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SOME REMARKS ON THE MOLLUSCA OF LAKE TANGANYIKA.

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This interesting subject, the molluscan fauna of Lake Tanganyika, has been much discussed during the last few years, especially by Mr. J. E. S. Moore, and the final results of his investigations are embodied in his work "The Tanganyika Problem." To the uninitiated the study of this fauna is quite a limited matter, involving, according to Mr. Moore, the consideration of only forty-six species of molluscs belonging to twenty-eight different genera.[1]

This apparent simplicity rapidly vanishes as soon as a serious investigation is made of the literature which has been published upon this subject. The late M. Bourguignat was the chief cause of all the difficulty, having multiplied both the genera and species in an absurd manner. Speaking of this writer, Mr. Moore[2] observes, "the characters which were used by this author as sufficient to define species and genera have not generally been held to be valid, even in a conchological sense; they throw no light on the matter in hand, and it is not necessary to discuss them further here." This is a very simple method of dealing with a most difficult subject, but will not be accepted by the systematist. Bad and useless as many of the species and even some of the genera may be, still they have to be considered, and an endeavour must be made to give to them their proper rank as good species as understood by most conchologists, or to relegate them to their true position as varieties or synonyms. To do this is one of the objects of the present paper. M. Bourguignat has described 242 species, and of these only 13 appear in Mr. Moore's list! Surely the remaining 229 are not *all* synonyms. His genera are 21 in number, of which only four are quoted in "The Tanganyika Problem." I quote these facts so as to show the general reader that the study of the molluscs of this lake is not the limited affair he might conjecture from a perusal of Mr. Moore's book. In addition, there are other writers besides M. Bourguignat whose works or names are not even mentioned by Mr. Moore. MM. Ancey, Giraud, Grandidier, Mabille, Martel, and Dautzenberg have described seventeen so-called species between them. Moreover, Professor E. von Martens has published

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[1] "The Tanganyika Problem," p. 138.

[2] Loc. cit., p. 220.

several species of which no cognizance is taken, and the writings of Pelseneer and Nicolas also are not referred to.

In the second place I propose to offer a few observations on the supposed resemblance between some of the 'halolimnic' species and the Jurassic fossils with which they have been compared, and in this place I may call attention to the fact that M. Bourguignat had, long before the invention of the compound 'halolimnic,' employed the term 'thalassoid' with reference to these Tanganyika shells. Thalassoid is a very descriptive word, and it is a pity, if its use in connection with these molluscs was known to Mr. Moore, that it was not adopted. It has been used by Professor von Martens and others.

It might be interesting, if not useful, to speculate upon the cause of so many shells from this lake having this marine aspect. Can the quality of the water, as hinted at by Bourguignat (ii, p. 78), have anything to do with it, or, as with a few exceptions all appear to be littoral or shallow-water forms, have these thick shells been developed to withstand the rough usage of the surf during storms? It does not follow, even if these species are the descendants of ancient marine types, that they should have thick shells. Many fresh-water species have excessively strong shells, *Unios* for example, whereas others, which may be found in the same rivers, are very thin. It is the same with many marine genera. Some of the species are strong and thick, whereas others are comparatively thin; but it is generally recognised that species found on the shores between tide-marks and in shallow water have stronger shells than those found in greater depths beyond the reach of the waves' action. If the fact of these Tanganyikan shells being met with near the shore has anything to do with their solidity, we might expect to find the same thing obtain in other large lakes, such as Nyassa and the Victoria Nyanza, but, with the exception of one or two species in the former, such is not the case. There must therefore be some other reason for this thickened thalassoid character, and it may be that they are, as supposed by Mr. Moore, the descendants of some very ancient stock which have retained in an exceptional degree their marine facies. The thalassoid genera comprise those forms which are found only in Tanganyika and have more or less the appearance of being of marine origin, and it is curious that, as far as we know them, they are restricted to the Gastropoda. None of the Pelecypods exhibit other than a fresh-water aspect. The Gastropod genera are about twenty-three in number, exclusive of about ten others which I consider synonyms. Only of nine of these do we know anything of the soft parts, and that almost exclusively from the investigations of Mr. Moore and Miss Digby. It will be interesting to know the conclusions which may be arrived at when these same forms have been investigated by others, as they certainly will be some day. The genera which have been studied are *Tiphobia*, *Bathanalia*, *Chytra*, *Limnotrochus*, *Bythoceras*, *Paramelania*, *Tanganyicia*, *Lavigeria* (= *Nassopsis*), and *Spekia*, and the following still remain to be investigated, namely, *Bridouxia*, *Baizea*, *Syrnolopsis*, *Anceya*, *Giraudia*, *Joubertia*, *Randabelia*, *Leroya* (?), *Edgaria*, *Hirthia*, *Stanleya*, *Rumella*, *Lechaptoisia*, and *Burtonilla*. Of these *Randabelia*, *Joubertia*, and

Edgaria will probably prove closely related to *Lavigeria*, and *Leroya* may be merely a solid form of *Lanistes*, as suggested by Dr. von Martens. Most of the remainder are quite small forms, and it will certainly be a very long time before their complete history is known. It therefore becomes mere conjecture to suppose that they bear any relationship with marine forms, either living or extinct, merely because they have a thalassoid appearance. Many fresh-water shells in other parts of the world have this same facies. A good example of this solid marine aspect is met with in the so-called *Melania brevis* of D'Orbigny, from the rivers of Cuba. A feature common to this species and the Tanganyikan thalassoid shells is the feeble development of the periostracum, it being in some apparently entirely absent, whilst in others it is extremely thin or hardly noticeable. In considering the supposed resemblance between some of these Tanganyikan shells and certain Jurassic fossils, I will take the species in the order in which they occur in "The Tanganyika Problem."

1. Paramelania Damoni and Purpurina bellona.

There certainly is a very strong resemblance in this case, and I must agree with Mr. Moore that the two forms appear to be generically inseparable, but I cannot endorse the opinion which, according to Mr. Moore's work, I am supposed to have expressed, that "even within a specific range, there is no valid conchological distinction" between them. Slight differences in the general form, in sculpture, and the aperture, preclude such a decision. But this species of *Paramelania* has also been considered by Mr. C. A. White and Dr. Leopold Tausch as belonging to the fresh-water genus *Pyrgulifera*, which occurs in the Bear River Laramie beds of Wyoming and Utah, and also in the Upper Chalk at Ajka in Hungary, and I must confess that there is little to distinguish these fossils generically from *Paramelania*. One species, especially *Pyrgulifera Pichleri*, displays all the features of the Tanganyikan shell in a remarkable manner. The general form and character of the sculpture is of the same type in both, and the apertures are quite similar, both having continuous peristomes and a peculiar effusion at the anterior end. It is interesting to again call attention to the similarity of these lacustrine forms, because we should rather expect to find a fossil representative of the Tanganyikan shell in these Cretaceous deposits than in the older Jurassic formations.

2. Nassopsis nassa and Purpurina inflata.

The shell depicted by Moore appears to be the *Lavigeria coronata* of Bourguignat, and it certainly is not the *Melania nassa* of Woodward. I should here mention that the genus *Nassopsis* is a synonym of *Lavigeria*, which has two years' priority.

The genus *Lavigeria* I do not consider the same as *Purpurina*, for it differs in having a tubercular prominence on the columella, which seems to be entirely absent in the fossil form.

If we admit that both *Paramelania* and *Nassopsis* are congeneric with *Purpurina* we are placed in a very awkward position. These

two forms are known to be anatomically distinct, and therefore it becomes certain that they cannot both be the same as *Purpurina*. However, as I have above observed, I consider *Nassopsis* (= *Lavigeria*) distinct.

3. Bathanalia Howesi and Amberleya.

These two forms are very similar in general outline, but differ in the former being umbilicated, and having a thin continuous peristome. *Amberleya* is imperforate, and the columellar margin of the peristome is thickened and reflexed. I may mention that Mr. Moore's figures of *Bathanalia* both in the Quarterly Journal of Microscopical Science and in "The Tanganyika Problem" have this margin of the aperture reflexed in an exaggerated manner, so that it does somewhat resemble that of *Amberleya*. I do not propose to assert that the fact of *Bathanalia* being umbilicated distinguishes it generically from *Amberleya*, but merely point it out as a feature which, in conjunction with the other difference referred to, seems to indicate that these ancient and recent forms are not the same. Something more than a mere general resemblance is wanted before we can say that such genera as these are identical. I may add, however, that if we knew that the animals of the shells in question were similar, there would be no attempt to part these forms on conchological grounds, but as we have not this knowledge it seems to me very hazardous to unite them, more especially considering the countless ages which have passed since Jurassic times.

4. Limnotrochus Thomsoni and Littorina sulcata.

In this case also the Tanganyikan shell is umbilicated and the *Littorina* imperforate, but the columellar margin of the peristome in the *Limnotrochus* is less reflexed and the whorls are spirally ridged, and without the longitudinal plicæ which are found in the *Littorina* referred to. Here, again, the shells do not offer any very striking differences, but still I should hesitate to unite them, as they do not absolutely agree in all respects.

5. Chytra Kirkii and Onustus.

The form of Oolitic *Onustus* with which Mr. Moore compares the Tanganyikan shell is radiately costate, whereas *Chytra* exhibits only spiral ornamentation. The peristome is not continuous, as in the latter form, nor is the lower margin of it deeply sinuated in the same manner. In one feature *Chytra Kirkii* differs entirely from *Onustus* (or *Xenophora*), namely, in the character of the operculum. In this respect it approaches certain forms of Littorinidæ, e.g. *Pagodus* and *Echinella*.

