

ADDITIONS TO THE JAPANESE LAND SNAIL FAUNA, IV.

BY HENRY A. PILSBRY.

In the present communication the description of Japanese *Clausiliidæ* is continued, and that of the *Pupidæ* begun. The genesis of *Balea*-like forms in Japan is considered in some detail, together with various other divergent branches from the Euphæduroid phylum.

For most of the material described I am indebted to the liberality of Mr. Y. Hirase, a corresponding member of this Academy.

Mr. E. R. Sykes also has entrusted to me certain specimens collected in Japan by Dr. Hungerford, many years ago, representing species described but not figured by Dr. O. von Möllendorff; and I have included herein some account of such of these as are closely related to my new forms. My thanks are due to both of these co-workers for their kind assistance.

Section ZAPTYX Pils.

Proc. A. N. S. P., 1900, p. 672.

This strongly differentiated group has hitherto been known from southern Kiushiu and the Loo Choo Islands only; but a representative has now been found to the north and east in an island belonging to the province of Izu. I have attempted below to explain its presence there.

Typical *Clausilia* (*Zaptyx*) *Hirasei* occurs at Kagoshima, the type locality, and on Sakura Island in Kagoshima Bay. A more slender form, of a richer, darker brown color, but the same internal structure, has been sent by Mr. Hirase (No. 557) from Kikai,¹ Osumi, at the head of Kagoshima Bay. Many specimens are very small, length $7\frac{1}{2}$ mm., but others reach $10\frac{1}{2}$ mm. in length. As the shell is quite slender, this is one of the smallest *Clausilias*

¹ In treating of *Eulota connivens*, *Proc. Malac. Soc. Lond.*, IV, p. 77, Mr. Gude has confused this locality with the island Kikai-ga-shima, of the Oshima group, south of Kiushiu. This island is in the Loo Choo group, broadly speaking, but belongs for administrative purposes to Kagoshima Ken or prefecture.

known, as well as one of the most complicated in internal structure.

Clausilia hachijoensis n. sp. Pl. XXVII, figs. 39, 40.

Shell fusiform, rimate, rather thin, of a dark, rich brown color; rather weakly wrinkle-striate, the latter part of the last whorl distinctly and sharply striate. Whorls 8 to $8\frac{1}{2}$, slightly convex, the apex obtuse, the last whorl somewhat flattened laterally, and gibbous or sack-like below. Aperture trapezoidal-piriform, the peristome continuous, brown, narrowly expanded and subreflexed. Superior lamella rather small, compressed, vertical, distant from the spiral lamella. Spiral lamella short, lateral, not reaching a ventral position, a short *lamella fulcrans* lying parallel to it. Inferior lamella receding, immersed, visible in an oblique view in the aperture, moderately spiral within; subcolumellar lamella either emerging or immersed. Principal plica short and lateral, one or two short sutural plicæ lying above it; *upper palatal plica exceedingly short* and joining the lunella. Lunella lateral, rather long and straight.

Clausilium strongly curved throughout, the apex rounded, straightened or slightly emarginate on the palatal side, near the apex.

Length 10, diam. $2\frac{1}{3}$ to $2\frac{1}{2}$ mm.

Bachijo (or Hachijo) Island, prov. Izu (Mr. Y. Hirase, No. 638).

This species is about the size of the largest specimens of *C. Hirasei* and *C. hyperoptyx*, but is a trifle wider. It differs from both in wanting a parallel lamella, and the upper palatal plica is extremely short, a mere dilation of the upper end of the lunella. In *C. Hirasei* it stands free of the lunella, and in *C. hyperoptyx* is united with it and is much longer. The principal plica is shorter than in the other two species. The clausilium is much more curved than in either of these species, and its apical end has a somewhat different shape.

The specimens were sent with *C. Tryoni*, an *Euphædusa* much resembling this species in size and color.

Bachijo or, as most charts spell it, Hachijo (or sometimes Fatsizio) Island lies in the Pacific just above the 33d parallel N. lat., and near 140° E. long. It is somewhat over 100 miles from the nearest mainland, and is about twenty-one miles long by seven

and a half wide. A chain of islets reaches northward to the Sagami Sea; but I am disposed to believe that its molluscan fauna has been derived chiefly from the islands south of Kiushiu by means of drift, as it lies directly in the Kuro Shiwo, or "Black Current," and *Zaptyx*, the group to which *C. Hachijoensis* belongs, is distinctly a southern group, unknown in Hondo Island. Small islets at wide intervals are scattered down to the Bonin (Ogasawara) group, but they rise from a submarine ridge in the sea bed between 1,000 and 2,000 fathoms depth.

The two species of *Clausilia* here described and *Clausilia* (*Reinia*) *variegata* var. *nesiotica* Pils. are the first land shells known from the island.

Section EUPHÆDUSA Böttger.

Clausilia Tryoni n. sp. Pl. XXV, figs. 1, 2, 3.

Shell small, rimate, thin, fusiform, dark purplish brown, glossy, finely striatulate, the last whorl more coarsely rib-striate. Whorls 8, rather convex, the apex obtuse, next three or four whorls attenuated, the last whorl flattened on its last half. Aperture piriform, the peristome rather thin, narrowly expanded and subreflexed, continuous, adnate or very shortly free above, deeply emarginate at the position of the superior lamella. Superior lamella thin but high, continuous with the spiral lamella. Inferior lamella rather small, weak below, though emerging nearly to the lip-edge, rather abruptly becoming stronger and converging toward the superior lamella within, strongly spiral. *Subcolumellar lamella emerging.* *Principal plica short*, its lower end visible from the aperture, deep within the throat, the other end extending past the palatal plicæ to a lateral position. *Upper and lower palatal plicæ small, oblique and parallel*, lateral in position, the lower one smaller. *There is no trace of a lunella.* The inferior and spiral lamellæ are of equal length within, and reach to the middle of the ventral side.

