

THE TENEBRIONIDAE OF SOUTHERN AFRICA

XXXII. NEW PSAMMOPHILOUS SPECIES FROM
THE NAMIB DESERT

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(With 4 Text-figures and 11 Plates)

THE present paper represents a further contribution to our knowledge of the amazingly rich and endemic Tenebrionid fauna of the Namib Desert, South-West Africa. Most of the species described herein belong to the remarkable ecological category of the *ultra-psammophilous* species which are so far known to occur exclusively under the peculiar conditions of the vegetationless sand of the ever-shifting dunes of this desert.†

Ecological and bio-geographical notes, as well as observations on the early stages, are cited under the respective systematic units. All types are preserved in the Transvaal Museum.

Our gratitude is due to the S.A. Council for Scientific and Industrial Research, the Director and Board of Trustees of the Transvaal Museum, as well as to Mr Bernard Carp, who generously sponsored the 1959 Expedition to the Kuiseb area of the Namib.

Remark. A * in front of names refers to new genera, species and subspecies, which are described after the general discussion of the respective tribes.

MOLURINI AND TENTYRIINI

Both tribes are composed of many hundred species, spread over the whole of the African continent. While the Molurini, however, are confined to the African continent, Arabia, Mesopotamia and the Mediterranean, the Tentyriini, in their new conception (see Koch, 1955*a*), are African-Asiatic-American, with the predominantly alate subtribe Epitragina displaying not only xerophilous but also well pronounced mesophilous tendencies.

Without going into details of morphology, which are particularly complex because of the great omniformity of body in both tribes, the primary constitution, as opposed to all the diurnal tribes, is very well characterized by the presence of well-developed and true hypomera of elytra, the free mobility of thorax and hind body and the free and non-fused pleurital and pleural margins of the sterna and elytra respectively.

As opposed to the diurnal and heliotactic tribes, this structure of body implies moisture-storing to hygroscopic properties because of the open body sutures and the more or less loosely jointed parts of the body. Accordingly, with the excep-

† On the ecology of the *ultra-psammophilous* species cf. Koch (1961). With regard to the terms relating to a bio-geographic division of the Namib Desert, compare the preceding article (Koch, 1962) and Koch (1960*a*). Descriptions of the first known early stages of Namib Tenebrionids may be found in the following article (Schulze, 1962).

tion of the Trachynotina of Molurini, almost all other species are of nocturnal, umbriphilous to crepuscular life habits. In this connexion we have to reject various incorrect statements in literature. For example, Hesse (1938), who attributes to *Psammodes* the 'obliteration of all the sutures and articulating parts of the body and legs' and interprets this structure as an 'adaptive response to high temperatures and a low humidity and the consequent high evaporation'. However, the daily rhythm of all Tentyriini and Molurini is based strictly on a nocturnal ancestral disposition, and accordingly the absence of the hermetic connation of the body sutures (which is found in the heliotactic tribes) represents a common ancestral or primitive organization structure; the *Psammodes*, belonging to the very same Molurini, are as nocturnal insects, not exposed to the daylight conditions mentioned by Hesse, and their open and non-connate body sutures indicate therefore a primary adaptive response to nocturnal conditions, in particular the enjoyment of night moisture.

Although very well represented in Southern Africa and the Namib Desert, only a very restricted number of species has become adapted to the life in the Namib dunes, and none has entered into the biotope of the barren portion of the dunes. These species, which are without exception nocturnal and errant plant-followers, are *Archinambia peexi* and *Namibismus castaneus* of Tentyriini, and the endemic *Namibomodes* and **Uniungulum*, as well as several species of *Phanerotomea*, *Psammodes* and *Synhimba* of Molurini, to which eventually may be added the littoral to sublittoral species of **Brinckiu* (Molurini, Hypomelina).

With the exception of the ultra-evolutionary case of **Uniungulum*, the secondary adaptive modifications are developed to a lesser degree than in the other tribes. Depigmentation of the cuticle occurs in *Archinambia*, *Namibismus*, **Uniungulum* and in some species of **Brinckia* and *Namibomodes*; a moderate prolongation of the appendages and their parts is found to be almost general; a fine ciliation of the pseudopleural crest of elytra can be observed in *Namibomodes*, **Uniungulum* and **Brinckia*; while a smoothening of the sculptural structures has taken place in *Archinambia*, *Namibismus*, and to a certain degree also in *Namibomodes*. A moderate increase of the convexity of elytra can be reported only of *Archinambia*, as the great elytral convexity of the *Namibomodes*, *Phanerotomea*, *Psammodes* and *Synhimba* is a constitutional character, which is found likewise in the mesophilous representatives of the respective genera, such as, for example, the *Phanerotomea* and *Psammodes* of the south-east African Province; on the other hand a flattening of the elytra occurs in the Namib **Brinckia* and **Uniungulum*. Diaphanous elytra are possessed by *Archinambia* and **Uniungulum*, while a softening of the integument is characteristic for **Uniungulum* and to a lesser degree also for **Brinckia*.

The asymmetry of the unguis spurs, which will be mentioned in many species of the following tribes, exists also in *Namibomodes*, and reaches, under otherwise hypertrophic conditions, the highest possible degree of atrophy in **Uniungulum hoeschi*, in which the outer spur of the claws of the intermediate and posterior legs has disappeared altogether, except for a small rudimentary portion which is enclosed in the tarsal socket of tibia.†

Singular secondary adaptations are the loss of the wings in *Namibismus* and the merely rudimentary development of the epipleural and pseudopleural structures of elytra in **Uniungulum*.

Surface secretion has been watched during the night in various species of

† Although reduction and loss of the claws has been observed in various families of Coleoptera (e.g. Anoplini of Curculionids, and particularly in many Scarabaeid beetles), this is the only case known within the Tenebrionids, apart from the entire loss of claws (and reduction also of tarsal segments) in the Somalian *Trachyscelis subcoecus* from the littoral sands of the Indian Ocean (cf. Koch, 1960b).

Phanerotomea, *Synhimba*, *Namibomodes* and *Brinckia*. In some species this secretion produces a somewhat waxlike substance, viz. usually a pruinescent coating of the body surface. As this coating frequently occurs also in highly heliotactic groups of deserticolous Tenebrionids (e.g. *Zophosini* or *Adesmiini*) and, as we have observed it to become greatly developed under dry conditions but gradually disappear with the increase of air moisture, it may represent a waterproofing substance curbing evaporation, somewhat similar probably to Wiggsworth's cuticular waxes. In other species, such as those of *Namibomodes* and *Brinckia*, the cuticle produces a secretion of an adhesive nature to which grains of sand stick, forming thus a thick layer of probably increased moisture-storing property. The development of a somewhat scaly white pilosity on elytra is known to occur only in *Phanerotomea argenteofasciatum*.

MOLURINI, OXURINA

Gen. *Namibomodes* Koch, *sensu novo*

(= *Namibomodes* s.str., Koch, 1952a)

The discovery of several new species of the hitherto monotypical subgenus *Namibomodes* s.str. of *Namibomodes*, suggests the generic separation of *Namibomodes* from the two subgenera *Palpomodes* and *Pygmaeodes*, on account of the constant atrophy of the outer unguis spur.

Thus the subgenus *Palpomodes* Koch, 1952a (cf. also Koch, 1958) has to be elevated to the rank of genus, while *Pygmaeodes* Koch, 1952a (and 1958) becomes a subgenus of *Palpomodes*. The *Palpomodes* are readily distinguished from *Namibomodes* by the symmetric, equilong claws and the hypertrophic development of the apical segment of maxillary palpi in the ♂ (not ascertained for *Pygmaeodes rudebecki*, of which only a single ♀ is known). To the genus *Palpomodes*, in its new conception, belong the species *physoptera* (Gebien, 1920) with the subspecies *angolensis* (Koch, 1958), *halophila* (Koch, 1958) and *rudebecki* (Koch, 1952a); the appendageless cadaver of a fourth species was collected at the Roessing Mountains (Oct. 1957, C. Koch leg.).

Namibomodes is sharply separable, not only from *Palpomodes* but also from all other Molurini in general by the unequal length of the unguis spurs, of which the outer one is considerably reduced in length. Another peculiarity is the formation of the pseudopleural crest of elytra, which is found to be dissolved into a longitudinal row of small, subdentiform granules on which the lateral cilia are inserted.

