. ASTERIAS POLYTHELA VER. Type
- 9. ORTHASTERIAS FORRERI FORCIPULATA VER. Type

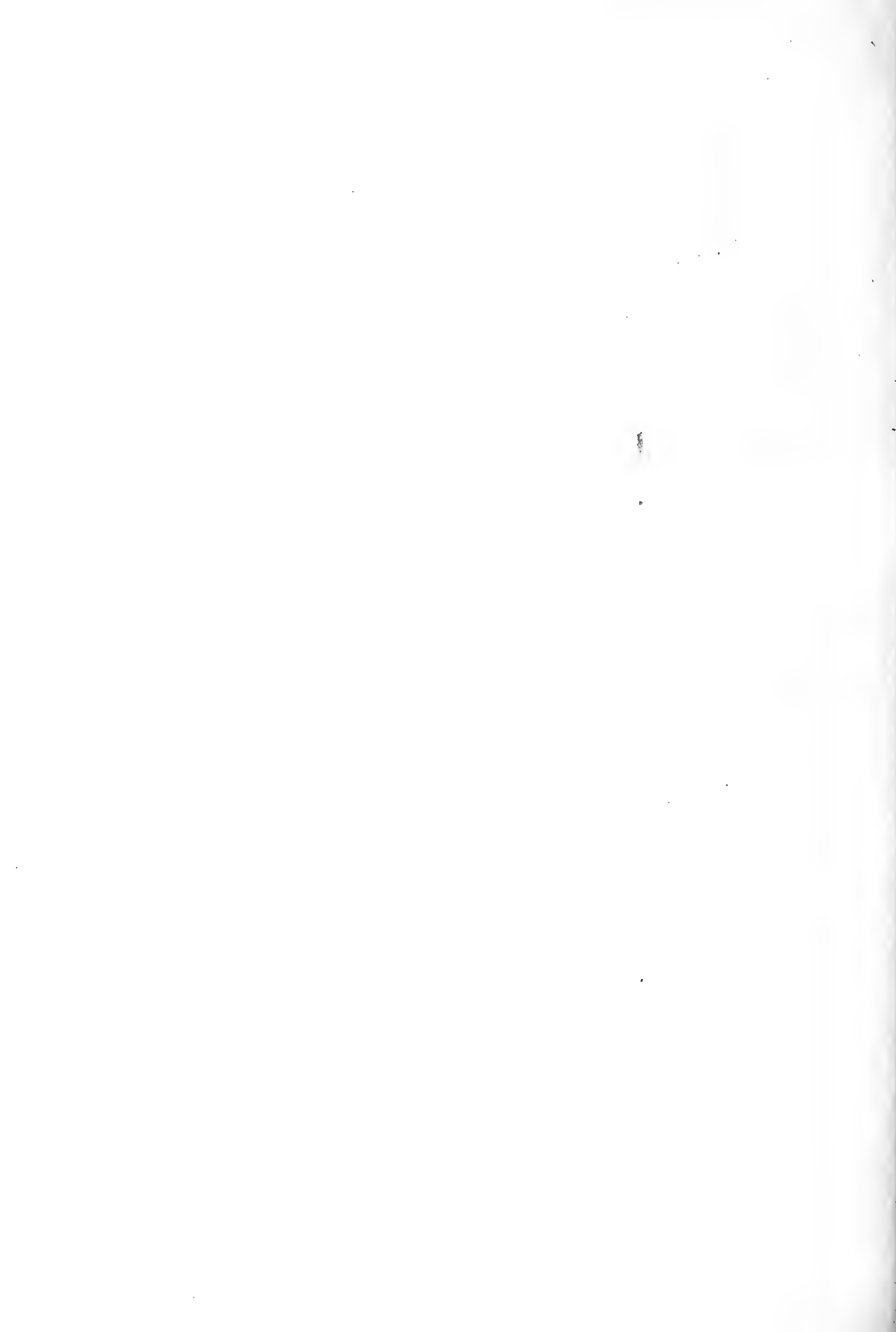
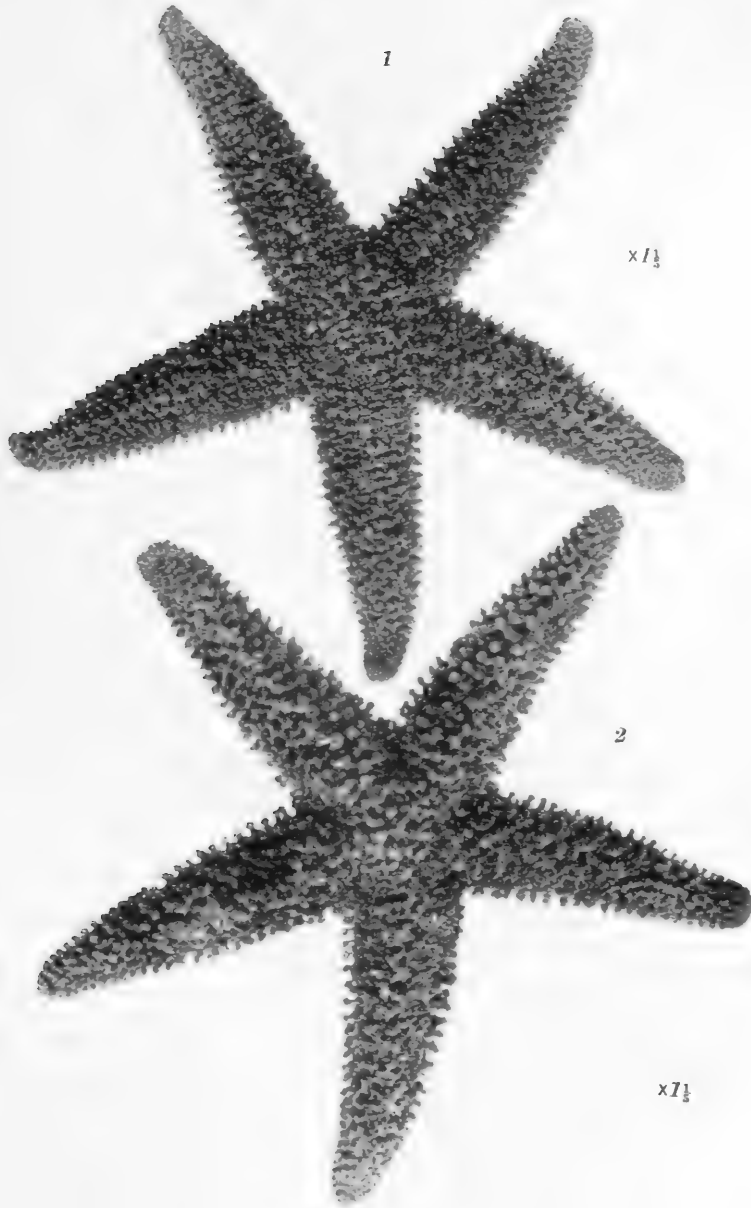




PLATE LXXI.

- FIG. 1. *Leptasterias arctica* (Murdoch) Verrill. Dorsal side; $\times 1\frac{1}{2}$. No. 1428, Mus. Comp. Zoöl.
- FIG. 2. *L. arctica* (Murdoch). Dorsal side; $\times 1\frac{1}{2}$. Same number. Both from Alaska.



HELIOTYPE CO., BOSTON

1.2. LEPTASTERIAS ARCTICA (MUR.)

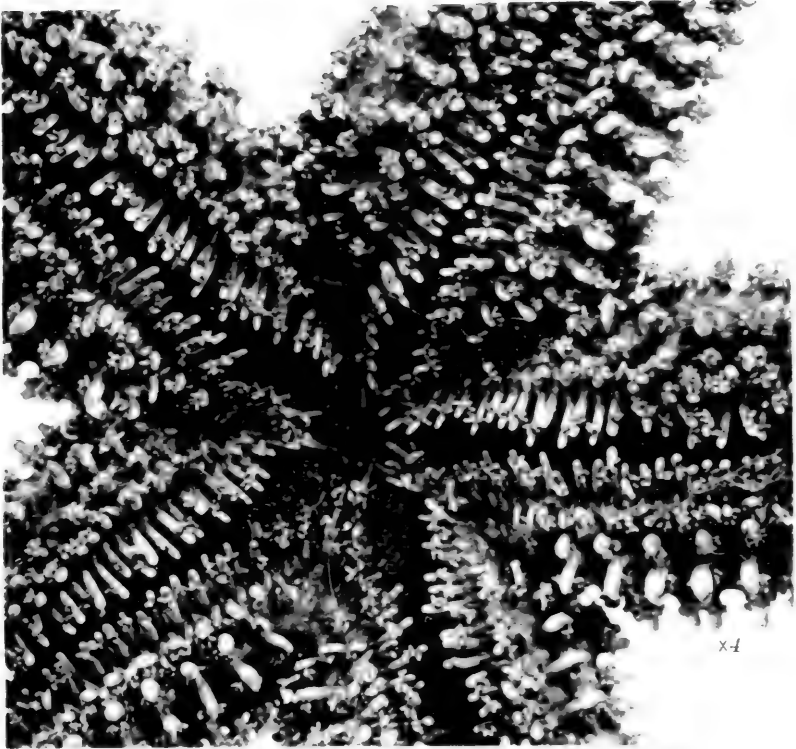




PLATE LXXII.

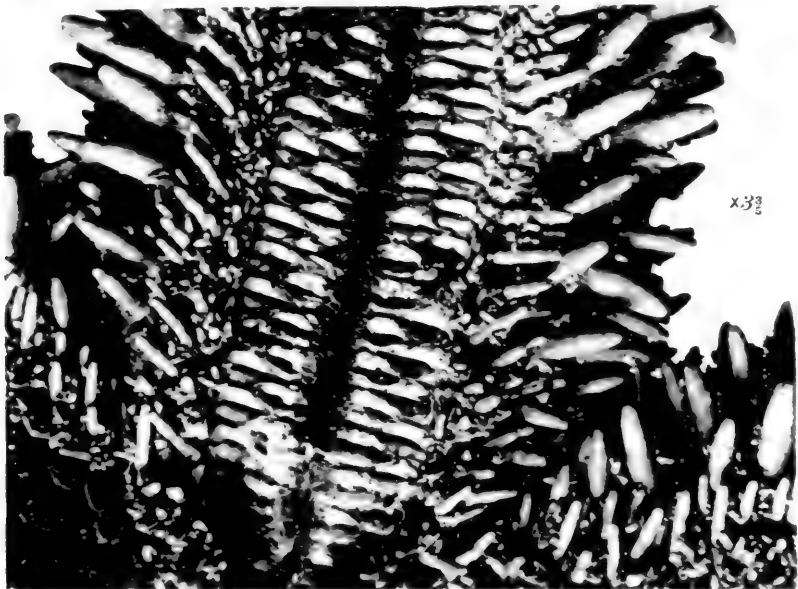
- FIG. 1. *Leptasterias arctica* (Murdoch). Actinal side; $\times 4$. Alaska.
No. 1428. Mus. Comp. Zoöl.
- FIG. 2. *Asterias polythela* Verrill. Type. Actinal side; $\times 3\frac{3}{4}$. Arctic Alaska,
Steamer Corwin. No. 15820.

1



x4

2



x33

HELIOTYPE CO., BOSTON

1. LEPTASTERIAS ARCTICA (MUR.)
2. ASTERIAS POLYTHELA VER. Type

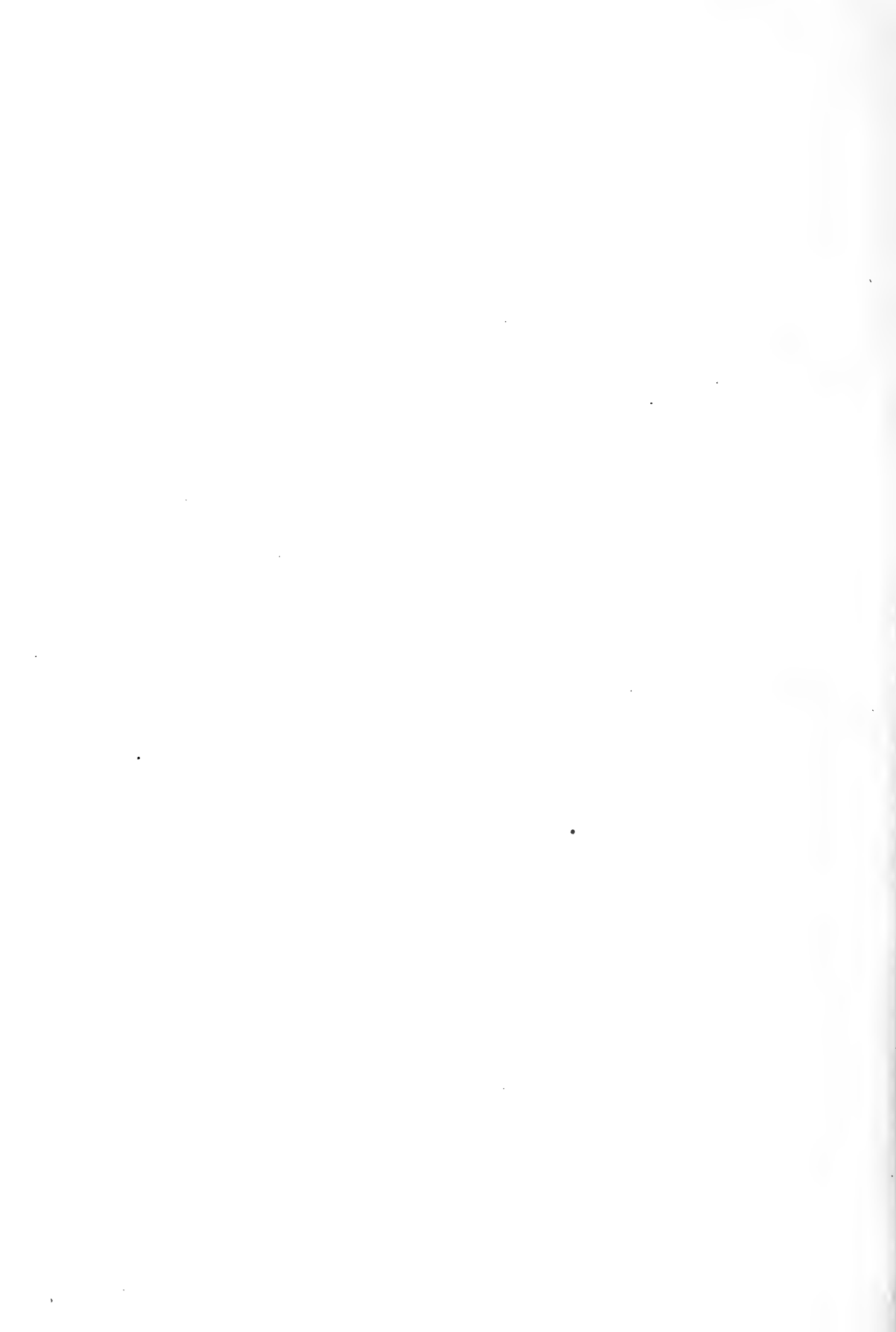




PLATE LXXIII.

- FIG. 1. *Pycnopodia helianthoides*. Young, with sixteen rays, showing regular normal mode of interpolation of new rays; 1, odd anterior primary ray; 2, 3, 4, 5, 6, successive pairs of interpolated rays; a, odd posterior primary ray; b, b' and c, c' second and third pairs of primary posterior rays; $\times 2$.
- FIG. 2. *Leptasterias inequalis* Verrill. Type. Dorsal side; a, ossicles, with spines removed; $\times 2$.



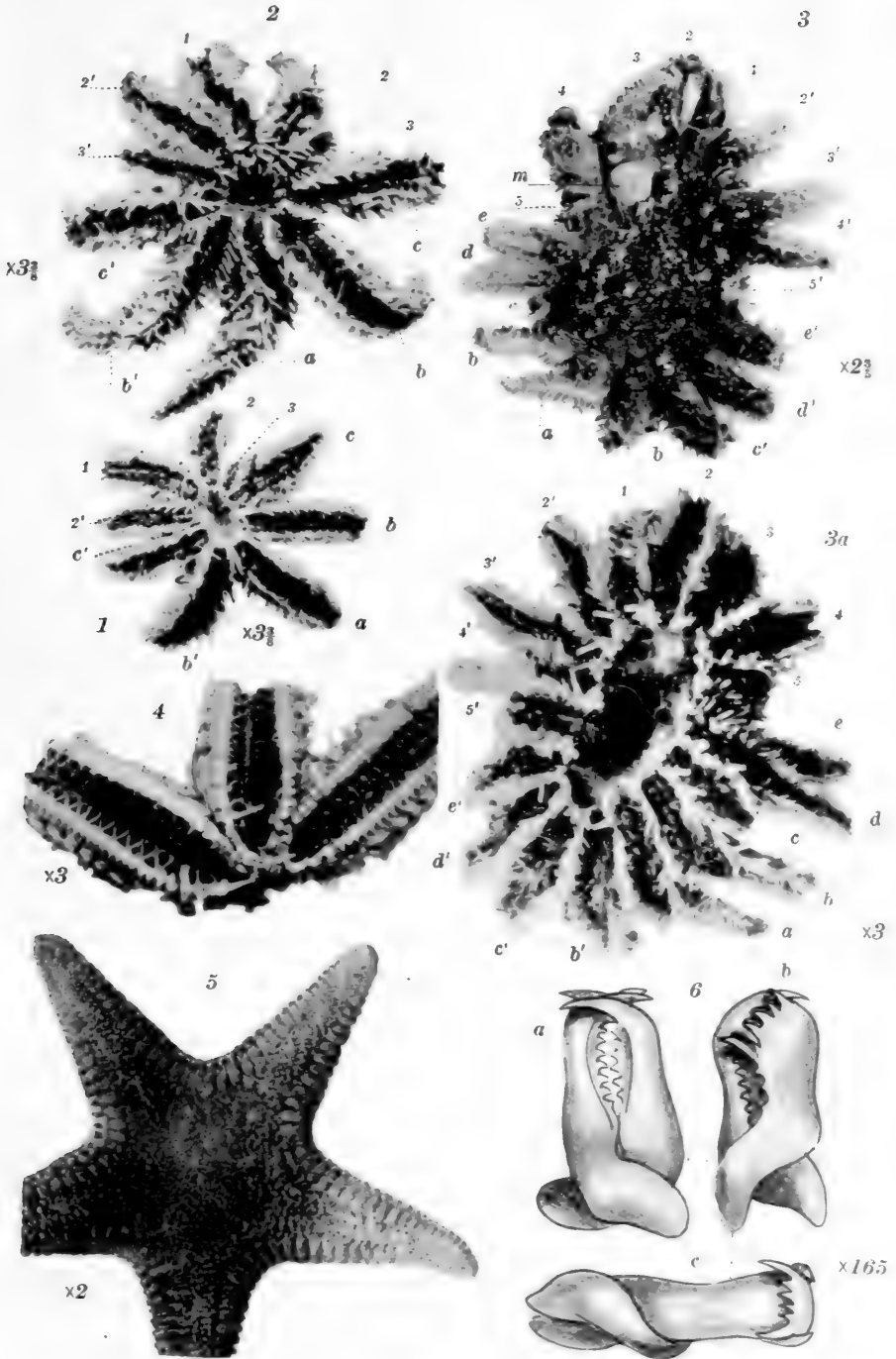
HELIOTYPE CO., BOSTON

1 *PYCNOPODIA HELIANTHOIDES* (BR.) YOUNG
2 *LEPTASTERIAS INEQUALIS* VER. TYPE



PLATE LXXIV.

- FIG. 1. *Pycnopodia helianthoides*. Very young, with nine rays; 1, odd anterior primary ray; 2, 2', first pair of interpolated rays; 3, small budding ray of second pair; 3', position in which the mate to No. 3 should appear, but no rudiment of it is visible externally; a, odd posterior primary ray; b, b' and c, c', second and third pairs of posterior primary rays; $\times 3\frac{3}{8}$. From Dutch Harbor, Alaska.
- FIG. 2. The same. A somewhat larger specimen with ten rays, in normal order; $\times 3\frac{3}{8}$. Lettering as in fig. 1. From Kadiak.
- FIG. 3. The same. A somewhat larger, abnormal, oblong young specimen with eighteen rays, not all in regular order (see page 200); m, madreporic plate of abnormal size; $\times 2\frac{3}{8}$. Lettering of rays as in fig. 2, with the addition of pairs 4 and 5 anteriorly, and d, d' and e, e' posteriorly. The last two pairs are abnormal; c is an abnormal budding ray. From Kadiak, Alaska.
- FIG. 3a. The same specimen. Actinal side; $\times 3$. Lettering as in fig. 3.
- FIG. 4. *Stenasterias macropora* Verrill. Type. Portion of the actinal side with the spines removed; $\times 3$.
- FIG. 5. *Leptychaster pacificus* Fisher. Dorsal view; \times about 2.
- FIG. 6. *Pycnopodia helianthoides* (Brandt). Minor pedicellariæ; a, b, c, side and profile views; $\times 165$.



HELIOTYPE CO., BOSTON

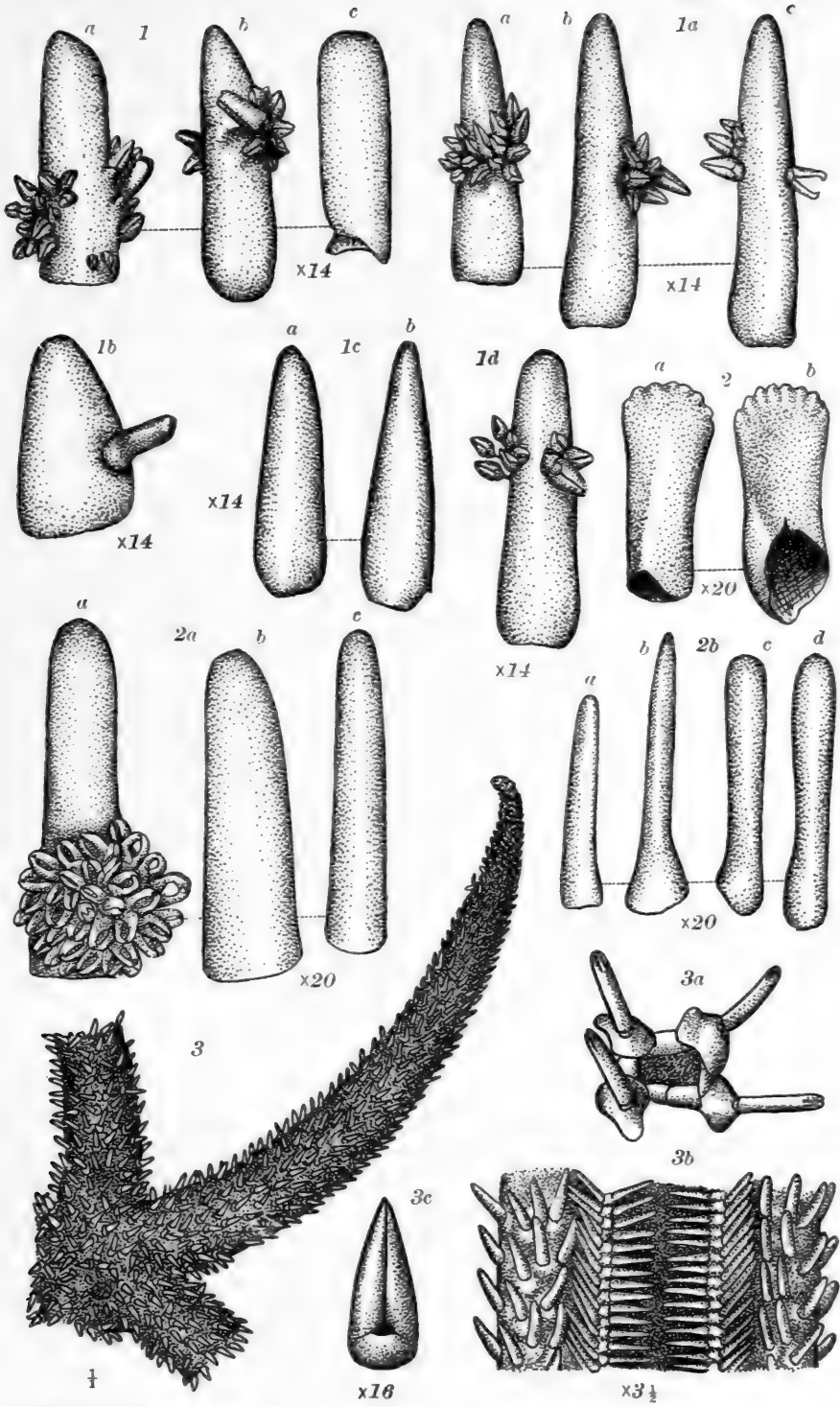
1-3a. PYCNOPODIA HELIANTHOIDES (BR.) YOUNG.
 4. STENASTERIAS MACROPORA VER.
 5. LEPTYCHASTER PACIFICUS FISHER
 6. P. HELIANTHOIDES (BR.)





PLATE LXXV.