6. Spekia zonata and Neridomus.

In this instance, Mr. Moore observes that "the shells of the Tanganyika genus *Spekia* are practically indistinguishable from the fossil remains of the shells of the marine Jurassic genus *Neridomus*." This, in my opinion, is entirely wrong, as the character of the base

of the shell is quite different. I may here mention that the figure given by Mr. Moore of *Spekia* is nothing like that shell, and I can hardly believe that it was taken from it. *Neridomus*, or *Neritodomus* as emended by Fischer, is a globose shell with a convex columellar callus, such as may be observed in some species of Naticidæ and *Neritina*, whereas the most remarkable basal excavation in *Spekia* at once distinguishes that species. In this respect and in general form it bears a strong resemblance to *Lacunopsis Jullieni*, Deshayes, and *L. Harmandi* of Poirier, fresh-water forms from Cambodia, but probably the animals are very different; at all events, they do not agree in respect either of the radula or opercula.

7. Melania admirabilis and Cerithium subscalariforme.

In respect of these forms Mr. Moore writes:—"There is among the Gastropods of the halolimnic group a very remarkable and characteristic shell which Smith named *Melania admirabilis*. It is a Cerithoid form totally unlike any other living type which is known, but it has been found by comparison that it is practically indistinguishable from the Inferior Oolitic fossil known as *Cerithium subscalariforme*." I certainly cannot agree in the above opinion, and I have no hesitation in saying that, in this instance, the supposed resemblance is purely imaginary. The *Melania admirabilis* possesses all the characters of that genus, and is not unlike in style of sculpture certain other species, for example, *Melania cancellata*, Benson, *M. Henriettæ*, Gray, *M. Gredleri*, Bttgr., and others. Longitudinal costæ upon the whorls with spirals around the base of the body-whorl are features which occur in a considerable number of species. The aperture is exactly that of *Melania*, and bears no resemblance to that of *Cerithium*, which has a distinct anterior or basal canal, entirely wanting in true *Melanias*. All the specimens hitherto found of this species have been dead shells and devoid of epidermis. In this condition they have a less fluviatile appearance, and, being solid, they might at a first glance be mistaken for a marine form. However, the exact agreement with *Melania*, in every respect, leaves no doubt as to their true location. In regard to solidity and marine aspect I would again call attention to *Melania brevis*, D'Orbigny, from the rivers of Cuba, also to many species of fresh-water *Neritina*, the *Lithoglyphi* of the Danube, *Pachydrobia*, *Lacunopsis*, and *Jullienia* from Cambodia, *Melanopsis* from Syria, and the remarkable genus *Miratesta* from Celebes. All of these have quite as thalassoid an appearance as many of the Tanganyikan species.

8. Tiphobia and Purpuroidea.

This is the final comparison which Mr. Moore suggests with regard to these Tanganyikan shells, and, I must confess, it is a very unfortunate one. He observes, "*Tiphobia* of Tanganyika is matched by an Oolitic fossil genus, *Purpuroidea*, from which it is very difficult, if not impossible, on conchological grounds, to distinguish it." As a conchologist of some experience, I fail to perceive the great resemblance between these forms, and we might just as well compare

Tiphobia with some of the recent *Purpuras*. Besides being quite of thin texture, the Tanganyikan shell has a peculiarly prolonged rostrum, which is hollowed out or grooved on the inner side; moreover, the spines at the angle of the whorls are hollow and delicate, whereas in *Purpuroidea* the nodules in the same position are shorter and solid. The anterior canal in the latter genus is somewhat like that of *Purpura*, being shallow, broad, and short; in fact, I may say it bears no resemblance to the grooved rostrum of *Tiphobia*.

Thus we come to the conclusion of the consideration of these so-called 'halolimnic' forms with reference to their supposed Jurassic prototypes, and with what result? Of the eight genera discussed, one only, in my opinion, can be regarded as satisfactorily agreeing with the fossil form, namely, *Paramelania* with *Purpurina*, but this is the one instance, I have shown, in which the genus in question has a representative in a later period, namely, *Pyrgulifera* of Upper Cretaceous times.

With regard to the rest of the genera, I think it has been clearly demonstrated that, in my opinion, they do not correspond to the Jurassic forms from which they are said to be indistinguishable. In some cases they exhibit a general resemblance of outline, and that is all, but when we come to take into consideration their other characters, especially with regard to the aperture, we find so much difference, that it cannot be said that any one of them is absolutely identical with the Jurassic type.

That these Tanganyikan shells have had a marine ancestry, the same as other fresh-water shells, of course must be recognised, and that they may have retained a more thalassoid facies than others is possible, but that it can be said that they are indistinguishable from certain Jurassic types I cannot admit. Other lakes besides Tanganyika have their special faunas, including forms which are found nowhere else, for example, Lake Baikal and the Caspian and Aral Seas, and in all three we find living together both fresh-water and marine types.

Fresh-water molluscs do not, of course, form a natural class of themselves. The different families have their relationships with various marine groups, and this connection may be more or less intimate. Although they may have had common ancestors in remote ages, yet the divergence of characters existing between them at the present day precludes the possibility of affirming definitely their common origin. All fresh-water molluscs have had their position in the system of classification assigned to them, and in this connection I may refer to a few examples.

The genera *Clea* and *Canidia* appear to be closely allied to the marine *Nassas* and *Buccinums*; the *Melanias*, according to Bouvier, show a near relationship to the *Cerithia*; *Vivipara* should be ranged near the Turbinidæ and Trochidæ, *Ampullaria* is considered to come near the *Viviparas*, *Bithinia* has an affinity with *Littorina*, and *Valvata* with *Bithinia* and the Rissoidæ.

I merely refer to these relationships, in passing, to call attention to the fact that, whether thalassoid in aspect or not, the relationship of fresh-water shells with marine forms is a recognised fact. It is not,

therefore, at all remarkable that these Tanganyikan thalassoid species should in their anatomy exhibit more or less close similarity to marine families. *Tiphobia*, for example, is said to resemble *Xenophora*, *Strombus*, and *Capulus* as regards the radula, whilst, in respect of the nervous system, it approaches both *Melania* (*amarula*) and *Cerithium*. "The whole anatomy of *Chytra* is singularly like that of *Capulus*." *Paramelania* and *Bythoceras* are "regarded as a group of rather primitive Cerithoids," and "*Spekia* would in many ways appear to be very like a primitive *Rissoa*."

This now brings me to the conclusion of the introductory discussion of these most remarkable shells, which, I am well aware, is all too brief and superficial, but still it is the expression of opinion of a professional conchologist which can be compared with the results criticised. I will now give a short resumé of the species which compose the fauna of the lake, but before doing so I would call attention to a remarkable classification of the thalassoid forms published by H. Nicolas in 1899. From the fact that some of the genera had been placed in different families by various writers he resorted to the plan of placing the whole of the twenty-four genera which had been previously described in the single family Tanganyikidæ, which had been proposed by M. Nourry in 1897. The genera, he points out, have relationship with eight marine families, which he enumerates, and finally distributes them into the following ten groups or series, namely—Buccinopsidæ with *Bourguignatia* as the typical form, Nassopsidæ with *Paramelania*, Muricidopsidæ with *Tiphobia*, Trochodopsidæ with *Limnotrochus*, Neritopsidæ with *Spekia*, Rissopsidæ with *Horea*, Cancellopsidæ with *Lavigeria*, Naticidopsidæ with *Rumella*, Littorrinidopsidæ with *Stanleya*, and Pyramidellopsidæ with *Syrnolopsis*.

The absurdity of this classification at once becomes apparent upon a very slight investigation. Here we find *Bourguignatia*, which is generically the same as *Paramelania*, placed in one section, Buccinopsidæ, whilst *Paramelania* is located in Nassopsidæ. Moreover, it has been shown by Mr. Moore that this genus bears relationship to the *Cerithia*, so that these group names suggested by M. Nicolas are misleading with respect to the affinity of the form in question. The same may be said of all the other sectional names suggested by that author for genera which have been studied anatomically. *Lavigeria* (=*Nassopsis*), for instance, placed in Cancellopsidæ, has no relationship with *Cancellaria*, if that genus is referred to, *Tiphobia* has nothing to do with *Murex*, nor *Spekia* with *Nerita* or *Neritopsis*, *Limnotrochus* is not a *Trochus*, *Syrnolopsis* is not a Pyramidellid, and *Bathanalia* is not allied to the Turbinidæ. Of course, these sectional names were suggested to their author by the general form of the shells, but I must confess I do not see the resemblance in several cases; for instance, *Spekia* does not seem to recall *Nerita*, *Lavigeria* a *Cancellaria*, or *Paramelania* a *Nassa*. Here I may also refer to the classification proposed by Bourguignat (i), which was based on a collection brought from Tanganyika by M. Giraud. Here two new families are proposed, Hauttecœuridæ and Giraudidæ, the former to include the genera *Tanganikia* and *Hauttecœuria*, and the latter to include *Giraudia* and

Reymondia. Later, in another work (iii), he proposed the families Hylacanthidæ, instead of Tiphobidæ, for *Tiphobia*, and Syrnolopsidæ for *Syrnolopsis*.