The clausilium is broad, strongly curved, a little pointed or tapering toward the apex, and very slightly thickened there.

Length $11\frac{1}{2}$, diam. 3 mm.

Bachijo (Hachijo) Island, prov. Izu (Mr. Y. Hirase, No. 638).

This pretty little *Euphædusa* was sent with *Clausilia* (*Zaptyx*)

hachijoensis, which it resembles in size and color. It will be known by the unusually strong superior lamella, emerging sub-columellar lamella and total absence of a lunella, the two palatal folds being small, remote and parallel. The clausilium though wide is a little tapering below, and less thickened at the apex than in most of the related species.

There is some variation in sculpture, one specimen being densely and rather sharply striate, while the others are smoother.

Group of C. Hungerfordiana.

Shell with the ordinary slender contour and piriform aperture of *Euphaedusa*. *Superior lamella wanting*, or represented merely by a slight thickening of the lip-edge. Inferior lamella rather strongly developed. Lunella subobsolete or wanting; palatal plicæ 2; the principal plica short. Shell usually variegated with white streaks.

This new "*Formenkreis*" contains two species, both Japanese.

Clausilia Hungerfordiana Mlldff. Pl. XXV, fig. 4.

Von Möllendorff, Journ. Asiatic Soc. of Bengal, LI, Pt. 2, No. 1, p. 2, Pl. 1, fig. 1 (July, 1882).

The specimen figured is from Hungerford's collection, and is now in that of Mr. E. R. Sykes. It is slender, thin, conspicuously streaked and maculate with buff-white on a brown ground. It is finely, rather irregularly striatulate, the striæ becoming coarser and distinct on the back of the last whorl. The superior lamella is represented by a slight thickening of the lip-margin. Inferior lamella strong. Subcolumellar lamella very deeply immersed. The rather short principal plica is lateral, the lunella subobsolete, upper and lower palatal plicæ being developed.

Length 12, diam. 2.5 mm.

Nara, Yamato.

Thus far known from the type locality only, a town lying east from Osaka, in northern Yamato.

Clausilia monelasmus Pils. Pl. XXVII, fig. 5.

Pilsbry, Proc. A. N. S. Phila., 1900, p. 674, Pl. 24, figs. 4-6; Pl. 25, figs. 26-29.

The specimen here figured has the inferior lamella more receding than in the type, and the shell is variegated with white.

It is evident that this is a northern species very closely related

to *C. Hungerfordiana*, from which it differs in being smaller and more graceful, decidedly more attenuated above, with much stronger striation. There is no trace of a lunella. It is from Hokkaido Island, while *C. Hungerfordiana* is from southeastern Hondo. Perhaps northern Hondo will supply specimens of intermediate character.

The shell figured is 10 mm. long.

Group of C. euholostoma.

Shell shorter than in normal *Euphædusæ*, the whorls reduced to 7-7½; aperture broad, squarish-oval, scarcely narrower above than below; peristome continuous, the broadly arched parietal margin in part adnate, though distinct. No superior lamella. Inferior lamella strong; spiral lamella and principal plica very short; no lunella; upper and lower palatal plicæ developed. Clausilium Euphædusoid.

The single species of this group approaches *Reinia* in contour, but, like the preceding group, the superior lamella is obsolete and the inferior lamella strong.

Clausilia euholostoma Pils. Pl. XXV, figs. 6, 7, 8.

Pilsbry, Nautilus, XIV, p. 108 (January 1, 1901).

Shell rimate, slenderly pupiform, brown, finely striate. Apex rather acute; spire rapidly tapering above; whorls 7-7½, quite convex, the last two forming much more than half the shell's length, and of about equal diameter. Aperture of a broad, squarish-oval form, scarcely narrower above than below; peristome white, reflexed, continuous, the strong parietal margin arcuate and in part adnate. Superior lamella wanting. Spiral lamella reduced to a short plate deeply immersed, developed in a lateral position. Inferior lamella appearing in a front view as a strong triangular plate, strongly spiral within. Subcolumellar lamella very deeply immersed. Principal plica reduced to a short fold, lateral in position and about twice as long as the small upper and lower palatal plicæ. No lunella. Clausilium very similar to that of *C. comes*,² but the palatal margin is more straightened near the apex, and the columellar margin is more strongly notched near the filament.

Length 8.6, diam. 2.4 mm.; length of aperture 2.3 mm.

Length 7.3, diam. 2.2 mm.; length of aperture 2 mm.

² See these *Proceedings* for 1900, Pl. XXV, figs. 35, 36.

" Mikuriya, prov. Suruga (Y. Hirase). Types No. 79,724 Coll. A. N. S. P., No. 563 of Mr. Hirase's collection.

This species is one of the most extraordinary modifications of the Euphædusan stock yet known. The large aperture resembles in form that of no other *Clausilia* known to me, and shows but one lamella, the inferior; the superior lamella being wholly atrophied, and the spiral lamella and principal plica reduced to short laminae in the region where the clausilium lodges. There is no trace of a lunella. The clausilium remains well developed, is slightly thickened distally, and has all the characters of that of *Euphædusa*.

In the strong development of the inferior lamella, *C. euholostoma* resembles *C. Hungerfordiana* Mlldff. and *C. monelasmus* Pils., which are likewise deficient in the superior lamella. *C. euholostoma* agrees with the typical forms of *Reinia* in having the aperture wide above, not piriform as in the group of *C. Hungerfordiana*. It is intermediate between the two groups in number of whorls and in general contour.

