FURTHER NOTES ON THE FRESH-WATER SHELLS OF TASMANIA,

(With a description of New Species)

BY

ROBERT M. JOHNSTON.

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INTRODUCTORY.

The publication of the Rev. J. E. Tenison-Woods' paper, in enabling collectors to determine and compare the catalogued fresh water species with those in their immediate neighbourhood, has been most valuable, and has given a healthy impetus to local observation. As the list, however, was only published by the Society but a year ago, it cannot be expected that any considerable addition could have been made to our knowledge in this particular study since that time. Still, as the types for the various species were mainly derived from southern habitats, it is possible that some varieties peculiar to northern Tasmania may have escaped notice, and consequently there may be a difficulty in the exact specific determination of certain of our northern varieties. Indeed, I find, with respect to *Physa*, *Lymnea*, and *Bithynella*, that the difficulties in the way of classification are very great, because of their extreme variability even in the same habitat. This difficulty is, unfortunately, increased where the full range of variability may have escaped the classifier's notice. Perhaps it is owing to this that Mr. Brazier's two species—*Paludestrina Legrandiana* and *P. Wisemaniana*, so far as written description is concerned, could not be identified by Mr. Woods, who could have scarcely failed to recognise them from Mr. Brazier's description had he seen the most common species from northern habitats. I am fully convinced, from a careful examination of the living shells in the neighbourhood of Launceston, that *Paludestrina Legrandiana* (Brazier), *P. Wisemaniana* (Ibid), *Bithynella unicarinata* (Tenison-Woods), *B. Tasmanicus* (Ibid), are simply the chief varieties of one species. As the classifier, who has frequently to be content with dead specimens and a meagre show of varieties, may find it difficult sometimes to know what may constitute permanent characteristics, it may be of some use to state my observations with respect to certain characters which, in my opinion, are very inconstant.

In the first place, I have noticed that the keel membrane characteristic of *B. unicarinata* (Tenison-Woods) and *Paludestrina Legrandiana* (Brazier) is not a reliable character. In the swamp drains, in Launceston, the four *varieties* may be

obtained in myriads on the submerged leaves of Triglochin and Potamageton. Indeed, varieties may be found abundantly which shade off imperceptibly from one to the other of the chief varieties. Again, size and degree of transparency, whether due to the shell or its covering, are very deceptive, as I find that, in the same neighbourhood, a particular species, as it approaches brackish or salt water, becomes thinner, more transparent, and, frequently, reduced to half the fresh water size. The aspect of certain shells is also much affected by local causes. Thus, shells in still water, fresh, where much dead wood is found, are invariably covered with a dark coat, and the shell is usually more solid. Where the water plants, Triglochin and Potamageton, abound, the shell becomes coated with a rusty brown color from decomposed vegetable matter.

Those shells which adhere to stones more or less exposed to the direct rays of the sun, are frequently bleached white, and become more solid in shell structure, and sometimes very brittle.

In the 1st Basin, Launceston, I have noticed that a small shell, which answers essentially to the description *Bithynella Legrandi* (Tenison-Woods), mimics closely the color of the rock upon which it adheres. There generally it is found with a white shelly lip. Perhaps this mimetic tendency may help to explain the extreme variability of the genus *Bithynella*, which is undoubtedly the most prolific fresh water genus in Tasmania. It is also the most generally distributed shell, and is found from the sea to 3000 feet above its level. *Physæ* and *Pisidia*, however, have a greater vertical range, as certain species of *Physa* and *Pisidium* abound in Youl's Lake, Ben Lomond, 5070 feet above sea level. The species are, however, very stunted at that height.

Although I shall presently describe one or two peculiar and remarkable shells—one of them, at any rate, of a rare genus hitherto known as confined to America and Cuba—yet, when we consider the wonderful minuteness of fresh water shells, the paucity of collectors, and the vast regions yet unexplored in Tasmania and Australia, it would be unwise to make wide generalisations upon our limited collections, however tempting it may be for individual observers to so. As yet, I believe, we are a long way off that completeness of knowledge of the fresh water shells of Tasmania to justify anyone in considering that our fresh water shells are exceptionally distinct from neighbouring regions, where, possibly, the same lack of knowledge also prevails.

