

押し開き、その間に半ば埋れてゐる。かゝるものは、その殻の表面が淡緑色で群體の色によく似てゐて見つかりにくい。然し又貝が群體の中に全く埋れてしまつてゐることもある。この場合はその局部が瘤状に膨れ上つてゐるのみで、別に變つた所はない。この様なものは殻が白色で表面に何の附着物もない。本種はこれまで數ヶ所でかなり多數採集することが出来たが、ザクロスナギンチャクの群體以外では一度も發見したことがない。又同群體中にはかなり多數群居してゐること等から考へて、その兩者の關係が寄生であるのか共生であるのかは今、俄に斷定は出来ぬが、兩者の間には何等かの密接な生態的關係がありはしないかと思はれる。それ等は何れ今後の觀察に譲ることとする。

## 日本産ヒザラガヒ類の研究 (2)

### Studies on Japanese Chitons. (2)

瀧 庸, 瀧 巖

(By ISAO TAKI and IWAO TAKI, brothers.)

*Callistochiton jacobaeus* (GOULD, 1859).

(Pl. II, fig. 1; textfigs. 12-21)

*Chiton* (*Leptochiton*) *jacobaeus* GOULD, Proc. Boston Soc. Nat. Hist., vii, p. 164 (Dec. 1859); Otia Conch., 1862, p. 117.

*Callistochiton jacobaeus* CARPENTER, MSS.

*Callistochiton jacobaeus* PILSBRY, 1892, Man. Conch., vol. 14, p. 267; 1895, Cat. Mar. Moll. Japan, p. 114.

General appearance: shell rather small in size, elongate, with rounded, elevated back, both the end valves vaulted, prominently ribbed; girdle narrow, scaly; uniformly brownish.

Head valve (textfigs. 12, 13): semicircular, apex elevated, its posterior margin shallowly sinuated, whence 10 (often 9 or 11) well-defined ray-ribs radiate, forming conspicuous lobes at the

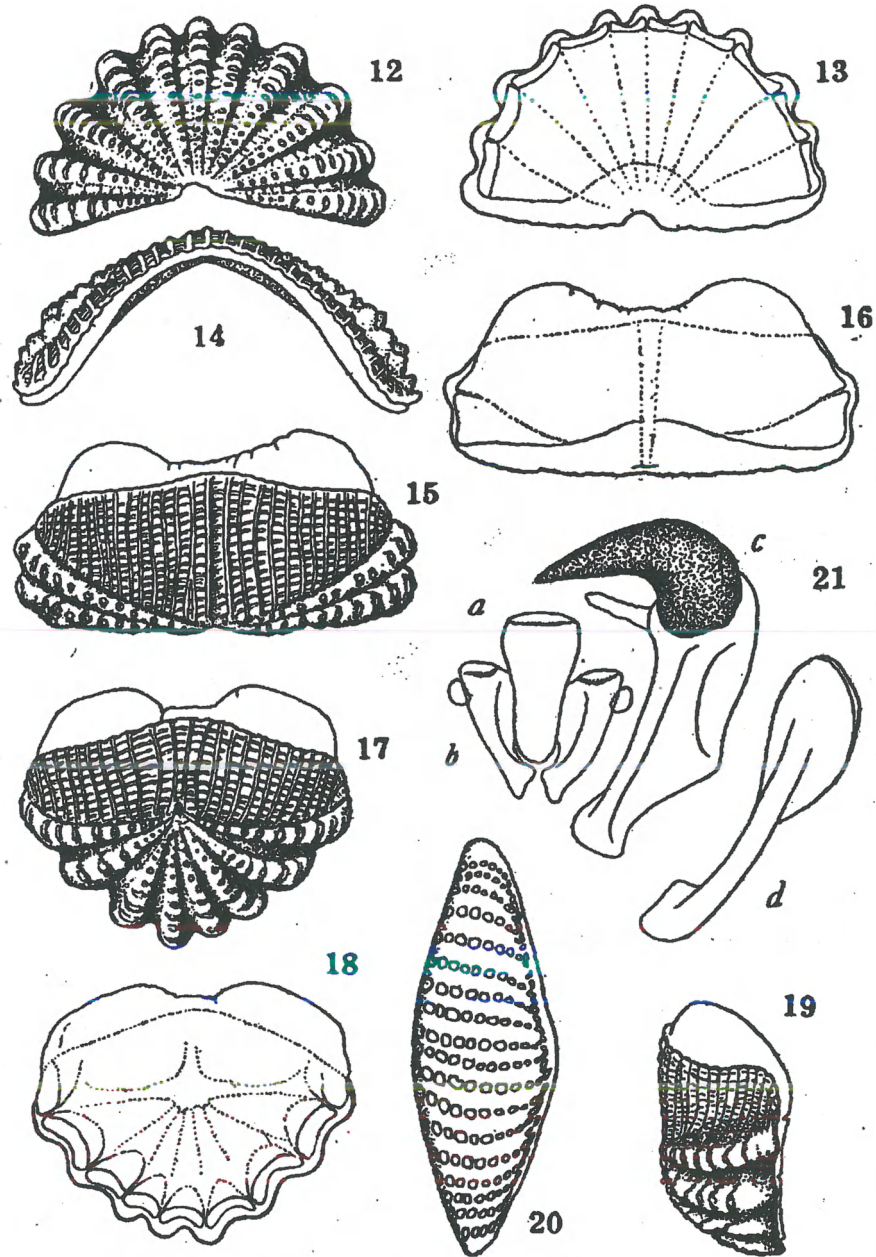
margin. The posterior pair of ray-ribs arranged on almost a straight line which passes through the apex. Upon these ray-ribs there are scattered about 10 (9-12) papillose granules, exposing their eroded surface in the adult specimen. The interspaces between these ray-ribs are approximately as wide as the ray-ribs, nearly smooth, though traversed by several quite obsolete concentric ridges. Interior (textfig. 13): insertion-plate short, straight, thin, slightly sinuated at the margin; each of 10 shallow slit-lines terminating in a slit, which is concealed under the lobe of the corresponding ray-rib. Both the eaves and the slit-lines are furnished with minute truncate spines.