Section REINIA Kobelt.

Reinia Kob., Jahrb. d. D. Malak. Ges., III, 1876, p. 34, proposed as a section of *Balea*; type *Balea variegata* A. Ad.

The type of *Reinia* is a small tapering-pupoid species, with *discontinuous peristome*, the aperture being Buliminoid, deficient in lamellæ and *without plicæ, lunella or clausilium*. It was included by Böttger next to *Balea*; but that group as usually constituted consists of no less than three series of species, each totally distinct and unrelated.

It was Dr. O. von Möllendorff who with keen insight first pointed out the fundamental distinction between *Balea* and *Reinia*.³ He recognized in the Chinese *C. eastlakeana* a less modified form of *Reinia*, and after discussing the characters of the group, declared it to be related to the eastern Asiatic group *Phædusa*. The relation of *Reinia* to *Phædusa*, von Möllendorff further held, is comparable to that of *Alopi* to the true *Clausilia* of Europe: "Phylogenetisch dürfte *Reinia* als der lebende Rest der Vorfahren der heutigen *Phædusa*-Arten aufzufassen sein, wie

³ Jahrb. d. D. Malak. Ges., X, p. 262-265, 1883, under description of *C. eastlakeana*, a species from Fu-dshow, on the island Nan-tai, province of Fu-dshien, southern China.

die Baleo-Clausilien die direkten nachkommen des Prototyps der Europäischen Clausilien sind.”⁴

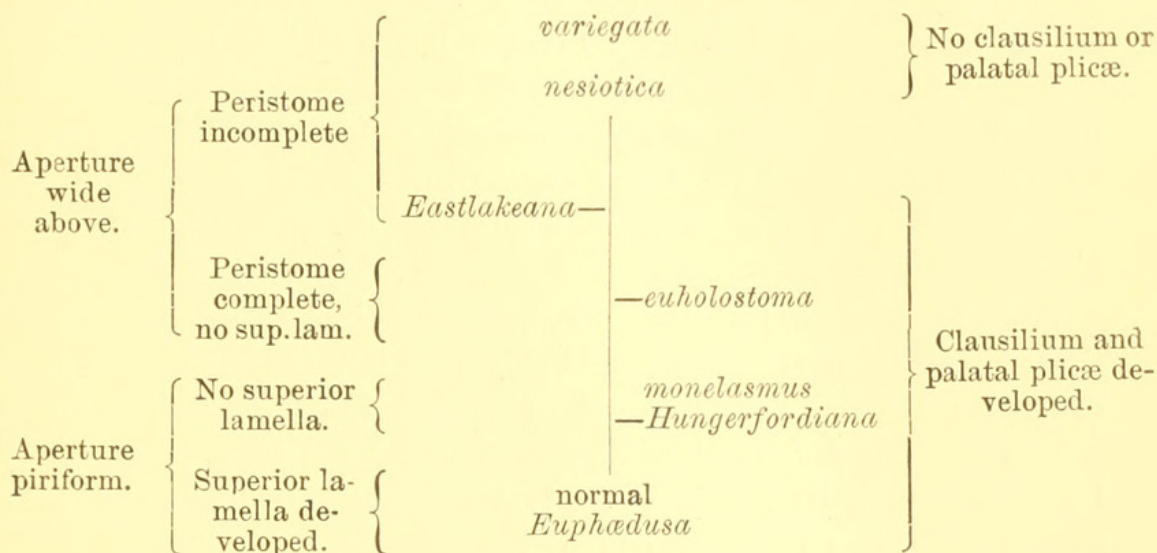
The conclusion that *Reinia* stands in close relationship with *Phædusa*, and has nothing to do with *Balea*, was forced upon me by the study of a series of Japanese species, before I knew that von Möllendorff, nearly twenty years ago, had been led to the same result by the structure of a Chinese form. Only in one point of view the data before me seem to modify the ideas of the German savant: the Japanese series establishes such a connection between *Reinia* and *Euphædusa* that the descent of the former from the latter is strongly indicated. *Reinia* is not a primitive *Phædusa*, but a degenerate one. I regard *Reinia variegata* as the secondarily simplified end of a series leading from typically Euphædusoid ancestors, just as *Balea perversa* is a secondarily simplified, and not a primitive, *Clausilia*. The east Asiatic series leads from forms with many whorls, well-developed clausilium, lamellæ and folds, and continuous peristome, to those with few whorls, no clausilium, the lamellæ and plicæ reduced and in part lost, and the peristome adnate above and finally interrupted. Böttger has demonstrated that the older tertiary *Clausiliidæ* of Europe had a narrow clausilium and the superior lamella was continuous with the spiral lamella; the widening of the clausilium and separation of the superior and spiral lamellæ being modern characters. Now *Reinia* and its nearest allies have the spiral and superior lamellæ interrupted, and the clausilium when developed is of the very broad type. These considerations seem to render the hypothesis that *Reinia* is a primitive *Phædusa* quite inadmissible.

The chief characters of *Reinia* and the Euphædusoid forms leading toward it, are stated in the following table:

⁴ *L. c.*, p. 265.