As an illustration of how a classifier may be misled by

inconstant characters, I may refer to Mr. Woods' statement with respect to *Physa ciliata*—"*This ciliated form is quite exceptional in the genus, only one other being found in India.*" So far from being exceptional in Northern Tasmania, I have found the reverse to be true. Nearly all the species of *Physa* are ciliated, especially in young individuals, in the following localities, viz.: North and South Esk Rivers, Avoca, Distillery Creek, Racecourse Creek, Launceston; Lamont's Creek, Punch Bowl, Kerry Lodge Creek, Pools, St. Leonards; and First Basin, Deloraine; Circular Head, George Town. I have since learned, from Mr. Woods himself, that a ciliated shell, closely allied to a Northern species, abounds in the neighbourhood of Melbourne, thus adding another link to the fresh water fauna of the two near though isolated regions. It may be allowed, therefore, that the presence or absence of ciliæ is a very unreliable character. The ciliæ, as a rule, are so remarkably delicate that the mixing up of several specimens in the same box is apt to rub off every trace of those beautiful ciliated lines so conspicuous on the surface of the shell when carefully removed from the water.

I have noticed that in the young shell of *P. Diemenensis* (Sow.), the ciliæ are usually in two or three contiguous rows on the crown of the whorl immediately below the suture. In another species which I have not yet satisfactorily determined, I have counted as many as 25 rows disposed also in transverse curves on the last whorl. Sometimes, when washed off, the former growth of ciliæ has left a permanent wavy decussate structure on the transparent pale horny shell. This feature is another point which Mr. Woods states is peculiar in an Indian species. When we consider the delicacy of the ciliæ it is easy to understand that dead specimens, frequently handled or rubbed against each other, would reveal no trace to the classifier. Hence I maintain that the character is unreliable for classification purposes.

I have found a specimen of *Pisidium Tasmanicum*, with a white silvery-ciliated umbo, near Avoca. From Christchurch, New Zealand, I obtained a single specimen of a *Bithynella*, collected by Mr. T. R. Atkinson, and, although the lip is imperfect, I am satisfied that it is closely allied to *B. Tasmanica* (Tenison-Woods).* This, again, may prove another link in the distribution of fresh water shells.

In regard to limited distribution of peculiar forms, it must be borne in mind that fresh water shells hybernate during a

* Mr. Woods, subsequently to the reading of this paper before the Royal Society of Tasmania, had come to a similar conclusion, in referring, with others, the N.Z. species to *B. coralla* (Gould).

portion of the year; that the mature shells are rarely found on the shallow margins of lakes or pools, where collectors are often obliged to obtain their specimens; that the young of various species differ very materially in ornament and general form from mature specimens; that such a remarkable form as *Gundlachia petterdi (mihi)*, only 2 and 3 *mil.* long., and being transparent, is not to be found, even where conditions are favorable, without the aid of a keen experienced eye; and therefore, when we take all things into consideration (not forgetting the paucity of experienced collectors), we ought to be assured that the various districts have been fully worked up before instituting final comparisons with distant regions. Even then, the recent fossil deposits of fresh water shells on Barren and Badger islands show how important connecting links in time and space may easily be overlooked or ignored. It must be remembered that contiguous, though completely isolated, pools may easily be stocked with certain fresh water shells where the conditions are favorable.