- FIGS. 1-1d. *Orthasterias merriami* Verrill. Spines and pedicellariæ from No. 1181; 1, *a, b, c,* and 1c, ordinary dorsal spines; 1a, *a, b, c,* marginal spines; 1c, adambulacral spines; 1b, a stout dorsal with a major pedicellaria attached; 1d, inferomarginal; $\times 14$; No. 1181, Mus. Comp. Zoöl.
- FIGS. 2-2b. *Orthasterias dawsoni* Verrill. Type. Spines and pedicellariæ, $\times 20$; 2, *a, b,* large valves of major pedicellariæ; 2a, dorsal spines; *a,* with wreath of minor pedicellariæ; *b, c,* pedicellariæ removed; 2b, adambulacral spines; *a, b,* from inner row; *c, d,* from outer row.
- FIGS. 3-3c. *Orthasterias koehleri* (de Loriol) Verrill. Type. After de Loriol; 3, part of dorsal side, about natural size; 3a, four dorsal ossicles and spines; 3b, portion of actinal side, $\times 3\frac{1}{2}$; 3c, a major pedicellaria; $\times 16$.



A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

1-d. *ASTERIAS KATHERINAE* GRAY
 2-2b. *O. DAWSONI* VER. Type
 3-3c. *O. KOEHLERI* (LOR.) Type

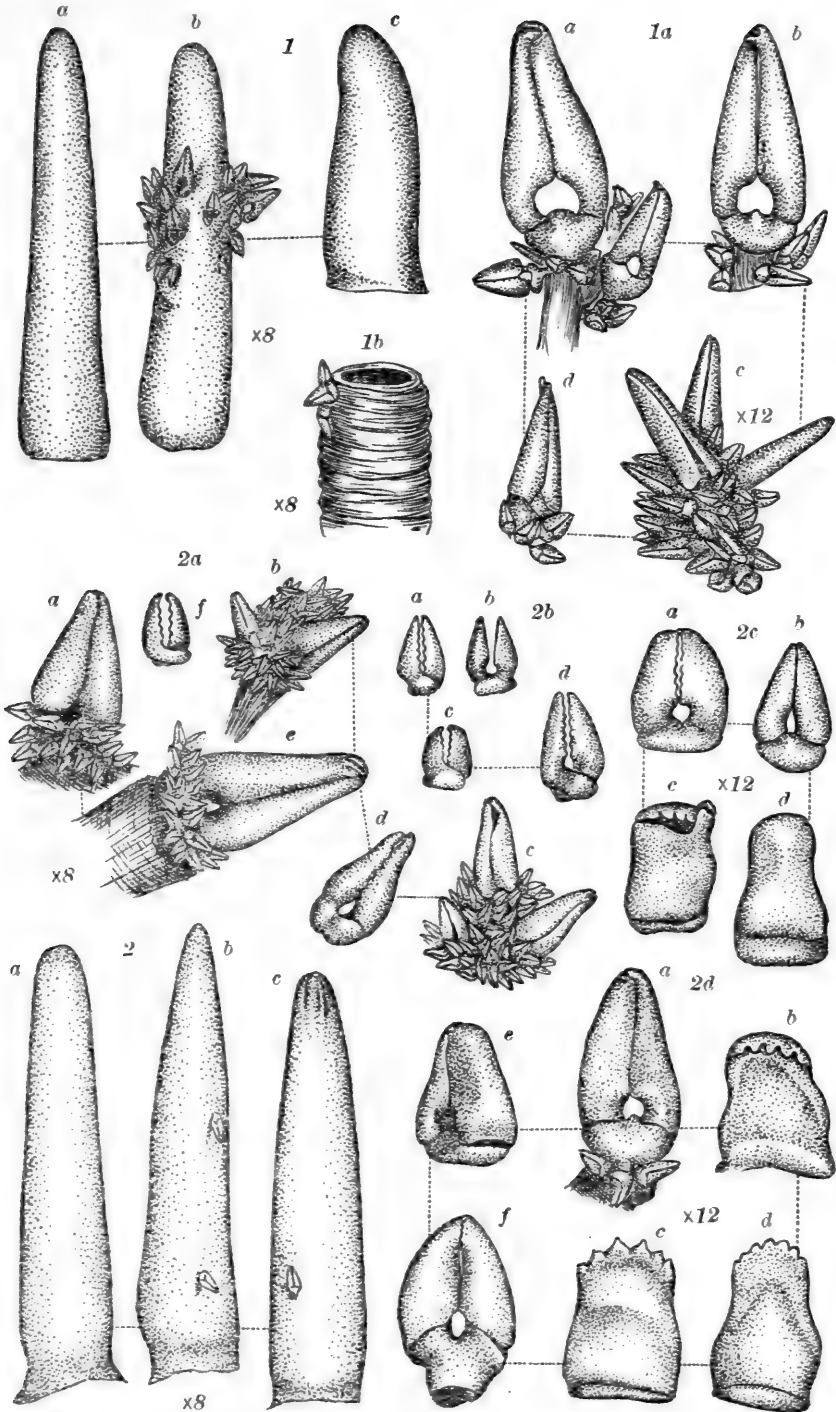




PLATE LXXXVI.

FIGS. 1-1b. *Pisaster brevispinus* (Stimpson). Spines and pedicellariæ of No. 1301, Mus. Comp. Zoöl., Gulf of Georgia, $\times 8$; *a, b, c*, dorsal spines; *1a, b, c*, pedicelled clusters of adambulacral pedicellariæ, from inner edge and within the groove, consisting of both major and minor kinds, of various sizes, attached to a common pedicel; *1b*, tip of a sucker-foot with pedicellariæ attached.

FIGS. 2-2d. *Pisaster papulosus* Verrill. Type. *2, a, b, c*, marginal spines; *2a, a-e*, clusters of adambulacral or furrow pedicellariæ attached to a common pedicel and containing both sorts; *f*, a minor pedicellaria much enlarged; *2b, a-d*, minor pedicellariæ more enlarged; *2c, a-d*; and *2d, b-f*, dorsal and lateral large dermal major pedicellariæ of several forms; *2d, a*, is an adambulacral group.



A. HYATT VERRILL DEL.

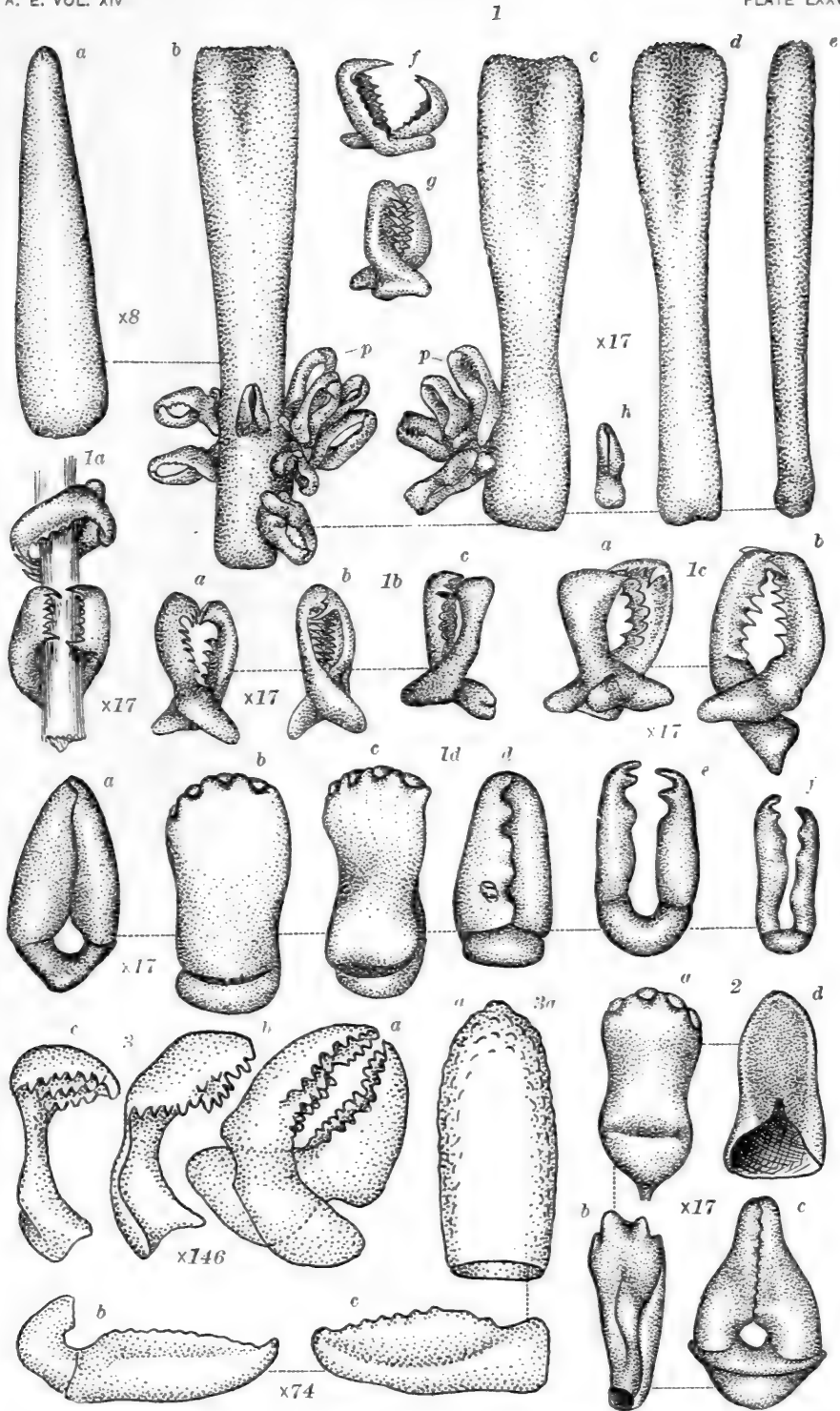
HELIOTYPE CO., BOSTON

1-1b. *PISASTER PAPULOSUS* VER. VAR.
2-2d. *P. PAPULOSUS* VER. TYPE



PLATE LXXVII.

- FIGS. 1-1d. *Orthasterias forreri* (Loriol) Verrill. Spines and pedicellariæ; 1, *a*, dorsal spine with pedicellariæ removed, $\times 8$; 1, *b*, lower marginal; *c*, upper marginal; *d*, outer adambulacral; *e*, inner adambulacral spine; $\times 17$; *f*, *g*, *h*, some of the detached minor pedicellariæ; 1*a*, two of the minor pedicellariæ grasping a fiber of hemp from the tangles; 1*b*, 1*c*, dermal minor pedicellariæ from the dorsal side, $\times 17$; 1*d*, *a-f*, dermal major pedicellariæ from dorsal and lateral areas.
- FIG. 2. *Orthasterias leptolena* Verrill. Type. Major pedicellariæ; *a-d*, four varieties from the dorsal and lateral areas; $\times 17$.
- FIG. 3. *Allasterias forficulosa* Verrill. Minor pedicellariæ; *a*, with valves united; *b*, *c*, detached valves; $\times 146$.
- FIG. 3*a*. The same; *a*, *b*, *c*, detached valves of major pedicellariæ; $\times 74$.



A. HYATT VERRILL DEL.

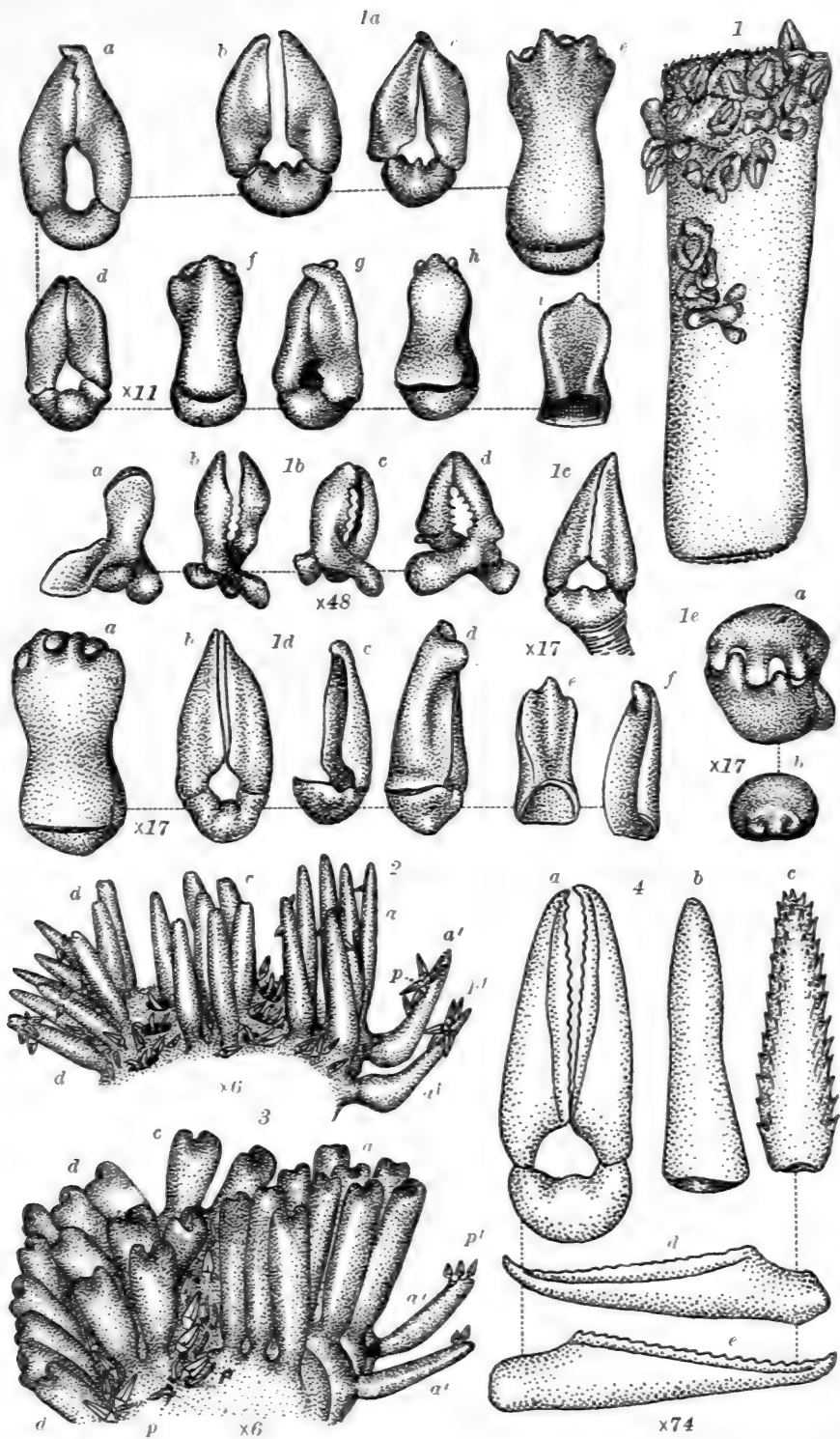
HELIOTYPE CO., BOSTON

1-1d ORTHASTERIAS (STYLASTERIAS) FORRERI (LOR.)
 2. O. LEPTOLENA VER. Type
 3-3a. ALLASTERIAS ANOMALA VER. Type



PLATE LXXVIII.

- FIG. 1. *Orthasterias columbiana* Verrill. Cotype. A dorsal spine and minor pedicellariæ from the largest specimen from Victoria; $\times 13$. Prov. Mus. British Columbia.
- FIG. 1a. The same. Type. *a-i*, large dermal major pedicellariæ from the dorsal and lateral areas; $\times 11$.
- FIG. 1b. The same. Type. *a-d*, minor pedicellariæ; $\times 48$.
- FIG. 1c. The same. A pedicelled adambulacral major pedicellaria; $\times 17$.
- FIG. 1d. The same. Type. *a-f*, major pedicellariæ from the dorsal and lateral areas; $\times 17$.
- FIG. 1e. The same. End views of two of the larger major pedicellariæ; $\times 17$.
- FIG. 2. *Allasterias rathbuni nortonensis* Verrill. Adambulacral (*a*); peractinal (*c*); and inferomarginal (*d, d*) groups of spines; *a', a'*, inner or furrow-spines on alternate plates; *p, p*, papulæ and dermal pedicellariæ; *p', p'*, adambulacral pedicellariæ; $\times 6$.
- FIG. 3. *Allasterias anomala* Verrill. Type. $\times 6$. Lettering as in fig. 2.
- FIG. 4. The same. Major pedicellariæ (*a*) and detached valves (*c-e*); $\times 74$.



A. HYATT VERRILL DEL.

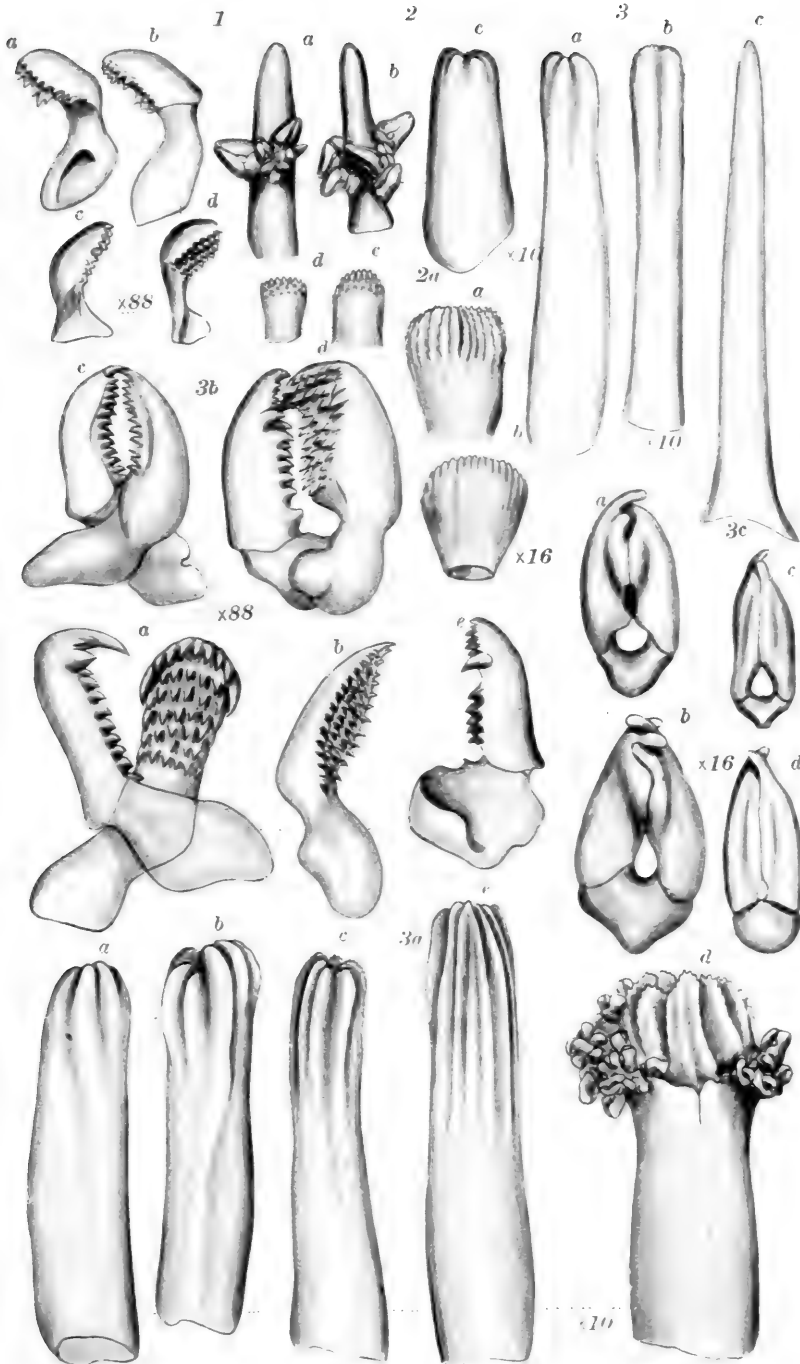
HELIOTYPE CO. BOSTON

1-1c. *ORTHASTERIAS COLUMBIANA* VER. Cotype
 2. *ALLASTERIAS RATHBUNI NORTONENSIS* VER.
 3-4. *A. ANOMALA* VER. Type



PLATE LXXIX.

- FIG. 1. *Asterias polythela* Verrill. Type. Detached valves of minor pedicellariæ mounted in balsam; *a-d*; $\times 88$.
- FIG. 2. The same specimen. Spines and pedicellariæ; *a, b*, adambulacral spines; *c*, a marginal spine with pedicellariæ removed; $\times 10$.
- FIG. 2a. The same specimen. *a-d*, larger and smaller dorsal spines; $\times 16$.
- FIG. 3. *Orthasterias columbiana* Verrill. Largest specimen from Victoria. Cotype. Spines, with pedicellariæ and skin removed; *a, b*, outer adambulacrals; *c*, inner one; $\times 10$.
- FIG. 3a. The same specimen. Spines cleaned of skin and pedicellariæ except *d*; *a, b*, dorsals; *c*, upper marginal; *d*, dorsal covered with a sheath bearing pedicellariæ near the tip; $\times 10$.
- FIG. 3b. The same specimen. Minor pedicellariæ mounted in balsam; *c, d*, entire; *a, b, e*, dislocated valves; $\times 88$.
- FIG. 3c. The same specimen. Dermal major pedicellariæ from the dorsal and lateral areas; $\times 16$.



A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

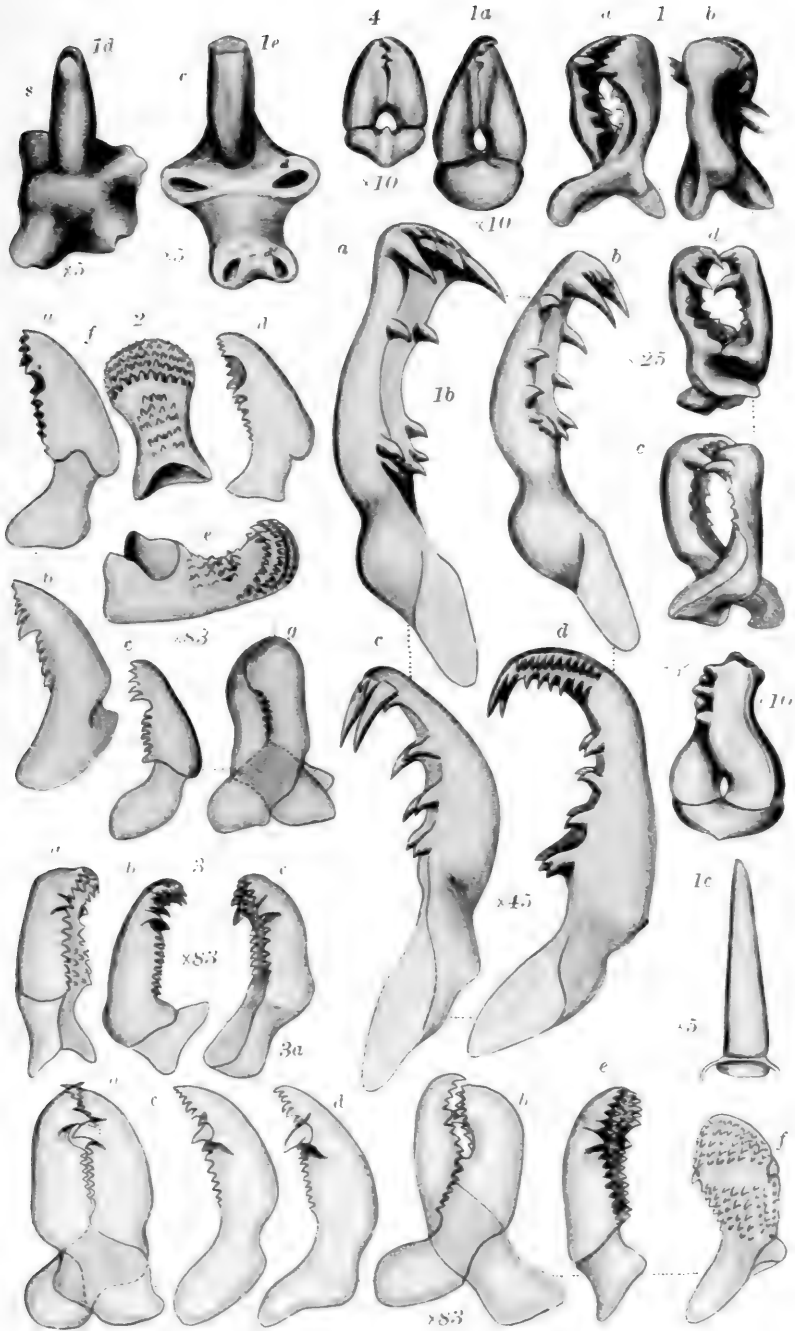
1-2a ASTERIAS POLYTHELA VER. Type
3-3c ORTHASTERIAS COLUMBIANA VER.





PLATE LXXX.