Species.	Whorls.	Peristome.	Sup. lamella.	Spiral lamella.	Inf. lamella.	Lunella.	Princ. plica.	Pal. Plicae.	Clausilium.
<i>Variegata</i>	6	incomplete	minute, not marginal	short, dorsal	receding, dorsal	none	none	none	none
<i>Nesiotica</i>	6½	"	"	dorso-sublateral	receding, sub-lateral	"	"	"	"
<i>Eastlakeana</i>	7	"	small, sub-marginal	lateral	lateral	"	short	2	euphaedusoid
<i>Euholostoma</i>	7-7½	complete	none	short, lateral	strong, lateral	subobsolete	very short	2	"
<i>Monelasmus</i>	8½	"	"	strong, lateral and ventral	strong, latero-ventral	none	short, latero-dorsal	2	"
<i>Hungerfordiana</i> .	9	"	"	"	"	"nearly obsolete"	"	2	"

The interrelations of the above species are further illustrated in the following diagram, the median portion of which shows the probable phylogeny of the forms under consideration:



It will be seen from the table and diagram that no sharp line can be drawn between *Reinia* and *Euphædusa*. The number of whorls varies, by easy stages; the form of the aperture is not correlated with other characters; and upon the whole, it is obvious that we have to deal with forms in various stages of change and of degeneration of the closing-apparatus, from an Euphædusoid ancestor. In fact, it is not quite certain that they had a single common progenitor; they *may* be descendants from three species of *Euphædusa*; but however this may be, it is obvious that the original stock, whether one or three, belonged to the *aculus* group of *Euphædusa*; and some apparently trivial features of the whole series, such as the peculiar coloration, give me reason to believe that the phylogeny indicated above is not far wrong.

Clausilia (*Reinia*) *variegata* (A. Ad.). Pl. XXV, figs. 11, 12.

Balea variegata A. Adams, Ann. and Mag. Nat. Hist. (ser. 4), I, p. 469 (1868); Kobelt, Fauna Jap., p. 63, Pl. 9, fig. 20 (1879); Martens, Sitzungsber. Ges. Naturforsch. Freunde zu Berlin, 1877, p. 105.

The shell is sinistral, rimate, thin, tapering-pupiform, the last whorl widest; *streaked with opaque buff* on an olivaceous or brownish corneous ground, and more or less marked with spiral lines of the darker color. The surface is irregular striatulate, the last half of the last whorl being striate. *Whorls 6*, convex and regularly increasing. The aperture is broadly ovate, with white,

reflexed peristome; the right and left margins scarcely converging above, *widely separated*, connected by a *thin, adnate parietal callus*. The superior lamella is minute, short and removed from the edge of the parietal callus. It is widely separated from the rather short, spiral lamella. Inferior lamella receding, small, becoming higher inside, extending to a dorsal position. Sub-columellar lamella very deeply immersed, a long pit between it and the inferior lamella. There are no plicæ. Clausilium wanting. Length 8.3, diam. above aperture 2.6, length of aperture 2.8 mm.

Tago (A. Adams) (Tako, in western Shikoku, province of Iyo); Uweno, near Tokyo, and Ujeno (Hilgendorf); Tokyo (Dönitz); Takasaki, prov. Kozuke (Y. Hirase, No. 525).

This species was found by Hilgendorf under the bark of trees, by Dönitz in hollow trees. It is viviparous, one specimen I opened containing a young shell.

Clausilia Eastlakeana Mlldff., of which I have specimens from the original locality, is undoubtedly nearer *variegata* than any Japanese species, having the same discontinuous peristome; but it has longer, stronger lamellæ, palatal plicæ and an Euphædusoid clausilium.

Clausilia (Reinia) variegata var. *nesiotica* nov. Pl. XXV, figs. 9, 10.

Whorls $6\frac{1}{2}$; striation stronger than in *variegata*, the last whorl with fine incised spiral striæ. Inferior and spiral lamellæ decidedly more strongly developed.

Length 8.3–9.5, diam. 2.7 mm.

Hachijo Island, off Izu (Mr. Y. Hirase, No. 525b).

This insular race has slightly less degenerate lamellæ than the typical form from Hondo. Some specimens from the outlying Ogasawara (Bonin) Islands, Mr. Hirase's No. 469, apparently belong here, though as only young ones have been received, I am not certain of them.

Section TYRANNOPHÆDUSA Pilsbry.

This section is not allied to *Euphædusa*, as I formerly supposed, but to *Hemiphædusa*, with which it agrees in the receding inferior lamella, straightly ascending within, and remote from the superior lamella. Whether it will stand as a separate section, or become a subordinate group of *Hemiphædusa*, depends upon the emphasis

placed upon the different form of the clausilium. *Hemiphaedusa* now comprises various shell-forms, especially among Chinese species, and will probably require to be more or less subdivided.

As the figure of *C. mikado* Pils. was on too small a scale to show the form of the spire well, I give here an enlarged outline, Pl. XXVII, fig. 35.

Clausilia iotaptyx Pilsbry. Pl. XXVII, fig. 38.

These *Proceedings* for 1900, p. 674.

The reference to plate in my former paper should read *Pl. XXIV*, not "Pl. XXV." In the description, p. 675, eighth line from top, the lunella was stated to be "lateral," whereas it is, in fact, nearly *ventral*. The same correction should be made in the third line from bottom of same page.

The systematic position of this species was left in doubt in my former paper; but further study inclines me to place a good deal of weight upon the characters of the clausilium in deciding on the classification of any Phædusoid species; and this would throw *C. iotaptyx* into my section *Tyrannophaedusa*. The definition of that group must then be extended to include species with fewer whorls, but having the same type of closing apparatus. As in *C. mikado*, the upper half of the shell is attenuated.

Clausilia iotaptyx, var. *clava* Pilsbry. Pl. XXVII, figs. 36, 37.

Pilsbry, *Nautilus*, XIV, p. 108 (January, 1901).

Much smaller than *C. iotaptyx*, but similar in form; whorls $11\frac{1}{2}$ –12, the first globose, following 7 or 8 attenuated, last 3 swollen and forming more than half the length of the shell, the last whorl tapering below, impressed at the position of the principal plica, more or less distinctly ridged behind a wide shallow constriction behind the lip. Finely striate where not eroded; whitish or dirty buff, and lustreless. Aperture as in *C. iotaptyx*, but the subcolumellar lamella is sometimes wholly immersed. Closing apparatus more lateral than in *iotaptyx*, the upper palatal plica strong but short, lower plica shorter, connected with a rudimentary, straight lunella, which does not reach the upper palatal fold.

