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tibiæ and tarsi with numerous ones. *Wings* hyaline: veins yellow; the first vein from the discal cell bulges at the base into the first posterior cell, which is open at border; the fourth is also open, but the last part of its upper vein from the transverse vein enclosing the discal cell turns so sharply downwards that it almost closes the cell, leaving only a narrow opening at border. Halteres yellow.

[To be continued.]

LXV.—*A Synoptical Revision of the Coleopterous Genus Hexodon (Dynastinæ).* By GILBERT J. ARROW.

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THE genus *Hexodon* forms a very homogeneous and peculiar group of species confined to Madagascar and owing its chief distinctive feature to the loss of the wings, a highly exceptional phenomenon in the Dynastinæ, but evidently here of very ancient date. It has been accompanied, as in apterous Coleoptera of various other groups, by the development of lateral folds to the elytra and the reduction of the shoulder prominences, and the latter feature has been balanced in *Hexodon* by the horizontal development of the lateral folds and the production of secondary or false shoulders.

A further peculiarity is found in the structure of the antennal club, the first joint of which is drawn out in such a way that the point of articulation of the penultimate joint is removed to near its middle.

The sexual characteristics of the genus, which have not been noticed, although strongly marked, are interesting as combining two opposite tendencies exhibited in the Dynastinæ. In a large part of that subfamily the males have the front claws unsymmetrical and the inner one enlarged and distorted or toothed. This is almost always accompanied by a considerable shortening and thickening of the front tarsus. In another great division all the tarsi, but especially the front ones, are elongated in the males, the claws remaining simple and symmetrical. In *Hexodon* the inner front claw is thickened and distorted, but at the same time there is a great elongation of all the tarsi as in the second division. The pygidium is vertical in the male and oblique and more exposed in the female.

The combination of features elsewhere distinctive of

different groups seems to indicate the genus as representing the ancestral type from which both have been derived. Aberrant as it is, it is not remotely related to *Dyscinetus* and the rest of the Cyclocephalini, in which, however, the more recent character of the contraction (instead of elongation) of the front tarsus of the male prevails, elongation being an ancient condition found in many groups of Lamellicornia.

The Cyclocephalini are a large and flourishing group, almost entirely confined to America. *Ruteloryctes tristis*, Arrow, is a solitary representative in Africa, and it seems that *Hexodon* is another example of the survival in Madagascar of an ancient type formerly widespread, but now almost extinct in the Old World. There is great dissimilarity in aspect, as there must also be in habits, between *Hexodon* and the flower-haunting Cyclocephalini of the New World, and it seems that, as with *Hypocephalus* and many other "living fossils," survival from the remote past has been due to the acquisition of peculiar sluggish and lurking habits.

In the 'Catalogue of Madagascar Coleoptera' by M. Alluaud published in 1900, four species of *Hexodon* are enumerated; but of these *H. hopei*, Koll., as I have found by examination of Hope's original specimen at Oxford, is identical with *H. unicolor*, Oliv. Another name, *H. rotundatum*, occurs upon the plates published long before in connection with the same work, and the examination in the Paris Museum of the specimen figured has proved it to be a rubbed female specimen of *H. reticulatum*, Oliv.

The number of known species has been raised to five by the description of *H. griseosericans*, Fairmaire, and *H. minutum*, Sternberg. A co-type of the former is in the British Museum and I have seen a second co-type in the collection of Dr. Sicard. I have also been allowed to examine the type of *H. minutum*, which is now the property of Herr H. Prell, and that of *H. reticulatum*, Oliv., from the Dufresne collection in the Edinburgh Museum.

I have examined altogether considerably more than a hundred specimens of the genus in order to obtain as clear an idea as possible of its specific differentiation. All the specimens fall readily into two groups, which have numerous and well-marked differences; but within these two groups subdivision is much less easy, owing to the considerable variation in shape and sculpture and the absence of any important structural differentia.

In the first division, represented by the first-described species, *H. reticulatum*, Oliv., the elytra are not abbreviated,

meet in a sharp angle at their extremities, and, in the males at least, completely hide the abdomen as seen from above. The visible part of the mesonotum is smooth and shining, with or without a cluster of minute punctures on the scutellum, which is very short and broad; the prosternal process is rather long and erect, and in the male the penultimate joint of the front tarsus is produced beneath the last joint into a slender rod almost as long as the rest of the joint.

In the second division, represented by *H. unicolor*, Oliv., the elytra are abbreviated and separately rounded behind (or at least their posterior edges do not form a continuous line), and the end of the abdomen is almost always visible from above. The exposed part of the mesonotum is entirely opaque and finely sculptured, the scutellum forming a well-marked lobe, the prosternal process is triangular and very short, and the male has only a short prolongation of the penultimate joint of the front tarsus or none at all.