Median valve (textfigs. 14-16): oblong, scarcely beaked, weakly carinated, side slope well arcuated; jugum indistinguishable; central area broad, distinct, sculptured with 10-15 weak longitudinal riblets, the interspaces between these riblets are regularly latticed across, forming square depressions on the tegmentum; lateral area distinct and narrow, sharply elevated, 2 conspicuous ray-ribs radiating from the beak, on which about 10 granules are scattered; posterior margin granulated. Interior (textfig. 16): sinus very shallow, narrow, sometimes faintly bounded by a few incisions on both sides; sutural laminae thin, translucent, rather narrow, with a sharp, arcuated edge; teeth short, sinuated, 1 slit on each side, concealed under the lobe of the anterior ray-ribs of the lateral area.

Tail valve (textfigs. 17-19): mucro slightly in front of the center, bluntly pointed; central area broad, with about 12 longitudinal riblets, with interspaces latticed across as in the median valves; anterior margin slightly undulated. Posterior area broad, well vaulted; from the mucro 7 (often 6 or 8) graniferous ray-ribs radiate, which increase gradually in size towards the extremity till they form a lobed margin at their terminals. Interior (textfig. 19): sutural laminae thin, narrow, trapezoid in outline; sinus shallow, narrow, often faintly notched on each side; teeth sinuated, under each corresponding lobed edge of ray-ribs there is a slit, the number of slits being 7, often 6 or 8 in all, whence a V-shaped spinous area expands toward the center.

Girdle rather narrow, covered with elongated, spindle-shaped, 10-16, usually 12-striated scales (ca.  $110\mu \times 38\mu$ ) (textfig. 20).

Ctenidia almost holobranchial, about 22 on each side, covering



*Callistochiton jacobaeus* GOULD. カブトヒザラガヒ

the posterior  $5/6$ — $6/8$  of the length of the foot.

Colouration: pale brown, yellow-ochre or pale dirty yellow, rarely ashy, often with dark brown patches in the proximal area of the shell-plate, as shown in Pl. II, fig. 1. Girdle similar to the tegmentum, but finely punctated with darker colour. Interior white, teeth grayish.