Alt. 12, diam. 2.8 mm.

Alt. 11.5, diam. 2.5 mm.

Senzan, Awaji Island (Y. Hirase). Types No. 79,723 Coll. A. N. S. P., from No. 292 of Mr. Hirase's collection.

This insular subspecies has one-half to one whorl more than the typical form from Omi province, although it is much smaller; the spire is somewhat more slender, and the lunella is comparatively degenerate.

Section HEMIPHÆDUSA Bttg.

Group of C. validiuscula.

Clausilia gracilispira Mlldff. Pl. XXVII, figs. 27-34.

Von Möllendorff, Journ. Asiatic Soc. of Bengal, LI, Pt. 2, No. 1, p. 5, Pl. 1, fig. 3 (July, 1882); LIV, Pt. 2, No. 1, p. 63 (1885).

Two specimens labeled as this species were transmitted to me by Mr. E. R. Sykes. They formed part of Brigade-Surgeon Hungerford's collection, and were taken by him near Kobi, Japan, about twenty years ago.

One of the specimens is slightly stouter and reddish, the other more slender and pale yellowish green. I shall refer to them as the reddish and the green examples.

The green specimen (Pl. XXVII, figs. 27-29) is slender, much attenuated above, and has $9\frac{1}{2}$ convex whorls. It is rather strongly, regularly striate. The last whorl is somewhat cylindric, and on its last half the space above the position of the principal plica is distinctly swollen. The aperture is decidedly oblique and ovate; and from its obliquity appears abnormally short in the figures, from being foreshortened. The peristome is rather widely reflexed, shortly free, a little emarginate above, and viewed from the base, it is seen to be *distinctly notched to the right of the superior lamella*. The superior lamella is marginal and slightly projecting, rather short, and *distinctly flat-topped*; continuous with the spiral lamella. The inferior lamella is very receding, hardly visible in a front view. Within it ascends straightly, is rather stout, and terminates below in a perceptible "knot" or callous thickening. The subcolumellar lamella is very deeply immersed, not visible within the mouth. Both spiral and inferior lamellæ ascend to a ventral position, the former being higher in the region where the clausilium lodges. The principal plica is visible within the aperture, and penetrates to a lateral position, being thus fully a half-whorl long. Below it there are four plicæ, the upper and lower well developed; two very short, indistinct, minute callous nodules or plicæ lying between them.

The clausilium (Pl. XXVII, figs. 30, 31) is parallel-sided, acuminate below, abruptly and deeply emarginate above on the columellar side of the filament.

Length 10, diam. 2 mm.

This specimen agrees with von Möllendorff's description of *C. gracilispira* in color and form, but differs in having fewer whorls, $9\frac{1}{2}$ instead of 10-11, and in having two minute intermediate palatal plicæ instead of only one. Moreover, the lip is rather broadly reflexed, not merely "*breviter expansum*."

The reddish specimen (Pl. XXVII, figs. 32-34) is wider than the green, with the space above the principal plica very convex (fig. 34). Whorls $9\frac{1}{2}$. The aperture is less oblique than in the green specimen, but otherwise similar; the oblique flattening of the top of the superior lamella, and the notch in the peristome to the right of it being well marked. Internally it is similar to the green specimen except in the following respects: the spiral and inferior lamellæ are longer, ascending almost past the ventral position; and between the upper and lower palatal plicæ there is one very low, nodule-like callus or intermediate plica.

Length 10, diam. 2.2 mm.

This specimen agrees with von Möllendorff's description in having an identical palatal armature. In color and general appearance it is a good deal like *C. aurantiaca* var. *Erberi* Bttg. I did not examine the clausilium. The rather peculiar form of the superior lamella, in a front view, is the same in the two specimens; and when the intermediate palatal plicæ are so reduced as in these shells, I am disposed to believe that the differences above recorded are not of specific value.

It is obvious, however, that more material is needed to satisfactorily elucidate the characters of the species.

Group of C. sublunellata.

This group was defined by von Möllendorff in 1885. It is characterized by the palatal armature, the species examined by him having "below the principal plait, first an upper palatal, after this a very short second one, and then a short, straight lunella, which in some forms is somewhat obsolete, but always discernible."

In my opinion the group should be enlarged to include species which have below the principal plica or plait, one upper palatal

plica, followed by a straight lunella, or a short, low callous nodule representing the lunella. There is no lower palatal plica, nor inward curve of the lower end of the lunella, representing such plica.

Since the lunella is a secondary evolution-product, formed by the coalescence of primitive palatal plicæ, it is natural that species representing certain intermediate stages should occur.

Clausilia micropeas Müll. Pl. XXVIII, figs. 41, 42, 43.

Von Möllendorff, Journ. Asiatic Soc. Beng., LI, Pt. 2, No. 1, p. 12; LIV, Pt. 2, No. 1, p. 64.

A specimen from Hungerford's collection, doubtless one of the original lot, was kindly lent me by Mr. E. R. Sykes. On account of its relationship with the following species, figures and descriptive notes are here given. It has not before been figured.

