13. A New Species of *Sismondia*¹⁾ from the Oligocene of Titi-zima.

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About twenty specimens of small echinoid of *Sismondia* derived from the Oligocene limestone of Titi-zima, Ogasawara Group (Bonin Islands), are described in this note. After careful examination, all of the specimens were found to represent one new species of the Fibulariid genus *Sismondia*,²⁾ allied to but quite distinct from *Sismondia polymorpha* P. M. Duncan and W. P. Sladen.

*Sismondia convexa*³⁾ sp. nov. Figs. 1-13

Holotype:—One complete specimen. Stored in the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai; Reg. No. 7100 a.

Paratypes:—Four other specimens. Stored in the same Institute; Reg. No. 7100 b.

Referred specimens:—Fifteen small specimens. Stored in the same Institute; Reg. No. 60325, Collected by Mr. K. Toyosima, 1933.

Figured specimens:—Holotype, two paratypes and one of referred specimens.

Locality:—Minami-zaki, Titi-zima, Ogasawara Group (Bonin Islands).

Horizon and Age:—*Lepidocyclina* (*Eulepidina*)—limestone. Oligocene according to Mr. Sh. Hanzawa.⁴⁾

Twenty specimens at hand, range from 10 to 18 mm in longitudinal diameter.

Holotype:—18 mm in longitudinal and 15 mm in transverse diameters, 6.5 mm in height. Test stout, 3.5 mm thick, decagonal-ovoid in marginal outline, very contracted anteriorly, truncated posteriorly, obtusely angular, margin swollen, 4 mm thick, depressed at middle part of each interambulacrum: upper surface evenly convex to summit

1) A detailed account of the genus and species will be published shortly.

2) *Sismondia* E. Desor, 1857, Synop. Ech. Foss., Fasc. 4, 5, p. 225 (generic diagnosis with ten genosyntypes).

Genologotype:—*Scutella occitana* DeFrance, 1827, Dict. Sci. Nat., Vol. 48, p. 231 (Valognes, Manche; Eocene; no longer in Caen Mus.)=L. Agassiz, 1840, Syst. Ectyp. Echin., p. 6 (Pauillac, Médoc, Gironde; Priabonian; coll. A. d'Orbigny: Neuchâtel Mus. (Type moule Q 37).

Type by subsequent designation by J. Lambert and P. Thiéry, 1914, Ess. Nomen. Rais. Ech., 4, p. 296.

Besides the genotype, the following 17 species may be included in the genus, *S. altavillensis* (DeFrance), *S. antillarum* G. Cotteau, *S. bigranularis* J. Lambert, *S. caillaiudi* G. Cotteau, *S. crustula* H. L. Hawkins, *S. desori* H. Coquand, *S. gracilis* G. Cotteau, *S. javana* H. Gerth, *S. macrophylla* C. Mayer-Eymar, *S. murravica* R. Tate, *S. omboni* P. Oppenheim, *S. polymorpha* P. M. Duncan and W. P. Sladen, *S. varians* R. Fourtau, *S. rosacea* (N. Leske), *S. saemanni* P. de Loriol, *S. thuielei* V. Gunthier, *S. zitteli* C. Mayer-Eymar.

3) *convexa*=arched, in reference to the convexity of the test.

4) Sh. Hanzawa, 1925, Note on the Foraminiferous Rocks of the Okinawa-jima and the Bonin Islands. Jour. Geol. Soc. Tokyo, Vol. 32, p. 482 (in Japanese).

through axis of 111-5; mouth sunken 3 mm below sides of test: in longitudinal profile, upper surface slightly concave, sides convex, posterior side margin more sharply inclined than anterior one; in transverse profile, upper and lower surfaces evenly convex, parallel; actinal surface evenly concave orally, posterior to peristome more sharpened. Ambulacra, petaloid area 10 mm long; petals subequal, about 5.5 mm long, 2 mm wide, open by nearly a millimeter at their distal ends, poriferous areas of petals (22-24 pore-pairs on each side) nearly parallel or a little convergent near their bases and then slightly divergent distally; ambulacra somewhat carinated, and consequently concavity and convexity alternated in ambital outline; pores not very large, pores of a pair set obliquely sloping interradially and adorally, joined by a shallow groove; nearly all plates perforated by minute pores in rows, parallel and immediately adoral to transverse sutures, rows curve adorally towards interradiial sutures and mingle with scattered pores (often grouped obscurely in sets of three); ratio of ambulacra width to that of interambulacra (measured to ambitus), 7:3. Apical system nearly central, situated 9 mm from anterior margin of test; 1.5 mm wide by 2 mm long, closely tuberculated; 4 small genital pores close to interradiial angles of madreporite; madreporic pore single, close to genital pore 2. Interambulacra between petals very narrow, widening towards distal end of petals, but soon narrowed by renewed expansion of ambulacra; tuberculation rather sparse, appearing imperforate, rather larger than ambulacral pores. Peristome central on actinal surface, small and obtusely pentagonal in outline, over 1 mm wide by 1.5 mm long. Periproct round, situated at 4.5 mm from posterior margin, not over 1 mm in diameter. Radiating partitions within test (in paratype) well developed, stout and broad.

Variations:—Considerable variation occurs in my specimens in the shape of the marginal outline of the test, and these changes are apparently related to both size and age. The ambital outline may assume almost any form from rounded-ovoid as in the small existing *Echinocyamus platytatus* H. L. Clark¹⁾ (in small specimens), to decagonal-ovoid, characteristic of the living sea-urchin *Clypeaster japonicus* L. Döderlein²⁾ and *Clypeaster europacificus* H. L. Clark³⁾ (in large specimens). Since all coronal plates have undergone considerable changes in size, and often in shape, during the growth of the test, the peculiar character of the extra-petaloid ambulacrals may perhaps be a sign of its obsolescence, a degenerate condition probably derived phylogenetically from a more normal biporous state. I cannot draw the fluctuate line of variation in this species, because of the sufficient number of specimens on the one hand and to the lack of forms intermediate between large and small specimens on the other.