- FIG. 1. *Orthasterias forreri* (de Loriol) Verrill. Minor pedicellariæ, *a, b, c, d*, mounted in balsam; $\times 25$.
- FIGS. 1a, 1a'. The same specimen. Two large dorsal dermal major pedicellariæ; $\times 10$.
- FIG. 1b. The same specimen. *a-d*, four detached valves of minor pedicellariæ, mounted in balsam; $\times 45$.
- FIG. 1c. The same specimen. A cleaned dorsal spine; $\times 5$.
- FIGS. 1d, 1e. The same. Dorsal plates; $\times 5$. 1d, dorso-lateral with a spine; 1e, carinal seen from inner side; *c*, connective ossicle; *d, d'*, facets for articulation of transverse connective ossicles.
- FIG. 2. *Orthasterias dawsoni* Verrill. Type. *a-f*, disarticulated valves of minor pedicellariæ mounted in balsam; *g*, one entire; $\times 83$.
- FIGS. 3, 3a. *Orthasterias californica* Verrill. Type. Minor pedicellariæ mounted in balsam; 3a, *a, b*, are entire; the rest, *c, f*, are disarticulated valves; $\times 83$.
- FIG. 4. *Pisaster papulosus* Verrill. Type. Major pedicellaria; $\times 10$.



A. HATT VERRILL DEL.

HELIOTYPE CO., BOSTON

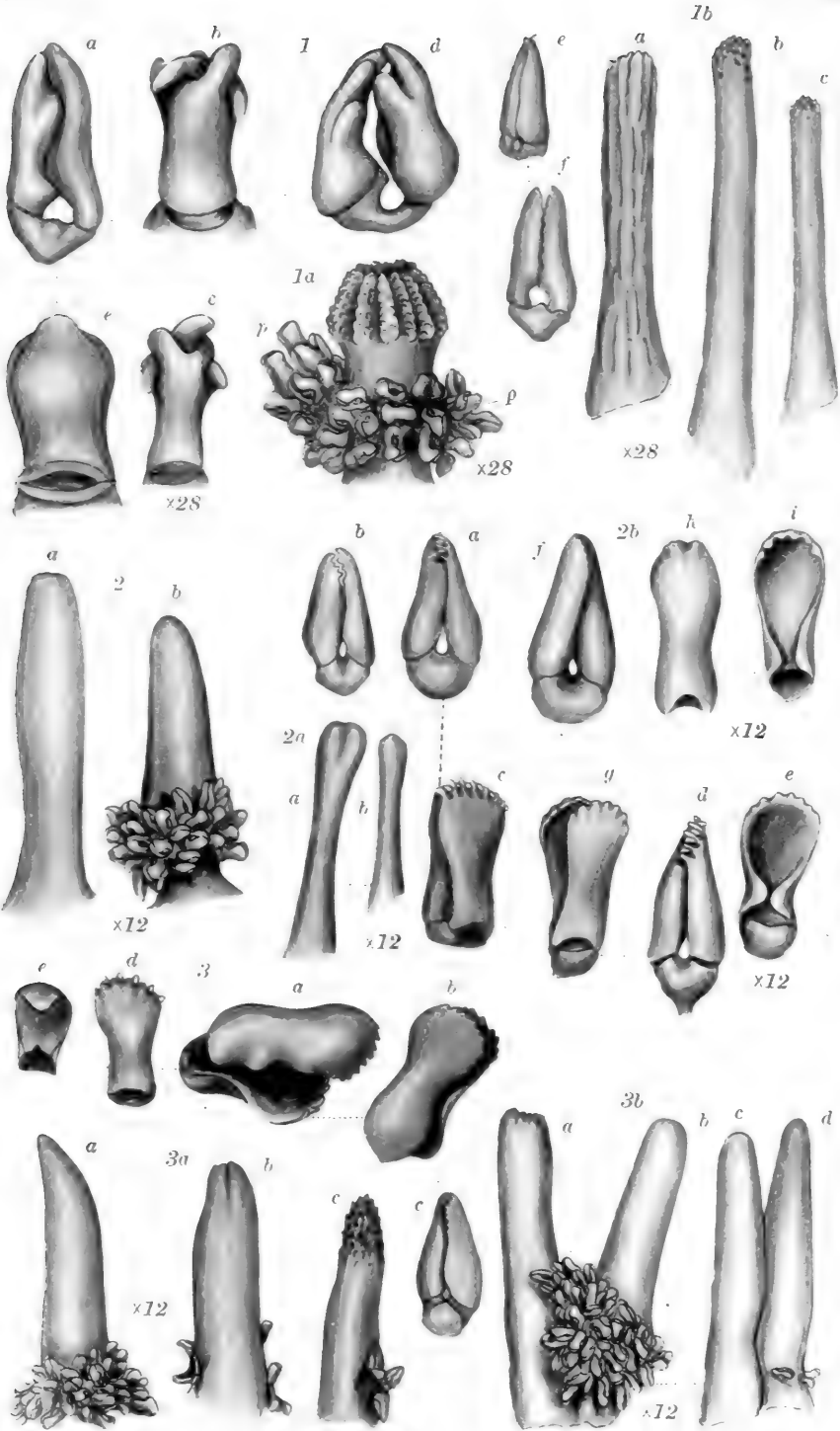
1-1c. *ORTHASTERIAS FORRERI* (LOR.) Type
 2. *O. DAWSONI* VER. Type
 3-3a. *O. CALIFORNICA* VER. Type
 4. *PISASTER PAPULOSIS* VER. Type





PLATE LXXXI.

- FIG. 1. *Distolasterias chelifera* Verrill. Type. Dermal major pedicellariæ; *a, b, c, d*, are elongate, strongly unguiculate forms; *e* is a stouter form, and not unguiculate; $\times 28$. No. 1346, Mus. Comp. Zoöl.
- FIG. 1a. The same specimen. One of the dorsal spines bearing a wreath of minor pedicellariæ, *P, P*; $\times 8$.
- FIG. 1b. The same specimen. Spines cleaned; *a*, marginal spine with pedicellariæ removed; *b*, outer adambulacral; *c*, inner adambulacral; *e, f*, adambulacral major pedicellariæ; $\times 28$.
- FIG. 2. *Orthasterias californica* Verrill. Type. *a*, an inferomarginal spine, cleaned; *b*, a dorsal spine with a wreath of minor pedicellariæ; $\times 12$.
- FIG. 2a. The same specimen. *a*, outer; *b*, inner adambulacral spine; $\times 12$.
- FIG. 2b. The same specimen. Major pedicellariæ; *a, b, c, d, e*, dorsal; *f, g*, adambulacral; *h, i*, actinal interradial; $\times 12$.
- FIG. 3. *Orthasterias dawsoni* Verrill. Type. Dermal major pedicellariæ; *a, b*, stout dorsal form; *c, d, e*, more slender spatulate or platelet-form sorts from the lateral area; $\times 12$.
- FIG. 3a. The same specimen. Spines; *a, b, c*, dorsal spines treated with Javelle water to remove most of the pedicellariæ; $\times 12$.
- FIG. 3b. The same specimen. Inferomarginal spines; *a, b*, a pair with pedicellariæ; *c, d*, a smaller pair cleaned with Javelle water; $\times 12$.



A. HYATT VERRILL DEL.

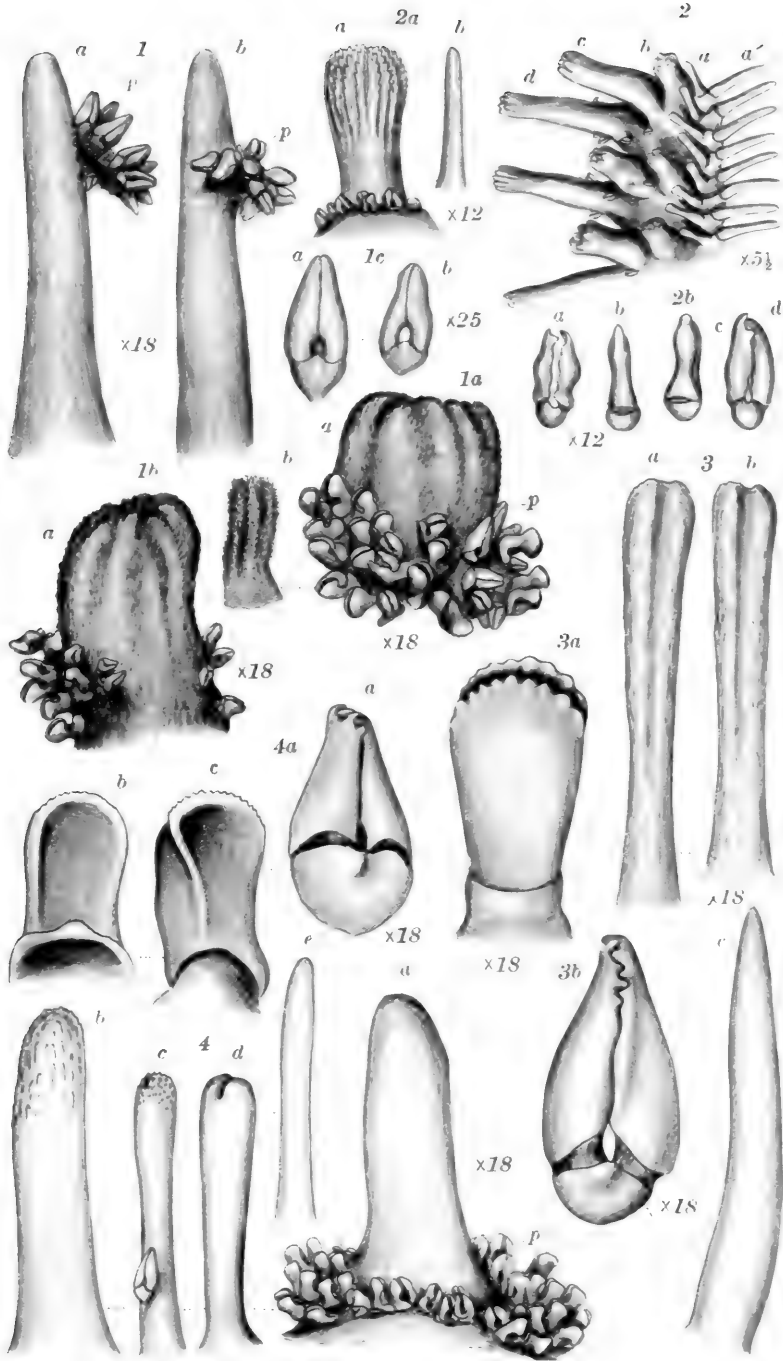
HELIOTYPE CO., BOSTON

1-1b. DISTOLASTERIAS CHELIFERA VER. Type
 2-2b. ORTHASTERIAS CALIFORNICA VER. Type
 3-3b. O. DAWSONI VER. Type



PLATE LXXXII.

- FIG. 1. *Asterias victoriana* Verrill. Type. *a, b*, adambulacral spines with epispinal clusters, *p, p*, of pedicellariæ of both sorts; $\times 18$.
- FIG. 1a. The same specimen. Dorsal spines; *a*, one of the larger, and *b*, one of the smaller sorts; *P*, minor pedicellariæ; $\times 18$.
- FIG. 1b. The same specimen. An inferomarginal spine and minor pedicellariæ; $\times 18$.
- FIG. 1c. The same specimen. *a, b*, two of the major pedicellariæ; $\times 25$.
- FIG. 2. *Orthasterias biordinata* Verrill. Type. Group of spines of the actinal side; *a'*, inner, and *a*, outer adambulacrals; *b*, peractinals; *c, d*, inferomarginals; $\times 5\frac{1}{2}$.
- FIG. 2a. The same specimen. *a*, dorsal spine; *b*, adambulacral spine; $\times 12$.
- FIG. 2b. The same specimen. Dorsal dermal major pedicellariæ, front and profile views; $\times 12$.
- FIG. 3. *Orthasterias gonolena* Verrill. Spines cleaned with Javelle water; *a, b*, outer adambulacrals; *c*, marginal; $\times 18$. No. 1825, Mus. Comp. Zoöl.
- FIG. 3a. The same specimen. A large denticulate dermal major pedicellaria from the lateral or intermarginal area; $\times 18$.
- FIG. 3b. The same specimen. Major pedicellaria from the outer adambulacral spines; $\times 18$.
- FIG. 4. The same specimen (No. 1825). Spines; *a*, one of the dorsal spines with a basal wreath of minor pedicellariæ; *b*, inferomarginal, cleaned; *c, d*, outer adambulacrals; *e*, inner adambulacral; $\times 18$.
- FIG. 4a. The same; *a, b, c*, major pedicellariæ; details; $\times 18$.



A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

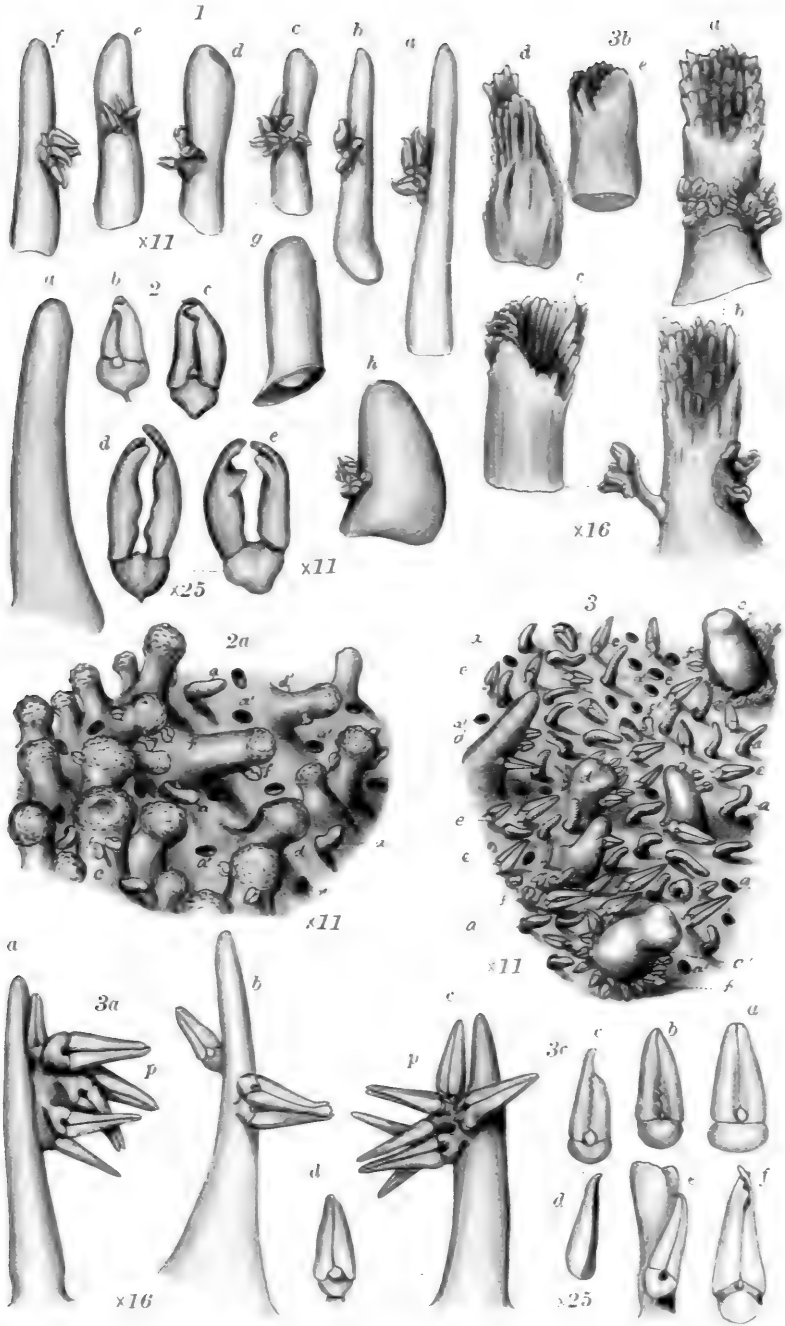
1-1c. ASTURIAS VICTORIANA VER. Type
 2-2b. ORTHASTERIAS BIORDINATA VER. Type
 3-3b, 4, 4a. GONOLENA VER.





PLATE LXXXIII.

- FIG. 1. *Asterias katherinæ* Gray. Spines with pedicellariæ; *a*, adoral adambulacral; *b*, inner adambulacral; *c*, *d*, outer adambulacral; *e*, *f*, peractinals; *g*, *h*, inferomarginals; $\times 11$.
- FIG. 2. *Leptasterias arctica* (Murdoch). Spines and major pedicellariæ; *a*, adambulacral spine; *b*, *c*, adambulacral major pedicellariæ; *d*, axillary or interradiial one; *e*, unguiculate marginal one; $\times 25$.
- FIG. 2a. The same specimen. Finer spined variety. Portion of the dorsal surface showing spines, *c*, *d*, *d'*; papulæ, *a*, *a*; minor pedicellariæ, *f*, *f*; papular pores, *a'*; $\times 11$.
- FIG. 3. *Allasterias forficulosa* Verrill. Type. Portion of the dorsal surface, showing spines, *c*, *d*; papulæ, *a*, *a*; papular pores, *a'*; dermal major pedicellariæ, *e*, *e*; circumspinal minor pedicellariæ, *f*, *f*; dermal minor pedicellariæ, *f'*, *f'*; $\times 11$. Japan. No. 1183. Mus. Comp. Zoöl.
- FIG. 3a. The same specimen. Adambulacral spines, *a*, *b*, *c*, and attached major pedicellariæ, *P*, *P*; *d*, one of the same, detached; $\times 16$.
- FIG. 3b. The same specimen. *a-e*, marginal spines; $\times 16$.
- FIG. 3c. The same specimen. Major pedicellariæ; *a*, *b*, *c*, *d*, dorsal dermal; *e*, marginal; *f*, axillary; $\times 25$.



A. HYATT VERRILL DEL.

HELIOTYPE COLL. BOSTON

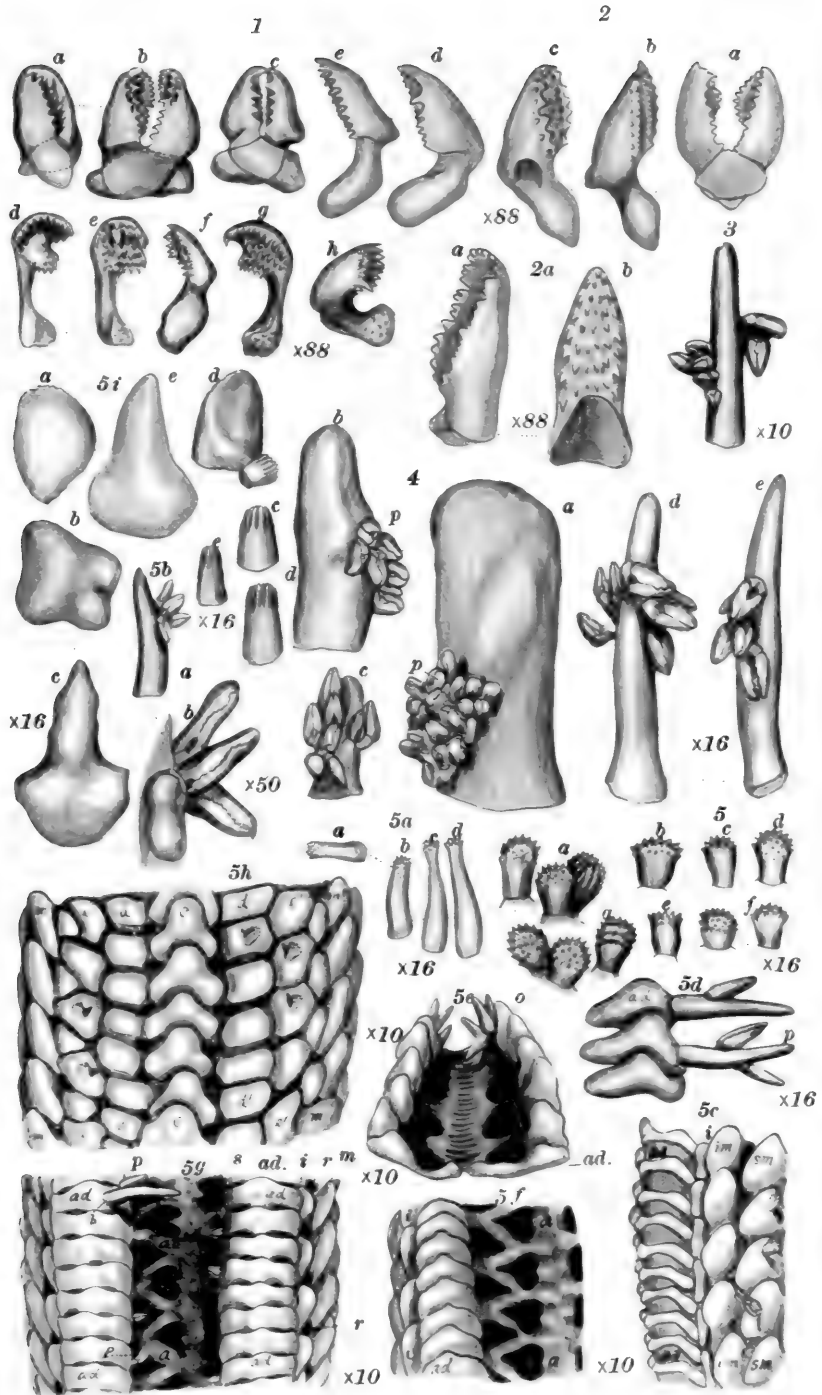
1. ASTERIAS KATHERINÆ GRAY
 2-2a. LEPTASTERIAS ARCTICA (MUR.)
 3.3c. ALLASTERIAS FORFICULOSA VER. Type





PLATE LXXXIV.

- FIG. 1. *Allasterias forficulosa* Verrill. Type. Minor pedicellariæ mounted in balsam; *a, b, c*, entire; *d-h*, detached valves; $\times 88$. Japan. No. 1183, Mus. Comp. Zoöl.
- FIG. 2. *Asterias multiclava* Verrill. Type. Minor pedicellariæ in balsam; *a*, entire; *b-c*, separated valves; $\times 88$.
- FIG. 2a. The same specimen. Dermal dorsal major pedicellariæ; *a, b*, separated valves; $\times 88$.
- FIG. 3. *Asterias polythela* Verrill. Type. Adambulacral spines and pedicellariæ; $\times 10$.
- FIG. 4. The same specimen. Spines with adhering pedicellariæ; *a, b, c*, dorsals; *d, e*, adambulacrals with major pedicellariæ; $\times 16$.
- FIG. 5. *Stenasterias macropora* Verrill. Type. *a-g*, dorsal spines, mostly from bases of rays; $\times 16$.
- FIG. 5a. The same specimen. Adambulacral spines, *a-d*; $\times 16$.
- FIG. 5b. The same specimen. *a*, adoral spine with pedicellariæ; *c, d, e*, marginal spines, $\times 16$; *b*, oral pedicellariæ, $\times 50$.
- FIG. 5c. The same. Group of ossicles of actinal side; *ad*, adambulacrals; *i*, peractinals; *im*, inferomarginals; *sm*, supramarginals; $\times 10$.
- FIG. 5d. The same. Adoral adambulacral plates (*ad*), and spine with pedicellariæ (*p*).
- FIG. 5e. The same. Adoral portion of the groove, with large pores of sucker-feet; *ad*, adambulacral plates; *o*, oral spines; $\times 10$.
- FIG. 5f. Portion of groove and plates from middle of ray; *a, a*, ambulacral plates and large pores; *ad*, adambulacral plates; *i*, peractinals; $\times 10$.
- FIG. 5g. The same. Segment of actinal side of a ray deprived of spines; *a, a*, ambulacral plates and large sucker pores (*s*); *a, d*, adambulacral plates; *i*, peractinals; *m*, inferomarginal; *b*, a remaining adambulacral spine; *p, p*, adambulacral pedicellariæ; *r, r*, papular pores; $\times 10$.
- FIG. 5h. The same. Dorsal side of ray, with spines removed; *c, c*, median or carinal row of plates; *d, d*, and *d' d'*, right and left secondary rows of plates; *e, e'*, second pair of secondary rows of plates; *m, m'*, supermarginal rows; single papular pores lie between the plates in rows; $\times 10$.
- FIG. 5i. The same. Skeletal ossicles; *a*, peractinal plate; *b*, supermarginal; *c*, inferomarginal; *d*, adambulacral; *e*, supermarginal; $\times 16$.