Radula (textfig. 21, *a-d*): central tooth (21 *a*) with wide, recurved, faintly and finely denticulated cusp, base narrow; centro-lateral (21 *b*) with a recurved, minutely denticulated cusp, having a broad extension along the inner margin, and a small auriculate, crescent appendage on the outer margin. Major lateral (21 *c*) well developed, with simple, sharp, elongated claw-like cusp, below which, inside, there is a finger-like process, the stalk is furnished with an outer expansion; major uncinus (21 *d*) large, curved, spatulate, with a slender stalk and a broad wing.

Measurements: Length 12.0, width 6.3, height 2.7 mm.

Locality: Shimoda, Japan (GOULD); Toba, Prov. Shima (Prof. T. MINOURA); Kushimoto, Prov. Kii (Prof. T. KOMAI), Ōshima, near Kushimoto (Messrs. T. KURODA and K. OKAMOTO), Seto, (Iw. TAKI), Gobō (Mr. K. Okamoto). This species is not abundant and to be found under stones at the low tide mark in the rocky shores.

The distribution of this species, within our present knowledge, ranges from Idzu to Kii, along the Pacific coast of the Central Japan.

Juvenile specimens: median valves sharply carinated, beaked, sculpture very prominent. Shell rather flat, divergence about  $135^{\circ}$ .

Remarks: *Callistochiton jacobaeus* (GOULD) is hitherto unfigured. Since GOULD's description, except PILSBRY and CARPENTER, nobody re-examined this. The identification of GOULD's species with our specimens seems to be indubitable, except the following character. GOULD describes (*vide* PILSBRY, Manual, p. 267, also Otia Conch., p. 117, in latin), "end valves.....ornamented with 10 scaly radiating ribs", this statement conforms well to the head valve but not to the tail valve, which usually bears 7 ray-ribs<sup>1</sup>. This

may be due to a mistake of the observation, judging from his statement "posterior valve having 7 slits". It is highly probable that the agreement between the numbers of the ray-ribs and the slits should occur in this species. NIERSTRASZ<sup>2</sup> gives a table of the numbers of the ray-ribs and slits of the species of the genus *Callistochiton*, in which similar disagreement about this species with GOULD's description is found.

### *Chiton komaianus*, new species.

(Pl. II, fig. 6; textfigs. 22-31)

General appearance: *Chiton* of moderate size, elevated, beaked and smoothly carinated, yellowish green. The whole tegmental surface is quincuncially pitted into a fine reticulum.

Head valve (textfigs. 22, 23): broad, slope nearly straight, apex elevated, in the apical region sculpture is missing, whence 19 or 20 rows of rounded tubercles radiate, of which 10 are longer and prominent, the rest short, lying in the intercalating position, the former comprise 7 (in the median part) to 10 (in the posterior ray) tubercles, the latter only 2-5. The posterior pair of the tubercular rows wide, each tubercle thickened and somewhat directed inward. Anterior margin somewhat lobate, posterior tuberculated. Interior (textfig. 23): insertion-plate scarcely protruded out of the tegmentum, with 8 slits, which correspond to the terminals of the 8 median longer ribs of tubercles, teeth finely pectinated.

Median valve (textfigs. 24-26): oblong, broad, strongly beaked, scarcely carinated, anterior margin faintly undulated, jugum distinct, broadly wedge-shaped, its anterior margin truncate, finely sculptured

Head- Tail- valve	9	10	11	Totals
6		8	2	10
7	3	39	4	46
8	1	12	1	14
9		1		1
Totals	4	60	7	71

1) Of the 71 specimens we have examined, the relation between the numbers of ray-ribs on the end-valves is shown in the accompanying table.