1) H. L. Clark, 1914, Mem. Mus. Comp. Zool. Harvard College, Vol. 46, p. 63, pl. 217, f. 1-6 (Port Phillip; coll. T. S. Hall: Mus. Comp. Zool.).

2) L. Döderlein, 1885, Archiv. für Naturg., Vol. 51 (1), p. 100 (Sagami Bay, 80 meters; coll. L. Döderlein: Strassburg Mus.).

3) H. L. Clark, 1914, op. cit., p. 27, pl. 123, f. 13-16, pls. 129, 130, 131, 136, f. 1 (Albatross Station 2795, Gulf of Panama, 33 fms.; 3014, Gulf of California, 29 fms.: Mus. Comp. Zool.).

Remarks:—This species is, beyond doubt, the best defined in the genus *Sismondia*, and is characterized by very convex form and the ambital margin of test, form of the petaloid area, mode of occurrence of the minute pores along the ad-apical sutures of the ambulacral plates, all which form a notable combination of characters. The convexity of this species does not seem to have been effected by either outer physiological or by pathological deconstruction phenomena, as, the arrangement of the coronal plates or the petaloid are very regularly placed and there are no traces of fracture on the tests. In convexity of test only, this species simulates *Porpitella*¹⁾ *supera* (L. Agassiz), thus suggesting “parallelism” in development subject to environmental influences and not an indication of specific connection.

Relationships:—In tracing the morphogenetic relationships of the allied species, to be regarded are the following three points:—1) an analysis of the individual and a recognition of each separate structure, 2) a knowledge of the corresponding features of the original member of the group (sometimes available, often partly hypothetical), and 3) a knowledge of the ultimate possibilities of each structure in the course of its development (hypothetical, but to be roughly ascertained by considering the most highly developed conditions found in the group). However, care must be taken to eliminate, as far as possible, conditions related to direct results of adaptation to environment. The small specimens (probably young) of this species seem to be closely related to *Sismondia polymorpha* P. M. Duncan and W. P. Sladen²⁾ and also to *S. javana* H. Gerth.³⁾ To sum up briefly the morphogenetic position of the species, its features must be analysed separately and the various stages of progress be appreciated. The conception of the relative position of three species can be made clear by expressing a few important characters, as:—

Structure	Apical system	Podial pores	Petaloid area	Minute pores
Trend of development in Fibulariidae	flush→ more definite	set close→ set apart and increase in nr.	flush→ definite	simple→ specialized
<i>S. javana</i>	Ra	rA	Ra	R ?
<i>S. convexa</i>	A	A	A	A
<i>S. polymorpha</i>	R	R	R	Ra
R=retarded development Ra=slight progress		A=accelerated development rA=progress, but not complete		

Assuming that the foregoing morphogenetic relationship of *S. polymorpha* with *S. convexa* and *S. javana* is correct, an interesting feature is presented in the systematic point, as follows.

1) N. A. Pomel, 1883, Thèses.....Class. Method. Gen. Ech., p. 72.=*Scutellina supera* L. Agassiz, 1841, Mon. Ech., Mon. Scut., p. 103, pl. 21, f. 15-19. (Grignon; Eocene: Coll. Auguste: Neuchâtel Mus.).

2) P. M. Duncan and W. P. Sladen, 1884, Pal. Ind., Ser. 14, Vol. 1, Pt. 3, p. 137, pl. 25, f. 1-13 (South of Trak Hill, W. Sind; Khirthar Series: Mus. Geol. Soc. London).

3) H. Gerth, 1922, Samml. Geol. Reichs-Mus. Leiden, N. F., Vol. 1, p. 502, pl. 62, f. 4, 4a (Goenoeng Spolong, Java; Miocene: coll. Martin-Icke: Reichs-Mus. Leiden).

S. javana is an "Older Miocene" species from West Progo Mountains in Java, and it may be the form of arrested or retarded development in the course of morphogenesis, and the species may indicate the retarded or retrogressive point in the development-life-curve just prior to extinction. While in *S. convexa*, an almost contemporaneous or a little earlier form, each separate structure as now known, denotes the ultimate possibilities in development in the course of morphogenesis of

Explanation of Figures.

- Figs. 1-3, holotype. $\times 2$. Figs. 4-7, two paratypes. $\times 2$.
 Figs. 8-9, one of referred specimens. $\times 2$.
 Fig. 10, ambulacral plates. Enlarged. Fig. 11 *a*, Peristome. Enlarged.
 Fig. 11 *b*, apical system. Enlarged. Fig. 12, petal III. Enlarged.
 Figs. 13 *a-d*, outline of holotype. Natural size.
 Figs. 14 *a-c*, outline of *S. polymorpha*. For comparison.
 Figs. 15 *a-b*, outline of *S. javana*. For comparison.

the species. *S. polymorpha* has more or less indefinite features in the morphological trends and may indicate the ascending point in the morphogenetic series, and also may be regarded the form more or less ancestral to the more specialized species of the younger geological ages.

Diagnosis :—*Species sismondiae*. *Disco subdecagonali, longitudinali, convexiusculo, antice angustiore, postice subtruncato, margine subinflato; basi concava; petalis angustis, elongatis, apertis, sulcis transversis conjunctis; ano inter os et marginem posticum medio.*

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