A. HYATT VERNILL DEL.

HELIOTYPE CO., BOSTON

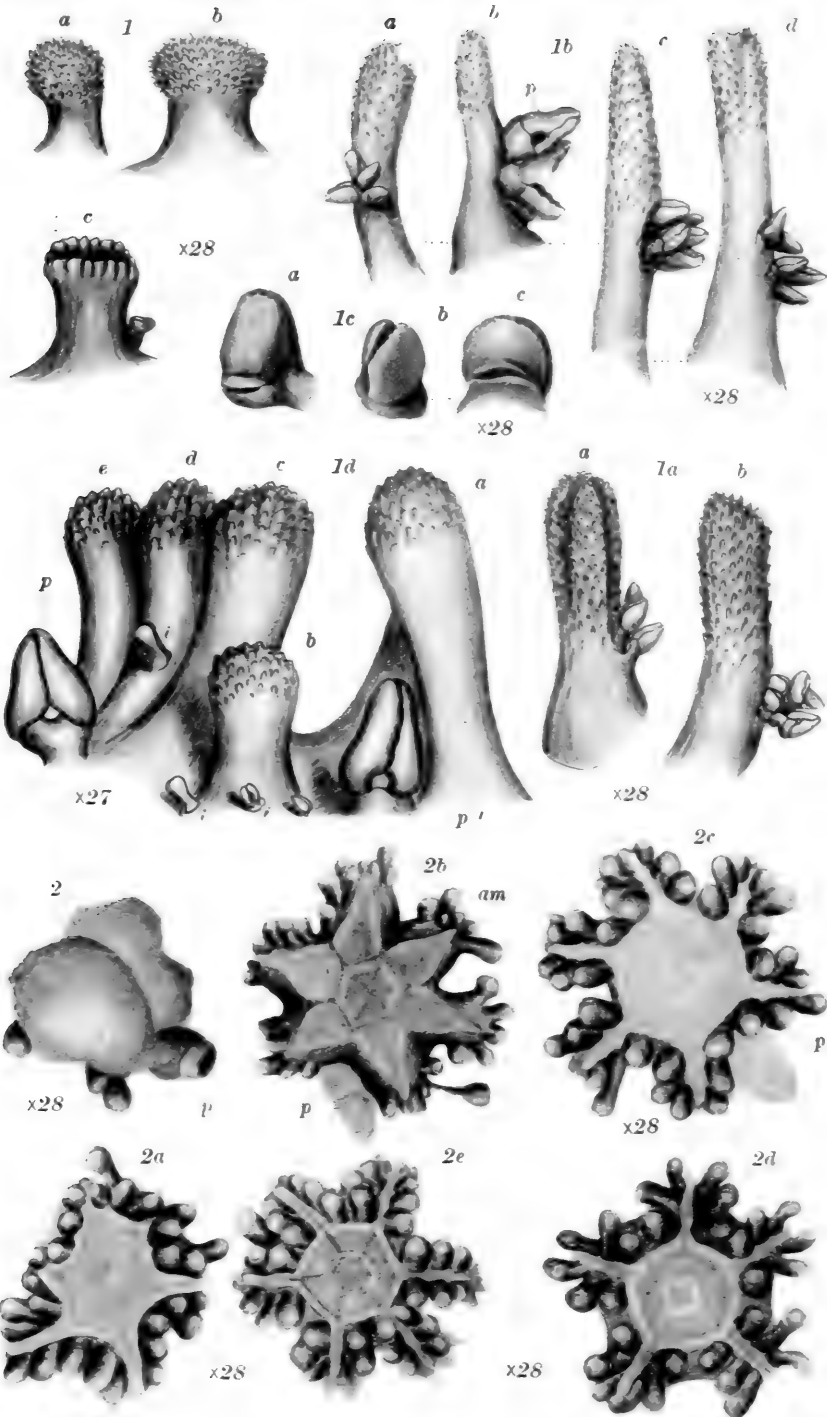
1. ALLASTERIAS FORFICULOSA VER. Type
 2-2a. ASTERIAS MULTICLAVA VER. Type
 3. 4. A. POLYTHELA VER. Type
 5-5i. STENASTERIAS MACROPORA VER. Type





PLATE LXXXV.

- FIG. 1. *Leptasterias epichlora alaskensis* Verrill. Type. Dorsal spines, *a, b, c*, of different sorts; $\times 28$. Dutch Harbor.
- FIG. 1a. The same specimen; *a*, inferomarginal spine; *b*, superomarginal; $\times 28$.
- FIG. 1b. The same specimen; *a, b, c*, adambulacral spines; *d*, peractinal; $\times 28$.
- FIG. 1c. The same specimen; *a, b, c*, large, erect, intermarginal major pedicellariæ; $\times 28$.
- FIG. 1d. The same specimen; marginal spines and pedicellariæ; *a*, superomarginal spines; *b, c, d, e*, inferomarginals; *p, p'*, major pedicellariæ; *i, i'*, minor pedicellariæ.
- FIGS. 2-2e. The same. Young carried by parent, in different stages of growth; *a, b*, younger stages; *p*, pedicel for attachment; *a, m*, podia or ambulacral feet; $\times 28$. In 2, the form is irregular, with few podia; in 2a, the form has become stellate, but with unequal rays. Later stages are regularly stellate; 2d is five-rayed; the others are six-rayed like the parent.



A. HYATT VERRILL DEL

HELIOTYPE CO., BOSTON

LEPTASTERIAS EPICHLORA ALASKENSIS VER. Type.
AND YOUNG OF THE SAME



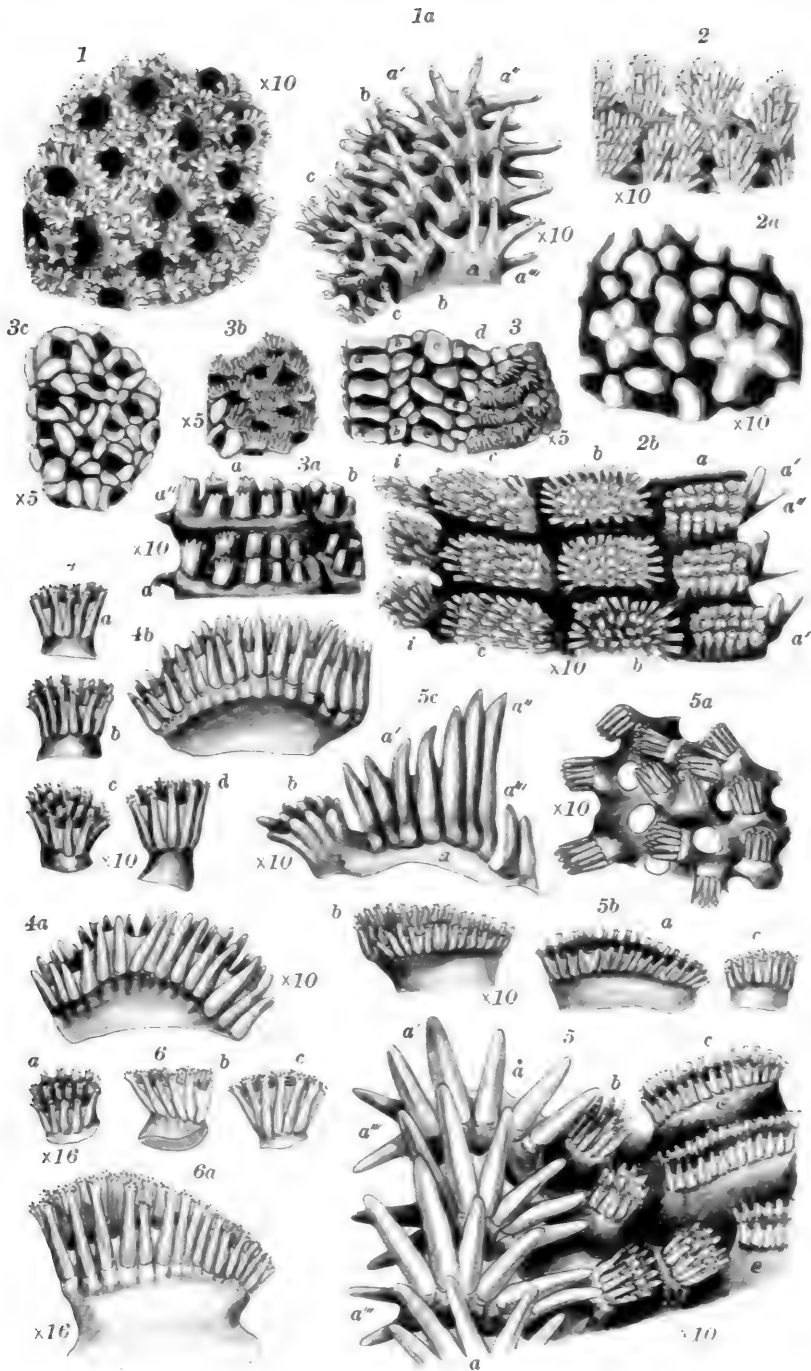
PLATE LXXXVI.

- FIG. 1. *Bunodaster ritteri* Verrill. Type. A group of dorsal parapaxillæ from the base of a ray; $\times 10$.
- FIG. 1a. The same specimen. A group of dorsal plates from the base of a ray, with spines removed; $\times 10$.
- FIG. 2. *Dermasterias imbricata* (Grube). Young. One of the interactinal areas deprived of spines; *ad*, adambulacral plates, *o*, jaw plates; *im*, inferomarginals; *p*, *p*, first rows; *P*, *P*, second rows of interactinal plates; 1, 1 and 2, 2 and 3, 3, first three pairs of interactinal plates; *u*, *u*, odd or unpaired plates; $\times 5$.
- FIG. 2a. The same specimen; *ad*, adambulacral plates from near base of ray; *p*, two rows of interactinal plates; *m*, inferomarginals; $\times 5$.
- FIG. 2b. The same specimen; *o*, *o*, jaw-plates; *ad*, adoral adambulacrals; *f*, rudimentary plates, perhaps superambulacral; *ib*, interbrachial septum; $\times 5$.
- FIG. 2c. The same specimen. Supramarginal plates, from inner side; 1, 1 and 2, 2, first and second interradiar pairs; $\times 5$.
- FIG. 3. *Solaster stimpsoni* Verrill. Type. One of the adambulacral combs of spines.
- FIG. 4. *Pteraster tessellatus* Ives. A jaw and adoral parts; *o*, *o*, apical oral spines; *o'*, *o'*, lateral oral spines; *e*, *e*, hyaline epioral spines; 1, 2, 3, first three pairs of adambulacral combs; $\times 5$.
- FIG. 4a. The same specimen. Portion from near middle of radial area; *am*, ambulacral groove; *a-d*, four combs of adambulacral spines; *m*, *m*, actinomarginal spines; *l*, latero-ventral surface; $\times 5$.
- FIG. 4b. The same specimen. Part of an interbrachial area, rendered translucent by varnish; *a*, *a*, spinules of parapaxillæ as seen through the translucent skin; *m*, actinomarginal spines; *ad*, adambulacrals; $\times 5$.
- FIG. 4c. The same. One of the hyaline epioral spines; $\times 10$.
- FIG. 5. *Henricia sanguinolenta* var. *rudis* Verrill. A group of dorsal pseudopaxillæ from the base of a ray; $\times 16$. Point Franklin. No. 7623.
- FIG. 5a. The same specimen. *a-d*, adambulacral spines; $\times 16$.
- FIG. 6. *Henricia tumida borealis* Verrill. Type. A group of dorsal ossicles, mostly with spinules removed from the base of a ray; $\times 10$.
- FIG. 6a. The same specimen. Group of dorsal pseudopaxillæ, with spinules and papular pores; $\times 10$. Alaska, Harriman Expedition.



PLATE LXXXVII.

- FIG. 1. *Henricia tumida* Verrill. Type. Portion of dorsal surface; $\times 10$.
- FIG. 1a. The same specimen. Group of spines of actinal side; *a'*, *a'*, adambulacrals; *b*, *b'*, peractinals; *c*, *c'*, inferomarginals; $\times 10$.
- FIG. 2. *Henricia leviuscula spiculifera* (Clark). Group of pseudopaxillæ from the side of the base of a ray; $\times 10$. Bering Sea.
- FIG. 2a. The same specimen. Group of dorsal ossicles with spines removed; $\times 10$.
- FIG. 2b. The same specimen. Portion of actinal side; *a*, *a'*, adambulacrals and spines; *a''*, furrow-spine; *b*, *b*, peractinal pseudopaxillæ; *c*, *c*, inferomarginals; *d*, *d*, superomarginals; $\times 10$.
- FIG. 3. *Henricia arctica* Verrill. Type. Cape Lisburne. Portion of actinal side with spines partly removed; *a*, adambulacrals; *b*, *b*, peractinals; *c*, *c*, inferomarginals; *d*, *d*, superomarginals; *e*, *e*, intermarginals; $\times 5$.
- FIG. 3a. The same specimen. *a*, *a*, two adambulacrals and spines; *a'*, furrow-spine; *b*, peractinal.
- FIG. 3b. The same specimen. Group of dorsal pseudopaxillæ; $\times 5$.
- FIG. 3c. The same specimen. Group of ossicles from base of ray; $\times 5$.
- FIG. 4. *Solaster endeca* (Linn.) Forbes. Typical from Atlantic; *a*, *b*, *c*, dorsal pseudopaxillæ from base of ray; *d*, superomarginal; $\times 10$.
- FIGS 4a, 4b. The same specimen. Inferomarginal plates; 4a, adoral side; 4b, aboral side; $\times 10$.
- FIG. 5. *Solaster galaxides* Verrill. Type. Portion of actinal side; *a*, *a*, adambulacrals spines, actinal group; *a'*, furrow-spines; *b*, *b*, *b'*, peractinals; *c*, *c*, inferomarginals.
- FIG. 5a. The same specimen. Group of dorsal pseudopaxillæ and papular pores from the base of a ray; $\times 10$.
- FIG. 5b. The same specimen; *a*, adoral, and *b*, aboral sides of inferomarginal plates; *c*, superomarginal plate; $\times 10$.
- FIG. 5c. *Solaster galaxides* Verrill. Cotype. *a*, actinal group of adambulacrals spines; *a'*, furrow-spines; *b*, peractinals. No. 1897, Mus. Comp. Zool.
- FIG. 6. *Solaster dawsoni* var. *arctica* Verrill. Type. Dorsal pseudopaxillæ, *a*, *b*, *c*, from base of ray; $\times 16$.
- FIG. 6a. The same specimen; inferomarginal plate; $\times 16$. From Point Franklin.



A. HYATT VERRILL DEL.

HELIOTYPE CC BOSTON

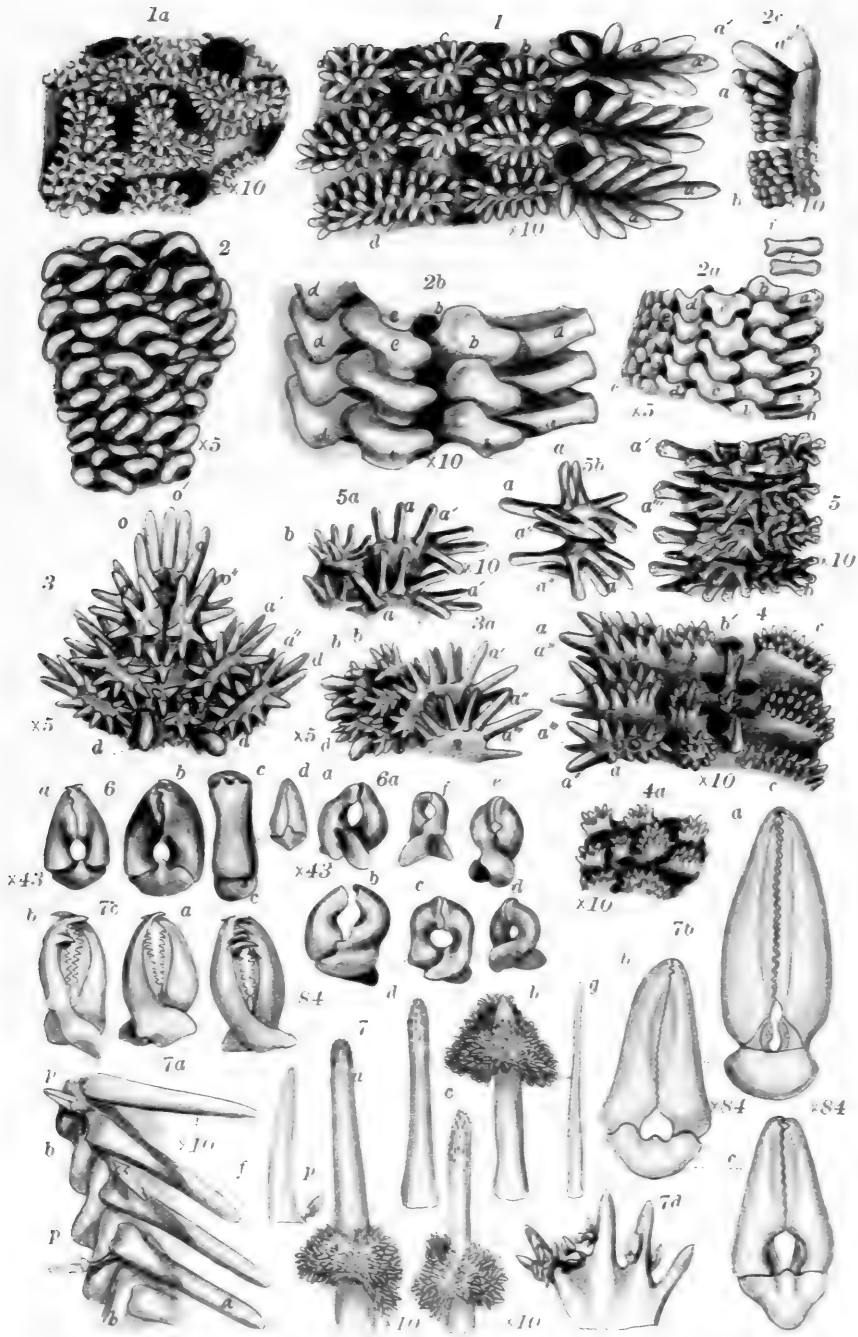
1-1a. HENRICIA TUMIDA VER. Type
 2-2b. H. LEVIUSCULA SPICULIFERA (CLARK)
 3-3c. H. ARCTICA VER. Type
 4-4b. SOLASTER ENDECA (L.)
 5-5c. S. GALAXIDES VER. Type
 6-6a. S. DAWSONI ARCTICUS VER. Type





PLATE LXXXVIII.

- FIG. 1. *Henricia leviuscula* var. *inequalis* Verrill. Type. Portion of the actinal side of a ray; *a, a*, enlarged adambulacral spines; *a', a'*, longer adambulacral spines on inner angle of plate; *b*, interactinals; *c*, second row of interactinal pseudopaxillæ; *d*, inferomarginal plates and spines; $\times 10$. No. 5183, Yale Mus.
- FIG. 1a. The same specimen. Group of dorsal pseudopaxillæ and papulæ from base of a ray; $\times 10$.
- FIG. 2. *Henricia leviuscula* var. *lunula* Verrill. Type. Group of dorsal ossicles from the base of a ray, cleaned; $\times 5$. British Columbia. Yale Mus.
- FIG. 2a. The same specimen. Plates of the actinal side of the middle of a ray, cleaned; *a, a*, adambulacrals; *b, b*, peractinals; *c, c*, inferomarginals; *d, d*, superomarginals; *e, e*, latero-dorsals; *f*, two adambulacral spines; $\times 5$.
- FIG. 2c. The same specimen. Plates of actinal side, more enlarged ($\times 10$). Lettering as in fig. 2a.
- FIG. 2c. The same specimen; *a*, adambulacral spines; *a'*, enlarged inner spine; *a''*, furrow-spine; *b*, peractinal spines; $\times 10$.
- FIG. 3. *Henricia sanguinolenta* (Müller). Typical form from New England. A jaw and adjacent parts; *o, o, o'*, apical or peroral spines; *o'', o''*, lateral adoral spines; *a', a''*, adambulacral spines of first and second free plates; *d, d*, exsert papulæ; $\times 5$. Eastport, Me. (coll., A. E. Verrill). Yale Mus., No. 5099.
- FIG. 3a. The same specimen. Spines from the actinal side near the base of a ray; *a, a*, adambulacral plates; *a', a''*, adambulacral spines; *a'''*, furrow spine; *b, b'*, interactinal spines; *d, d*, papulæ; $\times 5$.
- FIG. 4. *Henricia sanguinolenta miliaris* Verrill. Type. From a New England specimen. A portion of the actinal surface of the middle of a ray; $\times 10$. Lettering as in fig. 3a, with addition of *c, c*, the inferomarginal plates.
- FIG. 4a. The same specimen. Group of dorsal pseudopaxillæ from near base of a ray; $\times 10$. Eastport, Me. (coll., A. E. Verrill). Yale Mus.
- FIG. 5. *Henricia tumida borealis* Verrill. Type. Portion of plates and spines from the actinal side near the base of a ray; $\times 10$. Lettering as in figs. 3a and 4. Dutch Harbor, Alaska, Harriman Expedition. Yale Mus.
- FIG. 5a. The same specimen. *a, a*, ambulacral spines; *a', a'*, larger spines on edge of groove; *b, b*, peractinal spines; $\times 10$.
- FIG. 5b. The same specimen. Adoral adambulacral plates and spines; $\times 10$. Lettering as in fig. 5a.
- FIG. 6. *Orthasterias forreri forcipulata* Verrill. Type. Larger dorsal, dermal, major pedicellariæ of three sorts; *a, b*, stout, erect denticulate form; *c*, spatulate or plateiform sort; *d*, lanceolate form; $\times 43$.
- FIG. 6a. The same specimen. Minor pedicellariæ of different sizes, *a-f*; $\times 43$.
- FIG. 7. *Pycnopodia helianthoides* (Brandt). Spines; *a, b, c*, dorsals with wreaths of minor pedicellariæ; *d*, the same, cleaned of the pedicellariæ; *f*, an adambulacral spine with a pedicellaria (*P*) attached to its base by a pedicel on the edge of the furrow; *g*, an adoral spine, cleaned; $\times 10$.
- FIG. 7a. The same specimen. A group (*b, b*) of adambulacral overlapping plates; *a, a*, adambulacral spines; *p, p*, major pedicellariæ on slender pedicels; $\times 10$.
- FIG. 7b. The same specimen. *a, b, c*, three forms of small lanceolate major pedicellariæ; $\times 84$.
- FIG. 7c. The same specimen. *a, b, c*, three of the minor pedicellariæ; $\times 84$.
- FIG. 7d. The same specimen. One of the jaws with apical or peroral spines and pedicellariæ; $\times 10$.



A. HYATT VERM. DEL.

HELOTHER CO. BOSTON

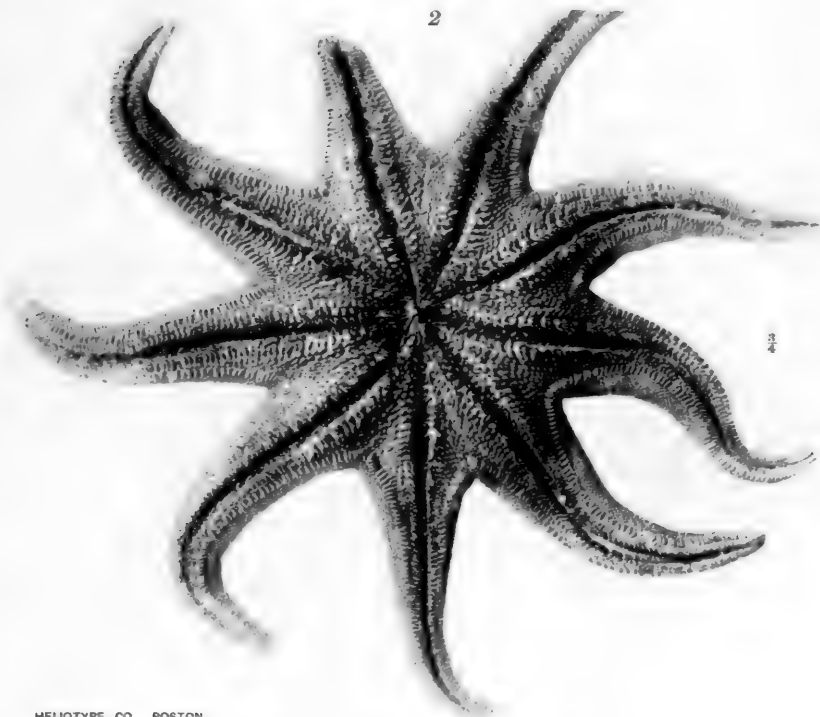
1-1a. HENRICIA LEVIUSCULA. VAR.
 2-2c. H. LEVIUSCULA, VAR. LUNULA VER. Type
 3-3a. H. SANGUIOLENTA (MULL.) Typical
 4-4a. H. SANGUIOLENTA MILIARIS VER. Type
 5-5b. H. TUMIDA BOREALIS VER. Type
 6-6a. ORTHASTERIAS FERRERI FORCIPULATA VER. Type
 7-7d. PYCNOPODIA HELIANTHOIDES (BR.)





PLATE LXXXIX.

- FIG. 1. *Solaster endeca* (Linn.) Forbes. Typical. Actinal side of a large New England specimen; $\frac{4}{9}$ natural size. Eastport, Me. Yale Mus.
- FIG. 2. *Solaster galaxides* Verrill. Type. $\frac{3}{4}$ natural size. Vancouver Is.