Both *Namibomodes* and *Palpomodes*, which are components of the Oxurina (Koch, 1955a), are endemic to the True Namib, the former represented by errant plant-followers of the barchan dunes, the latter being indigenous to the low flats of the Northern Namib. All species are strictly nocturnal. The cuticle of the body produces some kind of secretion to which grains of sand adhere, thus forming a thick layer of sand which probably serves to store up a certain amount of night moisture. As a result of this phenomenon a perfect degree of homochromous coloration is attained and, when resting, such specimens are practically indistinguishable from the surrounding sand. Similar cases are known among other Southern African nocturnal Tenebrionids, such as further Molurini and Eurychorini, and also from Northern Africa (e.g. *Machlopsis crenatocostata* Redtenbacher, cf. Mellini) and Somalia (*Diaderma* Koch, 1960b).

Larvae of *Namibomodes* in the insectarium of the Transvaal Museum.

Namibomodes zarcoi sp.nov.

Very similar to *Namibomodes serrimargo* (Gebien, 1938), but readily distinguished by the smaller size of body, the transverse pronotum, the broader and subventricose elytra and, in particular, the dull abdomen which exhibits a densely rugose, coriaceo-reticulate background of cuticle.

As both species are homogeneous and agree well in the coloration of body and formation of sclerites, I am confining the description to the following differential diagnosis:

<i>serrimargo</i>	<i>zarcoi</i>
Length of body 16-17 mm.	Length of body 9-10½ mm.
Pronotum practically square, scarcely broader than long; lateral margination formed by a row of dense coarse punctures; discoidal punctation strong, not or only slightly coarser than punctures on sides	Pronotum distinctly transverse, with continuous and sharp lateral carina; discoidal punctation very fine, much finer than punctures on sides
Prosternum with the granules becoming more scattered on middle; the apical declivity of intercoxal apophysis with smooth upper half	Prosternum evenly covered with an extremely dense granulation, which covers also the whole apical declivity of the intercoxal apophysis and reaches the foraminal margin
Elytra oval; discoidal punctures less concentrated, with the intervals between punctures very distinctly larger than the diameter of punctures; background of cuticle micro-granulate only on posterior half, and polished on anterior half (between primary punctures)	Elytra ventricose; discoidal punctures very concentrated, the intervals between punctures smaller than the diameter of punctures; the whole surface covered with dense, extremely fine micro-granules between primary punctures or granules
Episternum of metasternum sparsely granulate	Episternum of metasternum densely granulate
Abdomen shiny; background of cuticle polished between primary granules	Abdomen opaque on account of the densely rugose, coriaceo-reticulate micro-sculpture of cuticle between primary granules

DISTRIBUTION. Northern part of the Southern Namib, in the areas of the Kuiseb and Tsauchab Rivers: Gobabeb (May 1959, Carp Exped., holo-, allo- and 20 paratypes); Ronibank (do. 5 spec.); Sossus Vlei (Oct. 1957, C. Koch leg., several spec.); Tsauchab River dunes, Diamond Area no. 2 (do., several spec.).

HABITAT. Observed in Gobabeb crawling during the night on grassy portions of the barchan dunes together with specimens of *Namibomodes serrimargo*; unlike the black and shiny appearance of the latter, specimens of *zarcoi* were of a sandy coloration caused by an adhesive secretion to which particles of sand were adhering.

In dried collection-specimens of *zarcoi* there are preserved fragments of this secretory substance, which is of a somewhat wax-like consistency and of a greyish white tint in colour; we were unable to find any such fragments in the many dried specimens of *serrimargo*. The fine micro-granulation of the elytral cuticle in *zarcoi* may possibly be correlated, in some way or the other, with the ability to produce this secretory substance, as on the one hand the micro-sculpture is absent in the non-secretory *serrimargo*, but on the other hand an identical combination of secretory properties and micro-granulation is met with in the species of **Brinckia*.

DEDICATION. Named after my late friend Eduardo Zarco Segalerva, whose devotion to science has greatly added to the international reputation of the Spanish Institute for Entomology.

Namibomodes maculicollis sp.nov.

Very similar to *N. serrimargo* and *N. zarcoi*, and agreeing with both in the coloration of body, composition of sclerites, atrophy of the outer spur of claws, prolongation of appendages, the characteristic and non-dimorphic shape of tibiae, etc. The new species is more closely allied to *zarcoi* on account of the identical coriaceous-reticulate micro-sculpture of the abdominal cuticle, the carinate lateral margination of the pronotum, the transverse shape of the latter and the ventricose elytra. It exhibits also some characters of *serrimargo*, such as the larger size of body and the similar sculpture on the middle portion of the elytral disc. It is readily distinguished from both compared species, as well as from all *Palpomodes*, by the peculiarity of micro-granulate sides of the pronotum, which are found to be polished and practically unsculptured in both *serrimargo* and *zarcoi*.

The following differential diagnosis should be sufficient for the correct interpretation of the new species:

<i>zarcoi</i>	<i>maculicollis</i>
Length of body 9-10½ mm.	Length of body: 11-15½ mm.
The cuticle of the whole of pronotum polished, including the sides (as in <i>serrimargo</i>)	Pronotum with smooth disc, but the sloping sides densely covered with a fine micro-granulation
Prosternal apophysis very densely granulate throughout	Prosternal apophysis with smoothed sculpture on upper half of apical declivity (in this respect similar to <i>serrimargo</i>)
Elytra moderately ventricose, convex, with elongately sloping apical declivity (as in <i>serrimargo</i>); the whole surface covered with dense, extremely fine micro-granules between primary sculpture; discoidal punctures very concentrated, with the intervals between punctures smaller than the diameter of punctures	Elytra more strongly ventricose, convex, with rather steep apical declivity; the micro-granulation reaching the base on sides, but absent from the middle of anterior portion of disc; primary punctures on middle of disc comparatively scattered, with the intervals between punctures distinctly larger than the diameter of punctures (as in <i>serrimargo</i>)
Pseudopleura with micro-sculpture indistinct or absent, but the primary granules spreading from base to apical portion	Pseudopleura densely micro-granulate, with scattered primary granules only on anterior half
Inner contours of intermediate tibiae very weakly and gradually dilated towards apex (as in <i>serrimargo</i>)	Inner contours of intermediate tibiae with small, but abrupt dilation apically

DISTRIBUTION. Northern part of the Southern Namib, in the Kuiseb River area: Rooibank (May 1959, Carp Exped., holo-, allo- and 20 paratypes); Gobabeb (do. and Oct. 1957, C. Koch leg., several specimens).

HABITAT. In the grassy portion of the barchan dunes, together with *serrimargo* and *zarcoi* at Gobabeb, while *serrimargo* was absent from Rooibank. Most of the specimens, which were observed crawling on the sand during the night, were readily distinguishable from the black *serrimargo* and the sandy coloured *zarcoi* by the bluish tint of the upper surface of the body, due to a very fine, powdery pruinescence which is very often encountered in desertic and, in particular, petrophilous Tenebrionids.

Namibomodes rubra sp.nov.

(Pl. XVI)

In coloration and shape of body closely recalling the Tentyriid *Archinambia pecti*.

Very closely related to *Namibomodes zarcoi* on account of the small size of body (9 mm long), the densely set primary punctures on elytral disc, the carinate lateral margination and the great similarity in the punctuation of pronotum. It is, however, readily distinguished from this species by the apparently dimorphic shape of pronotum, which is more elongate and almost square in the ♂, but transverse in the ♀, the elongately oval shape of elytra (in this respect similar to *serrimargo*), the evanescent micro-granulation of elytral disc, and the less concentrated granulation on middle of prosternum and upper half of the apical declivity of intercoxal apophysis.

On account of the testaceous to red coloration of body, *N. rubra* differs at first sight from all the other *Namibomodes*, in which the body is of an intense black colour, except for the testaceous to brownish appendages.

DISTRIBUTION. South-western part of the Southern Namib: Daberas dunes, near to the Orange River, in Diamond Area no. 1 (May 1953, C. Koch and W. Graaf, leg., holo- and allotypes).

HABITAT. Crawling at night on the sand of the barchan dunes close to grassy vegetation, and, with the surface of body covered with sandy particles, as already reported of *Namibomodes zarcoi*.