The following table shows at a glance the genera of thalassoid forms which appear to me admissible, also the number of species described, and the number retainable. In considering some of the described species as synonyms, I very likely may have acted rashly, but in most cases I feel pretty confident that the decisions arrived at will eventually be maintained, whenever the opportunity occurs of studying the actual Bourguignat Collection at Geneva. For convenience sake the genera are given alphabetically :—

Genera admitted.	Number of Species described.	Number retained.	Genera admitted.	Number of Species described.	Number retained.
Anceya, Bourg.	2	2	*Lechaptoisia*, Ancey.	1	1
Baizea, Bourg.	2	2	*Leroya*, Grandid.	2	1
Bathanalia, Moore.	1	1	*Limnotrochus*, Smith.	3	1
Bridouxia, Bourg.	4	1	*Paramelania*, Smith.	5	3
Burtonilla, Smith.	1	1	*Randabelia*, Bourg.	2	2
Bythoceras, Moore.	2	2	*Rumella*, Bourg.	7	1
Chytra, Moore.	1	1	*Spekia*, Bourg.	7	1
Edgaria, Bourg.	42	10	*Stanleya*, Bourg.	3	3
Giraudia, Bourg.	14	8	*Syrnolopsis*, Smith.	8	2
Hirthia, Ancey.	2	2	*Tanganyicia*, Crosse.	34	1
Joubertia, Bourg.	3	3	*Tiphobia*, Smith.	4	1
Lavigeria, Bourg.	8	8			

The examination of the above table shows that 138 so-called species, distributed in twenty-three genera, have been described, but of these only about fifty-eight should, in my opinion, be retained.

Nine genera have been described which appear to be synonyms, namely :—

Bourguignatia, Giraud = *Paramelania*.
Cambieria, Bourg. = *Tanganyicia*.
Coulboisia, Bourg. = *Stanleya*.
Hauttecœuria, Bourg. = *Stanleya*.
Horea, Smith (preoc.) = *Lechaptoisia*.
Nassopsidea, Martens = *Edgaria*.
Nassopsis, Smith = *Lavigeria*.
Ponsonbya, Ancey = *Baizea*.
Reymondia, Bourg. = *Giraudia*.

In the following list all the important references are given, and, in order to economise space, some of the works referred to are indicated by numbers which will be found in the bibliography at the end of the paper.

I. THALASSOID FORMS.

Chytra Kirkii (Smith).

Limnotrochus Kirkii, Smith: iii, p. 426; ii, p. 286, pl. xxxiii, figs. 18–18*b*; Crosse, p. 128; Bourguignat, ii, pl. x, figs. 1–3; iii, p. 135; Martens, p. 209, pl. vi, fig. 40.

Chytra Kirki, Moore: i, p. 307, pl. xxiii, fig. 6; ii, pp. 228–234, figs. 11–16, and figs. on p. 350; Digby, Journ. Linn. Soc., 1902, vol. xxviii, p. 434, pls. xxxviii–xl.

Kytra Kirki, Moore: Proc. Zool. Soc., 1901, vol. ii, pp. 461, 465, pl. xxvi, fig. 2.

Limnotrochus Thomsoni, Smith.

Limnotrochus Thomsoni, Smith: iii, p. 425; ii, p. 285, pl. xxxiii, figs. 17–17*b*; Crosse, p. 127; Bourguignat, i, p. 59; ii, pl. x, figs. 4–7; iii, p. 136; Pelseneer, p. 105; Martens, p. 210; Moore, ii, pp. 233–7, figs. 17–20, and figs. on p. 349; i, pl. xxiii, fig. 5; Digby, Journ. Linn. Soc., 1902, vol. xxviii, p. 437, pls. xxxviii and xl.

With this species I unite *L. Giraudi* and *L. cyclostoma*, Bourguignat (ii, iii).

Tiphobia Horei, Smith.

Tiphobia Horei, Smith: i, p. 348, pl. xxxi, figs. 6–6*b*; ii, p. 293, pl. xxxiv, fig. 28, operculum; Crosse, p. 117, pl. iv, figs. 2–2*b*; Martens, p. 203, pl. vi, fig. 45; Moore, i, pp. 181–204, pls. xi–xiv; ii, pp. 221–8, figs. 2–7; Bourguignat, vii, vol. iii, pp. 141–150.

Hylacantha Horei, Bourguignat: ii, pl. ix, figs. 1–4; iii, p. 128; Ancey, Le Naturaliste, 1886, vol. iii, p. 292.

Hylacantha Bourguignati, Bourguignat: ii, figs. 5–7; iii, p. 132.

Hylacantha longirostris, Bourguignat: ii, figs. 8–10; iii, p. 129; Nicolas, C.R. Assoc. Française, 1898, 2e partie, p. 515, fig. 3.

Hylacantha Jouberti, Bourguignat: ii, figs. 11–13; iii, p. 131.

The characters pointed out by Bourguignat as distinguishing his so-called species, *H. Bourguignati*, *longirostris*, and *Jouberti*, have no specific value whatever, and merely indicate individual variation.

This is a striking instance of the 'species-making' as perpetrated by the Nouvelle école of French conchologists. Any reasonable person can see at a glance that all four forms are merely variations of one and the same species. With regard to the generic name employed by M. Bourguignat, namely, *Hylacantha* of Ancey, I have already shown[1] that this is not admissible, and that *Tiphobia*, which I originally proposed for this genus, must be retained. It is unfortunate that Mr. Moore persistently writes the name as *Typhobia*, which is a genus of Coleoptera, and has altogether a different derivation.

Bathanalia Howesi, Moore.

Bathanalia Howesi, Moore: Proc. Roy. Soc., 1898, vol. lxii, pp. 451–2, fig. 2; i, p. 192, pl. xii, figs. 29–33; op. cit., p. 316, pl. xxiii, fig. 3; ii, pp. 227–8, figs. 8–10; Proc. Malac. Soc., 1898, vol. iii, p. 92, fig. 2 on p. 93; Nicolas, C.R. Assoc. Française, 1898, 2e partie, p. 525, fig. 8 (1899).

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[1] Journ. de Conch., vol. xxxix (1891), p. 21.

Bythoceras iridescens, Moore.

Bythoceras iridescens, Moore: Proc. Roy. Soc., 1898, vol. lxii, p. 452, fig. 1; Proc. Malac. Soc., 1898, vol. iii, p. 93, fig. 1; ii, pp. 237–244, figs. 21–3; Nicolas, C.R. Assoc. Française, 1898, 2e partie, p. 525, fig. 9 (1899).

Bythoceras minor, Moore. Fig. 1.

Bythoceras minor, Moore: ii, pp. 242–4, fig. 24.

As this species has only been very briefly referred to, I append the following description.

Shell ovate, turreted, imperforate, solid, dirty whitish, but more or less covered with a thin brownish olive periostracum; spire elongate, acuminate, turreted; whorls 9 (exclusive of the minute protoconch, which is broken off), slowly increasing, slopingly gradate below the suture, scarcely curved at the sides, sculptured with oblique costæ (14 or 15 in number on the penultimate whorl), which are crossed by spiral sulci, giving the ribs a granose appearance. The rows of granules are usually five on the upper whorls and thirteen on the last. The uppermost row forms a coronation at the upper part of the whorls, and one or two of the granules just behind the labrum are produced into a short recurved spine. The body-whorl is produced anteriorly and forms a short rostration. The longitudinal ribs become more or less obsolete at the middle of this whorl, so that the spiral ridges upon the lower half are less distinctly granose. Under the lens the entire surface of the shell is seen to be covered with minute striæ of growth. Aperture oblique, ovate; peristome continuous in adult specimens, smooth, glossy, iridescent, expanded, of a dirty olivaceous tint, the outer margin sometimes being faintly grooved within.

Length 30, diameter 15 mm.; aperture 10 mm. long, 6 in width.

This species is smaller and more coarsely sculptured than *B. iridescens*, and has a smaller spine above the aperture. Both the costæ and spiral ridges are much more numerous in that species, and the granules are more bead-like. The characters of the aperture and peristome are practically the same in both forms.

Paramelania.

Paramelania, Smith: ii, p. 558; Bourguignat, i, p. 67; ii, pp. 36, 37, pl. xiv, figs. 17, 18; iii, p. 198; Martens, pp. 206, 209; Moore, ii, pp. 244, 245, figs. 25–27.

Pyrgulifera, White: Nature, xxv, p. 101; Tausch, Sitzungsb. Akad. Wiss. Wien, 1884, vol. xc, p. 56.

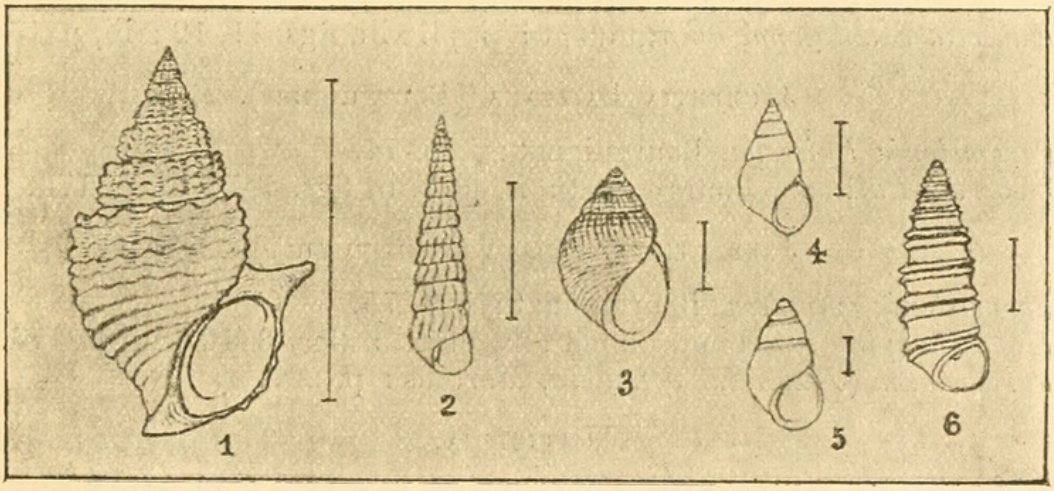
Bourguignatia, Giraud: Bull. Soc. mal. France, 1885, vol. ii, p. 193, pl. vii, figs. 5–7; Bourguignat, i, p. 66; ii, p. 29, pl. xii, figs. 1–10; iii, p. 165; Martens, p. 207.