2) H. F. NIERSTRASZ (1905): Bemerkungen über die Chitonen-Sammlung im zoologischen Museum zu Leiden, Notes from the Leyden Museum, Vol. XXV, p. 145.

longitudinally with about 12 striations (in the paratype this striation is invisible). Pleural area with longitudinal riblets, about 17 on each side, which become weak and short towards the center; lateral area conspicuously bounded, elevated, its proximal part strongly curved backward, tricostate, each rib ornamented with 6-10 tubercles, of which the anterior ray is the strongest and sharply elevated, median ray rather faint and short, its proximal portion inconspicuous, posterior one wide and prominent, each tubercle thickened and directed inward as in the head valve, giving the posterior margin a nodulous appearance. Interior (textfig. 26): sutural laminæ short and wide, with a faint inclination on each side; sinus wide, pectinate; teeth slightly protruded, pectinate, 1 slit on each side.

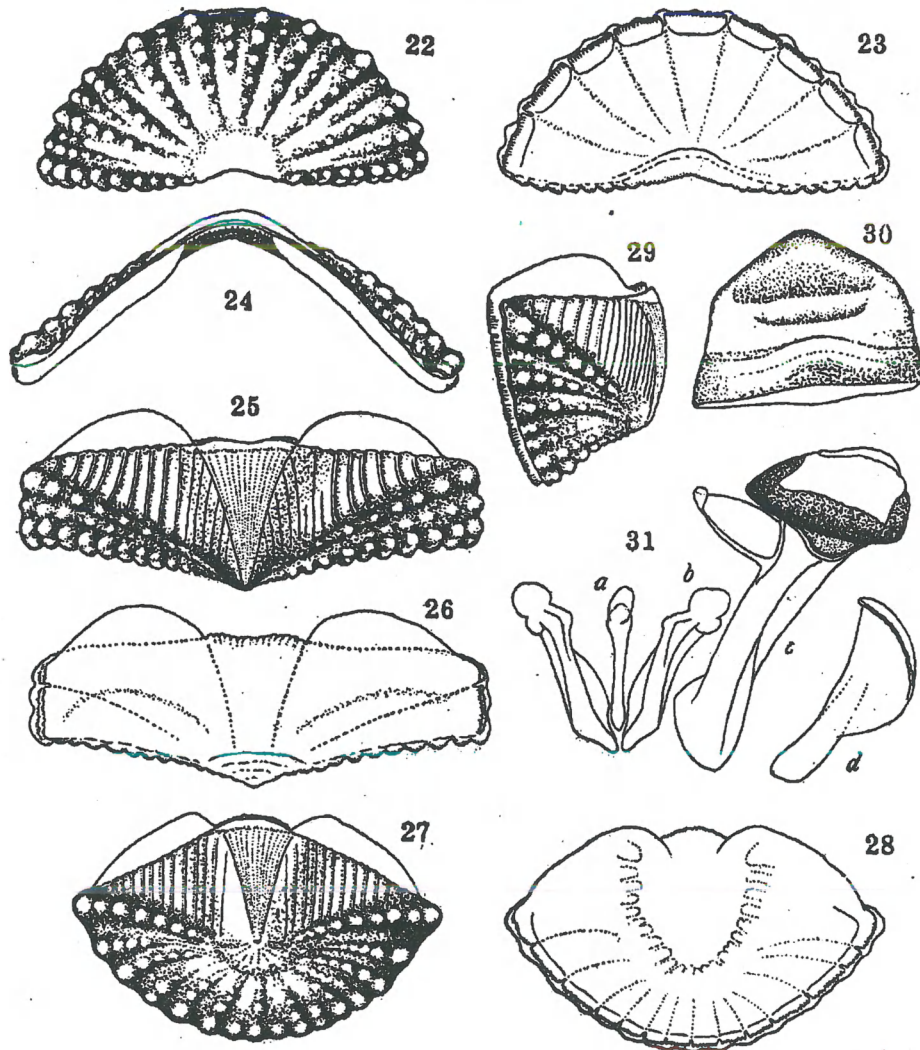
Tail valve (textfigs. 27-29): mucro central, beaked, around which is a smooth area; central area is a depressed rhomboid in outline, sculptures similar to the median valves; jugum well-elevated, striated, its anterior margin weakly protruded; posterior area broad, posterior slope concave, ornamented with 15-17 radial rows of tubercles, of which the anterior pair being the strongest, upon them about 6 tubercles lie; longer and shorter rays arrange approximately alternately as in the head valve, posterior margin undulated. Interior (textfig. 28): sutural laminæ low and wide, sinus convex, pectinate; slits 13, teeth finely pectinated.