The investigation of the genitalia of male Dynastinae frequently reveals striking differences in species which have a close external resemblance and is an indispensable criterion in cases of difficulty. The investigation in the present case has produced rather surprising results. The species of the first division are entirely unlike the remaining species in the form of the œdeagus, while showing only very slight differences between themselves. The paramera are long and slender and the left one (as seen from behind) has an overlapping internal flange.

In the second division the œdeagus is symmetrical and the paramera shorter and very markedly different in shape in the three species, although externally these are no more dissimilar than those of the first division.

Before making a careful study of this organ I regarded some of the forms of the very variable *H. unicolor* as specifically distinct, but the uniformity of their genitalia as contrasted with the dissimilarity found in the three species just mentioned obliged me to abandon that idea. On the other hand, to treat very slight differences in the form of the œdeagus as specifically insignificant would imply the non-validity of such (externally) very distinct forms as *H. patella* and *H. latissimum*. Thus this structure not only provides confirmation of the naturalness of the primary subdivision of the genus based upon external characters, but is the only really trustworthy criterion of species.

I have therefore been impelled to accept any tangible and apparently constant degree of difference in this respect

as indicating specific distinctness, while the amount of difference, when the marked constancy of this character is contrasted with the no less marked inconstancy of the external form of these beetles, must be held to show much more clearly than the latter the relationships existing between the species. We have here, in fact, a structure which is both more plastic, as shown by the extraordinary diversity of its forms often to be found in species undoubtedly very closely related to one another, and more stable, as seen in its constancy of shape when examined in a series of similar individuals, than any external character, and which by its nature is the best anatomical indicator of the possibility or otherwise of interbreeding. Reliance upon it will undoubtedly produce results sometimes conflicting with ideas of species which have been based only upon external features, and it may be necessary, in the absence of any other term, still to describe as "species" forms which show marked external differences without apparently any corresponding genital characters; but still more must we admit that, where distinct forms of genitalia occur, even if no external difference can be found (and I believe such cases to exist), these must be accepted as indicating distinct species.

In the present genus there is a concurrence of characters, internal and external, in all the forms I have distinguished, and it consists, so far as at present known, of a group of five exceedingly closely related and probably lately evolved species, forming the *reticulatum* group, and three more ancient and less closely interrelated species, forming also a natural group (the *unicolor* group).

The following synopsis gives the most salient characters of each species:—

1 (10). Posterior angles of the elytra sharp.
(<i>reticulatum</i> group.)	
2 (3). Body very convex, with scarcely
flattened elytral margins	1. <i>montandoni</i> , Buq.
3 (2). Body not very convex, with dis-
tinctly flattened elytral margins.	
4 (7). Hind angles of the pronotum
rounded.	
5 (6). Apical angles of the elytra slightly
produced	2. <i>reticulatum</i> , Oliv.
6 (5). Apical angles of the elytra not pro-
duced	3. <i>patella</i> , sp. n.
7 (4). Hind angles of the pronotum sharp.	
8 (9). Lateral margins of the elytra
narrow; elytra together scarcely
broader than long	4. <i>griseosericans</i> , Fairm.
9 (8). Lateral margins of the elytra broad;
elytra together distinctly broader
than long	5. <i>latissimum</i> , sp. n.

- 10 (1). Posterior angles of the elytra not sharp. (*unicolor* group.)
 11 (12). Posterior angles of the pronotum not or scarcely extending farther back than the middle of the base. 6. *unicostatum*, sp. n.
 12 (11). Posterior angles of the pronotum produced beyond the middle of the base.
 13 (14). Large; elytra not very convex, with the outer margins strongly flattened; mesonotum entirely opaque..... 7. *unicolor*, Oliv.
 14 (13). Small; elytra highly convex, with the outer margins not at all flattened behind; mesonotum smooth and shining in front of the scutellum 8. *minutum*, Sternb.

I have represented in outline the male genitalia of all these eight forms (the figures being numbered to correspond with those above), and descriptions of the three which are new now follow.

Hexodon patella, sp. n. (See fig. 3.)