The so-called genus *Bourguignatia* is, in my opinion, synonymous with *Paramelania*.

Paramelania Damoni (Smith).

Tiphobia (*Paramelania*) *Damoni*, Smith: ii, p. 559, fig. 1.
Paramelania Damoni, Bourguignat: ii, pl. xiv, fig. 17; iii, p. 200; Martens, p. 209; Martel & Dautzenberg, p. 177, pl. viii, fig. 22; Moore, ii, pp. 243–5, figs, 25, 27, and fig. on p. 345; i, pl. xxiii, fig. 1.
Melania Damoni, Pelseneer: p. 108.
Bourguignatia imperialis, Giraud: Bull. Soc. mal. France, 1885, p. 194, pl. vii, figs. 5–7; Bourguignat, i, p. 67; ii, pl. xii, figs. 8–10; iii, p. 169.
Paramelania imperialis, Martel & Dautzenberg: p. 178, pl. viii, figs. 23, 24, vars. *Guillemei* and *Mpalaensis*.
P. (*Bourguignatia*) *imperialis*, Martens: p. 207.

Bourguignatia imperialis, the type of the genus, seems to me absolutely synonymous with the present species. In a large series of specimens which I have examined I find all the connecting links between the shells originally described under these two names. There is considerable variation in the size of the specimens, the largest being 39 mm. in length, whereas the smallest, but equally adult example, is only 21. The plicæ vary in number from 10 to 15, and some are much more acutely spined at the angle than others.



Paramelania Bridouxi (Bourguignat).

Bourguignatia Bridouxi, Bourguignat: ii, pl. xii, figs. 1–4; iii, p. 166; Nicolas, C.R. Assoc. Française, 1898, 2e partie, p. 516, fig. 4.
Paramelania (*Bourguignatia*) *Bridouxi*, Martens: p. 207.
Var. = *P. Jouberti*, Bourguignat: ii, pl. xii, figs. 5–7; iii, p. 168.

This species does not appear to have been obtained by Mr. Moore. It is remarkable on account of the planulate or even concave upper part of the whorls.

Paramelania crassigranulata, Smith.

Tiphobia (*Paramelania*) *crassigranulata*, Smith: ii, p. 560, fig. 2.

Paramelania crassigranulata, Bourguignat: ii, pl. xiv, fig. 18; iii, p. 202; Martens, p. 209; Martel & Dautzenberg, p. 180, pl. viii, fig. 25; Moore, ii, p. 245, fig. 26, radula.

This species was originally described from two dead and rather worn shells. The large series of specimens obtained by Mr. Moore shows that it varies considerably, especially in size, the largest example being 32 mm. in length, whereas the smallest is only 19. The latter is quite adult, however, having the thickened, perfected peristome, and the same number of whorls as the larger shell. When describing this species I felt some hesitation in separating it from *P. Damoni*. However, an examination of the large series of both species collected by Mr. Moore shows that they are quite distinct. The distinguishing features originally pointed out are maintained, namely, the narrower excavation or tabulation at the upper part of the volutions, and the more rounded and more coarsely granulated ribs and spiral liræ. The angle of the body-whorl is not spinose as in *P. Damoni*.

Joubertia.

Joubertia, Bourguignat: ii, p. 32, pl. xiii, figs. 5–12; iii, p. 174.
Joubertia, as a subgenus of *Paramelania*, Martens: p. 207.

Joubertia Stanleyana (Bourguignat).

Paramelania Stanleyana, Bourguignat: i, p. 75.
Joubertia Stanleyana, Bourguignat: ii, pl. xiii, figs. 11, 12; iii, p. 176.

Joubertia Baizeana (Bourguignat).

Paramelania Baizeana, Bourguignat: i, p. 74.
Joubertia Baizeana, Bourguignat: ii, pl. xiii, figs. 5–7; iii, p. 174.

Joubertia spinulosa (Bourguignat).

Paramelania spinulosa, Bourguignat: i, p. 75.
Joubertia spinulosa, Bourguignat: ii, pl. xiii, figs. 8–10; iii, p. 175.
Paramelania (*Joubertia*) *spinulosa*, Martens: p. 207.

Lavigeria.

Lavigeria, Bourguignat, ii, p. 33, pl. xiii, figs. 13–17, pl. xiv, figs. 1–7 (1888); iii, p. 178; Martens, p. 207, as a subgenus of *Paramelania*.
Nassopsis, Smith: Ann. & Mag. Nat. Hist., 1890, vol. vi, p. 93; Moore, ii, pp. 250–6, figs. 33–8.

The animal has been described by Moore under the name *Nassopsis*. This genus is separable from *Edgaria* on account of the tubercular prominence on the columella. Its operculum is different from that of *Paramelania*.

Lavigeria grandis, Bourguignat.

Tiphobia (*Paramelania*) *nassa*, var. *grandis*, Smith: ii, p. 561.
Paramelania grandis, Bourguignat: i, p. 69.
Lavigeria grandis, Bourguignat: ii, pl. xiv, fig. 1; iii, p. 182.

Nassopsis grandis, Martel & Dautzenberg, p. 167.
Nassopsis nassa, Moore: i, pl. xxiii, fig. 2; ii, pp. 250–6, figs. 33–8, and fig. on p. 347.

LAVIGERIA DIADEMATA, Bourguignat.

Lavigeria diadémata, Bourguignat: ii, pl. xiii, figs. 15–17; iii, p. 179.
Paramelania (*Lavigeria*) *diadémata*, Martens: p. 207.
? *Nassopsis grandis*, var. *diadémata*, Martel & Dautzenberg: p. 168, pl. viii, fig. 6.
? *Nassopsis grandis*, var. *Jouberti*: iid., p. 169, pl. viii, fig. 7.

LAVIGERIA CORONATA, Bourguignat.

Lavigeria coronata, Bourguignat: ii, pl. xiii, figs. 13, 14; iii, p. 180; Nicolas, C.R. Assoc. Française, 1898, 2e partie, p. 517, fig. 6 (1899).
Paramelania (*Lavigeria*) *coronata*, Martens: p. 207.

Some specimens in the Museum differ slightly from the figure given by Bourguignat in having the upper part of the whorls rather less concave, the aperture a little shorter, and not so acuminate at the upper part of the peristome.

LAVIGERIA CALLISTA, Bourguignat.

Lavigeria callista, Bourguignat: ii, pl. xiv, fig. 2; iii, p. 183.

LAVIGERIA PEREXIMIA, Bourguignat.

Lavigeria pereximia, Bourguignat: ii, pl. xiv, fig. 3; iii, p. 187.

LAVIGERIA JOUBERTI, Bourguignat.

Lavigeria Jouberti, Bourguignat: ii, pl. xiv, fig. 4; iii, p. 185.
Nassopsis grandis, var. *Jouberti*: Martel & Dautzenberg, p. 169, pl. viii, fig. 7.

LAVIGERIA RUELLANIANA, Bourguignat.

Lavigeria Ruellaniana, Bourguignat: ii, pl. xiv, figs. 5, 6; iii, p. 190.

LAVIGERIA COMBSA, Bourguignat.

Lavigeria combsa, Bourguignat: ii, pl. xiv, fig. 7; iii, p. 189.

RANDABELIA.

Randabelia, Bourguignat: ii, p. 31, pl. xiii, figs. 1–4; iii, p. 170; Martens, p. 207, as a subgenus of *Paramelania*.

This genus appears to be very closely related to *Lavigeria*, and it seems possible that the two species of it may be the young state of that genus.

RANDABELIA CATOXIA, Bourguignat.

Randabelia catoxia, Bourguignat: ii, pl. xiii, figs. 1, 2; iii, p. 171.

RANDABELIA HAMYANA, Bourguignat.

Paramelania Hamyana, Bourguignat: i, p. 71.
Randabelia Hamyana, Bourguignat: ii, pl. xiii, figs. 3, 4; iii, p. 173.
Paramelania (*Randabelia*) *Hamyania*, Martens: p. 207.

Edgaria.

Edgaria, Bourguignat: ii, p. 34, pl. xiv, figs. 8–16; iii, p. 192; Martens, p. 208, as a subgenus of *Paramelania*.
Nassopsidia, as a subgenus of *Paramelania*, Martens: l.c., p. 208.

Edgaria may differ from *Lavigeria* in wanting the tubercular prominence on the columella, although in some specimens traces of it are observable. Neither the animal nor the operculum of any of the species are known. I am strongly of opinion that this so-called genus will eventually be united with *Lavigeria*.

Edgaria paucicostata (Bourguignat).