That wonderful observer, Mr. Darwin—whose care and patience are such that nothing important, however apparently trivial, escapes his notice—writes:—"Some species of fresh water shells have a very wide range, and allied species, which, on my theory, are descended from a common parent, and must have proceeded from a single source, prevail throughout the world. Their distribution at first perplexed me much, as their ova are not likely to be transported by birds, and they are immediately killed by sea water, as are the adults. I could not even understand how some naturalized species have rapidly spread throughout the same country. But two facts throw some light on the subject. When a duck suddenly emerges from a pond covered with duckweed, I have twice seen these little plants adhering to its back; and it has happened to me, in removing a little duckweed from one aquarium to another, that I have quite unintentionally stocked the one with fresh water shells from the other. But another agency is perhaps more effectual. I suspended a duck's feet, which might represent those of a bird sleeping in a natural pond, in an aquarium where many ova of fresh water shells were hatching; and I found that numbers crawled on the feet, and clung to them so firmly that, when taken out, they could not be jarred off. These just-hatched molluscs, though aquatic, survived on the duck's feet, in damp air, from twelve to twenty hours; and in this length of time a duck or heron might fly at least six or seven hundred miles, and would be sure to alight on a pool or rivulet if blown across sea to an oceanic island, or to any other dis-

tant point. Sir Charles Lyell also informs me that a Dytiscus has been caught with an *Ancylus* (a fresh water shell like a limpet) firmly adhering to it; and a water beetle of the same family, a Colymbetes, once flew on board the 'Beagle' when forty-five miles distant from the nearest land. How much further it might have flown with a favouring gale no one can tell."

Where local conditions are favourable for the support of certain fresh water shells, it follows, from the remarks of the learned naturalist, that there is no reason why isolated pools throughout Tasmania may not be interstocked by means of beetles and birds. The paucity or richness of local feed, with difference in altitude, etc., will be sufficient to effect modifications from the parent type form such as we are accustomed to see in Tasmania. I may, therefore, prior to describing the new forms, sum up these few introductory remarks by stating that, in my opinion, when the laws which, according to our best authorities, determine the distribution and relation of forms elsewhere, seem not to be able to explain certain anomalies in the distribution of certain forms in Tasmania, that the cause is more likely to be due to hasty inference or the imperfection of material for the formation of sound opinion than that the wide, well-considered, and unanimous verdict of our best authorities should be mistaken. I am not, however, aware that there is anything anomalous in the distribution of the fresh water shells of Tasmania; although I am persuaded that the meagre, isolated *collections* in a new country should produce many forms which, because of the gaps, would seem very exceptional.

New Species.

(Sizes given in Millimetres.)

Gundlachia. (Pfeiffer.)

Shell thin, obliquely conic; apex inclined posteriorly; base closed for two-thirds by a flat horizontal plate; aperture semicircular. (*Woodward's Moll.*, p. 303.)

Gundlachia Petterdi. *n. s.*

Shell minute, thin, pale horn, diaphanous, spirally oblong in two distinct tiers, apex obliquely inclined posteriorly, concentrically striate and crossed by fine radiating liræ, apical tier more incrusted with confervoid matter, and appearing partially and obliquely exserted upon the basal tier; projecting portion of apical tier as well as one-third of the basal one closed by a flat horizontal plate, all in the plane of the original aperture of apical tier; outer aperture broadly ovate; lip of basal tier continuous, although modified at junction with apical tier; inner aperture semicircular, and

determined to a great extent by the original aperture of apical tier; inner lip with slightly raised rim continuous, simple. In the young state the shell is simple, and resembles the common *Ancylus* in the same neighbourhood. Long. $2\frac{1}{2}$—3, lat. $1\frac{1}{2}$—$1\frac{3}{4}$, alt. $\frac{1}{2}$—$\frac{3}{4}$. Animal pale yellowish, with broad roundish muzzle, two short subulate tentacles; eyes sessile behind tentaculæ; mouth with dark serrated horny jaws, tongue linear, oblong, teeth numerous, 96 rows $\frac{15}{18}$—1—$\frac{15}{18}$; laterals equal, hooked, and inclined away from saddle-shaped medial, as in *Avicula* (see p. 303, *Woodward*). Habitat, on dead leaves in a pool, 1st Basin, Launceston; isolated from the South Esk.