Key to the species of Namibomodes (sensu novo)

1. (2) Abdomen shiny, with polished cuticle between primary granules.
N. serrimargo (Gebien, 1938)

The range of *serrimargo* is exceptionally wide, extending from Bogenfels in Diamond Area no. 1 northwards to Rocky Point on the Skeleton Coast. The following collecting stations are known to us: surroundings of Luderitz (F. Eberlanz leg., paratypes); Bogenfels (Dec. 1948, University California Exp.); Pomona (do.); Charlottenthal, 15 miles north-east of Luderitz (Sept. 1950, C. Koch & G. van Son leg.); Grasplatz (do.); 10 miles west of Haalenberg (do.); Gobabeb (Oct. 1957, C. Koch leg. and May 1959, Carp Exp.); Walvis Bay (Oct. 1957, C. Koch leg.); Swakopmund (Oct. 1950, G. Hobohm leg.; Dec. 1951, G. Hobohm, E. R. Scherz leg.); Rocky Point (June 1951, C. Koch leg.).

Serrimargo is an errant plant-follower of the barchan dunes and is of nocturnal habits, as are all the *Namibomodes*.

2. (1) Abdomen dull, with coriaceous-reticulate ground sculpture between primary granules.
3. (4) The sloping lateral portions of pronotum with very dense micro-granulation. *N. maculicollis* Koch, *supra cit.*
4. (3) The whole surface of pronotum with shiny and polished cuticle between primary punctures.
5. (6) Body black, appendages testaceous. Elytra ventricose, with secondary micro-granulation also on middle of disc. *N. zarcoi* Koch, *supra cit.*
6. (5) Front of body and sterna reddish brown; elytra, abdomen and appendages testaceous. Elytra elongately oval, with the secondary micro-granulation evanescent on middle of disc. *N. rubra* Koch, *supra cit.*

MOLURINI, HYPOMELINA

Gen. *Uniungulum* nov.

Body elongate, acuminate posteriorly, with small head and prothorax but considerably enlarged hind body; the front of body and sterna reddish to dark brown, the elytra, abdomen and appendages diaphanous and of a very pale yellowish to whitish yellow tint.

Head porrect; eyes large, prominent, compound of acinose corneal facets; genae auriculate, sharply separated from epistome. Maxillary palpi non-dimorphic; antennae filiform, elongate, with very elongate third segment. *Pronotum* with rudimentary margination. Prosternum emarginate anteriorly, in front of coxal cavities about one-quarter shorter than same; intercoxal apophysis much broader than mentum, situated at a lower level than coxae and bent towards foramen. *Elytra* considerably broader than front of body, very elongate, acuminate posteriorly, with an extremely dense, evenly developed, very fine granulation of the background of cuticle. Shoulders broadly rounded. Pseudopleural margination ventral in position, but only partially indicated by rudimentary and obscure traces; epipleural crest incipient and rudimentary. The ventrally reflected portions of elytra not jointed to the underside of hind body, but very loose and overlapping the lateral portions of abdomen, sterna and coxae. *Mesossternal* apophysis quadrangular, slightly broader than mesocoxal cavities; the latter with triangular lateral dilation for the reception of the large, transverse trochantin. Metasternum, between meso- and metacoxal cavities, about half the length of the latter, with complete pre-metacoxal sulcus, but without episternal suture; the episternal space with dense granulation. Abdomen large, the anal sternite with indistinct, extremely fine margination along sides; in the ♂ all sternites with a continuous, large discoidal patch of extremely dense, fine, squamiform granules of an intense testaceous tint. *Legs* very elongate, non-dimorphic. Tibiae subcylindrical, not dilated apically; the anterior tibiae with simply convex, non-carnate upper surface; calcaria short. Tarsi slender, with very elongate basal segment; the basal segment of posterior tarsi equal to the combined length of the remainder of tarsus. Claws three times as long as the tibial calcaria and unique in having only a single spur on the intermediate and posterior legs (viz. the inner spur, as the outer spur is atrophic to such a high degree that its rudimentary basal remainder is enclosed and concealed in the tarsal socket of tibia, see Text-fig. 1).

DIAGNOSIS. This new genus is a true member of the subtribe Hypomelina of Molurini owing to the absence of any episternal suture on metasternum, the densely granulate episternal space of metasternum, the night eyes, non-dimorphic legs, etc. (cf. Koch, 1955*a*).

It differs from all species of Hypomelina by the ventral position of the pseudopleural delimitation of elytra (which is lateral in position and therefore exposed dorsally in all the other Hypomelina); the loose ventrally reflected portion of elytra concealing and enveloping the sides of after body, the diaphanous and hygrophanous consistency of the soft elytral cuticle, abdomen and appendages, the whitish yellow colour of elytra, and other peculiarities. By the atrophy of pseudopleura and epipleura of elytra, however, it is distinguished not only from the Hypomelina but from all Molurini in general, while the uni-partite configuration of the claws on intermediate and posterior legs is a singular atrophic development by which, so far as is known to me, *Uniungulum* is differentiated from all other Tenebrionids. The asymmetry of the unguis spurs, found in *Namibomodes* and many Namib species of other tribes, reaches, under otherwise hypertrophic conditions of the claws, the highest possible degree of atrophy by

the disappearance of the outer spur in the intermediate and posterior legs. Although reduction and loss of the claws has been observed in various families of Coleoptera (e.g. Anoplini of Curculionids, many Scarabaeid beetles, etc.), this is the only case known within the Tenebrionids, apart from the entire loss of claws and reduction also of tarsal segments in the Somalian *Trachyscelis subcoecus* Koch from the littoral sands of the Indian Ocean.

TYPE SPECIES. *Uniungulum hoeschi* sp.nov.

Uniungulum hoeschi sp.nov.

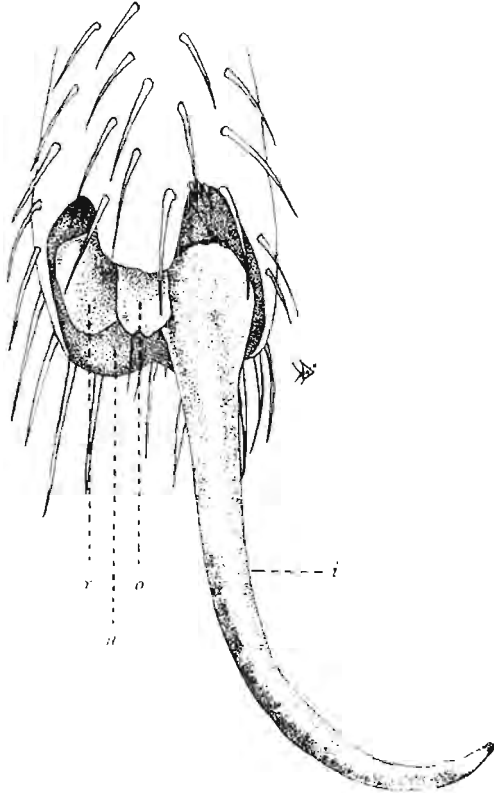
(Pl. XVII)

Head small, scarcely more than one-third the width of elytra. Upper surface shiny, sparsely punctured behind eyes, dull and densely covered with fine, setiferous, somewhat asperous punctures on the remainder. Eyes strongly prominent and projecting beyond lateral contours of head, slightly longer than genae and not emarginate by genal canthus. Genae rounded, forming auriculate lobes in front of eyes, which are separated from the epistome by a rectangular emargination. Epistome produced horizontally, truncate apically, separated from frons by two short, fine, shiny, oblique clypeal sutures on sides and by a transverse depression across middle portion. Labrum large, moderately transverse, ciliate and produced horizontally as are also the bifurcate mandibles. Under surface of head shiny, with roundish granules bearing long, erect, pale bristles on sides of postgenae. Gula with irregular transverse plicae. Mentum weakly transverse, with even surface and subtruncate, shiny apical margin, densely covered with short, erect bristles; submentum rectangular, three times as broad as long. Labium with palpi exposed. Maxillary palpi elongate, the apical segment subcylindrical and almost two-and-a-half times as long as broad. Antennae diaphanous, of a pale yellowish tint, very thin, with squarrose, fine, whitish bristles, a little more elongate than head and pronotum taken together; all segments elongate; the third segment the longest, about four times as long as the second segment or equalling the combined length of the fourth and fifth segments; segments four to eight at least twice as long as broad; the ninth segment distinctly dilated towards the apex; the tenth segment subtriangular, and the apical segment elongately oval.