Tiphobia (*Paramelania*) *nassa*, var. *paucicostata*, Smith: ii, p. 561.
Paramelania paucicostata, Bourguignat: i, p. 69.
Edgaria paucicostata, Bourguignat: ii, pl. xiv, figs. 8, 9; iii, p. 193.
Paramelania (*Edgaria*) *paucicostata*, Martens: p. 209.
Paramelania (*Edgaria*) *flexicosta*, Martens: p. 209, pl. vi, fig. 42.
Nassopsis paucicostata, Martel & Dautzenberg: p. 170, pl. viii, figs. 8, 9.
Nassopsis tiarella, Martel & Dautzenberg (*nec* Martens): p. 175, pl. viii, figs. 18, 19.

Edgaria callopleuros, *littoralis*, and *Monceti* of Bourguignat seem to be mere varieties of this species.

Edgaria tiarella (Martens).

Paramelania (*Edgaria*) *tiarella*, Martens: p. 209, pl. vi, fig. 43.

It is allied to *E. paucicostata*, but has fewer spiral liræ.

Edgaria variabilis (Martel & Dautzenberg).

Nassopsis variabilis, Martel & Dautzenberg: p. 174, pl. viii, figs. 16, 17.

The absence of spiral liræ and the coloration will separate this species from its nearest ally, *E. paucicostata*.

Edgaria nassa (Woodward).

Melania (*Melanella*) *nassa*, Woodward: Proc. Zool. Soc., 1859, p. 349, pl xlvii, fig. 4; Reeve, Conch. Icon., fig. 216; Brot, Conch. Cab., pl. vi, fig. 7; Smith, ii, p. 348; iii, p. 292, pl. xxxiv, figs. 26–26*b*; Crosse, p. 113; Pelseneer, p. 108.
Tiphobia (*Paramelania*) *nassa*, Smith: ii, p. 561.
Paramelania nassa, Bourguignat: i, p. 76; ii, pl. xvi, figs, 7, 8; iii, p. 227.
Nassopsis nassa, Martel & Dautzenberg: p. 165, pl. viii, figs. 1–5.
Paramelania (*Nassopsis*) *nassa*, Martens: p. 208.

The following species, which are all described and figured by Bourguignat (ii and iii), are, in my opinion, mere variations of this species; they are described under the genus *Paramelania*: *P. arenarum*, *elongata*, *Giraudi*, *Grandidieriana*, *lacrimosa*, *Lessepsiana*, *limnæa*, *Livingstoniana*, *Locardiana*, *Mabilliana*, *Milne-edwardsiana*, *nassatella*, *nassatiformis*, *pulchella*, *Randabeli*, *Servainiana*, *Smithi*, *venusta*. *P. Locardiana* is admitted as a species allied to *crassilabris* by

Martel & Dautzenberg, and *P. Milne-edwardsiana* is quoted by Martens as characteristic of his section *Nassopsidia*.

EDGARIA REYMONDI (Bourguignat).

Paramelania Reymondi, Bourguignat: i, p. 72; ii, pl. xv, figs. 20, 21; iii, p. 214.

This, together with the following species, all described by Bourguignat (ii, iii), seems to form another group: *P. bythiniformis*, *Cameroniana*, *Duveyrieriana*, *egregia*, *formosa*, *infralirata*, *Ledoulxiana*, *obtusa*, *timida*.

EDGARIA SINGULARIS (Bourguignat).

Paramelania singularis, Bourguignat: ii, pl. xv, figs. 16, 17; iii, p. 211.

EDGARIA BOURGUIGNATI (Bourguignat).

Paramelania Bourguignati, Giraud: MSS., Bourguignat, i, p. 73; ii, pl. xv, figs. 18, 19; iii, p. 213.

EDGARIA CRASSILABRIS (Bourguignat).

Paramelania crassilabris, Bourguignat: i, p. 84; ii, pl. xvi, figs. 15, 16; iii, p. 241.

Nassopsis crassilabris, Martel & Dautzenberg: p. 171, pl. viii, figs. 10, 11.

Nassopsis Guillemei, Martel & Dautzenberg: p. 172, pl. viii, figs. 12, 13.

A single specimen received by the Museum from Sir H. H. Johnston agrees very closely with the description of this species. It is, however, larger and the aperture proportionately longer than in the shell figured by Bourguignat.

EDGARIA LECHAPTOISI (Ancey).

Lavigeria (?) *Lechaptoisi*, Ancey: Bull. Mus. Marseille, 1898, vol. i, p. 145, pl. ix, fig. 1.

Judging from the figure and description, this figure approximates to *Hirthia globosa*, which may also be a form of *Edgaria*.

HIRTHIA.

Hirthia, Ancey: Bull. Mus. Marseille, 1898, vol. i, p. 142, pl. ix, figs. G, H.

This genus appears to be scarcely separable from *Edgaria*.

HIRTHIA LITTORINA, Ancey.

Hirthia littorina, Ancey: Bull. Mus. Marseille, 1898, vol. i, p. 142, pl. ix, fig. G.

HIRTHIA GLOBOSA, Ancey.

Hirthia globosa, Ancey: Bull. Mus. Marseille, 1898, vol. i, p. 144, pl. ix, fig. H.

Spekia.

Spekia, Bourguignat: Descript. Moll. Égypte, etc., 1879, p. 27; i, p. 35; ii, p. 15, pl. iv, figs. 20–27; pl. v, figs. 1–15; iii, p. 60; Martens, p. 205; Moore, ii, pp. 256–264, figs. 39–43.

Spekia zonata (Woodward).

Lithoglyphus zonatus, Woodward: Proc. Zool. Soc., 1859, p. 349, pl. xlvii, figs. 3–3*c*; Smith, i, p. 350; ii, p. 287.
Lacunopsis (*Spekia*) *zonata*, Crosse: p. 122, pl. iv, fig. 4.
Lacunopsis zonata, Pelseneer: p. 106.
Spekia zonata, Bourguignat: Descrip. Moll. Égypte, etc., 1879, p. 28; i, p. 37; ii, pl. iv, figs. 20–24; iii, p. 63; Martens, p. 205, pl. vi, fig. 41; Moore, ii, pp. 256–264, figs. 39–43, and figs. on p. 351; i, pl. xxiii, fig. 4.

The following so-called species have been described which I think may be united with *S. zonata*, namely, *S. Cameroni*, *Duveyrieriana*, *Giraudi*, *Grandidieriana*, *Hamyana*, *Reymondi* (Bourguignat, ii, iii). I am inclined to think that there is only one species of this genus, varying in the height of the spire and the extent of the basal concavity.

Tanganyicia.

Tanganyicia, Crosse: p. 123; Martens, p. 204; Moore, ii, pp. 246–253, figs. 28–32.
Tanganikia, Bourguignat: i, p. 41; ii, p. 16, pl. v, figs. 16–21; iii, p. 80.

Five species described by Bourguignat under this genus may be the young of *T. rufofilosa* (Smith), and all the twenty-four so-called species of *Hauttecœuria* are probably only variations of the same species. The four species of his genus *Cambieria* also are apparently young stages of this variable shell (see Bourguignat, ii, iii).

The names are as follows, arranged alphabetically:—(1) *Tanganikia Fagotiana*, *Giraudi*, *Maunoiriana*, *opalina*, *ovidea*; (2) *Hauttecœuria Bridouxiana*, *Brincatiana*, *Burtoni*, *Cambieri*, *Cameroni*, *Charmetanti*, *Duveyrieriana*, *eximia*, *Giraudi*, *Hamyana*, *Jouberti*, *Lavigeriana*, *Levesquiana*, *Locardiana*, *macrostoma*, *Maunoiriana*, *Milne-edwardsiana*, *minuta*, *Moineti*, *pusilla*, *Reymondi*, *Servainiana*, *singularis*, *soluta*; (3) *Cambieria Jouberti*, *Maunoiriana*, *ovoidea*, and *rufofilosa*. (Bourguignat, ii, iii.)

This appears to be an appalling lumping of various forms, but I must confess, without having the actual shells described for examination, it seems impossible to do otherwise.

Tanganyicia rufofilosa (Smith).

Lithoglyphus rufofilosus, Smith: ii, p. 288, pl. xxxiii, figs. 20, 20*a*; Moore, Proc. Roy. Soc., 1898, vol. lxii, p. 457, fig. 3.
Tanganyicia rufofilosa, Crosse: p. 125, pl. iv, figs. 5–5*b*; Martens, p. 204; Moore, ii, pp. 246–250, figs. 28–32.
Cambieria rufofilosa, Bourguignat: ii, pl. vi, figs. 8–10; iii, p. 86.

Rumella.

Rumella, Bourguignat: i, p. 89; ii, p. 40, pl. xvii, figs. 20–37; iii, p. 250; Martens, p. 214, pl. vi, fig. 47.

I do not at present see any sufficient reasons for specifically separating any of the forms described by M. Bourguignat. *R. neritinoides* (Smith), therefore, will stand as the sole representative of this genus. The other names are *R. callifera*, *Giraudi*, *globosa*, *Jouberti*, *Lavigeriana*, *Milne-edwardsiana*. (Bourguignat, ii, iii.)

Rumella neritinoides (Smith).

Lithoglyphus neritinoides, Smith: iii, p. 426; ii, p. 287, pl. xxxiii, fig. 19.
Lithoglyphus neritoides (sic), Pelseneer: p. 106.
Tanganyicia (?) *neritinoides*, Crosse: p. 126.
Stanleya neritoides (sic), Bourguignat: i, p. 87.
Stanleya neritinoides, Martens: p. 214.