This is a most interesting genus, hitherto confined to America and Cuba. The Tasmanian species differs from the Cuban one, *G. ancyliformis*, in being smaller, and, relatively to length, broader; the former being three times as long as it is broad, the latter scarcely twice as long as it is broad. It also differs in the position and shape of inner aperture, the Tasmanian species being more central and more rounded anteriorly. An examination, under the microscope, of the animal proves that it is closely allied to *Ancylus*. The teeth in the latter are simply fewer and larger. Both *Gundlachia Petterdi* and *Ancylus Woodsii* feed on diatomacea. I found large numbers of the frustules of various species in their stomachs. I have dedicated the species to Mr. Petterd, who has materially enriched our Tasmanian collections.

Amnicola. Gould and Haldemann, 1839.

Shell ovate, conical turbinated, covered with an epidermis, not perforated; spire acute; whorls few, rounded; aperture large, orbicular, and straitened backward; peristome continuous, outer margin thin, simple; operculum horny, spiral or paucispiral.

Amnicola launcestonensis. *n. s.*

Shell solid, small, globosely conical, with a short, somewhat acute, spire; epidermis dark, granular; whorls $4\frac{1}{2}$, convex, rapidly decreasing; body whorl much inflated, forming two-thirds of the whole length of shell; suture deeply impressed, aperture widely ovate, peristome continuous, outer lip slightly reflexed, inner lip obliquely reflexed against body whorl, causing a faint approach to an umbilicus; throat bluish white, shelly; operculum horny, paucispiral. Diam.—Max. 5 mil., min. 3 mil. Habitat—Still water, though in communication with the South Esk; in caverns, cataract, Launceston.

I have somewhat doubtfully referred this species to the

sub-genus *Amnicola*. Woodward makes it a sub-genus of *Melania*, while in Chenu's work it is referred to *Paludina*. From examination under the microscope I find that the muzzle tentaculæ and foot more closely resemble *Paludina;* while the long, narrow, linear band (twice as long as in any of the genus *Bithynella*) of 120 rows of 3—1—3 denticulated teeth, relates it more closely to *Melania*. The eyes, however, are sessile on the outer base of tentacles, which, as well as the transversely wrinkled and projected muzzle, are tinged more or less with dark blue, as in *B. unicarinata* (Tenison-Woods). The shape of shell closely imitates the genus *Ampullaria*, but the animal has not the tentacular muzzle, the shortly-stalked eyes, nor the shelly operculum of that genus. In many respects it approaches the genus *Valvata*; but as the aperture of shell is considerably modified by last whorl, I think the reference to *Amnicola* to be most suitable.

Ancylus Woodsii. *n. s.*

Shell small, oblong, ovate, white, transparent, depressedly obliquely conical; concave posteriorly, convex anteriorly, apex subcentral, concentrically striate and crossed by faint distant radiating liræ; epidermis not visible or absent, surface dotted with very minute transparent bluish-white egg-like bodies. Long. $2\frac{1}{2}$—3, lat. 2, height $\frac{1}{2}$. Animal and teeth almost similar to *Gundlachia Petterdi*. Habitat—South Esk; Meander, Deloraine; Avoca, Launceston; common on the submerged living leaves of Triglochin.

A very minute shell, and distinct from the other two described species, easily recognised by its size, flatness, and apex position.

Var. A. Shell larger than the above, pale horny, rounded on side most distant from apex. Long. $5\frac{1}{2}$, lat. 3, height 2. Isolated pool, St. Leonards; periodically connected with North Esk flood waters.

Var. B. Shell narrowly oblong, pale horn, apex more elevated than ordinary type. Long. $3\frac{1}{2}$, lat. 2, height 1. Pool, St. Leonards.

Var. Y. Shell more solid, with black epidermis. Long. $3\frac{1}{4}$, lat. 2, height 1. Hobart Town. Mr. Petterd.