Pronotum small, convex, only one-half wider than head, with evenly and weakly rounded sides which are widest at about middle, in the ♂ more slender than in the ♀ and from almost square to incipiently more elongate than broad, in the ♀ shorter and weakly transverse. Anterior margin subtruncate, with rounded anterior angles to which the marginal carina is confined. Sides narrowing more strongly towards the anterior margin than towards base, with middle section almost subparallel in the ♂, but rounded in the ♀; marginal carina very fine and evanescent on middle section. Anterior margin and sides briefly ciliate. Base subtruncate, with smoothed, dilated, blunt marginal carina; lateral angles obtusely rounded. Integument with dimorphic sculpture. In the ♂ it is very densely covered with rather strong, roundish to elongate punctures which tend to become longitudinally confluent; on the convex sides these punctures are scattered, round and deep, but the background of the cuticle between punctures exhibits a dull and very densely granular micro-sculpture which is lacking on disc; the punctures bear very short, fine bristles which are better developed and more obvious on sides. In the ♀ the discoidal sculpture is composed of fine, scattered, round punctures, which become more scattered on sides, where the granular micro-sculpture on the intervening spaces is less developed than shown in the ♂. Prosternum with dense, round, setiferous granules; the granulation on

episternum coarser but less concentrated, and separated from lateral margin by a smooth area; intercoxal apophysis densely granulated and of dilated shape apically.

Elytra elongately oval, broadest behind base, very large, particularly so in the ♀, about two-and-a-third times as long as the front of body in the ♂ but practically three times the length of the latter in the ♀, twice as broad as the pronotum in the ♂ and distinctly broader in the ♀. Sides with broadly rounded shoulders and subparallel to incipiently rounded middle portion, narrowing considerably



Text-fig. 1. *Uniungulum hoeschi* Koch, a nocturnal Molurid of the grassy, marginal dunes (Kuiseb area, Southern Namib). Formation of the posterior claws, with the rudimentary remainder of the almost entirely atrophied outer spur hidden in the unguis socket. Ventral aspect: *r*, rudimentary plate of outer spur; *o*, onychium; *u*, unguis socket; *i*, inner spur.

towards the attenuate apex posteriorly. Apical declivity flattened. Disc of each elytron with extremely slight traces of two to three longitudinal convexities or vein-like lines. Integument quite evenly covered with an extremely dense, round, deep, fine, granular punctation; between this fine ground sculpture with scattered, very briefly setiferous, large punctures which change to granules posteriorly; with dense, coarse, asperous granules apically becoming aggregated along suture. The apex of elytra gapes at the sutural angle, as the apex of each elytron is individually rounded. Scutellum triangular, densely punctured anteriorly, smooth and shiny behind. Pleural formation as in description of genus.

Underside of *hind body* covered with setiferous granules. Metasternum between meso- and metacoxal cavities one-third the length of the latter. Intercoxal process of abdomen truncate, moderately narrower than the mesocoxal apophysis. Abdomen in the ♀ shiny, evenly covered with an extremely dense, fine, briefly setiferous granulation; in the ♂ less shiny, with similar granulation of the background but the cuticle between granules somewhat cicatricose or transversely wrinkled, and in addition the disc of the four proximal sternites provided with a large, continuous patch of extremely dense, very fine, squamiform granules of a vivid testaceous to reddish brown coloration.

Legs very elongate, rather densely covered with short, squarrose, whitish bristles. Femora with moderately dense punctation on outer surface, the posterior femora reaching the combined length of the three abdominal sternites. Tibiae robust, the anterior tibiae with distinctly curved apical third of underside and slightly projecting, inner apical brush of whitish bristles in the ♂; the intermediate tibiae a little less stout, straight and about the length of the respective femora; the posterior tibiae longest, slender, about a quarter shorter than the posterior femora. The calcaria of anterior tibiae large and stout, with the longer spurs equalling the basal segment of respective tarsi in length, those of intermediate and posterior tibiae much shorter and thinner than the calcaria of anterior tibiae, with both spurs practically of equal length and about as long as the respective tibiae are wide apically. Tarsi with rather dense, stiff bristles below, moderately shorter than the respective tibiae, and with considerably elongate basal segments; the basal segment as long as the unguis segment in the anterior tarsi, and equalling the combined length of the remainder of tarsus in the intermediate and posterior tarsi. The two spurs of the anterior claws of unequal length, the outer spur being thinner and about one-quarter shorter than the inner spur; the outer spur only a little less elongate than the single spurs of the intermediate and posterior claws, slightly longer than the basal segment of anterior tarsi, as are also the single spurs of the intermediate and posterior claws in relation to the basal segment of the respective tarsi.

Size of body 15–21 mm long, 6–8 mm broad.

DISTRIBUTION. Northern part of the Southern Namib, in the Kuiseb River area: Rooibank (May 1959, Carp Exped., holo-, allo- and 10 paratypes).

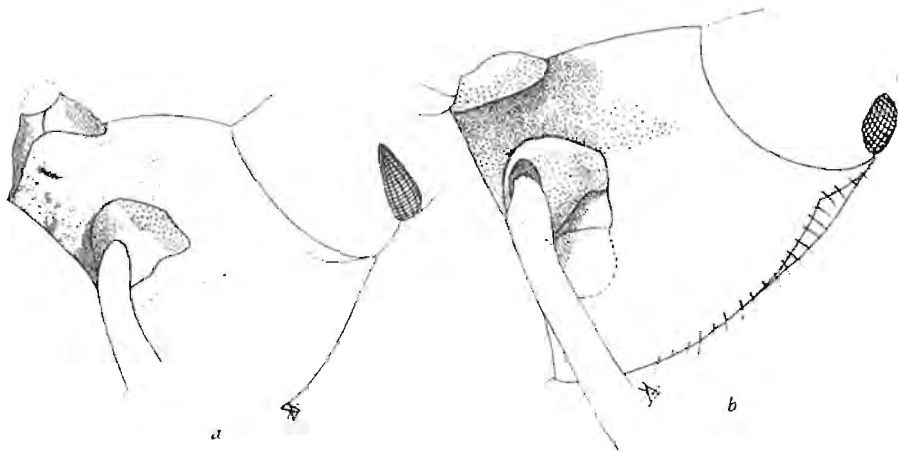
HABITAT. This very remarkable species was discovered at night in the marginal area of the barchan dunes, but only on the horizontal portion of the foot of dunes, on which tufts of dune-grasses were growing. When approached with a bright lamp, all specimens observed were sitting motionless on the barren sand and, on account of their homochromous and hygrophanous coloration, it took some time to distinguish them from the similarly coloured sand. Like most of the nocturnal dune-Tenebrionids, *U. hoeschi* also seems to be photophobic to a high degree and to stop crawling or running on the surface of the blown sand immediately it becomes aware of light. Only once, when using a torch which was giving a red light, did we surprise one specimen in motion, which, however, suddenly dug itself into the barren sand in a peculiar, almost vertical manner; only a small, coin-like convexity of the sandy surface indicated the spot where this specimen disappeared. On several days we returned to the very sites where we had regularly collected specimens at night, and though we dug up various portions of barren sand and also the dune-grasses down to the long roots, we were unable to find any specimens during the day. Some specimens were kept alive in the Museum insectarium where they remained buried deeply in the sand during the day, and during the night only single specimens of a series of about 10 appeared for a short while on the surface; unfortunately all specimens died after a few days.

DEDICATION. Named in honour of the eminent South-West African ornithologist and biologist, the late Dr W. Hoesch of Okahandja.

Gen. *Brinckia* nov. (Koch, 1955a, pl. IX, fig. 2)

Body elongate, flattened, densely sculptured.

Head porrect; eyes large, prominent, compound of acinose corneal facets; genae rounded, separated from epistome by an obtuse emargination; the transverse epistomal depression well marked. Maxillary palpi non-dimorphic. Antennae filiform, with elongate third segment. *Pronotum* often with rudimentary margination, the anterior margin not carinate on middle section. Prosternum emarginate anteriorly, in front of coxal cavities from one-and-a-quarter to twice the length of coxal cavities; intercoxal apophysis at the narrowest point about as broad as mentum or narrower, of peculiar shape (Text-fig. 2b) by being level with the prosternum right backwards to the apex, viz. quite horizontal and deeply embedded between coxae and latter therefore projecting beyond the level of apophysis; episternum with characteristic, scattered, round primary granules between the ground sculpture which is often wrinkled longitudinally. *Elytra* broader than front of body, elongate, flattened, densely sculptured, even or rarely with faint



Text-fig. 2. Formation of prosternal apophysis in: *a*, *Hypomelon* spec. (apophysis convex, with the apical portion bent towards foramen); *b*, *Brinckia* spec. (apophysis embedded between coxae, horizontal and level with prosternum).