Stanleya.

Stanleya, Bourguignat: i, p. 86; ii, p. 40, pl. xvii, figs. 13–15; iii, p. 246; Martens, p. 214.
Coulboisia, Bourguignat: ii, p. 40, pl. xvii, figs. 16–19; iii, p. 247; Martens, p. 214.

Stanleya rotundata, n.sp.

Stanleya neritoides, Bourguignat (nec *neritinoides*, Smith): ii, p. 39, pl. xvii, figs. 13–15; iii, p. 246.

A series of curious mistakes has occurred in connection with this species and the genus *Stanleya*. When founding that genus M. Bourguignat[1] gave as his type the *Lithoglyphus neritinoides* of Smith, associating with it at the same time two other species for which he subsequently founded his genus *Coulboisia*. But the shell which he regarded as the *Lithoglyphus neritinoides* was perfectly distinct from that species, which, however, practically constitutes the genus *Rumella*. Under these circumstances it becomes necessary to rename the shell mistaken by Bourguignat for *neritinoides*, and to apply the generic name *Rumella* to the true *neritinoides*. Later M. Bourguignat thought it necessary to separate his *Stanleya Giraudi* and *S. Smithiana* from his *S. neritoides* (*sic*), and to found for them the genus *Coulboisia*. This, however, in my opinion, was unnecessary, for, with the exception of some slight difference in form, they are all practically of the same general character.

The genus *Stanleya* appears to be closely related to *Rumella*, but has the spiral lines *engraven* in the shell, whereas in *Rumella* they are *superficial*. Also the columella callosity is less strongly developed. I have never seen any examples of this genus.

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[1] "Moll. région mérid. Tanganika," 1885, p. 86.

STANLEYI GIRAUDI, Bourguignat.

Stanleya Giraudi, Bourguignat: i, p. 88.
Coulboisia Giraudi, id.: ii, pl. xvii, figs. 16, 17; iii, p. 247.

STANLEYA SMITHIANA, Bourguignat.

Stanleya Smithiana, Bourguignat: i, p. 88.
Coulboisia Smithiana, id.: ii, pl. xvii, figs. 18, 19; iii, p. 248.

LECHAPTOISIA.

Horea, Smith (*nec* Bourguignat): III, 1889, vol. ii, p. 175; Martens, p. 211.
Lechaptoisia, Ancey: Bull. Soc. zool. France, 1894, vol. xix, p. 29.

M. Bourguignat employed the name *Horea* for the *Melania Tanganyicensis* of Smith a year before it was applied by myself to the species of the present genus. M. Ancey was therefore justified in proposing a fresh name for this group. Apparently closely related to *Stanleya*.

LECHAPTOISIA PONSONBYI (Smith). Fig. 3.

Rissoa (*Horea*) *Ponsonbyi*, Smith: III, 1889, vol. iv, p. 175.
Lechaptoisia Ponsonbyi, Ancey: Bull. Soc. zool. France, 1894, vol. xix, p. 29.
Horea Ponsonbyi, Martens: p. 211.

BRIDOUXIA.

Bridouxia, Bourguignat: i, p. 29; ii, p. 14, pl. iv, figs. 5–16; iii, p. 53; Martens, p. 205.

This genus is unknown to me except from the description and figures. The four so-called species apparently are mere variations of one and the same form. The names are *B. costata, Giraudi, Reymondi, Villeserriana*. (Bourguignat, ii, iii.)

BAIZEA.

Baizea, Bourguignat: i, p. 33; ii, p. 14, pl. iv, figs. 17–19; iii, p. 58.
Ponsonbya, Ancey: Bull. Soc. mal. France, 1890, vol. vii, p. 346; Martens, p. 296.

Described by Bourguignat as belonging to the Paludinidæ. A solid, smooth, glossy shell, closely resembling in general aspect some of the Naticoid *Lithoglyphi* of South Europe, but differing in the character of the umbilicus, which is neither a perforation nor a slit, but, in miniature, is rather similar to the basal excavation of the genus *Spekia*. Beyond the fact that *Ponsonbya* of Ancey, of which only a single species is known, is upright in growth instead of slightly oblique, it does not differ in any respect from *Baizea*.

BAIZEA GIRAUDI, Bourguignat.

Baizea Giraudi, Bourguignat: i, p. 34; ii, pl. iv, figs. 17–19; iii, p. 60; Ancey, Bull. Soc. zool. France, 1894, vol. xix, p. 28.

Baizea leucoraphe (Ancey).

Ponsonbya leucoraphe, Ancey: Bull. Soc. mal. France, 1890, vol. vii, p. 347; Martens, p. 296.

This species closely resembles *B. Giraudi*, but is not oblique in growth, and consequently the aperture is more upright.

Giraudia.

Giraudia, Bourguignat: i, p. 61; ii, p. 28, pl. xi, figs. 16–24; iii, p. 148; Martens, p. 206.

Reymondia, Bourguignat: i, p. 64; ii, p. 28, pl. xi, figs. 1–15; iii, p. 152; Martens, p. 206.

At present I fail to perceive any characters which are sufficient to separate *Reymondia* from *Giraudia*. As the word *Raymondia*, which is very similar to *Reymondia*, had previously been employed in insects, it will be convenient to apply the name *Giraudia* to these shells. Messrs. Martel & Dautzenberg have also united these two genera.

Giraudia præclara, Bourguignat.

Giraudia præclara, Bourguignat: i, p. 62; ii, pl. xi, figs. 16–18; iii, p. 149.

Reymondia præclara, Martel & Dautzenberg: p. 176.

Giraudia Grandidieriana, Bourguignat.

Giraudia Grandidieriana, Bourguignat: i, p. 63; ii, pl. xi, figs. 19–21; iii, p. 150.

This species appears to differ very slightly from *G. præclara*; indeed, it seems doubtful also whether *G. Lavigeriana* is anything more than a small slender variety.

Giraudia Lavigeriana, Bourguignat.

Giraudia Lavigeriana, Bourguignat: ii, pl. xi, figs. 22–24; iii, p. 151.

Giraudia quintana (Mabille).

Assiminea quintana, Mabille: Bull. Soc. Philom. Paris, 1901, vol. iii, p. 56.

This and the following species apparently belong to the genus *Giraudia*, and may even be synonymous with some of the species described previously.

Giraudia Foai (Mabille).

Assiminea Foai, Mabille: Bull. Soc. Philom. Paris, 1901, vol. iii, p. 56.

Giraudia Horei (Smith).

Melania (—?) *Horei*, Smith: iii, p. 427; ii, p. 292; pl. xxxiv, fig. 27; Crosse, p. 115; Pelseneer, p. 108.

Reymondia Horei, Bourguignat: i, p. 65; ii, pl. xi, figs. 1, 2; iii, p. 153; Martel & Dautzenberg, p. 175, pl. viii, figs. 20–1; Martens, p. 206.

With this species Martel & Dautzenberg have united *R. Giraudi*, *R. Jouberti*, *R. Monceti*, *R. pyramidalis*, and *R. Bridouxiana*, all of Bourguignat (ii, iii), and this decision is probably correct, but without seeing actual examples of each form it is difficult to give a decided opinion. I have, however, a strong belief that their decision will prove well-founded. *R. Foai* is probably another variety (Mabille, Bull. Soc. Philom. Paris, 1901, vol. iii, p. 57).

Giraudia minor (Smith). Fig. 4.

Reymondia minor, Smith : iii, 1889, vol. iv, p. 174.
Giraudia minor, Ancey : Bull. Soc. zool. France, 1894, vol. xix, p. 28.

Giraudia Tanganyicensis (Smith). Fig. 5.

Reymondia Tanganyicensis, Smith : iii, 1889, vol. iv, p. 175.
Giraudia Tanganikana, Ancey : Bull. Soc. zool. France, 1894, vol. xix, p. 28.

Leroya.

Leroya, Grandidier : Bull. Soc. malac. France, 1887, vol. iv, p. 191.
Leroya, Bourguignat : ii, p. 17, pl. vi, figs. 2–5 ; iii, p. 78 ; Moll. Afrique Équator., 1889, p. 180.
Leroya, as a group of *Lanistes*, Martens : p. 170.

This genus may be synonymous with *Lanistes*, but the two species described, *L. Bourguignati* and *L. Charmetanti*, are more solid than other species of that genus, but the opercula are similar. Both forms are considered by Martens merely varieties of *Lanistes Farleri* of Craven, but of this location I do not feel certain. The greater solidity of their shells and the different character of their peristome seem to distinguish them.

Leroya Bourguignati, Grandidier.

Leroya Bourguignati, Grandidier : Bull. Soc. malac. France, 1887, vol. iv, p. 192.
Leroya Bourguignati, Bourguignat : ii, pl. vi, figs. 2–5 ; iii, p. 79 ; Moll. Afrique Équator., 1889, p. 180.
Lanistes Farleri, Craven, var. : Martens, p. 172, pl. vi, fig. 34.
Leroya Charmetanti, Grandidier : l.c., p. 93 ; Bourguignat, Moll. Afrique Équator., 1889, p. 150, pl. vii, figs. 21, 22.

Syrnolopsis.

Syrnolopsis, Smith : iii, p. 426 ; Crosse, p. 118 ; Bourguignat, i, p. 16 ; iii, p. 139 ; Martens, p. 210.