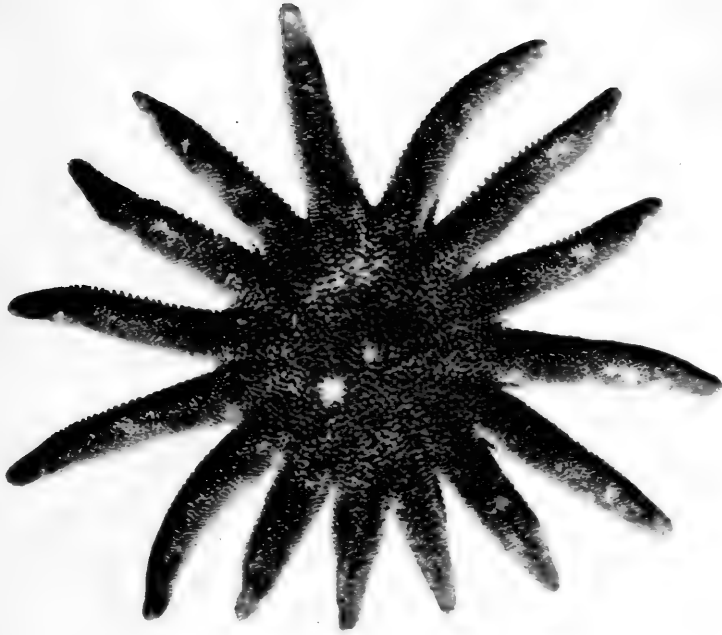
HELIOTYPE CO., BOSTON

1. SOLASTER ENDECA (L.) ATLANTIC
2. S. GALAXIDES VER. TYPE

PLATE XC.

- FIG. 1. *Solaster dawsoni* Verrill. Form with different rays; about natural size. Vancouver I, Surv. Canada.
- FIG. 2. *Solaster constellatus* Verrill. Type. About $\frac{3}{4}$ natural size.

1



2



HELIOTYPE CO., BOSTON

1. SOLASTER DAWSONI VER.
2. SOLASTER CONSTELLATUS VER. Type



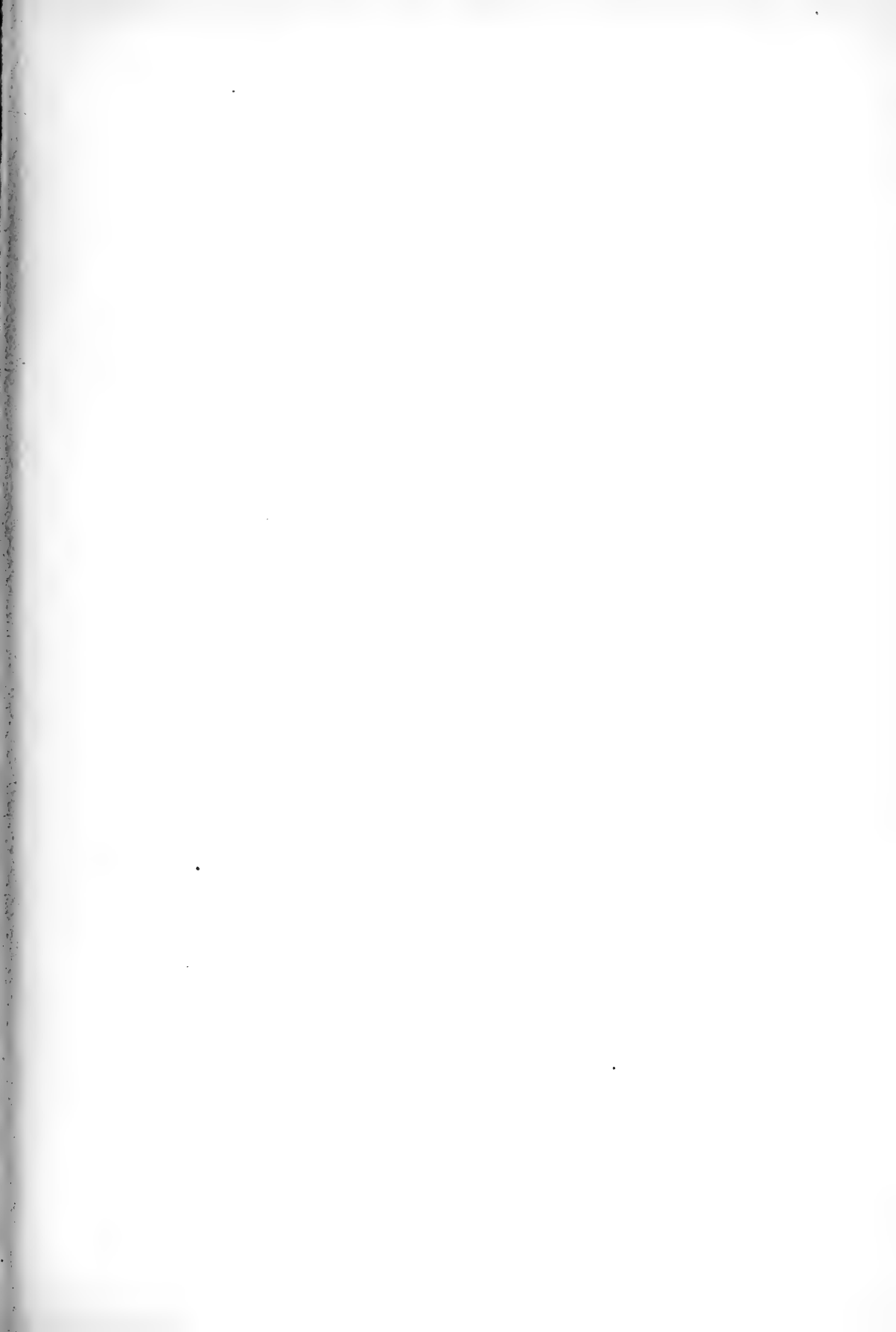
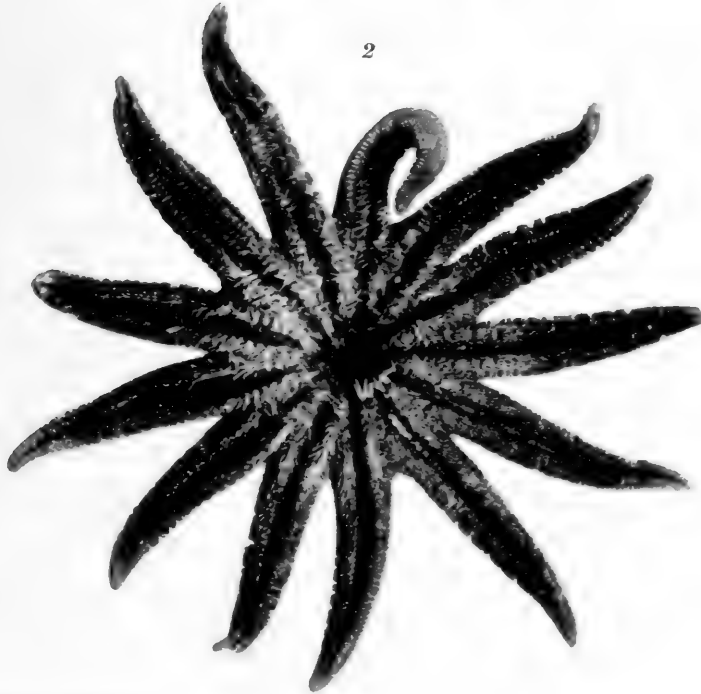
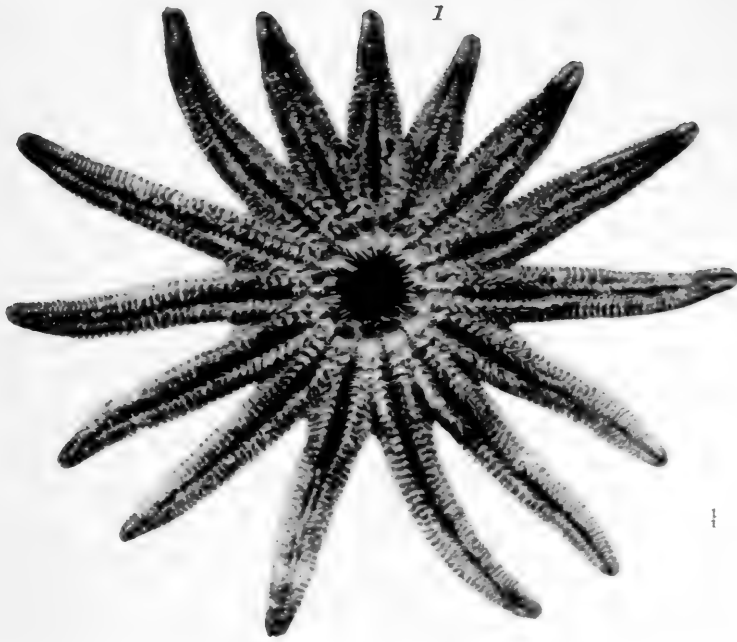


PLATE XCI.

- FIG. 1. *Solaster dawsoni* Verrill. Form with fifteen rays. Actinal side; about natural size.
- FIG. 2. *Solaster dawsoni* Verrill. Cotype. Actinal side; about $\frac{1}{2}$ natural size. Powell Is. Geol. Surv. Canada.



HELIOTYPE CO., BOSTON

1.2. SOLASTER DAWSONI VER.





PLATE XCII.

FIG. 1. *Solaster dawsoni* Verrill. Cotype. Same specimen as pl. xc, fig. 2.
Actinal side; $\times 2\frac{3}{4}$. Powell Is.



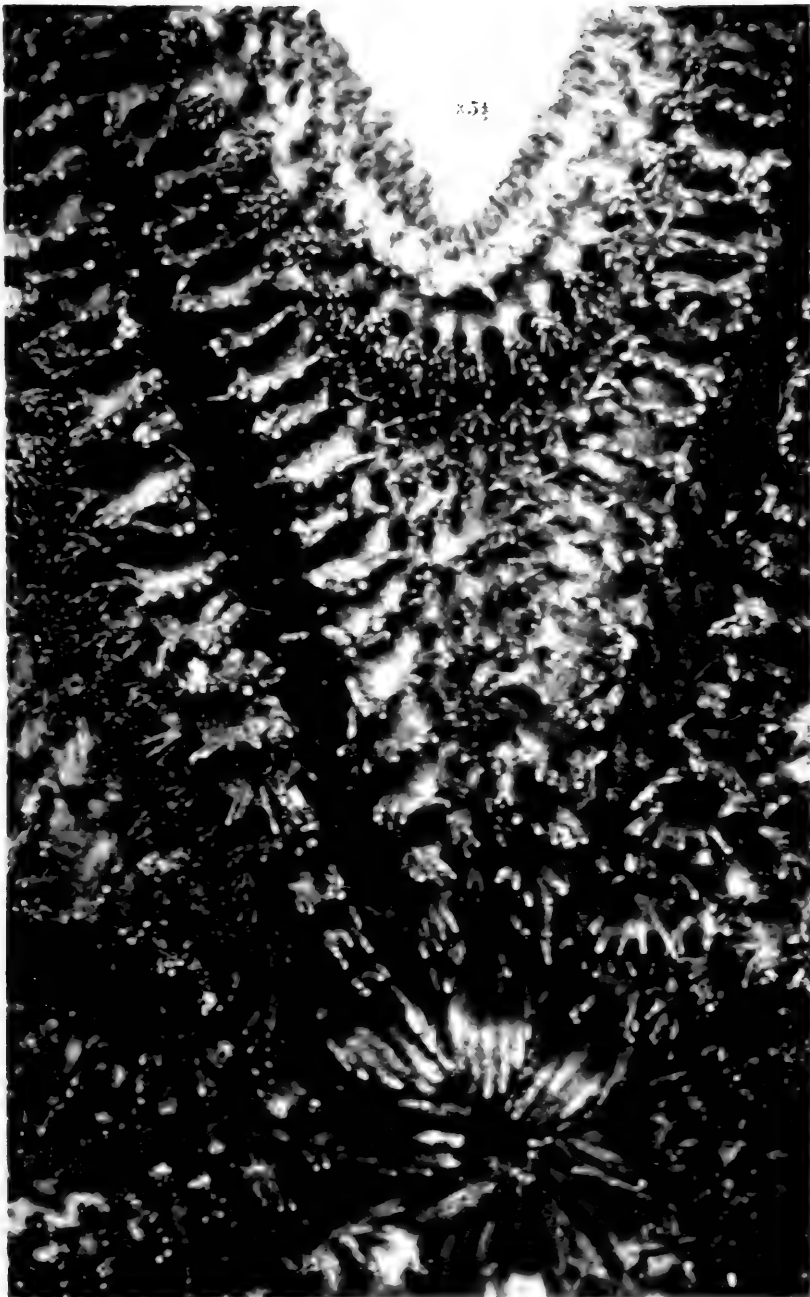
HELIOTYPE CO., BOSTON

SOLASTER DAWSONI VER. Cotype



PLATE XCIII.

FIG. 1. *Solaster constellatus* Verrill. Type. Actinal side; $\times 5\%$. Puget Sound. Mus. Univ. of Wash.



HELIOTYPE COLL. BOSTON

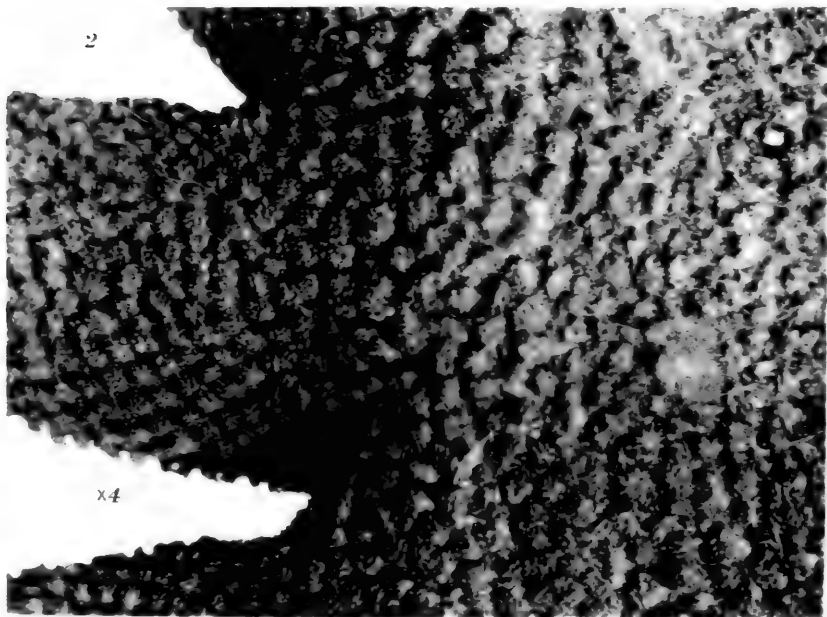
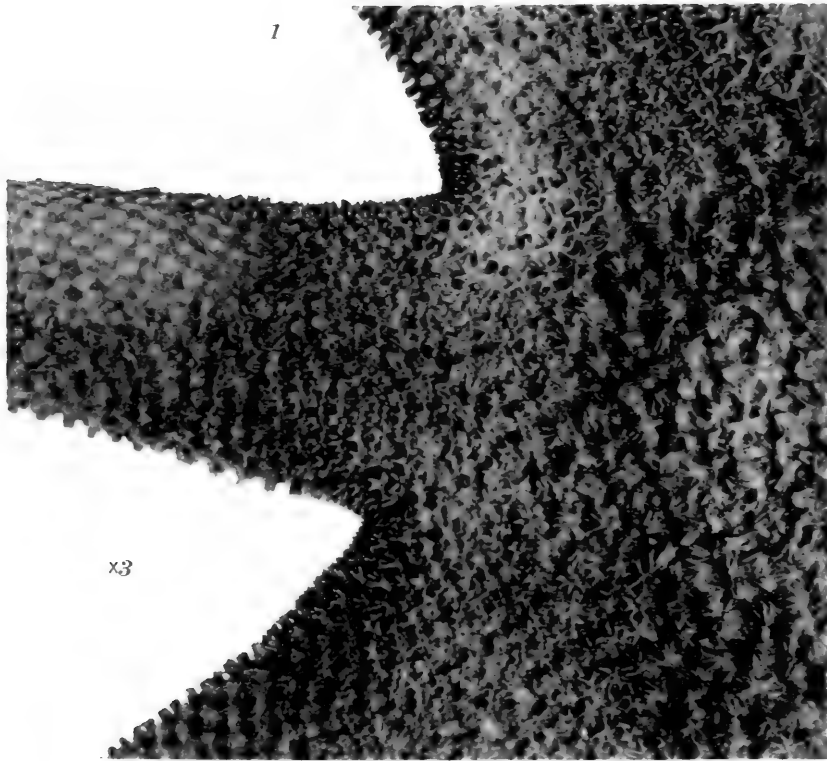
S. LASTER CONSPELLATUS VER. Type



PLATE XCIV.

FIG. 1. *Solaster constellatus* Verrill. Type. Dorsal side; X 3.

FIG. 2. *Solaster simpsoni* Verrill. Type. Dorsal side; X 4.



HELIOTYPE CO., BOSTON

1. SOLASTER CONSTELLATUS VER. Type
2. SOLASTER STIMPSONI VER. Type

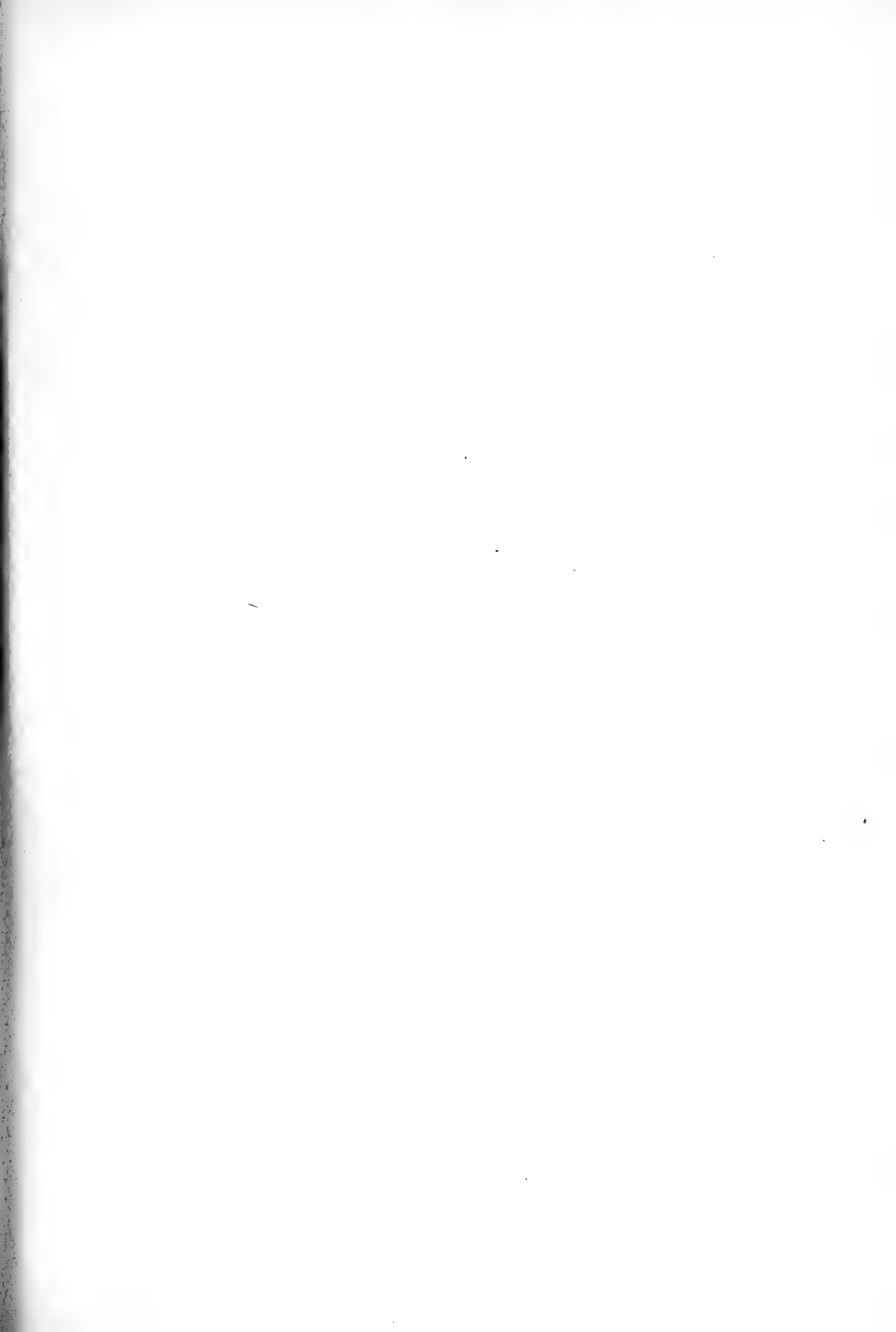
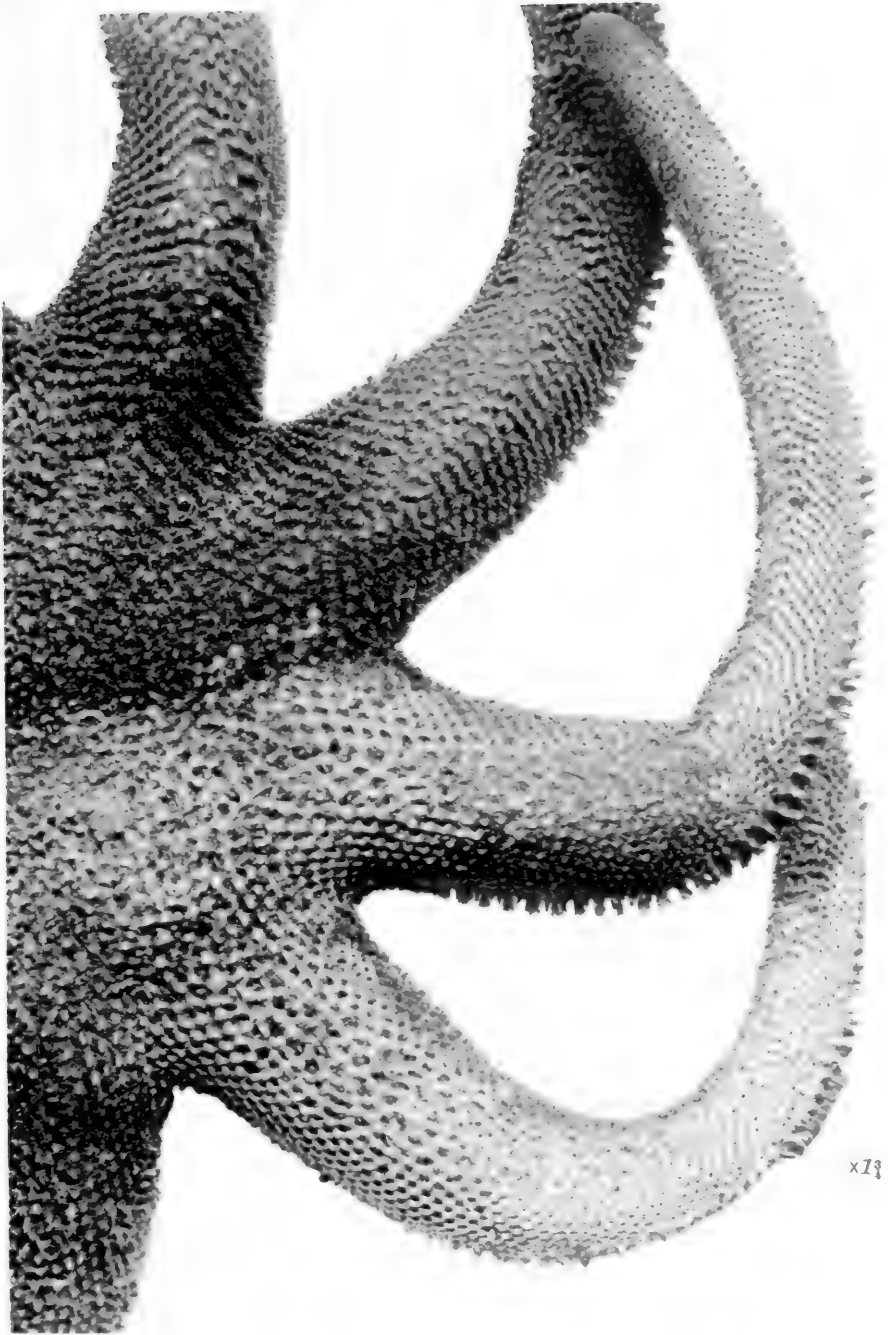


PLATE XCV.

FIG. 1. *Solaster stimpsoni* Verrill. Type. Dorsal side; $\times 1\frac{3}{4}$. No. 5407,
Yale Mus.



x73

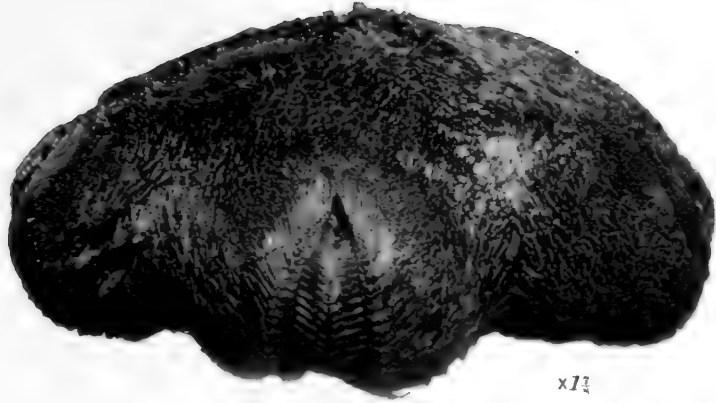
HELIOTYPE CO., BOSTON

SOLASTER STIMPSONI VER. Type



PLATE XCVI.