longitudinal convexities. Shoulders broadly rounded to obtusely angular. Pseudopleural carina lateral in position, very sharp, often serrate apically, entirely exposed dorsally, with a more or less broad and distinct submarginal depression running along inside of pseudopleural carina; pseudopleura concave, subcanaliculate, narrowing gradually towards apex and very narrow on posterior third; epipleural carina sharp, well indicated on two posterior thirds, becomes finer and situated almost on underside of elytra apically. The pleural portion not jointed to the underside of hind body, in no case overlapping the pleurital margins of the latter, but leaving the whole of sterna exposed. *Mesosternal* apophysis transverse, distinctly to considerably broader than mesocoxal cavities; the latter with triangular lateral dilation for the reception of the large, transverse trochantin. Metasternum between meso- and metacoxal cavities about one-third to not quite half the length of the metacoxal cavities, with complete pre-metacoxal sulcus; episternal suture extremely fine, often scarcely indicated, curved and abbreviated posteriorly; the episternal space densely micro-sculptured and with scattered primary granules. Anal sternite with fine but sharp margination on sides; in the

♂ the three to four proximal sternites with continuous patch of extremely dense, fine, round, reddish, granular scales. *Legs* elongate, non-dimorphic. Tibiae subcylindrical, but the anterior tibiae briefly compressed apically and forming a sharp, apical right angle externally; calcaria very elongate, those of posterior tibiae shorter than those of anterior and intermediate tibiae. Tarsi slender, with very elongate basal segment; the basal segment of posterior tarsi distinctly shorter than the combined length of the remainder of tarsus. Claws very elongate, with symmetrical, equi-long spurs, considerably shorter than the calcaria base of the anterior and intermediate legs, and about as long as the calcaria on the posterior legs.

DIAGNOSIS. Although this new genus exhibits very fine to obsolete episternal sutures of metasternum, it is best placed with the *Hypomelina* (cf. Koch, 1955*a*). It is readily distinguished from all other genera of this subtribe by the peculiar formation of the prosternal apophysis, the very elongate tibial calcaria and claws, the immarginate middle section of the anterior margin and the truncate base of the pronotum, the absence of red primary stripes or distinct primary convexities on elytra, the granular sculpture on meta-episternal space, etc. Among all Molurini a similar formation of the prosternal apophysis is met with only in the East African genus *Arturium* Koch which, however, belongs to the phryno-coloid Molurina.

TYPE SPECIES. *Psammodes debilis* Peringuey, 1899.

DISTRIBUTION. Spread throughout the Namib Desert, but confined to the littoral and sublittoral sands, ranging inland as far as the limits of the fog belt and absent from the vegetationless part of the barchan dunes. Errant plant-followers of strictly nocturnal habits. As in the *Namibomodes* and *Palpomodes*, the surface of cuticle is covered with a layer of sand in living specimens.

DEDICATION. I have much pleasure in naming this new genus in honour of Professor Dr P. Brinck of Lund University, editor of the important series of publications 'South African Animal Life'.

***Brinckia oograbiesensis* sp.nov.** (Koch, 1955*a*, pl. IX, fig. 2)

(Pl. XVIII)

Reddish brown to testaceous, the appendages paler and the elytra with darkened disc; almost opaque, flattened.

Head above granular, the epistome shiny, with rather dense, fine punctation. Genae lobiform, strongly rounded, constricted in front of eyes. Eyes projecting beyond genal contours, considerably longer than genae. Mentum densely rugose. Apical segment of maxillary palpi about twice as long as broad. Lateral portions of postgenae with scattered, elongate, erect hairs originating from sharp, round granules. Antennae slender, extending beyond pronotal base, distinctly accrescent apically, set with elongate, scattered, pale bristles; the third segment one-and-a-half times as long as the fourth segment; the following segments very elongate, becoming shorter towards the apex; the three distal segments forming a kind of loosely jointed club; the pre-penultimate segment subparallel, about one-third longer than broad and broader than the preceding segments; the preapical segment almost square; the apical segment elongate, pointed apically, one-and-a-half times as long as broad and considerably more elongate than the preceding segment.

Pronotum slender, slightly longer than broad, flattened, broadest at middle, uniformly covered with extremely dense, fine, round granules. Anterior margin subtruncate; sides moderately rounded and dilated towards middle, narrowing towards the base in a faintly sinuate course; the sharp lateral carina bent distinctly upwards, separated from the weak discoidal convexity by a medially dilated

justa-lateral depression. Base subtruncate, with complete marginal carina and shallow, roundish impressions on posterior angles; the latter slightly obtuse. Prosternum in front of coxal cavities about one-third times longer than the coxal cavities, uniformly covered with scattered, sharp granules bearing long, fine, erect bristles; episternum with the same sculpture, but the long bristles projecting from underneath beyond the lateral contours of pronotum, and with a horizontally demarcated, smooth, flattened, justa-marginal area on middle section; intercœxal apophysis horizontally flat, level with prosternum and about as wide as mentum.

Elytra elongate, considerably broader than front of body, broadest at basal third, thence weakly rounded and narrowing gradually towards the apex. Shoulders broadly rounded. Scutellum densely granular. Integument covered with very fine, dense secondary granules, intermixed with very slightly larger, scattered primary granules which become coarser on apical declivity; vestiture confined to very short, semi-erect to almost sessile bristles. Apical declivity elongately produced and faintly sloping towards the apex. Pseudopleural crest minutely serrate apically, flanked dorsally by a narrow, well indicated, complete justa-lateral canalication; pseudopleura concave, with extremely fine, sparse, setiferous granules.

Mesosternal apophysis and metasternum sparsely granulate; the latter about two-thirds the length of the basal sternite of abdomen. In the ♂ the disc of the four proximal sternites covered with a continuous patch of closely aggregated, roundish, convex, yellowish scales. Anal sternite with sparse, short, yellowish bristles.

Legs very slender. The posterior femora not quite as long as the three proximal sternites of abdomen taken together, the outer surface of the intermediate and the posterior femora densely and transversely rugose. Anterior tibiae with dilated inner apical portion, the posterior tibiae incipiently sinuate on distal half of inner contours; the calcaria of the anterior tibiae a little more elongate than the basal segment of anterior tarsi. The basal segment of the intermediate and the posterior tarsi a trifle more elongate than the combined length of the unguis and penultimate segments.

Length of body 8-10½ mm.

DISTRIBUTION. Transitional Namib, in the western part of northern Little Namaqualand: Isolated dunes of Oograbies (Aug. 1950, C. Koch and G. van Son leg., a single ♂ holotype). A further ♂ paratype is preserved in the South African Museum (Port Nolloth, Aug. 1890).

HABITAT. The single holotype was found crawling on the surface of blown sand during the night.

DIAGNOSIS. See key on p. 121. The new species differs from all other *Brinckia* by the *insularis*-like median dilation of the pronotal sides in association with the small size of body. On account of the latter it can only be compared with *serratina*, described below, from which it is distinguished by the medially flattened and dilated sides and the smooth, non-serrate lateral margination of the pronotum.

Brinckia serratina sp. nov.

(Pl. XIX)

Small, elongate, moderately shiny, sparsely setiferous; of a testaceous to reddish or dark brown colour, the appendages and the lateral margin of elytra testaceous to reddish.

Head strongly transverse, above densely covered with fine, round secondary granules and larger, scattered primary granules bearing fine, semi-erect, yellowish bristles. The prominent epistome almost rectangularly separated from genae; the

latter rounded, somewhat auriculate and distinctly narrowing towards eyes. Eyes strongly projecting beyond lateral outlines of head. Mentum small, weakly transverse, with smoothed anterior portion; apical segment of maxillary palpi very elongate, almost three times as long as broad. Antennae thin, extending beyond pronotal base, with scattered, elongate, pale cilia; the third segment one-and-a-third times as long as the fourth segment; the following segments very elongate; the prepenultimate segment slightly longer than broad; the penultimate segment almost twice as broad as long; the apical segment broadly oval, slightly longer than broad and more distinctly elongate than the pre-penultimate segment.

Pronotum from subcylindrical (δ) to quadrangular and almost square (♀), broadest at about middle, from slightly longer than broad to a trifle broader than long; evenly covered with rather dense, fine secondary granules and sparse, slightly larger primary granules. Anterior margin from subtruncate to shallowly emarginate, with obtuse lateral angles. Sides weakly rounded, with granular, straight lateral carina which is sharply serrate-denticulate and elongately ciliate if viewed from above. Discoidal convexity faint, in direct contact with the lateral margination, with a shallow to inconspicuous, transverse, prebasilar depression; the primary granules with microscopically short, sessile, pale bristles. Base subtruncate, with very fine, obsolescent margination; posterior angles slightly obtuse to almost rectangular. Prosternum large, in front of coxal cavities nearly twice the length of the latter and, as on episternum, with scattered, sharp, round, elongately setiferous granules; intercoxal apophysis horizontal, level with prosternum, at the narrowest point incipiently narrower than mentum.