Girdle: covered with inflated, smooth, solid scales, without any striation (textfig. 30).

Ctenidia: holobranchial, adanal, about 31 on each side.

On each side of the adanal portion of the pallial fold there is an anal lobe of mantle (Laterallappen of PLATE), well-developed. Similar structure is also seen in *Chiton kurodai*.

Colouration: a fine yellowish-green colour throughout. Tegmental surface greenish; dorsal part along the middle pale blue, next comes a broad greenish-yellow band, and thirdly a green peripheral band; longitudinal riblets of pleural area mottled with green, tubercles on the head and the tail valves also green; girdle greenish-yellow, tessellated with green bands. Interior: gray, median portion of articulamentum with a trace of grayish



*Chiton komaianns*, n. sp. オホクサズリガヒ

green; teeth and sutural laminae white. Paratype: greenish-yellow throughout, girdle but faintly tessellated.

Radula (textfig. 31, *a-d*): central tooth (31 *a*) slender, with an ellipsoid appendage on its tip; centro-lateral (31 *b*) rather slender, sharply keeled, the keel turns outward near the articulated point of the central tooth, apex with a round wing, outward is a small auriculate process; major lateral (31 *c*) with a simple, axe-shaped cusp, under which is a thin petaloid process inside, its tip

more or less reversed; major uncinus (31 *d*) short, blade broad, semicircular, its upper margin somewhat reversed.

Measurements: Length 20.5, width 9.6, height 5.5 mm. (Type).

Divergence about 110°.

Locality: Seto, Prov. Kii (under stones at low tide mark, in the rocky shores near the Seto Marine Biological Laboratory, April 1928, by Iw. TAKI, 2 specimens). Kushimoto, Prov. Kii (March 1929, by Prof. T. KOMAI, juvenile specimens).

We dedicate this species to Prof. T. KOMAI, the Director of the Seto Marine Biological Laboratory, who intends to undertake a biological survey of "the coast of the whole Kii Peninsula with the environs of Seto as the center".

The species which we are now to touch upon, seems in all probability, to be identifiable with *Mopalia retifera* of THIELE, whose description of it is rather incomplete, *e.g.* we cannot find any account on the head valve, the dimensions of specimens (though he has established this species on "meist unausgewachsene Exemplare"), radula, ctenidia etc., and moreover, the tegmental surface of the median and tail valves shown in his figures (Taf. III, figs. 61, 62) is far from a reticulum, although he named the specimen *retifera* with reference to this remarkable net-like sculpture. We propose to give a more complete and detailed description of this species below.

#### *Mopalia retifera* THIELE, 1909.

(Pl. II, fig. 2; textfigs. 32-43)

*Mopalia retifera* THIELE, 1909, Zoologica, Bd. 22, Heft 56, p. 30, pl. III, figs. 61-64, pl. IV, figs. 1-3.

General appearance: shell elongate-oval, with moderately elevated ridge, slightly encroached at the sutures; brownish or gray. Tegmental surface ornamented with characteristic reticular sculptures. Girdle leathery, covered with many spicule-bearing setæ of unequal length.

Head valve (textfigs. 32, 33): crescent in outline, with highly elevated apex, whence 8 (rarely 7) rows of tubercles radiate, 6-8 in a series, side slope nearly straight; posterior

edge also provided with a similar series of tubercles, its width being broader than the former; the interspaces between these riblets are sculptured into a reticulum, each component thread intersecting obliquely with each other, and forming rhomboid depressions. Interior (textfig. 33): insertion-plate well developed, nearly vertical, faintly striated, with 8 slits.