FIGS. 1, 2. *Pteraster hebes* Verrill. Type. Profile and dorsal views; 1,
× about $1\frac{7}{8}$; 2, × 2. Departure Bay. Geol. Surv. Canada.



x1 $\frac{1}{2}$



x2

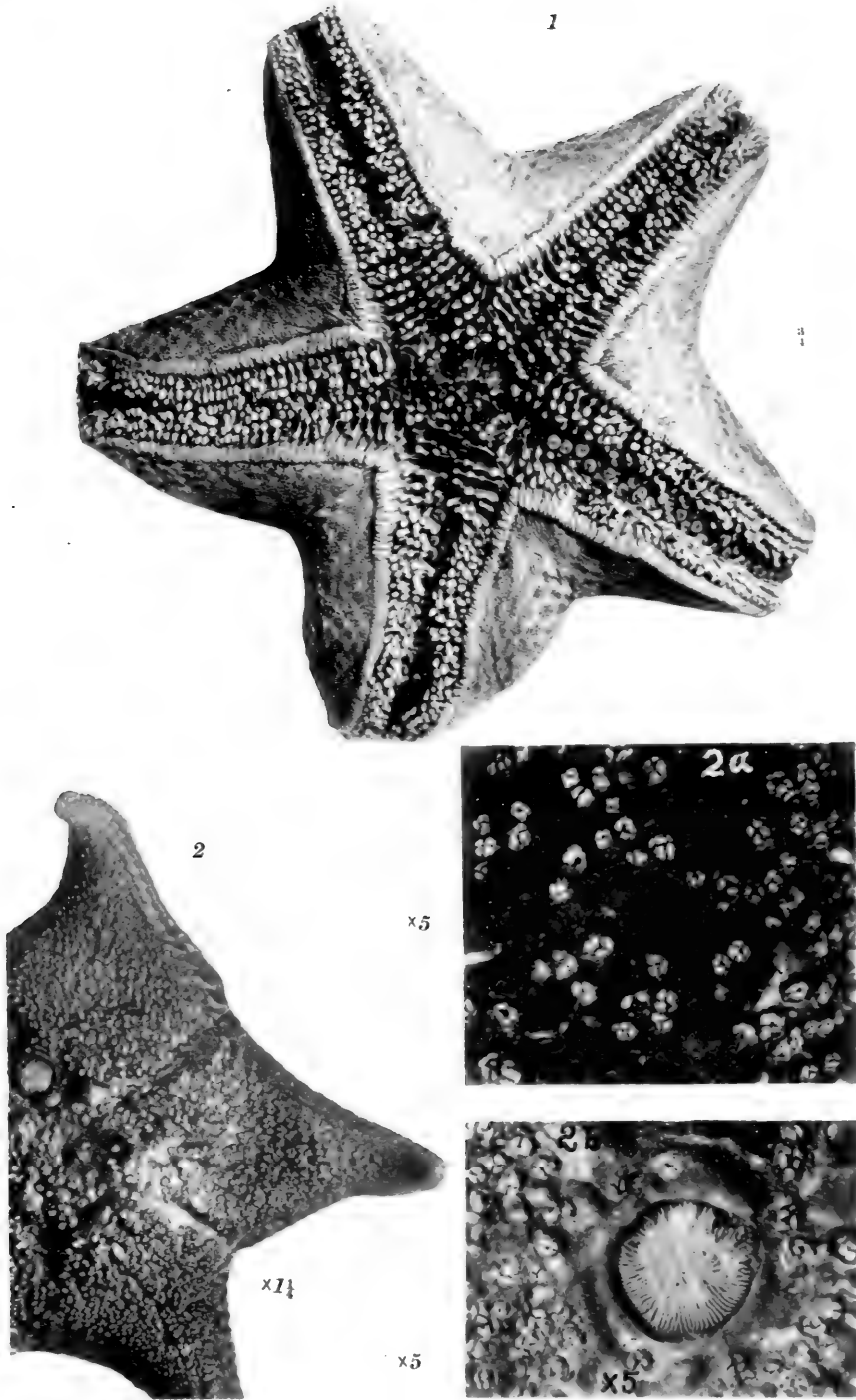
HELIOTYPE CO., BOSTON

1.2. PTERASTER HERES VER. Type



PLATE XCVII.

- FIG. 1. *Pteraster tessellatus* Ives. Actinal side of an alcoholic specimen from Alaska; about $\frac{3}{4}$ natural size. Yale Mus.
- FIG. 2. *Dermasterias imbricata* (Grube), var. *valvifera* Verrill. Type. Dorsal side, showing abundant pedicellariæ; $\times 1\frac{1}{4}$. Yale Mus.
- FIGS. 2a, 2b. The same specimen. Portions of disk; $\times 5$. 2a, shows many three-valved pedicellariæ and some four-valved; fig. 2b, shows also the madreporite.



HELIOTYPE CO., BOSTON

1. *PTERASTER TESSELLATUS* IVES
2-2b. *DERMASTERIAS IMBRICATA VALVULIFERA* VER. Type

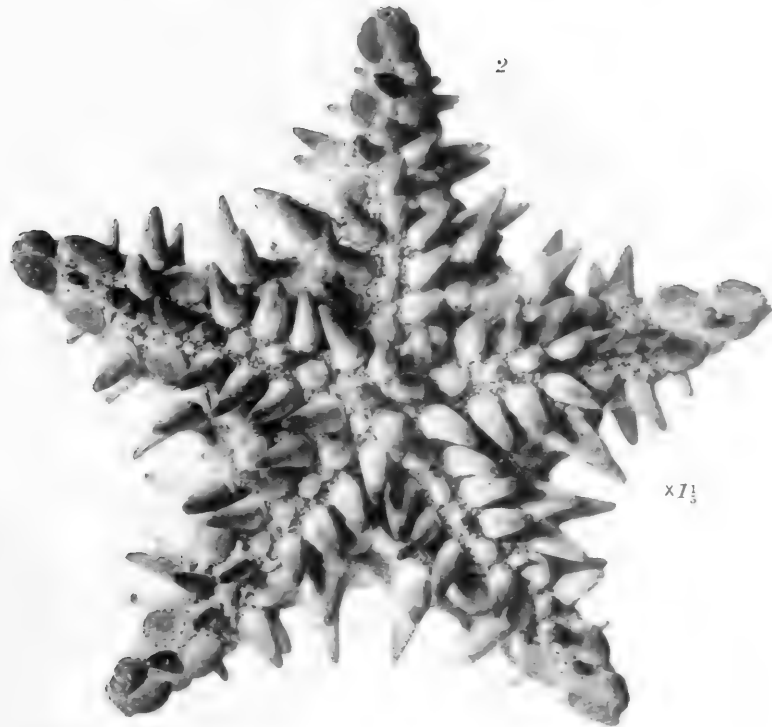


PLATE XCVIII.

- FIG. 1. *Hippasteria spinosa* Verrill. Type. Dorsal side; $\frac{2}{3}$ natural size.
Puget Sound. Univ. of Wash.
- FIG. 2. *Amphiaster insignis* Verrill. Type. Dorsal side; $\times 1\frac{1}{2}$. La Paz,
Lower Calif. Yale Mus.



2
3



2

$\times 1\frac{1}{5}$

HELIOTYPE CO., BOSTON

1. HIPPASTERIA SPINOSA VER. Type
2. AMPHIASTER INSIGNIS VER. Type

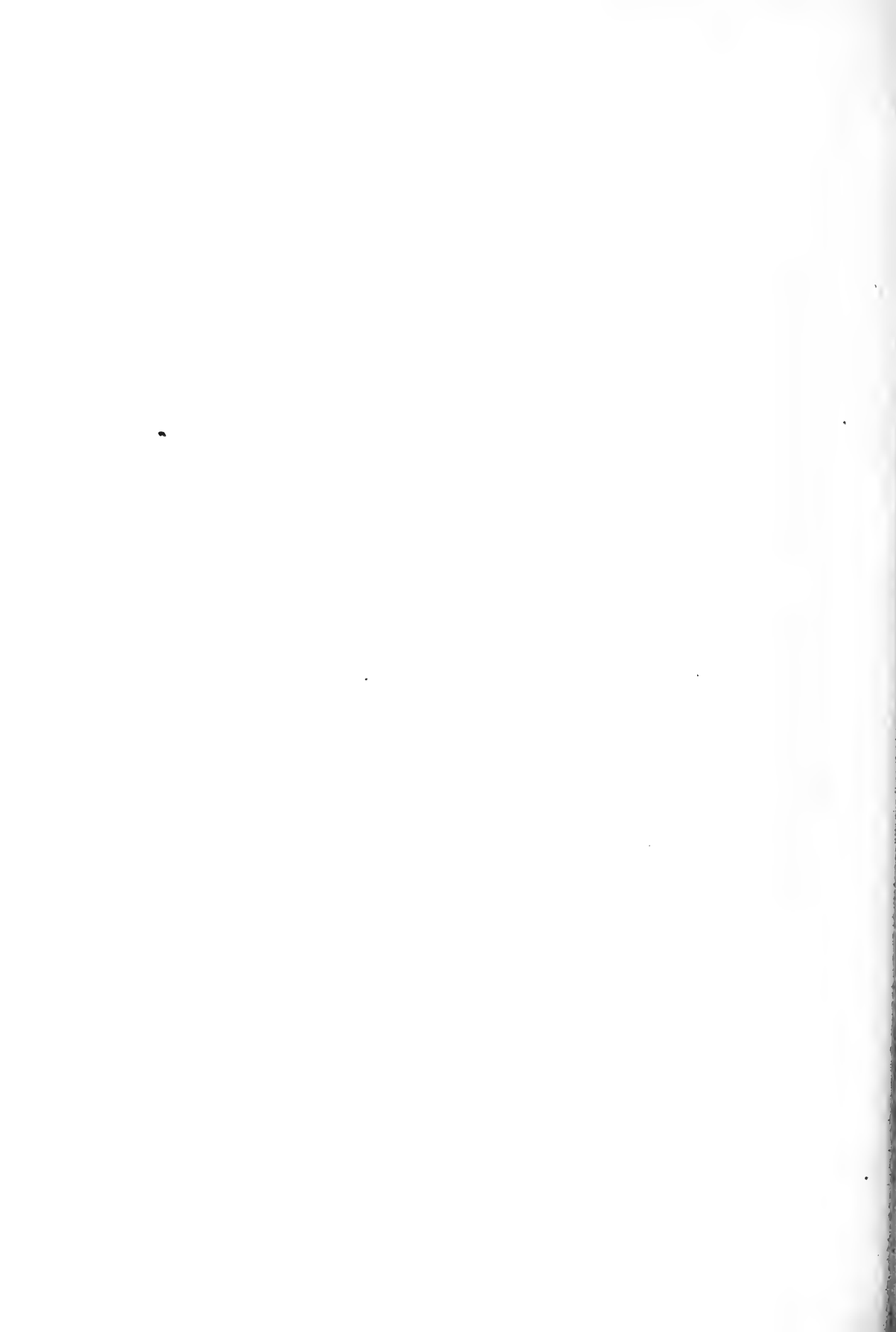
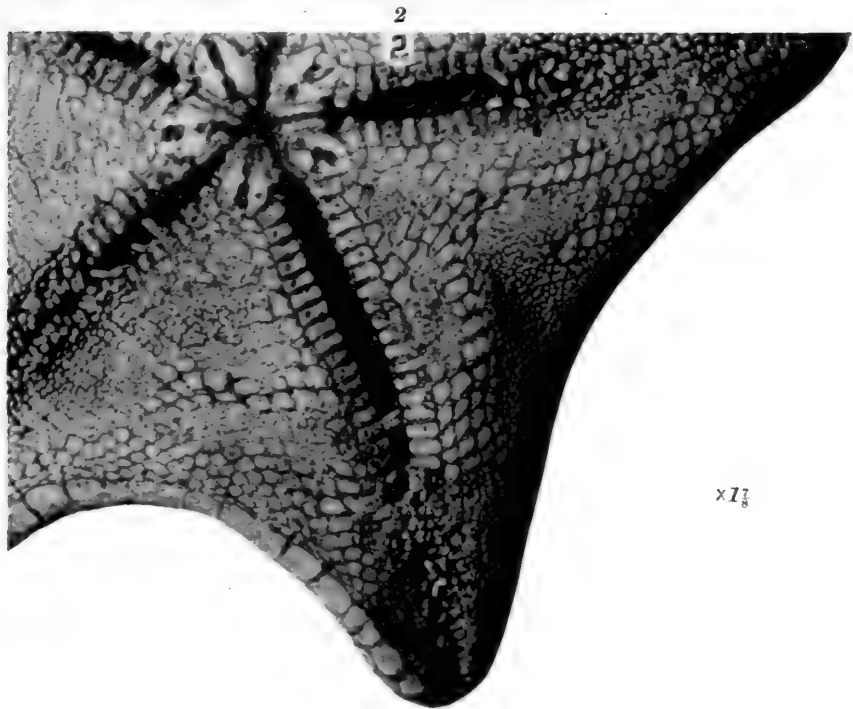
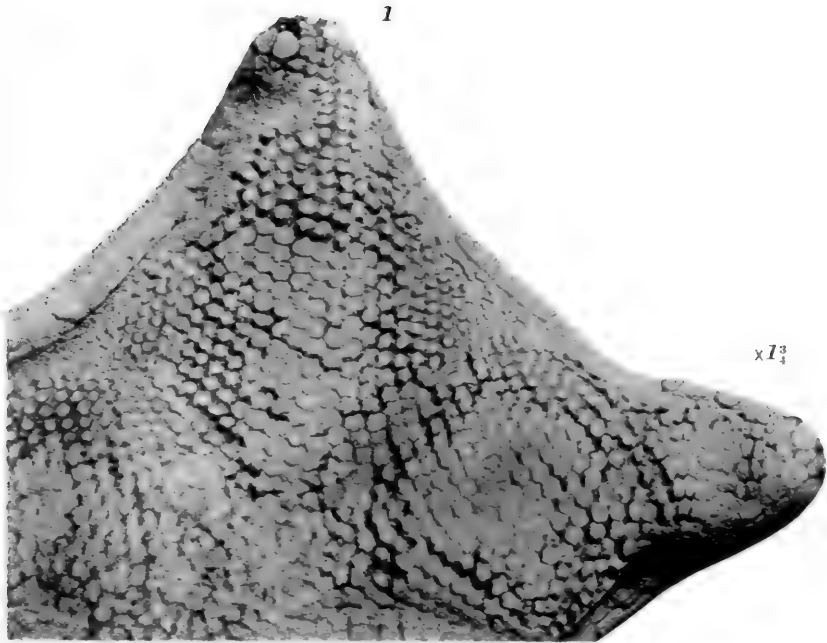




PLATE XCIX.

FIG. 1. *Tosiaster arcticus* Verrill. Dorsal side; $\times 1\frac{3}{4}$.

FIG. 2. The same specimen. Actinal side; $\times 1\frac{7}{8}$. Bering Is. U. S. Nat. Mus.



HELIOTYPE CO., BOSTON

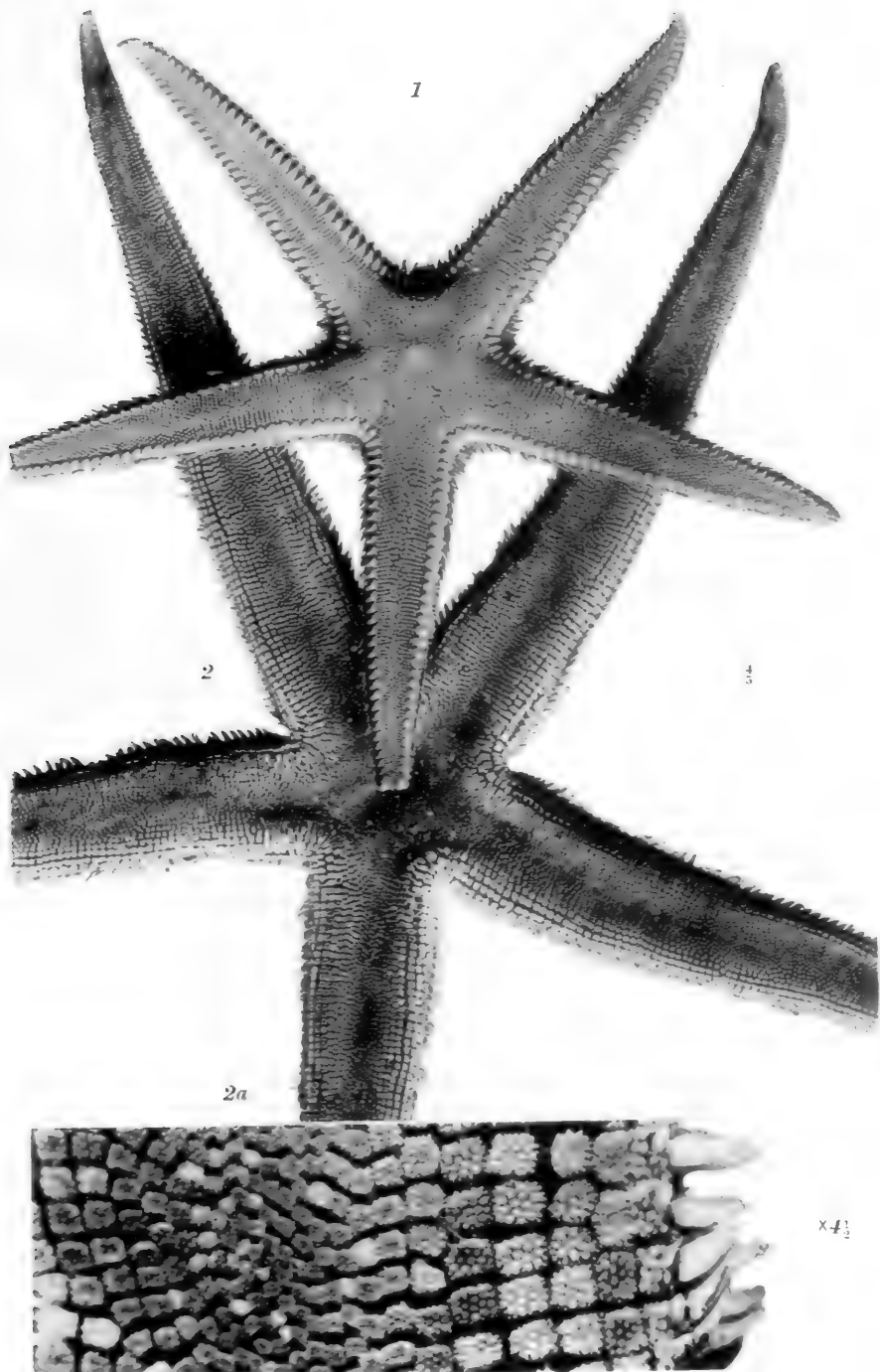
1.2. *TOSIASTER ARCTICUS* VER. Type





PLATE C.

- FIG. 1. *Astropecten californicus* Fisher; $\frac{4}{5}$ natural size. San Francisco.
FIG. 2. *Luidia foliolata* (Grube). Dorsal side; $\frac{4}{5}$ natural size. San Francisco.
FIG. 2a. The same. Portion of a ray; $\times 4\frac{1}{2}$.



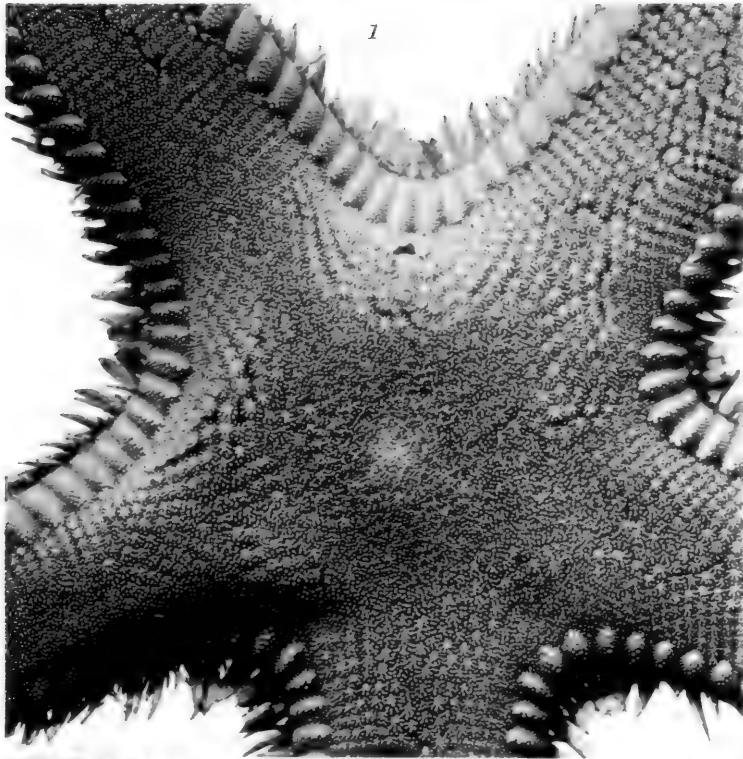
HELIOTYPE CO., BOSTON

1. *ASTROPECTEN CALIFORNICUS* FISHER
2. 2a. *LUIDIA FOLIOLATA* GRUBE

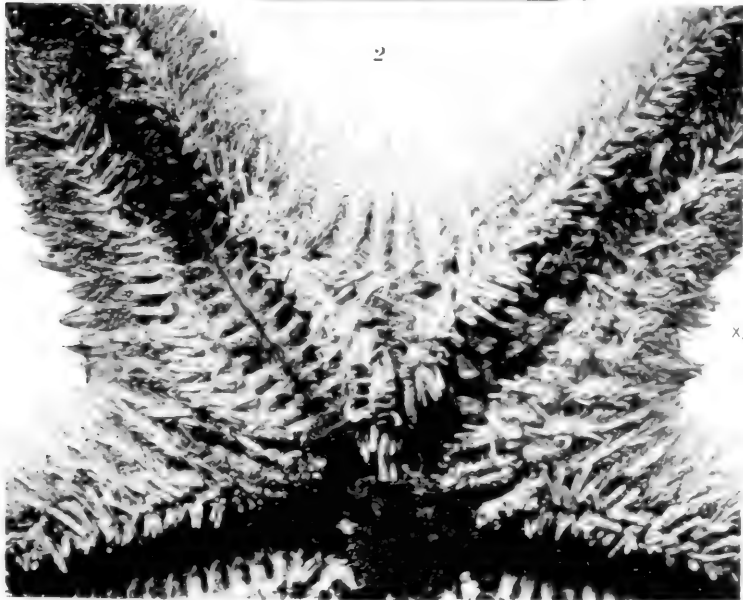


PLATE CI.

- FIG. 1. *Astropecten californicus* Fisher. Dorsal side; $\times 3$. San Francisco.
FIG. 2. The same specimen. Actinal side; $\times 2\frac{1}{3}$.



x3



x21
 $\frac{1}{2}$

HELIOTYPE CO., BOSTON

ASTROPECTEN CALIFORNICUS FISHER



PLATE CII.

- FIG. 1. *Astropecten californicus* Fisher. Young. Dorsal side; $\times 2\frac{1}{2}$. Off
San Francisco. Yale Mus.
- FIG. 2. The same specimen. Actinal side; $\times 2\frac{1}{2}$.