Rotundatum, fere circulare, marginibus lateralibus valde dilatatis; rufum, supra toto opacum, utroque elytro plaga antica punctisque duabus anteapicalibus nitidis ornato; capite (clypeo excepto), pronoti medio (linea mediana excepta) elytrorumque sutura et lineis vagis longitudinalibus infuscatis; corpore subtus nitido;

pedibus, prothoracis lateribus elytrorumque epipleuris læte rufis; capite antice minute emarginato, sutura clypeali fere toto obsoleto; pronoto brevi, angulis posticis rotundatis, vix productis, basi lævissime arcuato; scutello lato, paulo concavo, opaco, subtiliter ruguloso; elytris convexis, lateribus ubique regulariter arcuatis, antice late explanatis, apicibus conjunctim recte subtruncatis; processu prosternali prominentissimo, gracili. Long. 25 mm.; lat. max. 18.5 mm.

Hab. S.W. Madagascar: near Fort Dauphin.

The male type specimen in the British Museum is the only example of the species known to me. It has the nearly circular outline of *H. montandoni*, but is much less convex and more nearly related to *H. latissimum*. The coloration is quite peculiar. The ground-colour is a reddish chocolate, with the legs rather bright red, and the posterior part of the head and the middle of the pronotum, except a narrow median red line, nearly black. The hind angles of the pronotum are rounded and scarcely produced. The prosternal process is very long and slender.

Hexodon latissimum, sp. n. (See fig. 5.)

Nigrum, corpore subtus nitido, supra opaco, griseo-vestito, sed mesonoto polito, nitido, scutello lato, crebre punctulato; capite, prothorace, elytrorumque costis obscurioribus, costis ad marginem anticam (duabus internis nonnunquam etiam ad medium) confluentibus, postice abbreviatis; corpore latissimo, fere circulari, pronoto antice valde contracto, basi omnino fere regulariter emarginato, angulis posticis acutis; elytris conjunctim latioribus quam longioribus, apicibus recte subtruncatis, lateribus antice late deplanatis; processu prosternali erecto, sat gracili. Long. 25 mm.; lat. 18-19 mm.

Hab. N.W. Madagascar; Majunga.

The British Museum is indebted for a specimen of this to Dr. A. Sicard, in whose collection there is a second specimen.

This species is very closely related to *H. griseosericans*, although the much greater breadth of the elytra gives it a very different appearance. The dark elytral costæ are nearly parallel and not irregular as in *H. reticulatum* and are alternately strongly and feebly developed. The first and second primary costæ terminate at the apical callus and in the type specimen they also unite in the middle; but this may be exceptional, as in some examples of *H. reticulatum*. The second, third, and fourth primary costæ, and the intervening secondary ones, unite at the humeral callus, which lies in the middle of the anterior margin. The apical callus lies nearer to the apical and sutural edges of the elytron

than in *H. unicolor*, and the abrupt posterior termination of the third primary costa forms an additional callus which is present also in *H. griseosericans*.

Hexodon unicastatum, sp. n. (See fig. 6.)

Piceum, capite pronotoque nigrescentibus, pedibus sat læte rufis, corpore supra opaco, griseo-vestito; prothoracis et elytrorum marginibus extremis, singuli elytri vittaque arcuata paulo elevata postice abbreviata nitidis; ovatum, postice latissimum, clypeo antrorsum paulo contracto, sutura nulla; prothorace haud latissimo, basi leviter trisinuato, angulis posticis haud acutis aut valde productis; scutelli medio dense punctulato; elytris conjunctim latioribus quam longioribus, lateribus autem haud late deplanatis, postice truncatis, angulis suturalibus minute rotundatis; prosterno postice haud erecto:

♂, tarsis 4 anterioribus quam tibiis longioribus, posticis paulo brevioribus, pygidio convexo, haud porrecto:

♀, tarsis posticis quam tibiis multo brevioribus, pygidio porrecto. Long. 17-19 mm.; lat. max. 11.5-12.5 mm.

Hab. N.E. Madagascar; Antongil Bay.

The type specimen (received from Herr Felsche) is in the British Museum, and I have also examined a series in the Paris Museum containing both sexes, a pair of which has been kindly presented.

The species is a rather small one of distinctive shape, the prothorax being relatively narrower than is usual, and the elytra short and broad, but without strongly developed lateral flanges. The posterior angles of the prothorax are rounded and only slightly produced backwards, so that they are in a line with the slightly prominent median lobe. The mesonotum is closely punctured and opaque and the scutellum forms a well-marked lobe. There is a single smooth and shining median carina upon each elytron, extending from the middle of the basal margin to the apical callus when fully developed, but sometimes widely interrupted. The prosternum does not form a free process behind the coxæ, and the legs are rather less elongate in the male than in the other species of the genus.

MISCELLANEOUS.

WE omitted to mention in our April number that our thanks are due to the Trustees of the British Museum (Natural History) for kindly lending us the process-block illustrating Mr. Arrow's paper on *Phytalus smithi* (p. 456).