Median valve (textfigs. 34-36): oblong, smoothly arcuated on both corners of the anterior margin, beaked, carinated; jugum inconspicuous, though it is somewhat elevated and with apparently distinguishable sculptures, often the erosion of the surface makes this area quite distinct; lateral area is bounded from the central area by a conspicuous diagonal row of round, slightly depressed tubercles, about 9 in a series; central area shows a regularly reticulated sculpture, which is composed of the intersection of (a) about 14 or more, strongly inwardly arcuated riblets, starting from the tubercles on the diagonal rib and ending at the center or at the anterior margin, and (b) about 10 or more, strongly outwardly arcuated, less regular riblets, traversing across the area, diagonally or approximately longitudinally; producing rhomboid or square, or even round depressions, which become deeper and smaller toward the side. The majority of these points of intersection, especially in the side region, are swollen and weakly papillate. In the apparent jugal tract this net-like sculpture is so fine and the depressions are so narrow and slender that it looks like a net longitudinally pulled off. Lateral area has a reticulation similar to that of the head valve; posterior margin with a row of slightly depressed, backwardly directed granules, about 8 on each side. Interior (textfig. 36): sutural laminæ broad and short, with slight inclination on both sides, sinus rather narrow, deep; teeth prominently protruded, 1 slit on each side; eaves very short; both the eaves and the sinus spongy.

Tail valve (textfigs. 37-39): wide and short, scarcely elevated, with the mucro at about the posterior third of the tegmentum; the diagonal ribs, which divide the area into two regions, are rather obsolete, upon which several quite obsolete tubercles are

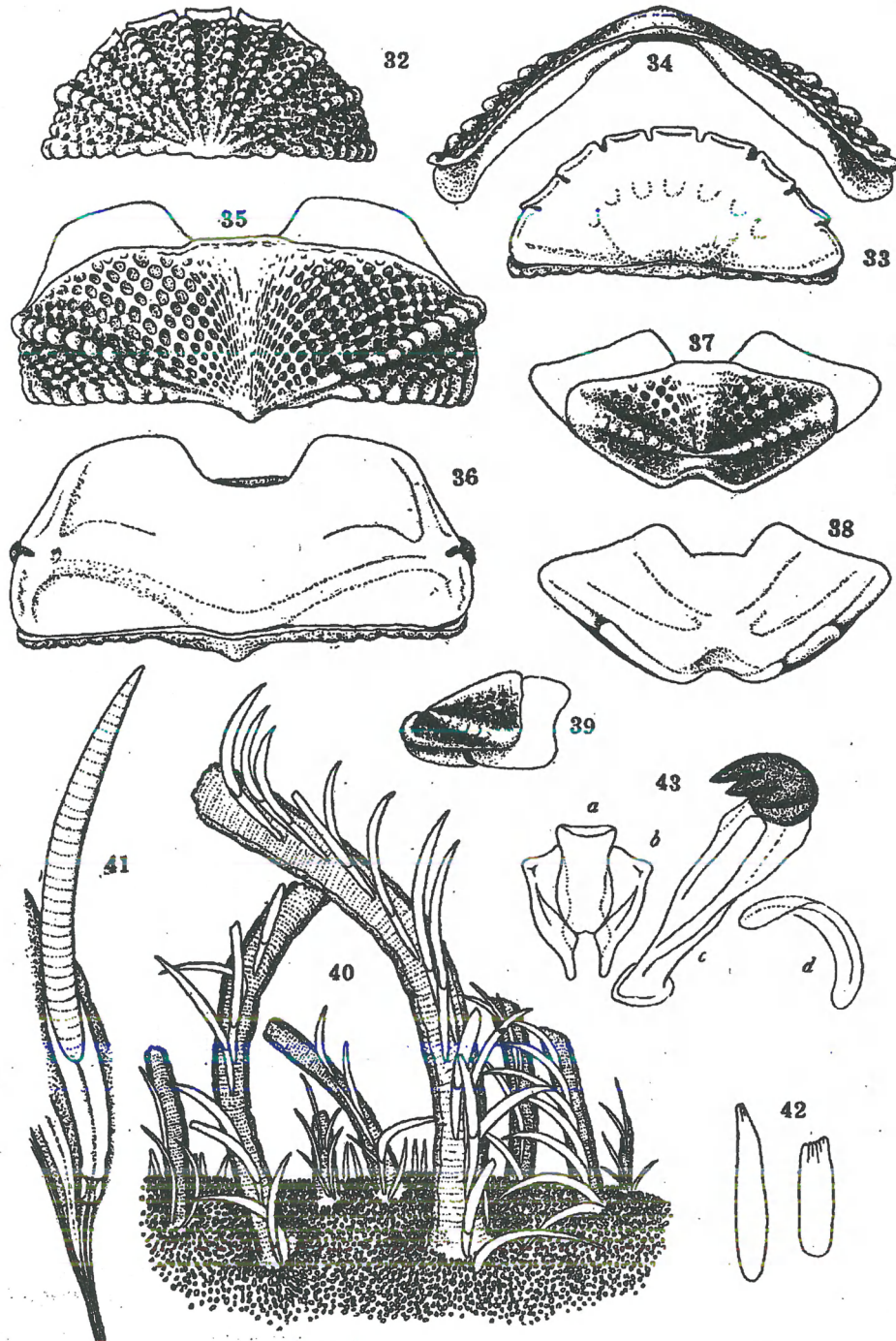
discernible, their proximal parts are slender and somewhat distinct, becoming gradually wider and lower toward the extremity; jugum rather distinct, slightly elevated, with an apparently granular or pitted sculpture, which is presumably, originally an extremely condensed reticulum. Posterior area slightly concave, the sculpture suggesting that it is originally a reticulum, but the mesh is so compressed and reduced that the whole sculpture looks quite obsolete and irregular. Interior (textfig. 38): sutural laminae wide, sinuated at the middle, its outer corners elongated, caudal sinus shallow, jugal sinus also shallow, flat; both the eaves and the sinus spongy; 1 slit on each side, often 2-4.