Ancylus Tasmanicus. (Tenison-Woods.)

Var. A. Thin pale horn. 1st Basin, Launceston.

Bithynella nitida. *n. s.*

Shell small, elongate pyramidal, somewhat solid, pale flesh color, shining; spire acute; whorls 6, rounded; aperture ovate; peristome continuous; margin very slightly thickened and reflexed, free from body whorl. Long. 3, lat. $1\frac{3}{4}$—2. Fossil, Thunder and Lightning Bay, Barren Island.

Pomatiopsis Badgerensis. *n. s.*

Shell pyramidal, generally decollate, thin, scarcely opaque, pale fleshy white, inside tinted reddish brown; whorls, prior to being decollated, usually 7, subsequently average 5; decussate with irregularly raised liræ, and indistinct varices; suture deeply impressed, aperture roundly ovate, peristome continuous, margin somewhat thickened, inflated, and reflected; inner lip conspicuously reflected. Long. 10, lat. $3\frac{1}{2}$—4. Fossil, Badger Island. A much larger shell, and very distinct from *P. striatula*. Menke.

Planorbis atkinsoni. *n. s.*

Shell minute, irregularly flatly discoid, with an open shallow umbilicus, and sunken nucleus; whorls 4, angled, rapidly increasing, depressed; preceding whorls embraced, and slightly sunk in the last; last whorl flattened irregularly above, slightly convex below; somewhat obsoletely keeled above at abrupt expansion near suture, and constricted and sharply keeled at periphery; surface finely, obliquely arcuately striate; aperture nearly two-thirds of the breadth of shell, obliquely and narrowly cordate-acuminate, with channel formed by the sharply keeled periphery, and two grooves anteriorly and posteriorly formed by the projecting keel of preceding whorl; margins simple, approaching, and obliquely connected by a more or less distinct callus; upper margin obliquely produced. Diam., max. 5, min. $3\frac{1}{2}$, alt. 1. Habitat, common on leaves of Triglochin, South Esk, from Avoca to Launceston.

This shell is very distinct from *P. tasmanicus* (Woods), the whorls of which are not flattened above, although there is in most specimens from Circular Head a slight approach to a keel. It seems to approach *Anisus kermatoides* (D'Orb.); the concave flattened sides are, however, reversed in the Tasmanian species. Dedicated to Mr. T. R. Atkinson, of Launceston, an enthusiastic conchologist.

Planorbis scottiana. *n. s.*

Shell discoidal, very minute, thin, pale horny, somewhat flattened above and below; whorls 4, depressedly rounded, finely transversely striated, regularly increasing; suture moderately sunk; aperture obliquely raised, roundly lunate; peristome simple. Diam., max. $2\frac{1}{2}$ mil., min. 2 mil., height $\frac{1}{2}$ mil. Habitat, restricted to the same isolated lagoon in which *Gundlachia petterdi* is found. It differs greatly from *P. tasmanica* and *P. atkinsoni* in size and form.

I have dedicated this species to the memory of the late Hon. J. R. Scott, who was an enthusiastic naturalist, and did much for the natural history of Tasmania.

REMARKS ON SPECIES ALREADY DESCRIBED, AS REGARDS DISTRIBUTION, ETC.