Elytra elongately oval, broader than front of body, with short but well developed shoulders. Scutellum densely sculptured. Sides rounded and narrowing moderately towards base, more or less strongly attenuate towards apex; the justa-lateral canaliculation very well indicated, rather broad, shiny, becoming dilated and flattened apically. Integument evenly covered with rather scattered, fine secondary granules, and with sparse, coarse, round primary punctures becoming finer towards middle, very scattered and granular on posterior portion; vestiture composed of punctiform micro-bristles of secondary granules and semi-erect, very short bristles of primary sculpture. Apical declivity flattened, produced backwards and faintly sloping towards the apex; the latter with rectangular hiatus at sutural angle. Pseudopleural crest briefly ciliate and subserrate apically; pseudopleura with very fine, sparse granules.

Mesosternal apophysis transverse, two-thirds broader than the prosternal apophysis at its narrowest point. Metasternum about two-thirds the length of the basal sternite of abdomen, sparsely granulate, with complete, sharply impressed, linear median sulcus. Abdomen uniformly covered with rather scattered, briefly setiferous granules becoming more scattered on penultimate and anal sternites; in the ♂ these granules much more concentrated but well separated on disc of the three proximal sternites.

Legs very elongate, thin, with sparse sculpture. Posterior femora thin, gradually dilated towards apex, about equal to the combined length of the three proximal sternites of abdomen; tibial socket of all femora slightly lobiform. Tibiae thin; the anterior tibiae with faintly dilated inner apical portion and with rectangular, non-dentiform, outer apical angle. Tibial calcaria a little more elongate than the basal segment of tarsi in the anterior legs, finer and much shorter than the basal segment of the respective tarsi in the intermediate and posterior legs. The basal segment of the posterior tarsi very little shorter than the combined length of the remainder of tarsus. Claws thin and fine, those on the posterior tarsi about the length of the tibial calcaria or of the penultimate segment of tarsi.

Length of body $5\frac{1}{2}$ –8 mm.

DISTRIBUTION. Transitional Namib, in the western part of northern Little Namaqualand: Port Nolloth (Oct. 1949, C. Koch leg., holo-, allo- and 5 paratypes).

HABITAT. Found, during a foggy night, crawling around plants on the surface of the small, white sandy dunes of the sublittoral area, close to the lighthouse, together with specimens of the larger *Brinckia vaga*; specimens of both species were densely covered with grains of the surrounding sand.

DIAGNOSIS. See key below. This new species, which represents one of the smallest forms of *Hypomelina*, is particularly well characterized by the serrate lateral carina of the pronotum, the very large prosternum, the absence of any justa-marginal canaliculation along the pronotal sides, the rather broad and well demarcated justa-lateral canaliculation along the sides of the elytra, the small size of body etc. It is distinguished from all other *Molurini* in general by the serrate-denticulate lateral carina of pronotum.

Key to the species of Brinckia

1. (4) Pronotum with broadly flattened submarginal depression on middle section of sides; there the discoidal convexity is very distinctly separated from the lateral carina which is more or less strongly reflected. Episternum of prosternum with sharply demarcated, horizontally flattened and smoothed middle portion of justa-lateral area.
2. (3) Body of large size, $11\frac{1}{2}$ –16 mm long. Pronotum with convex disc and covered with dense, elongate punctures which, particularly on sides, become more or less longitudinally confluent. In the ♂ the median third of the three proximal sternites of abdomen with a patch of aggregated, roundish scales. **B. insularis** (Peringuey)

Trachynotus insularis Peringuey, 1908; Gebien, 1920; *Trachynotus insularis* Gebien, 1910; *Psammodes insularis* Gebien, 1937; Gebien, 1938

This species is readily recognizable by the middle portion of pronotal sides, which is bent distinctly upwards; the lateral carina of pronotum is often interrupted between the anterior angles and middle.

Insularis was originally described from one of the small Namib islands, viz. Possession Island, but Gebien (1920) recorded it likewise from the mainland at Luderitz. We collected it as far south as between Soebatsfontein and Springbok (north-western Little Namaqualand), in November 1948. All our specimens have been compared with 2 paratypes from L. Schultze's original material.

3. (2) Body of smaller size, 8 – $10\frac{1}{2}$ mm long. Pronotum with flattened disc, uniformly covered with very fine, sharp, round and well separated granules. In the ♂ the median three-fifths of the four proximal sternites of abdomen with patch of aggregated, slightly elongate scales. **B. oograbiensis** Koch, *supra cit.* (Pl. XVIII)
4. (1) Pronotum without medially dilated submarginal depression or reflected lateral carina; the sides either with very fine justa-lateral canaliculation, or with the discoidal convexity reaching the lateral carina without being separated from the latter by any kind of depression. Episternum of prosternum evenly plane, without horizontally demarcated justa-lateral area on middle section.
5. (6) Size of body small, $5\frac{1}{2}$ –8 mm long. Lateral carina of pronotum serrate-denticulate. In the ♂ the abdomen without patch of scales. **B. serratina** Koch, *supra cit.* (Pl. XIX)
6. (5) Size of body large, $7\frac{3}{4}$ –17 mm long. Lateral carina of pronotum smooth. In the ♂ the three proximal sternites of abdomen with large median patch of aggregated, depressed scales.
7. (8) Sides of pronotum without justa-marginal canaliculation, the discoidal convexity therefore in direct contact with the lateral carina; the latter scarcely visible from above. **B. debilis** (Peringuey) (Pl. XVIII)

Psammodes debilis Peringuey, 1899; Gebien, 1937; Gebien, 1938; *Trachynotidus debilis* Gebien, 1920

Originally described from Walvis Bay, this species was recorded from Swakopmund by Gebien (1920, 1938), but is widely diffused in the littoral and sublittoral sands of the Northern Namib. We collected it from Sandwich Bay northwards as far as Baia dos Tigres in south-western Angola, at the following localities: Swakopmund, Walvis Bay, Sandwich Bay, Henties Bay, Cape Cross, Rocky Point and Baia dos Tigres. Most of the specimens were found at night on the surface of blown sand, almost always close to plants. As the whole of body is covered by a thick layer of sand, which sticks to the cuticle by means of an adhesive secretion, motionless specimens can only be detected with difficulty on the identically coloured sand.

8. (7) Sides of pronotum with narrow but distinct justa-lateral canaliculation along the lateral carina: the latter entirely visible from above.

B. *vaga* (Peringuey)

Trachynotidus vagus Peringuey, 1908; *Psammodes vagus* Gebien, 1937; Gebien 1938

In his Catalogue, Gebien (1937), lists two *Psammodes vagus*, both described by Peringuey; but while *P. vagus* Peringuey, 1899, belongs to the Phanerotomeina, *Trachynotidus vagus* Peringuey, 1908, is a Hypomelin of the genus *Brinckia*; in 1938 Gebien mistook the Phanerotomein for the Hypomelin. Peringuey's description of *Trachynotidus vagus* consists of only two lines of print, † and, though his species is very similar to *debilis*, he did not even mention this species which he had placed in another genus, viz. *Psammodes*. ‡ The type localities of *vagus* are Cape Cross, Rooibank and Port Nolloth. At the two first-mentioned localities, however, only *B. debilis* occurs, and it seems to be most probable that Peringuey re-described specimens from these localities as *vagus*, overlooking his previous description of *P. debilis*. At the last mentioned locality, viz. Port Nolloth, however, occurs a *Brinckia* which differs constantly from the *debilis* from north of the Orange River. If the rules of nomenclature are strictly applied, this form should be given a new name, since only the specimen from the first-mentioned locality, viz. Cape Cross, deserves to be considered the holotype of *vagus* which, however, must be identical with the *debilis* occurring also at Cape Cross. Although I was unable to examine the holotype of *vagus* (which is preserved in the Berlin Museum), I refer the specimens from Little Namaqualand, interpreted below, to *B. vaga*, since I identified them with a specimen from the original material of Schultze, bearing a classification label in the handwriting of Peringuey himself, which reads '*Trachynotidus vagus* PER. cotype'.