HELIOTYPE CO., BOSTON

1.2. ASTROPECTEN CALIFORNICUS FISHER (YOUNG)



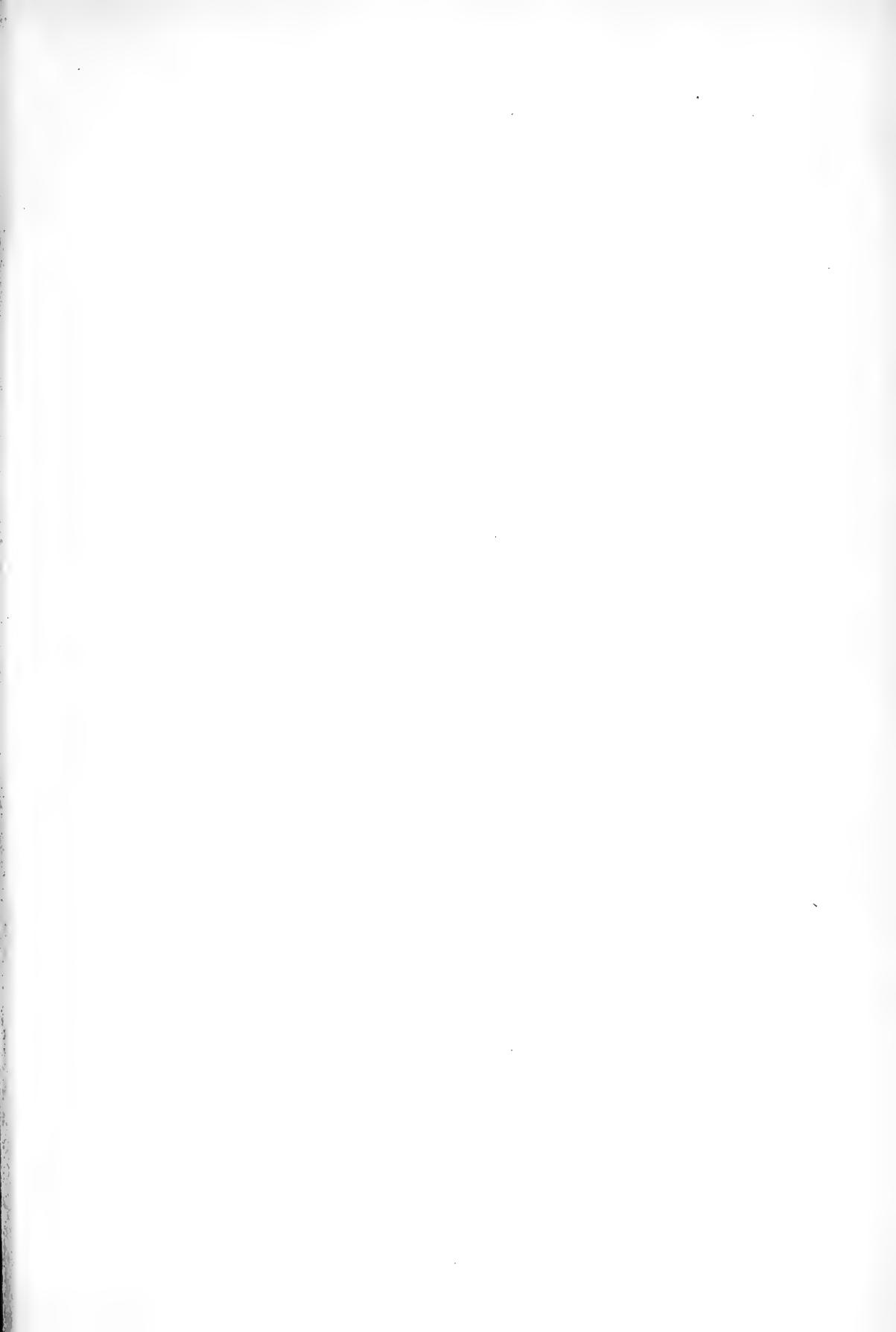
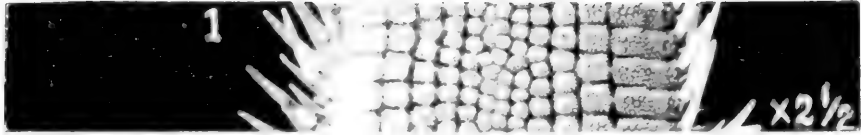


PLATE CIII.

- FIG. 1. *Luidia clathrata* (Say). Dorsal side of ray; $\times 2\frac{1}{2}$. Bermuda.
FIG. 2. *Luidia foliolata* (Grube). Dorsal side; $\times 2\frac{1}{2}$. San Francisco.
Yale Mus.



HELIOTYPE CO., BOSTON

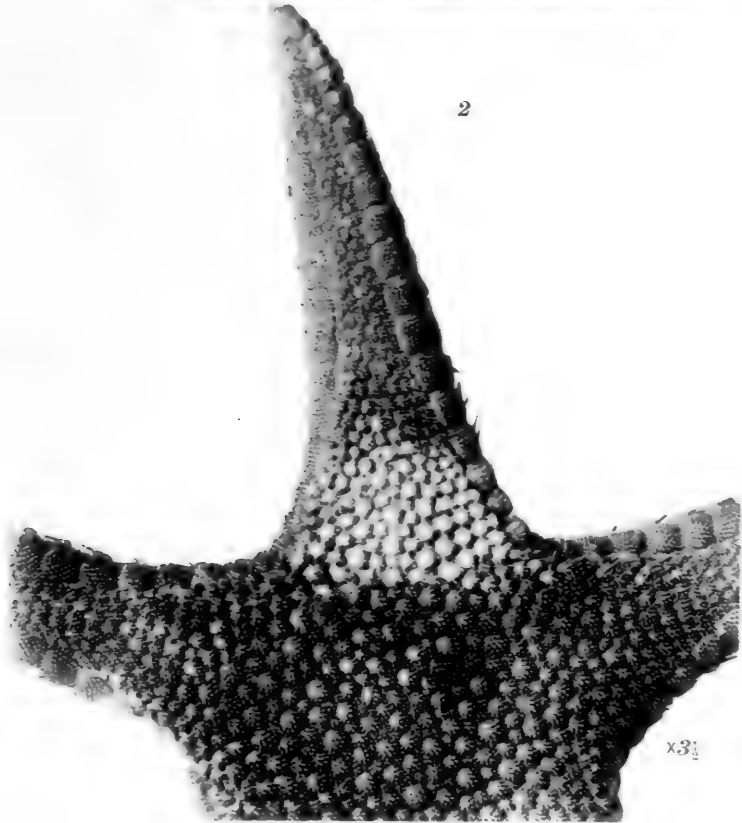
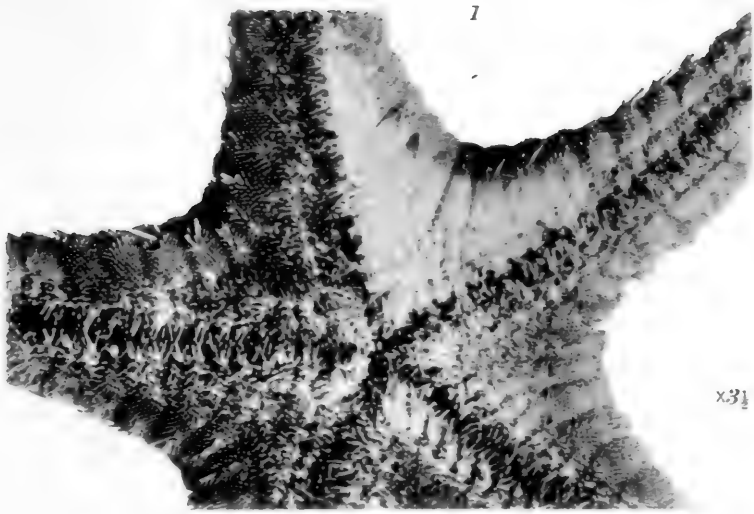
1. *LUIDIA CLATHRATA* SAY.
2. *LUIDIA FOLIOLATA* GRUBE





PLATE CIV.

- FIG. 1. *Bunodaster ritteri* Verrill. Type. Actinal side; $\times 3\frac{1}{2}$. Off San Francisco. Yale Mus.
- FIG. 2. The same specimen. Dorsal side with spines removed on base of one ray; $\times 3\frac{1}{2}$.



HELIOTYPE CO., BOSTON

BUNODASTER RITTERI VER. Type



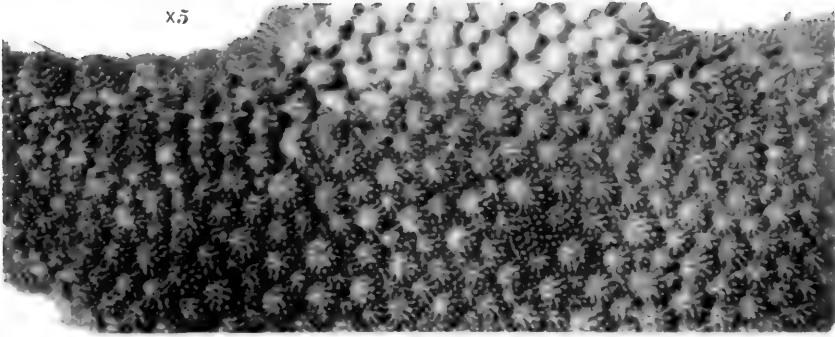


PLATE CV.

- FIGS. 1, 1a. *Bunodaster ritteri* Verrill. Type. Portions of the dorsal and actinal surface; $\times 5$. San Francisco.
- FIG. 2. *Luidia foliolata* (Grube). Same specimen as pl. c, fig. 2. Actinal side; $\times 2$. Off San Francisco.

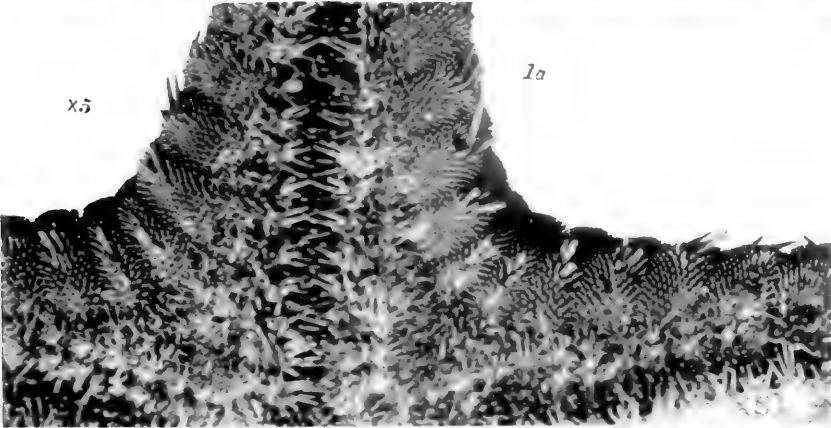
1

x5

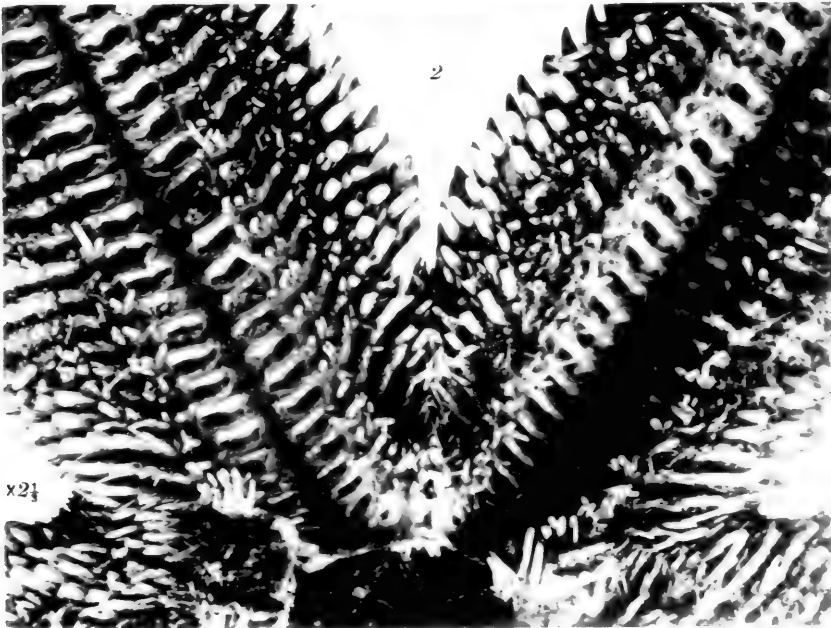


1a

x5



2



x21

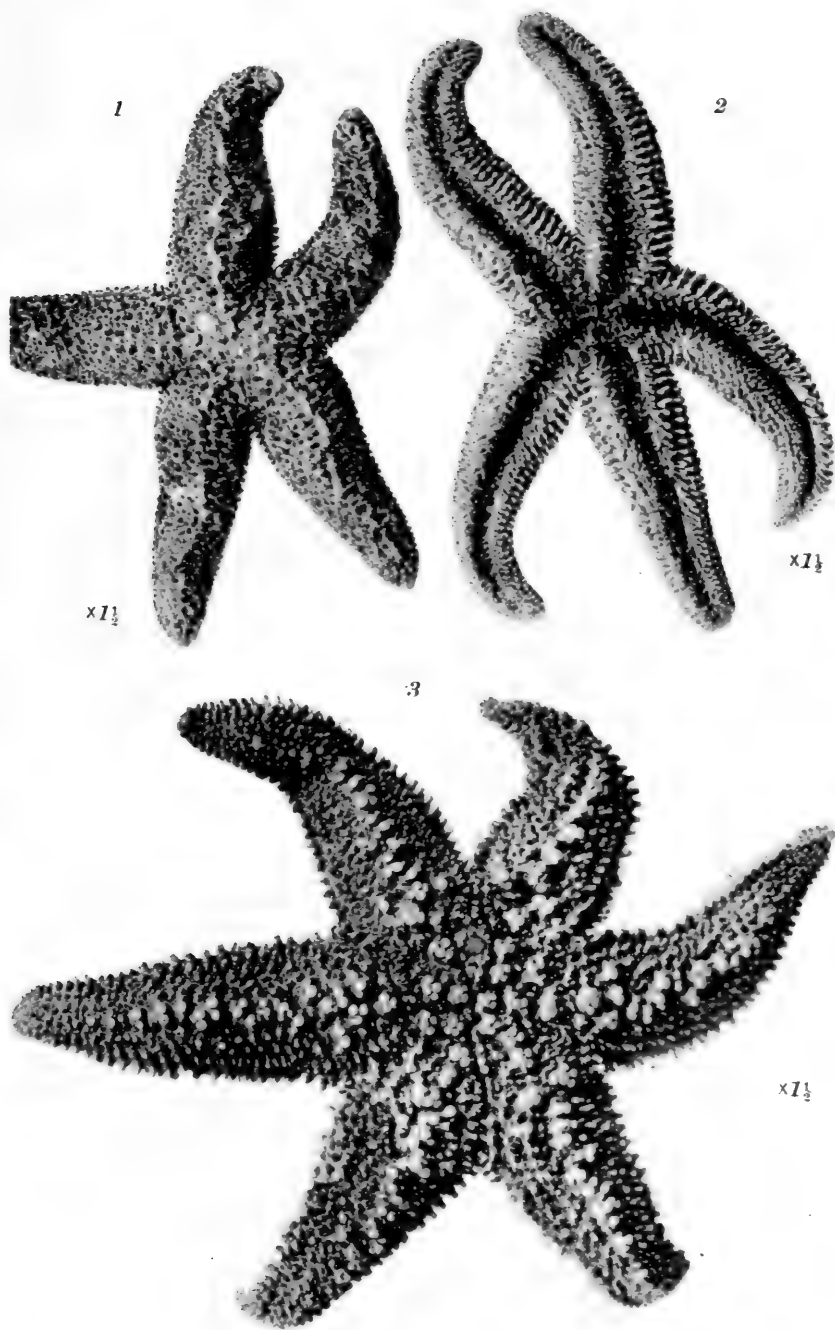
HELIOTYPE CO., BOSTON

1. 1a. *BUNODASTER RITTERI* VER.
 2. *LUIDIA FOLIOLATA* GRUBE



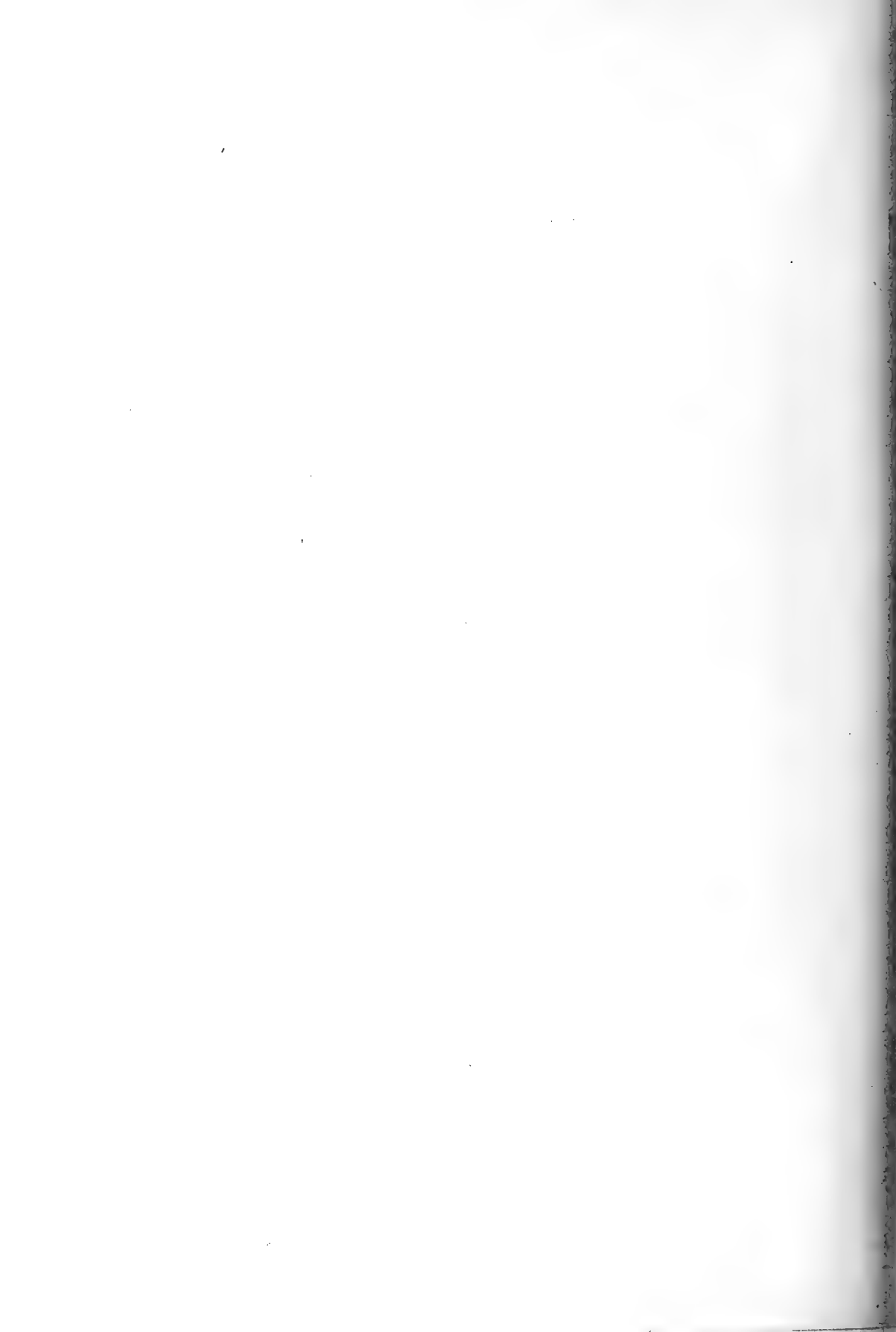
PLATE CVI.

- FIGS. 1, 2. *Evasterias troschelii* (Stimpson) Verrill. Young. Dorsal and actinal sides; $\times 1\frac{1}{2}$. Sitka. Yale Mus.
- FIG. 3. *Asterias acervata* Stimpson. A strongly acervate young specimen; $\times 1\frac{1}{2}$. Nazan, Alaska (Dall). U. S. Nat. Mus.



HELIOTYPE CO., BOSTON

1.2. *EVASTERIAS TROSCHELII* (ST.) YOUNG
3. *ASTERIAS ACERVATA* (ST.) YOUNG, VAR.



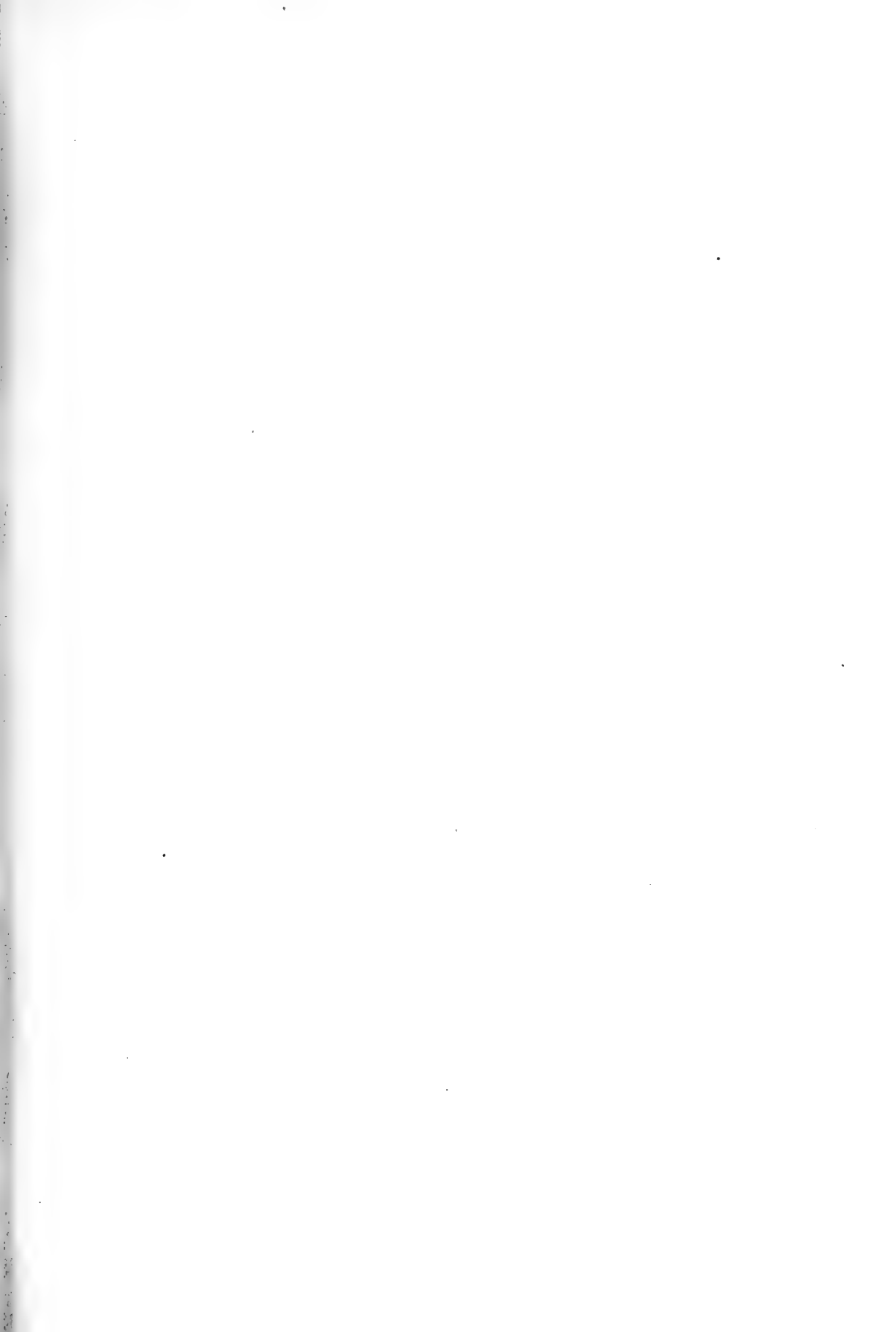


PLATE CVII.

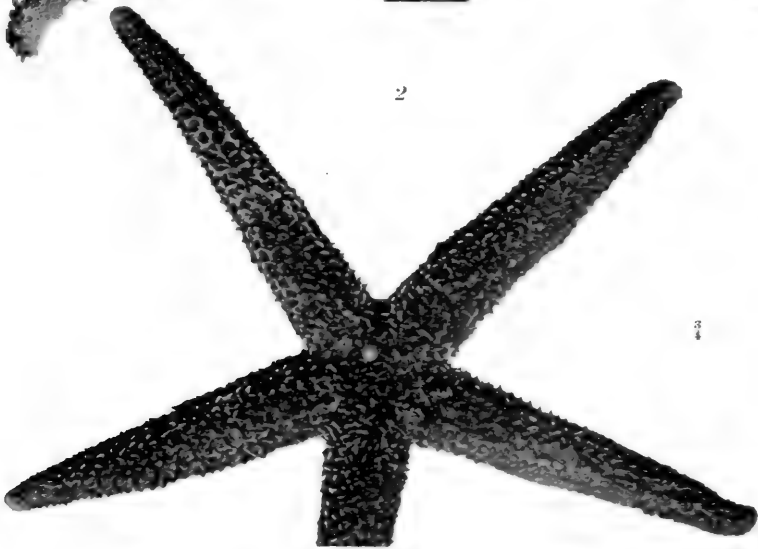
- FIG. 1. *Mithrodia bradleyi* Verrill. Type. Dorsal side; $\frac{3}{4}$ natural size.
Yale Mus.
- FIG. 2. *Echinaster tenuispinus* Verrill. Type. Dorsal side; $\frac{3}{4}$ natural size.
La Paz. Yale Mus.
- FIG. 3. *Henricia leviuscula spiculifera* Clark. Actinal side; $\times 1\frac{1}{8}$. Bering
Island. U. S. Nat. Mus.