Girdle (textfigs. 40-42): narrow, leathery, narrowly incised at the posterior end; covered wholly with setae (textfig. 40), of which sutural ones longer, their maximum length being 3 mm. and maximum breadth at base 0.3 mm.; flexible and usually curved, finely striated across; they give attachment to a certain number of slender, transversely grooved, glassy spicules (textfig. 41), which are deeply imbedded, the proximal portion is invested by a cup-like body (Conchinbecher of THIELE), which is connected by a small intermediate nodule to a fine slender branch of the axial thread of the setae. The entire surface of the girdle is covered with minute, approximately vertically implanted, brown spicules ( $60\mu \times 10\mu$ ) (textfig. 42), whose apices blunt or truncated, longitudinally fluted.

Ctenidia: merobranchial, abanal, 16-19 ctenidia on each side.

Colouration: generally brownish or dark yellow-ochre; one of the specimens (Pl. II, fig. 2) is variegated, that is, pink along the middle, a pair of brownish bands bound the apparent jugal tract, the rest of the valves light brown, mottled with many irregular dark dots, some of them being fringed with a trace of green colour, valves 1, 2, 5, 7 painted with a broad black patch on each side. Interior of the valves uniformly pale. Girdle usually dark yellow-ochre throughout.

Radula (textfig. 43, *a-d*): central and centro-lateral teeth nearly oblong, central (43 *a*) with a wide, reversed and smooth cusp, slightly swollen at the base; centro-lateral (43 *b*) somewhat



*Mopalia retifera* THIELE. ヒゲヒザラガヒ

curved inwardly, with a blunt, outwardly inclined cusp, its outer corners thickened; major lateral (43 c) well-developed, tricuspid, each cusp big and with a sharp point, stalk ridged, slightly winged; major uncinus (43 d) rather slender, blunt, with a narrow wing.

Measurements: (mm.)	Length	breadth	height
Specimen figured in Pl. II, fig. 2	20.3	10.7	3.6
Maximum size	26.8	15.5	5.2

Divergence varies from  $111^{\circ}$ — $125^{\circ}$ , average about  $120^{\circ}$ .

Locality: Seto, Prov. Kii; Mitsu, Prov. Iyo. Besides these, THIELE gives the following localities: "Kagoshima; Hojo, Provinz Awa; Enoshima; Tsingtau; Golf von Amur, gegenüber der Ostseite der Halbinsel von Jankowsky."

In many of the adult specimens, and in the juvenile ones as well, the tegmental sculpture described above is so much eroded that the smooth, faint diagonal ribs alone are discriminable, leaving a fine reticular sculpture quite obsolete; in the extreme case of the erosion the valves look like having no ornamentation.