B. vaga differs constantly from *debilis* on the formation of the pronotal sides as mentioned in the key, furthermore the pronotum is slightly shorter, broadest at middle and more strongly constricted anteriorly (in *debilis* the pronotum is slightly more elongate, broadest a little in front of middle and less strongly narrowed towards the anterior margin), the intercoxal portion of the prosternal apophysis is more strongly narrowed, the elytra are broader, the justa-marginal canaliculation of their sides is distinctly dilated posteriorly and the shoulders are better marked. The sculpture on elytra differs from that in *debilis* in that the secondary granules are considerably less concentrated, the primary granules very fine, poorly demarcated from the secondary granulation and also on apical portions scarcely more conspicuous, bearing only very short, semi-erect bristles, and the granulation on abdomen also is less dense. The legs are almost identical, but the outer surface of femora is very sparsely sculptured.

B. vaga was collected in great numbers in the littoral sands of north-western Little Namaqualand, from Grootmist northwards to Alexander Bay. It is a strictly nocturnal species, which behaves in the same way as *B. debilis* and *serratina*.

† Original description: '*T. insulari* verisimilis, praecipue differt statura nonnihil minore, prothoracis lateribus in medio minus acuminatis atque haud reflexis, elytris non costatis, granulis aequalibus tenuissimis creberrimis, obsitis. Long. $8\frac{1}{2}$ mm., lat. $3\frac{1}{4}$ mm.'

‡ Cf. also remarks by Gebien, (1920, p. 91), sub *debilis*.

MOLURINI, MOLURINA

Psammodes diabolica tactilis subsp. nov.

Differing remarkably from the typical *P. diabolica* Koch, 1952a, as follows:

diabolica f.t. (Pl. XVI)

Elytra broadly ventricose, entirely bare, with fine and very scattered granules on apical declivity; discoidal punctation less coarse.

Anal sternite in the ♂ with less concentrated and shorter setiferous punctation.

Legs shiny, with scattered, short, sub-punctiform, whitish bristles on femora, tibiae and upper surface of tarsi.

Dimensions 19–25 mm long, 10½–13½ mm broad, 8–10 mm high.

diabolica tactilis

Elytra oval, densely covered with erect, elongate pale brownish bristles of about the length of the eighth antennal segment; granules on apical declivity more numerous and coarse; discoidal punctation very coarse.

Anal sternite in the ♂ with very dense and elongately setiferous punctation.

Legs dull, with concentrated, distinctly elongate, pale bristles on femora and tibiae, and with very elongate, brownish bristles on upper surface of tarsi.

Dimensions 18½–20 mm long, 9½–10½ mm broad, 7½–8 mm high.

DISTRIBUTION. South-western part of the Southern Namib, in Diamond Area no. 1: between Rooilepel (Schakalberge) and Daberas dunes (May 1953, C. Koch and W. Graaf leg., holo-, allo- and 2 paratypes).

HABITAT. Found wandering during the night between grasses and stones on blown sand of the low ground of the lower Orange River area.

SYSTEMATIC POSITION. This new form agrees in all other particulars almost entirely with *P. diabolica*, including the structure of aedeagus. Although the abrupt development of very elongate tactile bristles on elytra is a modification to which so far specific value has been attributed in the systematics of Molurini, there is little doubt that *tactilis* is a subspecies of *diabolica* and not a species proper. Both forms are allopatric, since *diabolica* f.t. occurs on the opposite, southern bank of the Orange River.

REMARKS ON *P. DIABOLICA* F.T. The original description of *Psammodes diabolica* Koch, 1952a, was based on only two cadavers, of which the first, and best preserved one, was discovered in 1948 at about 20 miles east of Alexander Bay, while a further torso was collected two years later at Brandkaross. In November 1953, however, this striking species was recollected in considerable numbers at Grootderm, between the latter and Brandkaross and at Brandkaross itself, after Dr J. S. van Zijl had discovered the first living specimen in blown sand.

The partially incomplete original description may be supplemented as follows: Epistome well separated from supra-antennal portions. Mentum moderately transverse, truncate apically, with scattered, rather coarse punctures. Antennae very elongate, reaching the basal third of elytra, slightly compressed, scarcely accrescent towards apex, with seven shiny proximal segments and four dull distal segments; the third segment is longest, about five times as long as broad and more than one-third as long as the fourth segment; all the following segments considerably longer than broad; the apical segment elongately oval and about the length of the eighth segment. In the ♂, which was previously unknown, the abdomen with a continuous patch of dense, short, reddish brown bristles on the four proximal segments, extending to the discoidal two-quarters of width and originating from an extremely dense, fine, asperous sculpture, which changes to very dense, rather coarse punctures on the fourth sternite. Posterior femora not extending beyond elytral apex; the basal segment of posterior tarsi only a trifle

shorter than the remainder of tarsus. All tarsi densely and rather elongately setiferous below. The ♂ generally with less ventricose elytra.

The holotype of *diabolica* f.t. is based on a ♀ specimen; as ♂ allotype I designate a specimen from Grootderm (Nov. 1953, C. Koch leg.).

P. diabolica is strictly nocturnal and appears to be of psammo-petrophilous habits; during the day it was frequently dug out from the blown sand underneath large boulders. These peculiar and so far unobserved psammo-petrophilous habits, which we were also able to confirm in other Tenebrionids, such as *Vansonium*, *Calognathus* and the Saharan *Storthocnemis*, differ remarkably from those of the strictly petrophilous species, which are also found under stones, but always on the surface of the covered soil, or on the under surface of the stone itself.

CRYPTOCHILINI, CALOGNATHINI and VANSONIINI

These tribes form a closely inter-related phylogenetic line of Karroo-Namaqualand-Kalahari origin, spreading to Somalia only in the Cryptochilini by means of a Trans-Bechuana and East African branch. They are constitutionally well characterized by the constant hypertrophy of the usually squamiform and often pale derivatives of the cuticle, the hermetic connation of the body parts as indicated for both the Adesmiini and Zophosini, and, except for the Calognathini, by the increased volumen of the subelytral cavity.

The secondary adaptive characters, again, have undergone an exceptional and very complex development in the Namib species which, with the exception of the Vansoniini and *Fossilochile* of Cryptochilini, are diurnal but only moderately heliophilous.

In the *Pachynotelus* of Cryptochilini, which are endemic to the sandy dunes of the Namib Desert, we find a hypertrophic development of the tarsal ciliation, the claws and tibial calcaria, a special shovel-like modification of the fossorial apex of the tibiae, and in many cases an often striking enlargement of the two apical segments of the antennae in the ♂ (which, to a much lesser and not dimorphic extent takes place also in some Zophosina of the dunes). In the Calognathini, which actually do not occur in the interior of the barchan dunes but on the blown sand in front of the dune systems, and which are singularized in a remarkable manner by the stag-beetle-like enlargement of the mandibles in the ♂, we encounter surprisingly a complanation of the body and diminution of the subelytral cavity resulting therefrom, but a similar hypertrophy of the tibial calcaria and the ciliation of the tarsi and tibiae, whereby, however, the tarsi are strongly compressed laterally, a formation which usually is referred to as 'sand-shoes' (Buxton; Koch, 1950).

Of the nocturnal species, *Fossilochile rufa* differs little from *Pachynotelus*, but confirms that depigmentation of the cuticle is frequently associated with nocturnal life. Quite extraordinary peculiarities, however, are found in the morphology of the Vansoniini, which are distinguished by the particularly hermetic connation of body-parts, the remarkable reduction in the number of antennal segments because of the connation of the distal three segments, the extremely dense covering of the cuticle by a continuous layer of sessile, whitish scales, the presence of whitish scales between the corneal facets of eyes, while the structure of the legs and the 'sand-shoe'-like modification of the tarsi agree with the Calognathini, and the very much enlarged volumen of the cavity of the hind body with the Cryptochilini.

In many respects the peculiar structures of Vansoniini are strikingly homomorphologic with the Saharan *Storthocnemis* Karsch and *Pseudostorthocnemis* Gridelli. This case is a typical instance of the sometimes obscure limits in our interpretation of phylogenetic and secondary, convergent adaptive characters, as on the one hand the Namib Vansoniini and the compared Saharan genera live

under exactly parallel conditions of milieu, while on the other hand many of these characters may also indicate an ancient relationship between the Southern African Cryptochilini and the Saharo-Sindic Platypini and Pimeliini.†

In the discussed group of the Cryptochilini-Calognathini-Vansoniiini we can emphasize the facts that: (a) the hypertrophy of the squamiform covering of the cuticle is a constitutional adaptation, which is consequently found to be bound neither to the daily rhythm nor to the consistency of the soil nor to the degree of desert phenomena of the environment; and (b) the coloration of the squamiform covering tends to be pale to white in the Namib species in both the diurnal and the nocturnal forms.