The pale buff, slender shell is attenuated above, and consists of nearly 9, moderately convex whorls. It is delicately costulate-striate. The aperture is piriform-ovate, with moderately reflexed lip, which is quite deeply emarginate above. The superior lamella is vertical, rather slender and high, marginal, and continuous with the spiral lamella. The inferior lamella is deeply receding, not visible from in front. Within it ascends straightly. The sub-columellar lamella is wholly immersed. Within, the spiral and inferior lamellæ are of equal length, ascending to a point on the ventral side just above the superior lamella. The principal plica is rather short, not quite a half-whorl long, its lower end visible deep within the throat, whence it extends almost past a strictly lateral position. Below it there is a rather long upper palatal plica, and then a very low, rather wide and straight lunella. No lower palatal plica.

The long, narrow clausilium (Pl. XXVIII, figs. 44-46) is parallel-sided, slightly acuminate below, and not emarginate posteriorly.

Length 10.5, diam. 2 mm.

In this specimen the lunella is apparently better developed than in that opened by Dr. von Möllendorff, who in his first description states that there is a short upper palatal plica and sometimes a second punctiform one, the latter evidently being the vestige of a lunella. In his second article he finds "that there is an indication of a lunella below the second (generally punctiform) palatal

plait." In the specimen before me, the structure is clearly as described above and figured on my plate. When low, ill-developed or "punctiform," these palatal structures are doubtless subject to a somewhat wide range of variation, although the difference between a "punctiform plica with the indication of a lunella," and a "low, ill-defined lunella" occupying the same position, appears greater in the statement than the structure itself.

Compared with *C. perpallida*, this species differs in having the principal plica longer, and the superior lamella a little more prominent. The striation is also a trifle coarser, and the form more cylindric, less tapering. These differences do not seem to me to be of specific importance.

Clausilia micropeas var. *perpallida* Pilsbry. Pl. XXVIII, figs. 50, 51, 52.

C. perpallida Pils., Nautilus, XIV, p. 108 (January, 1901).

Shell rimate, slenderly fusiform, finely and distinctly striate, pale corneous. Apex obtuse, the first whorl globose; spire somewhat attenuated above. Whorls $9\frac{1}{2}$, convex, the sutures impressed, last whorl but slightly narrower than the penultimate, somewhat compressed. Aperture piriform, slightly oblique, with rather distinct, slightly retracted sinulus. Peristome somewhat thickened, reflexed, continuous. Superior lamella vertical, continuous with the spiral lamella, arising at the edge of the parietal lip. Inferior lamella deeply receding, visible only in an oblique view, within straightened and thickened below. Both the spiral and the inferior lamellæ penetrate inwardly to a fully ventral position, and are of about equal length; the former becoming very high for a short distance, just within the position of the palatal armature. Subcolumellar lamella is deeply immersed and either not visible within the aperture, or showing the end only in an oblique view. Principal plica less than a half-whorl long, the end visible within the aperture, inner end extending a little beyond a short, slightly curved, or forwardly diverging lateral upper palatal plica; below this, and not connected with it there is a low callous pad representing the lunella; no lower palatal fold. Clausilium long, slender and parallel-sided, somewhat acuminate toward the apex, tapering to the filament, the sides and apex thin; in profile seen to be curved, bow-like.

Length 11.4, diam. 2.6 mm.

Nishigo, province Uzen (Mr. Y. Hirase). Types No. 79,725 Coll. A. N. S. P., from No. 460*b* of Mr. Hirase's collection.

Distinguished by the pale color, subobsolete lunella, and absence of any lower palatal plica. It is closely related to *C. micropeas*, from which the shorter principal plica separates it.

Clausilia micropeas var. *hokkaidoensis* Pilsbry. Pl. XXVIII, figs. 47, 48, 49.

C. hokkaidoensis Pils., Nautilus, XIV, p. 108 (January, 1901).

Shell similar to var. *perpallida* except in the following characters: it is of a light brown color; the spire is a little less attenuated above; the peristome and superior lamella are thinner; the spiral and inferior lamellæ penetrate somewhat deeper; and the lunella is more distinctly developed, narrow and straight, extending downward to the position of the (wanting) lower palatal fold. Whorls $9\frac{1}{2}$.

Length 11.2, diam. 2.3 mm.

Length 10, diam. 2.2 mm.

Kayabe, Ojima, Hokkaido Island. Types No. 79,321 Coll. A. N. S. P., from No. 546*b* of Mr. Hirase's collection.

This is the *Hemiphaedusa* referred to in these *Proceedings* for 1900, p. 674, as occurring with *C. monelasmus*. I at first considered it specifically distinct, but am now disposed to look upon it as merely a northern race of *C. micropeas* of Hondo Island. It tapers more than *C. micropeas* which has a somewhat cylindric contour.

Group of C. awajiensis.

Clausilia harimensis Pilsbry. Pl. XXVI, figs. 16, 17, 18.

Pilsbry, Nautilus, XIV, p. 108.

Shell rimate, slender, gradually tapering to a rather acute apex, light brown, finely and weakly striate, more strongly and regularly so on the last two whorls, especially the last one. Spire gradually tapering, the last two whorls of about equal size. Whorls slightly over 9, moderately convex. Aperture trapezoidal-piriform, sinulus well developed; peristome thin, whitish, narrowly reflexed, continuous, emarginate at the position of the superior lamella. Superior lamella marginal, rather high but slender, oblique, disconnected from or subcontinuous with the spiral lamella. Spiral lamella ascending to a merely ventral position, very high inside. Inferior lamella deeply immersed, visible in an oblique

view only, straightened inside, thickened below. Subcolumellar lamella immersed, the end visible in an oblique view, but usually a weak continuation reaches to the edge of the peristome. Principal plica a half-whorl long, the lower end visible within the aperture; extending inward beyond the lunella. Upper palatal plica short, joined in the middle to the narrow, well-developed lunella, which descends obliquely, and curves backward below; the recurved lower end representing a lower palatal fold. Clausilium (Pl. XXVII, figs. 19, 20, 21) narrow, parallel-sided, abruptly curved where it passes into the wide filament, straightened toward the rounded, hardly angular apex; columellar side emarginate at the origin of the filament.