ANCYLUS	CUMINGIANUS.	Bourg.	Not seen in the northern part of Tasmania.
,,	tasmanicus	Ten.-Woods	Pale horn variety. 1st Basin, Launceston.
LYMNEA	tasmanica	do.	Not seen in the North.
,,	huonensis	do.	Ditto ditto
,,	Hobartonensis	do.	Both abundant near Launceston. They are very variable in size and shape, and run into each other. I think they are merely varieties of the same species.
,,	Launcestonensis	do.	
,,	sp.	do.	Fossil. Badger Island. Too imperfect for description.
PHYSA	aperta	do.	Not seen in the North.
,,	eburnea	Sowerby	Invariably ciliated in all the creeks when fresh, common.
,,	mamillata	do.	These I believe to be varieties of the same species. Intermediate varieties occur in Little Hampton Lagoon, frequently ciliated.
,,	ciliata	Ten.-Woods	
,,	nitida	Sowerby	Varieties occur in the creeks about Launceston, closely approaching the description given.
,,	Bruniensis	do.	Not seen in the North.
,,	Vandiemenensis	do.	Common, 1st Basin, Launceston, ciliated, 3 rows on crown in young state.
,,	huonensis	Ten.-Woods	Not seen in the North.
,,	legrandi	do.	Abundant in all creeks in the north. Very variable in size, shape, and color.
,,	tasmanica	do.	
,,	tasmanicola	do.	Doubtful.
,,	huonicola	do.	Ditto.

With respect to the Tasmanian genus it is interesting to notice that *P. tasmanica*, when examined by me, showed a most peculiar arrangement of the lingual teeth. The medials are 2-cuspid, the laterals 4-, 5-, and 6-cuspid; the extreme ones having a resemblance to the closed digits of the hand.

BITHYNELLA.

There is some confusion with respect to the shells classed under *Paludestrina*, by Brazier, and under *Bithynella*, by the Rev. J. E. Tenison-Woods. The latter classifies them under

Bithynella, because the opercula in specimens examined by him were partly shelly. I have never met with a shelly operculum in the North. In fact, the Tasmanian species is intermediate between the *Littorinidæ* and *Paludinidæ*. The animal resembles *Paludina* in the long slender tentaculæ, foot, and short linear tongue, of 3—1—3 denticulated teeth (about 54 rows). It inclines to *Littorina* in the almost sessile eye lobes, and in the horny pauci-spiral operculum. The species are most variable, according to the altered conditions which affect them. The degree of brackishness has a marked effect upon them. *B. unicarinata* (Tenison-Woods), in the drain near to the Railway Station, has 6 whorls, moderately thick shell, covered with the reddish decomposed confervæ. About a mile distant, where the water is still more brackish, the same species is very delicate pale horn, transparent, 6 whorls, and not one-half the size of the larger species. The carina of epidermal membrane is never constant. Sometimes, in awl-shaped hardened spines, as in *P. legrandiana* (Brazier); in interrupted lines, as in *Bithynella unicarinata* (Tenison-Woods); in continuous lines, simple; in continuous or interrupted lines, fimbriated; and most frequently without any apparent carina, as in *Bithynella tasmanica* (Tenison-Woods), or its synonym, *Paludestrina wisemaniana* (Brazier). In fact, I am inclined to the opinion, as already stated, that the following four shells are merely varieties of one species:—

Bithynella unicarinata (Tenison-Woods).
Paludestrina legrandiana (Brazier).
Ditto wisemaniana (Ditto).
Bithynella tasmanica (Tenison-Woods).

And the following may be considered distinct species, although they are extremely variable:—

Bithynella legrandi	Ten.-Woods	1st Basin, common.
,, dulvertonensis	do.	Not seen in the North.
,, huonensis	do.	George Town Heads, Sorell, Circular Head.
,, dunrobinensis	do.	Doubtful.
Pomatiopsis striatula	Menke	Not seen about Launceston.
Assiminea tasmanica	Ten.-Woods	Ditto ditto.
Planorbis tasmanicus	do.	Not seen about Launceston, but have received specimens in abundance from Circular Head, where they were obtained by Mr. T. R. Atkinson. The aperture, however, is slightly angled at outer edge.

Unio moretonicus	Reeve	Most common in all streams.
Ditto sp.		Fossil, Launceston tertiary Basin.
Pisidium Tasmanicum	T.-Woods	Abundant in all streams. St. Leonards, 1st Basin, Lake Youl, Ben Lomond, Avoca.
Ditto dulvertonensis	do.	George Town Lagoon, York Plains, Little Hampton Lagoon.
Cyclas tasmanicus	do.	Not seen.