Eight species of this genus have been described, but, as far as I can judge from the descriptions and figures, they might be restricted to two, namely, *S. lacustris* and *S. carinifera*.

M. Bourguignat does certainly point out certain differences in form and in the number of liræ within the aperture, but it seems to me possible that these characters may in some measure be due to difference of age. The other names are *Syrnolopsis Anceyana*, *Giraudi*,

Grandidieriana, *Hamyana*, *minuta* (Bourguignat, ii, iii), and *S. Foai* (Mabille, Bull. Soc. Philom. Paris, 1901, vol. iii, p. 56).

Dr. Tausch has considered this genus synonymous with *Fascinella* of the Upper Chalk at Ajka, Hungary, but I do not feel absolutely certain that such is the case. The figure he gives of that genus, copied from Sandberger, appears to show a different kind of columellar fold, and no mention is made of palatal liræ, which appear to be a feature in *Syrnolopsis*.

Syrnolopsis lacustris, Smith.

Syrnolopsis lacustris, Smith: iii, p. 426; ii, p. 288, pl. xxxiii, figs. 21–21*b*; Crosse, p. 119, pl. iv, fig. 6; Bourguignat, ii, pl. x, figs. 14–17; iii, p. 142; Pelseneer, p. 107; Martens, p. 210, pl. vi, fig. 46.

Fascinella lacustris, Tausch: Sitzungsb. Akad. Wiss. Wien., 1884, vol. xc, p. 68, pl. i, fig. 11.

Syrnolopsis carinifera, Smith. Fig. 6.

Syrnolopsis carinifera, Smith: iii, 1889, vol. iv, p. 174.

Anceya.

Anceya, Bourguignat: i, p. 14; Moll. Afrique Équator., 1889, p. 118; Martens, p. 211.

This genus appears to differ from *Syrnolopsis* only in being longitudinally costate.

Anceya Giraudi, Bourguignat.

Anceya Giraudi, Bourguignat: i, p. 15; Moll. Afrique Équator., 1889, p. 118, pl. vii, figs. 12, 13.

Syrnolopsis (*Anceya*) *Giraudi*, var., Smith: iii, 1890, vol. vi, p. 94.

Anceya admirabilis, Bourguignat.

Anceya admirabilis, Bourguignat: Moll. Afrique Équator., 1889, p. 119, pl. vii, figs. 10, 11.

Burtonilla, n.gen. Fig. 2.

Turbonilla (?) *terebriformis*, Smith: iii, vol. vi, p. 95; Martens, p. 212.

When describing this species I deemed it advisable to place it provisionally in a known genus. Since then our knowledge of the Tanganyikan fauna has been greatly increased, and we now find that none of the forms with a thalassoid facies fall into any of the known marine genera. Such being the case, it seems to me advisable to create a new genus for the reception of this curious and interesting shell. It may be thus characterized: — Shell elongate, slender, imperforate; whorls numerous, longitudinally costate, glossy, apparently without a periostracum; aperture entire, not channelled in front; columella reflexed anteriorly, above obsoletely uniplicate; labrum probably thin.

II. NON-THALASSOID SPECIES.

The second part of this paper deals with the rest of the fauna, consisting of the ordinary fresh-water forms. The total number of described species amounts to about 152, but many of these are evidently very slight variations. They are distributed thus among the following genera :—

	Species.		Species.
Limnæa	7	*Corbicula*	3
Planorbis	7	*Pisidium*	2
Isidora	2	*Unio*	19
Physopsis	1	*Grandidieria*	24
Neothauma	8	*Brazzæa*	13
Vivipara	2	*Moncetia*	6
Cleopatra	2	*Mutela*	8
Bythinia	1	*Burtonia*	13
Ampullaria	2	*Cameronia*	26
Lanistes	2	*Ætheria*	1
Melania	3		

Limnæa Natalensis, Krauss.

Limnæa Natalensis, Krauss: Südafr. Moll., p. 85, pl. v, fig. 15; Küster, Conch. Cab., pl. vi, figs. 1–3; Martens, Malak. Blätt., 1866, pl. iii, figs. 8, 9; Smith, ii, p. 295.

Six species have been described by M. Bourguignat (ii, iii): *Africana*, *Alexandrina*, *Debaizei*, *Jouberti*, *Laurenti*, and *Lavigeriana*. They are probably all forms of *Natalensis*.

Planorbis Sudanicus, Martens.

Planorbis Sudanicus, Martens: Malak. Blätt., 1870, p. 35; 1874, p. 41; Novit. Conchyl., vol. iv, pl. cxiv, figs. 6–9; Smith, i, p. 349; ii, p. 294; Crosse, p. 109; Bourguignat, ii, pl. i, figs. 13–15; iii, p. 15; Martens, p. 146, var. *major*.

Pl. Tanganikanus, Bourguignat (ii, iii), is probably the same as this species.

Planorbis Alexandrina, var.

Segmentina (*Planorbula*) *Alexandrina*, Ehrenberg, var. *Tanganyicensis*, Smith: ii, pl. xxxiv, figs. 30–30*b*; Martens, vol. iv, p. 150.
Planorbula Tanganikana, Bourguignat; iii, p. 23.

Planorbis Bridouxiana, Bourguignat.

Planorbis Bridouxiana, Bourguignat: ii, pl. i, figs. 9–12; iii, p. 20; Martens, p. 149.

Planorbis Adowensis, Bourguignat.

Planorbis Adowensis, Bourguignat: ii, pl. i, figs. 1–4; iii, p. 17; Martens, p. 147.

Planorbis Lavigerianus, Bourguignat.

Planorbis Lavigerianus, Bourguignat: ii, pl. i, figs. 5–8; iii, p. 19; Martens, p. 148.

PLANORBIS MONCETI, Bourguignat.

Planorbis Monceti, Bourguignat: iii, p. 18.

ISIDORA COULBOISI (Bourguignat).

Physa Coulboisi, Bourguignat: ii, pl. i, figs. 24–5; iii, p. 14.
Isidora Coulboisi, Martens: p. 139.

ISIDORA RANDABELI (Bourguignat).

Physa Randabeli, Bourguignat: ii, pl. i, figs. 26–7; iii, p. 12.
Isidora Randabeli, Martens: p. 140.

PHYSOPSIS TANGANYICÆ, Martens.

Physopsis Tanganyicæ, Martens, p. 144, pl. vi, fig. 12.

NEOTHAUMA.

Neothauma, Smith: i, p. 349; Crosse, p. 111; Grandidier, Bull. Soc. mal. France, vol. ii, p. 162; Bourguignat, i, p. 25; ii, p. 9, pls. ii, iii; iii, p. 24; Martens, p. 202; Moore, Proc. Zool. Soc., 1901, vol. ii, p. 466, pls. xxv, xxvi; ii, p. 264, fig. 46.

Of this genus I can admit only a single species, although M. Bourguignat has split it up into eight. It certainly exhibits very great variation, but I think all the connecting links are observable even in the set of illustrations given in M. Bourguignat's work. There certainly is much less variation shown in this species than in the common whelk, *Buccinum undatum*.

NEOTHAUMA TANGANYICENSE, Smith.

Neothauma Tanganyicense, Smith: i, p. 349, pl. xxxi, figs. 7–7*c*; ii, p. 293, operculum; iii, 1889, vol. iv, p. 173; Crosse, p. 112; Martens, p. 203; Moore, ii, pp. 264–5, figs. 44–46; Proc. Zool. Soc., 1901, vol. ii, p. 466, pls. xxv, xxvi.
Neothauma Tanganikanum, Grandidier: Bull. Soc. mal. France, 1885, vol. ii, p. 163; Bourguignat, i, p. 26; ii, pl. ii, fig. 1; iii, p. 26.

Pelseneer considered this species a *Paludina*. The other names applied to it are: *bicarinatum*, *euryomphalus*, *Giraudi*, *Jouberti*, *Vysseri*, all of Bourguignat, and *Bridouxiana* and *Servainiana* of Grandidier. (See Bourguignat, ii, iii.)

VIVIPARA BRINCATIANA, Bourguignat.

Vivipara Brincatiana, Bourguignat: ii, pl. iv, fig. 1; iii, p. 41; Martens, p. 183.

V. Bridouxiana, Bourguignat (ii, iii), does not seem to be separable from the present species, which may eventually prove to belong to the genus *Cleopatra*.

CLEOPATRA GUILLEMETI, Bourguignat.

Cleopatra Guillemeti, Bourguignat: ii, pl. iv, fig. 4; iii, p. 46; Martens, p. 186.

CLEOPATRA JOUBERTI, Bourguignat.

Cleopatra Jouberti, Bourguignat: ii, pl. iv, fig. 3; iii, p. 48.

BYTHINIA MULTISULCATA, Bourguignat.

Bythinia multisulcata, Bourguignat: ii, pl. iii, figs. 7, 8; iii, p. 52.

AMPULLARIA OVATA, Olivier.

Ampullaria ovata, Olivier: Philippi in Küster's Conch. Cab., pl. xiv, figs. 5, 6; Reeve, Conch. Icon., vol. x, fig. 64; Smith, i, p. 348; Crosse, p. 110; Bourguignat, Moll. nouv., 1863, p. 79, pl. x, fig. 11; ii, pl. vi, fig. 1; iii, p. 74; Pelseneer, p. 104.
A. Kordofana, Parreyss: Philippi, l.c., pl. xiii, fig. 1.