Length 11.5, diam. 2.8 mm.

Kashima, Harima (Mr. Y. Hirase). Types No. 79,133 Coll. A. N. S. P.

Allied to *C. awajiensis* Pils., but that species is far more obese, with tapering, compressed last whorl.

Clausilia perignobilis n. sp. Pl. XXVI, figs. 13, 14, 15.

Shell rimate, fusiform, attenuated above, moderately swollen below, pale brown, densely and finely striate. Whorls about 10, moderately convex, the early ones corneous, forming a slender apical portion, the last whorl somewhat compressed laterally. Aperture trapezoidal-piriform, slightly oblique, the sinulus somewhat retracted; peristome whitish, more or less emarginate above, very narrowly reflexed. Superior lamella small, vertical, reaching the margin, continuous with the spiral lamella. Inferior lamella very deeply receding, hardly visible from the mouth except in an oblique view. Subcolumellar lamella emerging, usually distinct to the lip-edge. Principal plica fully a half-whorl long, visible in the aperture, and extending inward beyond the upper palatal plica. Lunella lateral, oblique, shaped like the letter J, the lower end curving inward, the upper end joining the middle of a rather short upper palatal plica, which converges inwardly toward the principal plica.

Length 14.5, diam. 3 mm.; longest axis of aperture 3.2 mm.

Length 12.3, diam. 2.7 mm.

Length 12.3, diam. 3 mm.

Okinoshima, Tosa, Shikoku Island (types No. 80,843 Coll. A. N. S. P., from No. 584 of Mr. Hirase's collection).

I at first identified this species with *C. ignobilis* Sykes,⁵ described from Kinnayama, Shikoku Island, but upon requesting a comparison with the type of that species, Mr. Sykes noted several important differences. The first two or three whorls in *C. ignobilis* are much larger, not so slender and pointed as in *C. perignobilis*; and the lunella is bow-shaped, as in *C. shikokuensis*, not J-shaped.

In other words, the lunella in *ignobilis* and *shikokuensis* unites with the lower, outer end of the upper palatal plica, curving gradually and imperceptibly into it, the united plica and lunella having the shape of a drawn bow, while in *C. perignobilis* the lunella unites with the middle of the upper palatal plica, like the letter J.

In *C. perignobilis* the spiral and inferior lamellæ are both high and lamellar within, of equal length, attaining barely a ventral position. The inferior lamella ascends rather straightly, and is not spiral, seen from the back in a broken specimen, but is rather thick. It gives off a branch toward the superior lamella, on the parietal wall.

Clausilia perignobilis var. *kochiensis* nov.

Similar to *C. perignobilis* Pils., from which it differs in the more robust, broader contour, more widely reflexed peristome and coarser striation of the latter part of the last whorl.

Length 15.5, diam. 4 mm.

Length 13.6, diam. 3.8 mm.

Kochi, province of Tosa, Shikoku Island (Mr. Y. Hirase, No. 657b).

The J-shaped lunella has the form of that of *C. perignobilis*.

Section STEREOPLÆDUSA Bttg.

Clausilia japonica var. *perobscura* nov.

Similar to *japonica*, but of a very dark, almost blackish, brown color, and sculptured with much coarser, more widely spaced rib-striæ. Suture with a whitish margin below. Lower palatal fold very small.

Length 25, diam. hardly 6 mm. Whorls 11.

Shirano, Buzen (Mr. Y. Hirase).

It occurred with, or at least was sent with, a rather obese form

⁵ Proc. Malac. Soc. Lond., I, p. 261, and these *Proceedings* for 1900, p. 682, footnote.

of *C. japonica*, having the usual fine, sharp striation of that species.

Section MEGALOPHÆDUSA Boettger.

Clausilia Hiraseana Pilsbry. Pl. XXVI, figs. 24, 25, 26.

Shell rimate, strong, the last two whorls of about equal diameter, and forming half the shell's length, those above rapidly diminishing, the lateral outlines becoming somewhat concave toward the apex, the earlier three whorls being of about equal diameter; dark reddish brown, with a pale band below the suture, the earliest whorls white. Surface usually with a brilliant gloss, *sculptured with coarse, strong, slightly waved or uneven ribs*, which occasionally anastomose or branch, and become finer on the upper, imperceptible on the earliest whorls. Whorls $11\frac{1}{2}$ to 12, but several are self-amputated in old individuals; they are convex and parted by well-impressed sutures. The last whorl, viewed dorsally, is narrower than the swollen preceding whorl, and is rather compressed, hardly convex. Aperture rhombic-ovate, vertical; peristome continuous, reflexed, flesh-tinted, whitish at the edge. Superior lamella small, marginal, oblique, continuous with the spiral lamella. Inferior lamella low and receding, within rather straightly ascending and strongly thickened below. Subcolumellar lamella deeply immersed, not visible in a front view, but its end may be seen by looking obliquely into the aperture. Principal plica short, its lower end visible deep within the aperture, upper end scarcely extending inward beyond the palatal armature. Palatal plicæ or folds lying a little dorsal of a lateral position, four in number, equidistant, all strongly developed though short; the upper fold a little longer, diverging from the principal plica, the lower (fourth) fold slightly longer than the two median, and a little arched upward in the middle. No lunella.

Clausilium evenly and rather strongly arcuate, long and rather narrow, parallel-sided. The apex is slightly acuminate on the columellar side, being rounded and strongly thickened; on the palatal side straightened, a little concave (Pl. XXVI, figs. 22, 23).

Length 27 to $29\frac{1}{2}$, diam. 6 mm.