*Callistochiton jacobaeus* (GOULD, 1859) カブトヒザラガヒ (新稱)  
(第2圖版第1圖; 挿畫 12-21)

我等の得たる標本は上記の學名のものに同定することが出来ると思はれる。小形種で、頭板尾板共に半球状に膨れ、頭板に10、尾板に7、中間板側域に2條の顆粒状放射脈著しく、中間板中央域には格子状彫刻がある。色彩は淡褐色乃至灰色; 體長12, 幅6.3, 高さ2.7耗。產地: 伊豆下田 (GOULD); 志摩鳥羽 (菱浦忠愛氏); 紀伊大島 (黒田徳米氏, 岡本禎文氏); 同串本 (駒井卓氏); 同瀬戸 (瀧巖); 同御坊 (岡本禎文氏) 和名は頭, 尾板の放射脈を兜の鉢に見立て、附したものである。

*Chiton komaianus*, (新種) オホクサズリガヒ (新稱)  
(第2圖版第6圖; 挿畫 22-31)

クサズリガヒと同属であるがよほど違つた種で、嘴部著しく背域は僅かに區別せられ、側域には3條、頭板には19 (20)、尾板には17-20條の顆粒列があり、中間板肋域には約17條の縦肋がある。色彩は鮮黄綠色、殻の背部は稍々淡色、肉帯は黄と緑の横縞になつてゐる。體長20.5, 幅9.6, 高さ5.5耗; 紀伊瀬戸及び串本産。

*Mopalia retifera* THIELE, 1909. ヒゲヒザラガヒ (杉谷)

(第2圖版, 第2圖, 挿畫 32-43)

汚褐色乃至灰色の中形種で, 頭板に8條, 中間板, 尾板に各側1條の顆粒列があり, その他の殻板背面は規則正しき網目狀の彫刻を具へてゐることが著しい. 肉帯は長短様々の毛を以て被はれ, 各毛には多少彎曲した硝子質の針を一行に生ずるが, 時にはこの針が全部根本から折れて毛は平滑に見えることもある. 體長 26.8, 幅 15.5, 高さ 5.2 耗. 紀伊及び伊豫にて採集した.

本種は上記の學名に同定することが出来ると思はれるが, 原記載には産地として, 鹿兒島, 江ノ島, 安房北條, 支那青島, Amur 灣が擧げてある.

## EXPLANATION OF PLATE II. 第2圖版説明

1. *Callistochiton jacobaeus* (GOULD, 1859). カブトヒザラガヒ  
(12.0×6.3 mm, p. 141-145)
2. *Mopalia retifera* THIELE, 1909. ヒゲヒザラガヒ  
(20.3×10.7 mm, p. 148-152)
3. *Chiton kurodai* IS. TAKI & IW. TAKI, 1929. クサズリガヒ  
(19.2×11.5 mm, p. 52-53)
4. *Ischnochiton (Lepidosoma) iyoensis* IS. TAKI & IW. TAKI, 1929. セダカヤスリヒザラガヒ  
(23×13 mm, p. 52)
5. *Notoplax dallii* IS. TAKI, & IW. TAKI, 1929. ウスベニヒザラガヒ  
(15.5×9.0 mm, p. 50-52)
6. *Chiton komaianus* IS. TAKI & IW. TAKI, 1929. オホクサズリガヒ  
(20.5×9.6 mm, p. 145-148)
- 7-9. *Notoplax (Ikedaella) conicus* IS. TAKI & IW. TAKI, 1929. ヒトデヒザラガヒ  
7. dorsal, 8. ventral, 9. left side views.  
(22.7×9.5 mm, p. 48-50)

## Corrections.

- p. 47, line 4; p. 48, line 3; } for insertion-plate  
p. 49, line 2, 9; p. 51, line 9 } read sutural laminae  
p. 47 line 5 for multifissate in the posterior margin  
read insertion-plate multifissate  
p. 49 line 9 for ....., with 7 slits; read .....; slits 7;  
p. 50 line 1 for fig. 9 read fig. 8





Is. TAKI & Iw. TAKI: Japanese Chitons.