AMPULLARIA BRIDOUXA, Bourguignat.

Ampullaria Bridouxi, Bourguignat: ii, pl. v, fig. 22; iii, p. 72.

LANISTES SINISTRORSUS (Lea).

Meladomus sinistrorsus (Lea), Bourguignat: iii, p. 78.
Lanistes sinistrorsus, Martens: p. 167.

LANISTES JOUBERTI (Bourguignat).

Meladomus Jouberti, Bourguignat: ii, pl. vi, fig. 6; iii, p. 76.
Lanistes Jouberti, Martens: p. 165.

MELANIA ADMIRABILIS, Smith.

Melania (*Sermyla*) *admirabilis*, Smith: iii, p. 427; ii, p. 291, pl. xxxiv, fig. 24; Crosse, p. 114; Bourguignat, ii, pl. xi, fig. 25; iii, p. 164; Martens, p. 196; Moore, ii, p. 219, fig. 1, and figs. on p. 353.

MELANIA TUBERCULATA, Müller.

Melania tuberculata, Müller: Smith, ii, p. 291; Bourguignat, ii, pl. xi, figs. 26–7; iii, p. 163; Martens, p. 193.

MELANIA TANGANYICENSIS, Smith.

Melania Tanganyicensis, Smith: iii, p. 427; ii, p. 291, pl. xxxiv, fig. 25; Crosse, p. 115; Martens, p. 197.
Horea Tanganikana, Bourguignat: ii, pl. xi, figs. 28–9; iii, p. 161.

This species constitutes the genus *Horea* of Bourguignat, but I do not see any reason for separating it from *Melania*.

CORBICULA RADIATA (Parreyss).

Cyrena radiata, Parr.: Philippi, Abbild., vol. ii, p. 4, pl. i, fig. 8; Clessin, Conch. Cab. (*Corbicula*), pl. xxviii, figs. 16–18; Smith, ii, p. 295.
Corbicula Tanganikana, Bourguignat: i, p. 104; ii, pl. xviii, figs. 8–10.

C. Foai, Mabille (Bull. Soc. Philom. Paris, 1901, vol. iii, p. 58), is probably a variety of this species.

Unio.

Altogether, including the genus *Grandidieria*, which does not seem to be separable from *Unio*, forty-three species of this genus have been named. That many of these are mere synonyms there is very little doubt, but without more material to work with it seems hopeless to attempt to discuss them, many being known by description only. The names are : *U. Niloticus*, Cailliaud ; *U. Gerrardi*, *Böhmi*, *rostralis* (= *rostrata*, Bgt.), Martens (pp. 223, 238) ; *Burtoni*, Woodward ; *Tanganyicensis*, *Thomsoni*, *Horei*, Smith ; *Servainiana*, *Smithi*, *cyrenopsis*, *gravida*, *corbicula*, *insignis*, *rhynchonella*, *Bourguignati*, *callista*, *granulosa*, *singularis*, *Anceyi*, *incarnata*, *Giraudi*, *elongata*, *cyrenopsis*, *Locardiana*, *mira*, *rotundata*, *Hauttecœuri*, *Ujijensis*, *Charbonnieri*, *Coulboisi*, *Dromauxi*, *Randabeli*, *Visseri*, *Vinckei*, *Moineti*, *Menardi*, *Lavigerianus*, *Jouberti*, *Josseti*, *Bridouxi*, *Guillemeti*, *calathus*, all of Bourguignat. (i, ii ; Bull. Soc. mal. France, 1885, vol. ii, pp. 1–12 ; Nouveautés Malacol., 1886, pp. 7–23 ; Espèces nouv. et genres nouv. Oukéréwé et Tanganika, 1885, pp. 15–25.)

Mutela exotica (Lamarck).

Iridina exotica, Lamarck : Anim. sans Vert., 2nd ed., vol. vi, p. 571 ; Reeve's Conch. Icon., fig. 2.
I. elongata, Sowerby : Genera, fig. 1 ; Conch. Icon., fig. 1.
I. Nilotica, Sowerby : Zool. Journ., vol. v, pl. ii ; Conch. Icon., fig. 4 ; Küster, Conch. Cab., pl. xxv, fig. 3.
Mutela exotica, Smith : Proc., i, p. 350 ; ii, p. 296 ; Crosse, p. 131.

First collected in the lake by Mr. E. Coode Hore. *M. soleniformis*, Bourg., may be the same as this species. Other forms described from the lake are : *Bridouxi*, *Jouberti*, *Vysseri*, *Moineti*, *Monceti*, *Lavigeriana*, Bourguignat (ii, and Nouveautés Malacol., 1886, pp. 25–31).

Only four of M. Bourguignat's species have been figured, and these look as if they are mere variations of the same form.

Brazzæa.

Brazzæa, Bourguignat : iv, pp. 32, 38 ; v, p. 44 ; ii, p. 61, pl. xxviii, figs. 1–6, pl. xxix, figs. 1–5 ; Martens, p. 258.

Of this genus thirteen so-called species have been described, and judging from the figures of six of them there appears to be very little to distinguish them. The names are : *B. Anceyi*, *ventrosa*, *Randabeli*, *Newcombiana*, *Moineti*, *Lavigeriana*, *Jouberti*, *eximia*, *elongata*, *Coulboisi*, *Charbonnieri*, *Bridouxi*, *Bourguignati*. (Bourguignat, ii, and Nouveautés Malacol., 1886, pp. 45–59.)

Moncetia.

Moncetia, Bourguignat : iv, pp. 34, 38 ; ii, p. 65, pl. xxx, figs. 1–8 ; Martens, p. 258.

There seems little, if anything, to separate this genus from *Spatha*. It appears to be represented by a single variable species, which has been separated by M. Bourguignat under the names *M. Anceyi*, *Jouberti*, *Bridouxi*, *Lavigeriana*, *Moineti*, and *Rochebruniana*.

Burtonia.

Burtonia, Bourguignat: vi, p. 20; iv, p. 37; v, pp. 32–43, 53, pl. xxiv, figs. 1–4; pl. xxv, figs. 1–3; pl. xxvi, figs. 1–5; pl. xxvii, figs. 1–5; Martens, p. 257.

Burtonia Tanganyicensis (Smith).

Spatha Tanganyicensis, Smith: i, p. 350, pl. xxxi, figs. 8, 8*a*; ii, p. 296, pl. xxxiv, fig. 32; Crosse, p. 132.
Burtonia Tanganyikana and *Livingstoniana*, Bourguignat: vi, pp. 20, 23; iv, p. 38.
Burtonia Tanganyicensis, Martens: p. 257.

The following forms have also been figured: *B. Lavigeriana*, *Moineti*, *subtriangularis*, *elongata*, *magnifica*, *contorta*, *Grandidieriana*, *Livingstoniana*, and *Bourguignati* (Bourguignat, ii). With the exception of the last, I believe they will all prove to be mere varieties of one polymorphous species. *B. Bridouxi* and *Jouberti*, Bourg., which have not yet been figured, probably belong to the same category. *B. Foai*, Mabille (Bull. Soc. Philom., 1901, vol. iii, p. 58), is probably only a variety also.

Pleiodon Spekei, Woodward.

Pleiodon Spekei, Woodward: Proc. Zool. Soc., 1859, p. 348, pl. xlvii, fig. 2; Sowerby, Conch. Icon., vol. xvi, fig. 2; Küster's Conch. Cab. (*Iridina*), pl. lxx, fig. 1; Smith, i, p. 350; ii, p. 296; Martens, S.B. nat. Freunde, Berlin, 1883, p. 71; Pelseneer, p. 109; anatomy, p. 116, figs. 2, 3.
Cameronia Spekei, Bourguignat: Descript. Moll. Égypte, etc., 1879, p. 43; iv, p. 38.
Pliodon (*Cameronia*) *Spekei*, Crosse: p. 130.
Mutela (*Iridina*) *Spekei*, Martens: p. 256.

The figured so-called species of this genus from Tanganyika are: *P. Spekei*, Woodward; *Coulboisi*, *Landeaui*, *paradoxa*, *Josseti*, *Bourguignati*, *admirabilis*, *gigantea*, Bourguignat. Unfigured are the following: *P. Anceyi*, *Bridouxi*, *Charbonnieri*, *Vynckei*, *complanata*, *Dromauxi*, *Giraudi*, *Guillemeti*, *Jouberti*, *Lavigeriana*, *Locardiana*, *Mabilliana*, *Marioniana*, *Moineti*, *obtusa*, *pulchella*, *Randabeli*, and *Revoiliana*, all described by Bourguignat under the genus *Cameronia*. (See Descript. Moll. Égypte, etc., 1879, p. 42; Moll. fluv. Nyanza Oukéréwé, 1883, p. 19; i, pp. 106–110; Espèces nouv. et genres nouv. Oukéréwé et Tanganika, 1885, pp. 38–9; Nouveautés Malacol., 1886, pp. 66–93; iii, pp. 67–75, pls. xxxi–xxxv.)

Without having a good series of specimens it is impossible to express any decided opinion with regard to the value of the above numerous so-called species, but even judging from the figures already published, this seems to be another case of a polymorphous species having been split up into many. Dr. E. von Martens has also expressed his doubt with regard to the value of several of these forms.

ÆTHERIA ELLIPTICA, Lamarck.

Ætheria elliptica, Lamarck : Sowerby, Conch. Icon., figs. 1*a*, *b* ; Smith, i, p. 352 ; Martens, p. 216.

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