Okinoshima, province Tosa (Y. Hirase).

A fine, handsome species, easily known by its strong sculpture,

which finds no parallel among known Japanese *Clausiliidæ*. It is allied to *C. Fultoni* Sykes, described from Kinnayama, Shikoku Island, a species with fine striation.

Family PUPIDÆ.

Bifidaria armigerella var. *luchuana* nov. Pl. XXVIII, fig. 54.

Shell similar to *B. armigerella* (Reinh.), but with an infra-parietal lamella developed. Length 2.25, diam. 1.2 mm.

Kunchan, Okinawa (types No. 80,992 Coll. A. N. S. P., from No. 619*b* of Mr. Hirase's collection), and Yayeyama (No. 619 of Mr. Hirase's collection).

The type lot contains one sinistral specimen. *B. armigerella* (Reinhardt) is described and figured as with but two teeth on the parietal margin, evidently the angular and parietal lamellæ. It is from Misaki, in the province of Sagami.

Vertigo Hirasei Pilsbry. Pl. XXVIII, fig. 53.

Pilsbry, Nautilus, XIV, p. 128 (March 1, 1901).

Shell very minute, openly rimate, ovate, brown, glossy, somewhat transparent, faintly striatulate. Whorls $4\frac{1}{2}$, the last a little contracted and straightened near the aperture. Aperture truncate-ovate; peristome thin, hardly expanded, the outer margin straightened but not inflexed to form a sinulus, although it projects forward in a slight point or angle, visible when viewed in profile. Parietal wall bearing a rather strong lamella in the middle; columella with a somewhat smaller lamella; palatal plicæ two, near together, the lower larger, elongated, the upper tubercular, sometimes obsolete.

Alt $1\frac{2}{3}$, diam. 1 mm.

Yanagawa, province Chikugo, Kiushiu Island (Mr. Y. Hirase).

Types No. 79,738 Coll. A. N. S. P., from No. 570 coll. Hirase.

Belonging to the *V. modesta* group, this species is smaller than its allies. As in some forms of *V. modesta*, the upper palatal fold is sometimes obsolete. The only other Japanese *Vertigo* described, to my knowledge, is *V. hydrophila* (Reinh.), from the opposite end of the empire, Hakodate, Hokkaido Island. Reinhardt's species belongs to the group of *V. ovata*, and has five or six teeth. It is about the size of *V. Hirasei*, measuring $1\frac{3}{4}$ by 1 mm.

REFERENCE TO PLATES XXV, XXVI, XXVII, XXVIII.

PLATE XXV, Figs. 1, 2, 3.—*Clausilia (Euphædusa) Tryoni*. Hachijo Island.

Fig. 4.—*Clausilia (Euphædusa) Hungerfordiana*. Nara, Yamato.

Fig. 5.—*Clausilia (Euphædusa) monelasmus*. Kayabe, Ojima.

Figs. 6, 7, 8.—*Clausilia (Euphædusa) euholostoma*. Mikuriya, Suruga.

Figs. 9, 10.—*Clausilia (Reinia) variegata* var. *nesiotica*. Hachijo Island.

Figs. 11, 12.—*Clausilia (Reinia) variegata* A. Ad. Takasaki, Kozuke.

PLATE XXVI, Figs. 13, 14, 15.—*Clausilia (Hemiphædusa) perignobilis*. Okinoshima, Tosa.

Figs. 16, 17, 18.—*Clausilia (Hemiphædusa) harimensis*. Kashima, Harima.

Figs. 19, 20, 21.—*Clausilia (Hemiphædusa) harimensis*. Clausilium. Fig. 19, profile view from columellar side; fig. 20, view of interior face, tilted to show shape of the apex; fig. 21, the same, showing posterior emargination, the apical end foreshortened.

Figs. 22, 23.—*Clausilia (Megalophædusa) Hiraseana*. Clausilium. Fig. 22, showing shape of apex; fig. 23, shape of posterior end, the apical end foreshortened.

Figs. 24, 25, 26.—*Clausilia (Megalophædusa) Hiraseana*. Fig. 26, natural size.

PLATE XXVII, Figs. 27, 28, 29, 30, 31.—*Clausilia (Hemiphædusa) gracilispira*, green specimen. Fig. 30, showing form of the apex of the clausilium; fig. 31, the posterior emargination.

Figs. 32, 33, 34.—*Clausilia (Hemiphædusa) gracilispira*, reddish specimen.

Fig. 35.—*Clausilia (Tyrannophædusa) mikado*.

Figs. 36, 37.—*Clausilia (Tyrannophædusa) iotaptyx* var. *clava*.

Fig. 38.—*Clausilia (Tyrannophædusa) iotaptyx*.

Figs. 39, 40.—*Clausilia (Zaptyx) hachijoensis*.

PLATE XXVIII, Figs. 41, 42, 43.—*Clausilia (Hemiphædusa) micropeas*.

Figs. 44, 45, 46.—*Clausilia (Hemiphædusa) micropeas*, Clausilium. Fig. 44 showing shape of apex; fig. 45, profile from columellar side; fig. 46, shape of posterior end, the distal end foreshortened.

Figs. 47, 48, 49.—*Clausilia (Hemiphædusa) micropeas* var. *hokkaidoensis*.

Figs. 50, 51, 52.—*Clausilia (Hemiphædusa) micropeas* var. *perpallida*.

Fig. 53.—*Vertigo Hirasei*.

Fig. 54.—*Bifidaria armigerella* var. *luchuana*.



Pilsbry, Henry Augustus. 1901. "Additions to the Japanese Land Snail Fauna, IV." *Proceedings of the Academy of Natural Sciences of Philadelphia* 53, 465–485.

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