1

3

4



2

3

4



3

1

HELIOTYPE CO., BOSTON

1. *MITHRODIA BRADLEYI* VER. Type
2. *ECHINASTER TENUISPINUS* VER. Type
3. *HENRICIA LEVIUSCULA SPICULIFERA* (CLARK)

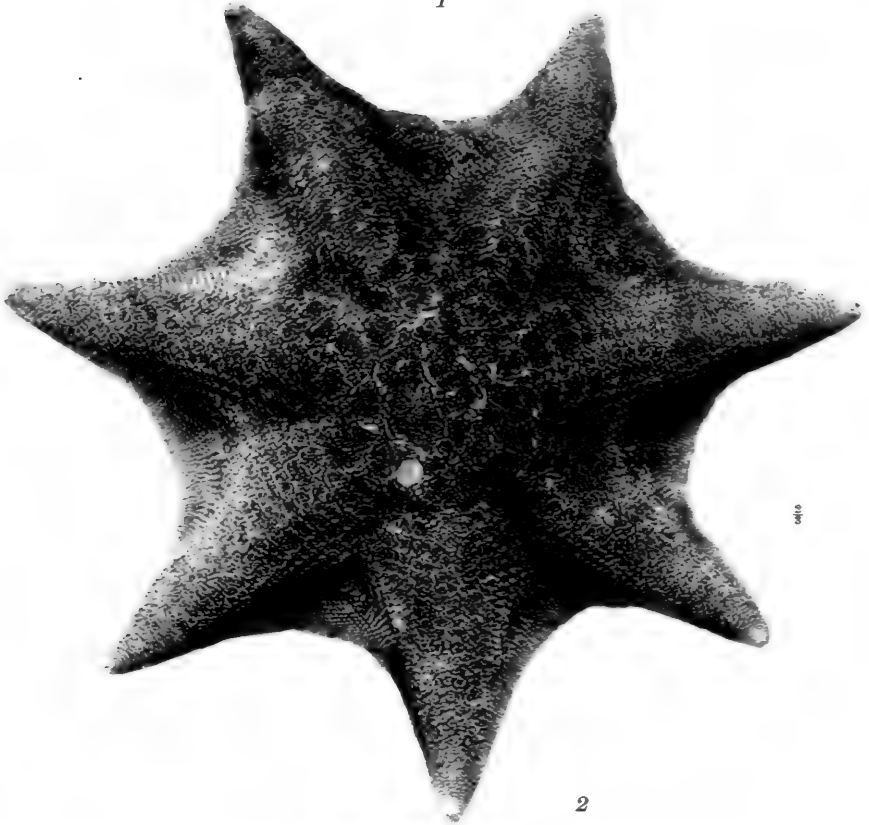




PLATE CVIII.

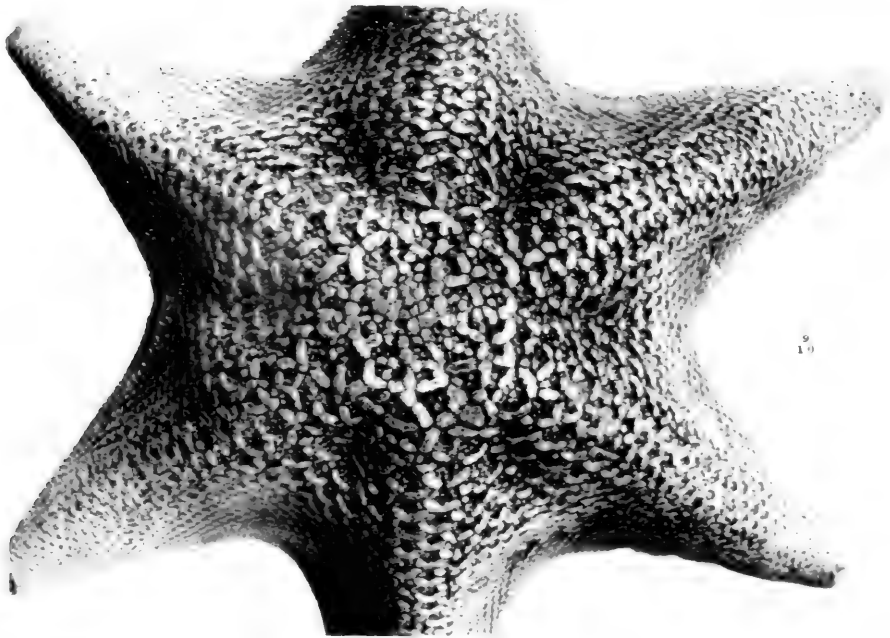
- FIG. 1. *Patiria miniata* (Brandt). A seven-rayed specimen. Dorsal side; about $\frac{2}{3}$ natural size. Departure Bay, Canada Geol. Survey.
- FIG. 2. The same. A six-rayed specimen. Dorsal side; about $\frac{9}{10}$ natural size. Departure Bay, Canada Geol. Survey.

1



ortho

2



9

10

HELIO TYPE CO., BOSTON

1. 2. PATIRIA MINIATA VER Varieties



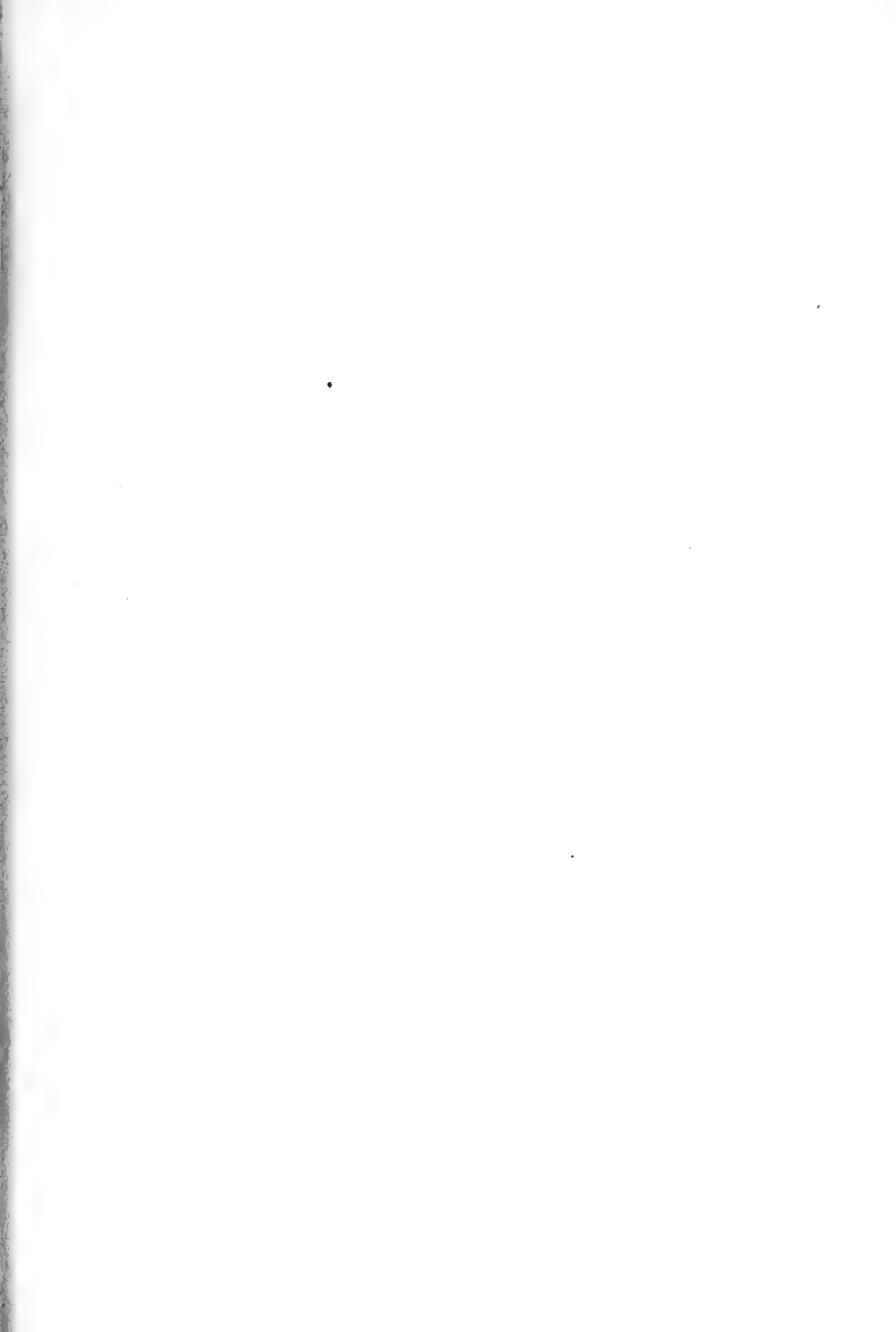
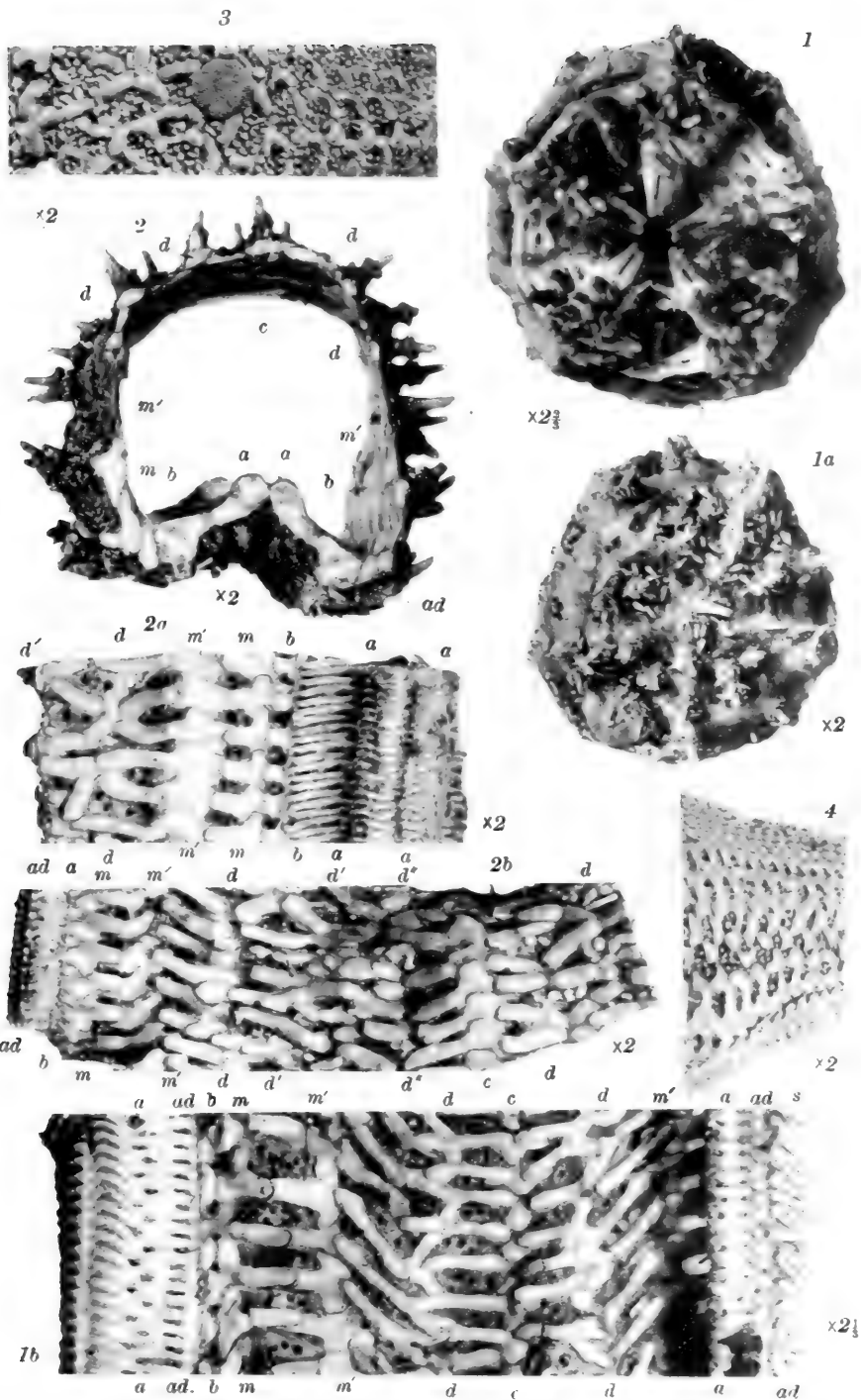


PLATE CIX.

- FIG. 1. *Orthasterias tanneri* Verrill. Cotype. Actinal side of disk, to show jaws and peroral spines; $\times 2\frac{2}{3}$.
- FIG. 1a. The same specimen. Dorsal side of disk, showing spines and pedicellariæ; $\times 2$.
- FIG. 1b. The same specimen. Section of a ray, showing inner surface of skeleton; cut through ambulacral plates and flattened out; *a, a*, ambulacral plates; *ad, ad*, adambulacral plates; *b, b*, peractinal plates; *m, m*, inferomarginals; *m', m'*, superomarginals; *d, d*, dorso-lateral plates and transverse connective ossicles; *s, s*, adambulacral spines; *c, c*, median radial or carinal plates; $\times 2\frac{1}{2}$.
- FIG. 2. *O. columbiana* Verrill. Type. Transverse section of a ray; *a, a*, ambulacral plates; *ad, ad*, adambulacrals; *b, b*, peractinals; *m, m*, inferomarginals; *m', m'*, superomarginals; *d, d*, dorso-lateral plates and transverse ossicles; *c*, carinals; $\times 2$.
- FIGS. 2a, 2b. The same specimen. Two parts of a transverse section of a ray, split through the ambulacral plates and flattened out, to show inner surface. Lettering as in fig. 1b, except that *d, d*; *d' d'*; *d'', d''* show the three rows of dorso-lateral plates; $\times 2$.
- FIG. 3. *Patiria miniata* (Brandt). Central part of disk and madreporic plate, with spinules removed; $\times 2$.
- FIG. 4. *Enoplopatiria siderea* Verrill. Type. Dorsal view of middle of a ray with spinules removed; $\times 2$.



HELIOTYPE CO., BOSTON.

1-1b. ORTHASTERIAS TANNERI VER. Cotype
 2-2b. O. COLUMBIANA VER. Type
 3. PATIRIA MINIATA (BR.)
 4. ENOPLPATIRIA SIDEREA VER. Type

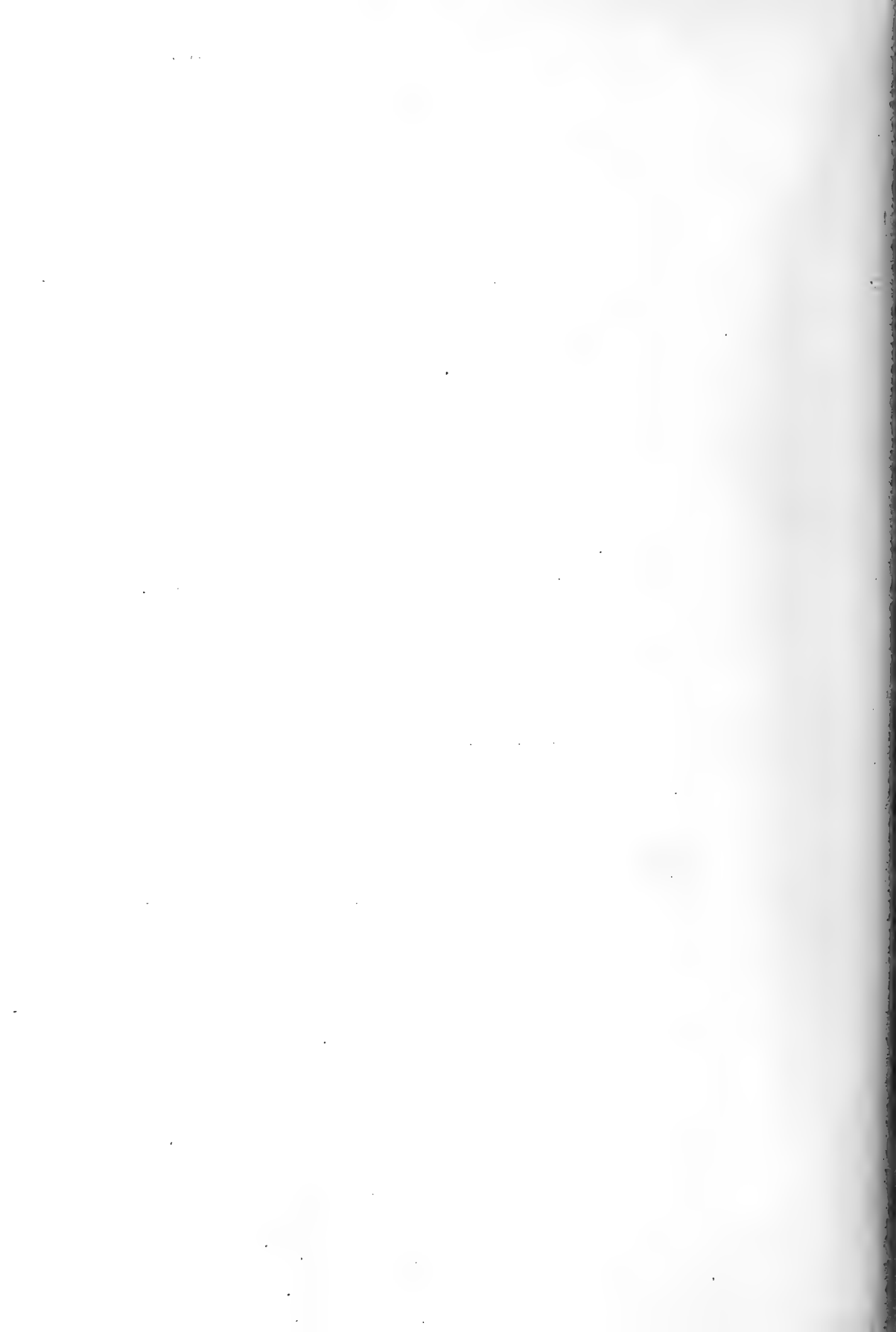
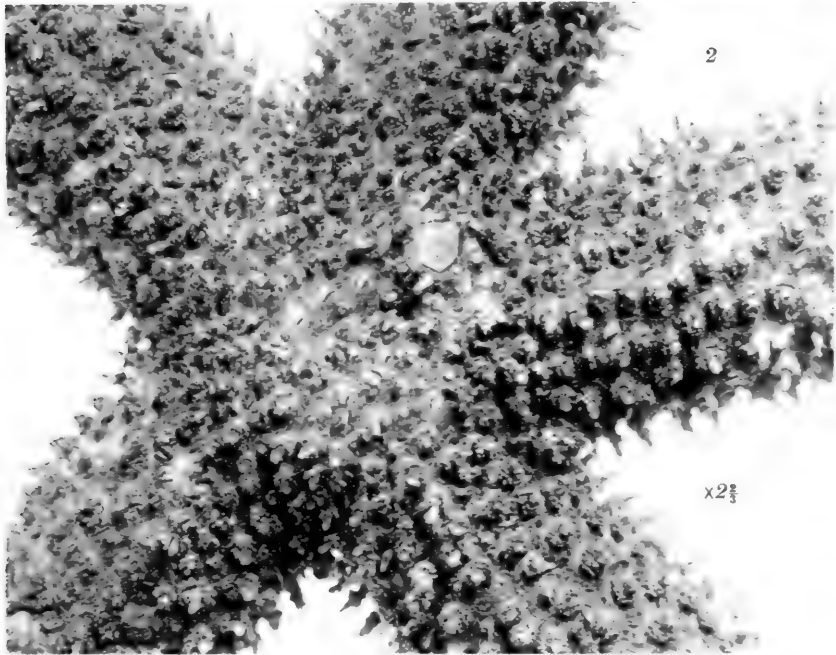
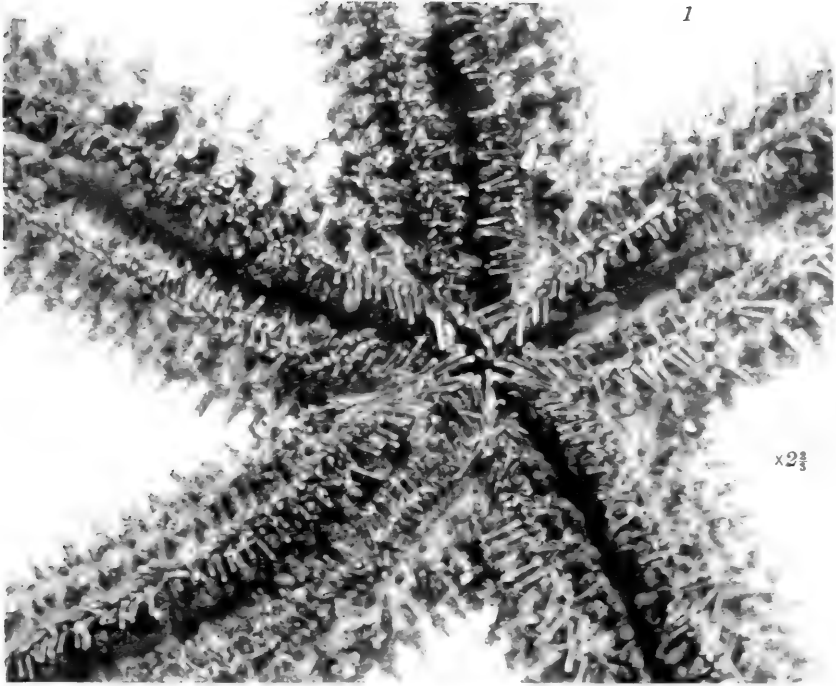


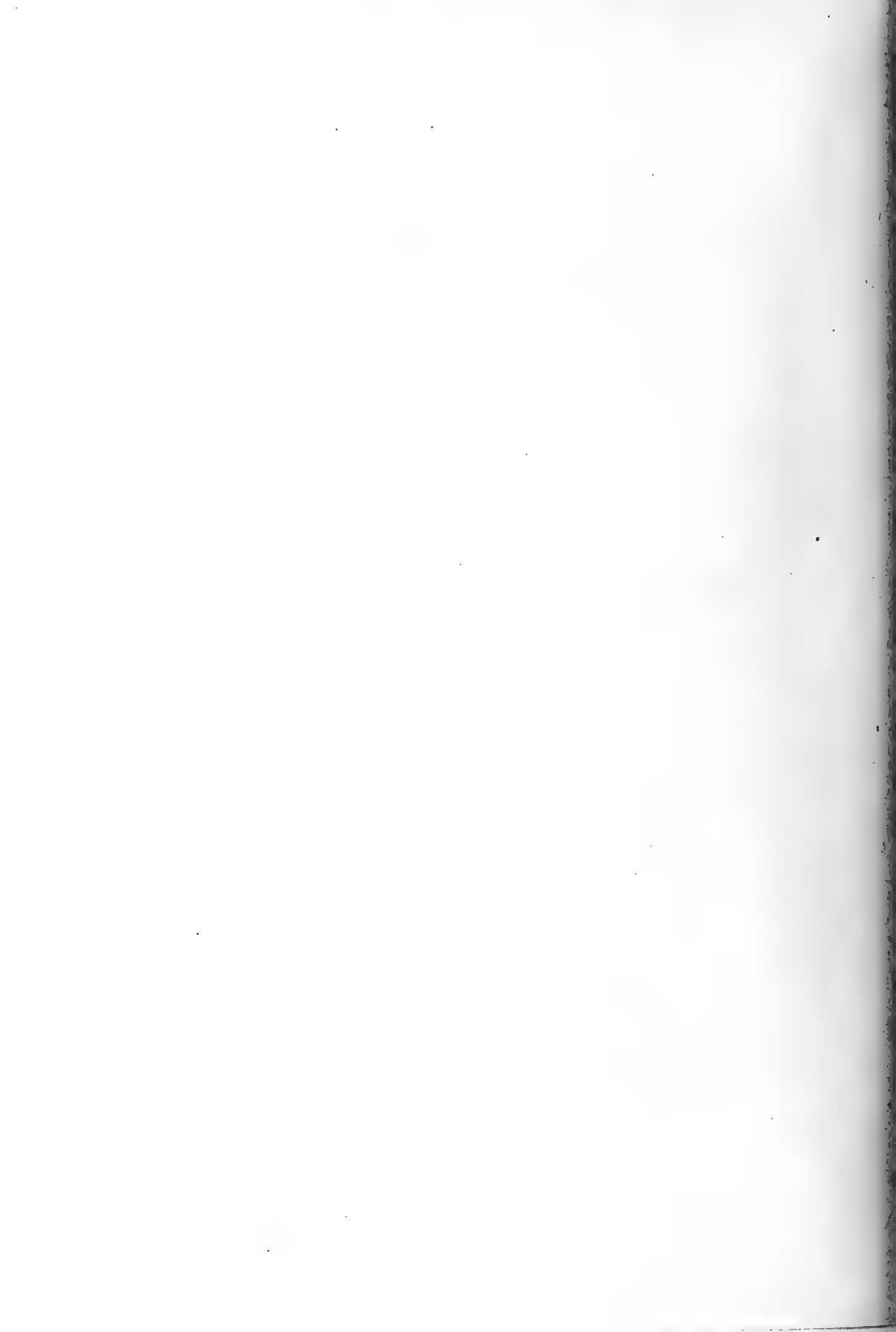
PLATE CX.

FIGS. 1, 2. *Distolasterias chelifera* Verrill. Type. Ventral and dorsal views;
× 2 $\frac{2}{3}$.



HELIOTYPE CO., BOSTON

1-2. *DISTOLASTERIAS CHELIFERA* VER. Type









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