Accordingly we have to rectify Gebien's conclusions, which associate the presence of pale to white bristles or scales on the surface of the body with diurnal life in deserts. The nocturnal Vansoniiini and *Fossilochile* exhibit the identical whitish scales and bristles respectively, as found in many heliophilous Cryptochilini and in the Calognathini, whether occurring within or outside the Namib Desert.

The development of laterally compressed 'sand-shoes' in the Vansoniiini and Calognathini is undoubtedly connected with digging and tunnelling in blown sand, and is found also in various Saharo-Sindic Pimeliini (e.g. *Homalopus* Solier) and Platypini (e.g. *Storathocnemis*), as well as in the Tropic and Trans-Bechuana African *Tarsoenodes* Gebien (Molurini), and as a somewhat similar formation also in some genera of the *Caedius*-group of Opatrina (e.g. *Messoricolum* Koch). According to my own observations on *Storathocnemis* in the Sahara (Koch, 1937, and also Mellini), and on the morphologically parallel *Vansonium* in the Namib, it seems, however, that both genera share very peculiar psammo-petrophilous habits, as they are found usually in gravelly plains, where they prefer to tunnel into the soft and powdery sand under stones; they have never been observed in the coarse and shifting sand of the true dunes. The Calognathini appear to have similar habits and occur preferably in blown sand which invades the slopes of rocky outcrops, but are absent from the barehan dunes proper.

CALOGNATHINI

Calognathus chevrolatii subsp. *eberlanzi* Koch, 1950

This form, which was hitherto known from the surroundings of Luderitz, Haalenberg and Namib (70 miles north-west of Aus), was collected by us subsequently in the northern part of the Southern Namib, at Sossus Vlei, Walvis Bay and Gobabeb.

C. chevrolatii Guerin is one of the most characteristic species of the True Namib, ranging from the southern bank of the Orange River to Porto Alexandre in Angola. It occurs in three sharply defined subspecies of which the typical form‡ inhabits the lower Orange River area, spreading inland as far as the Daberas dunes, the subspecies *eberlanzi* is diffused from the Luderitz area northwards to the Kuiseb River, while the subspecies *atricolor* Pic is known only from Porto Alexandre and Baia dos Tigres in Angola.

† A detailed discussion of these special problems is found in Koch (1950).

‡ A beautiful painting of this form by Dr (Mrs) M. C. Ferreira was reproduced in Ferreira, M. C., Elementos Morfologia Externa Coleópteros (*Bol. Inst. Angola*, 6, 1955, pp. 43-80, 15 figs., 2 colour plates).

VANSONIINI

Vansonium bushmanicum namibense subsp. nov.

(Pl. XX)

This new subspecies differs from the typical *V. bushmanicum* Koch, 1950, on the following characters:

<i>bushmanicum</i> f.t.	<i>bushmanicum namibense</i>
Upper surface of intermediate tibiae inermous, without spines between middle and apex (Text-fig. 3a)	Upper surface of intermediate tibiae armatus; there are two spines between middle and apex (Text-fig. 3b)
Apical margin of epistome with a shiny tubercle halfway between the median emargination and the genal angle; lateral contours of genae subparallel anteriorly, dilating towards eyes posteriorly	Apical margin of epistome without tubercle between the median emargination and the genal angle; lateral contours of genae obliquely narrowing towards eyes
Antennae slender, the penultimate segment a trifle longer than broad, the apical segment elongately oval	Antennae stouter, the penultimate segment small and transverse, the apical segment only slightly more elongate than broad
Sides of pronotum with the indication of a blunt marginal edge on anterior half	Sides of pronotum evenly convex on anterior half
Prosternal apophysis shorter, about the width of coxal cavities; discoidal portion of mesosternum scarcely longer than broad	Prosternal apophysis more elongate, distinctly narrower than coxal cavities; discoidal portion of mesosternum distinctly longer than broad apically
Discoidal surface of elytra separated from the reflected lateral surface by a distinct lateral edge; each elytron with faintly costiform median and humeral ridges plus a narrow supplementary ridge between the latter and the lateral edge	Discoidal surface of elytra usually plane or with incipient traces of longitudinal convexities; the sides of discoidal surface without or with only very faint lateral edge

DISTRIBUTION. North-eastern part of the Southern Namib, in Diamond Area no. 2: Tsauchab River, about 30 miles west of the farm Sesriem (Oct. 1957, C. Koch leg., holo-, allo- and 2 paratypes).

HABITAT. Captured during the night, while slowly crawling on the horizontal base and lower part of the slope of a marginal barchan dune, as well as on the gravelly plain of the Tsauchab River depression. Until this discovery *V. bushmanicum* was believed to be strictly endemic to the blown sand of Little Bushmanland, where it was collected at Pofadder, Nabeis and also Kakamas.

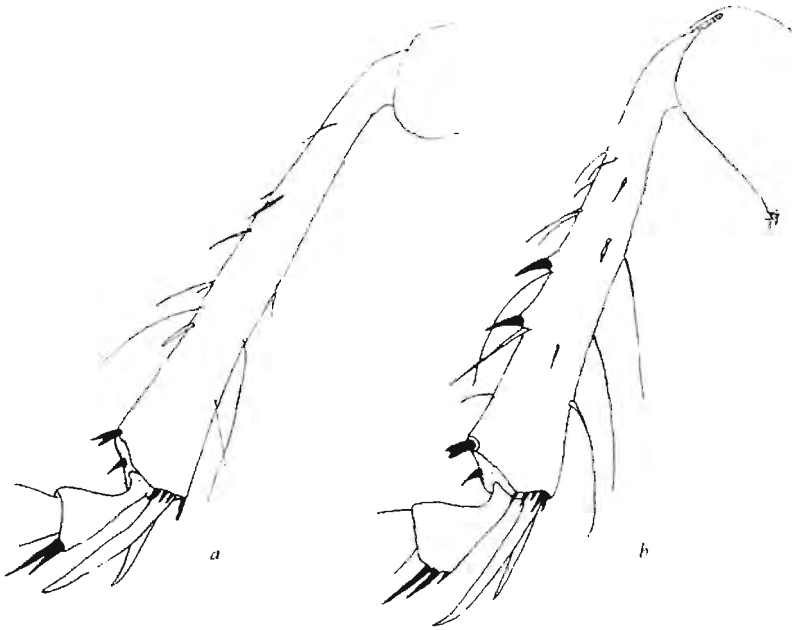
CRYPTOCHILINI

Pachynotelus kuehnelti sp. nov.

The following description is based on a single fragment consisting of elytra, meso- and metasterna plus the respective coxae.

Elytra subparallel, elongate, very high, evenly and very densely covered with coarse, shiny granules which are absent only from two narrow longitudinal stripes of white scales. The lateral edge is composed of a single row of granules, which are not larger than the discoidal granules and therefore poorly demarcated; as this lateral edge delimits the sides of elytra only quite close to the shoulders, the pseudopleura are visible from above for practically the whole length. The lateral contours of elytra are strongly narrowed towards base on anterior quarter, subparallel to slightly concave on two median quarters, and rounded and narrowed towards the apex on posterior quarter. The shiny granules on disc are closely concentrated but not in contact with one another, with the intervening spaces

between them being less than their diameters; they become smaller but more sharply raised on apical declivity; since these granules are umbonate, it is possible that they may also bear bristles in fresh specimens, which are very often found to be rubbed off in cadavers of *Pachynotelus*. The two longitudinal and scaly stripes are positioned as follows: The discoidal stripe runs from the base to the apex of elytra on about the inner third of each elytron in a faintly S-curved course; the outer stripe does not reach the apex and is remarkable as it divides into two stripes on basal two-thirds, of which the outer stripe is narrower than the inner stripe, ending at some distance from the apex. The cuticle underneath the white scales of these stripes is very densely covered with a rugose, granular micro-sculpture; there are some widely spaced, single and shiny granules along the midline of these stripes, which project beyond the surface of the layer of white scales.



Text-fig. 3. Intermediate tibia of: a, *Vansoniium bushmanicum bushmanicum* Koch; b, *V. bushmanicum namibense* subsp. nov.

The perpendicular pseudopleura are very large and at about middle distinctly broader than the respective discoidal portion of elytron; they are covered evenly with the same densely set, coarse granules as on discoidal surface. The formation and sculpture of the meso- and metasterna do not differ much from those in *Pachynotelus albonotatus* Haag, except for the concentration of the large, shiny primary granules which stick out from the layer of whitish scales of ground sculpture.

Dimensions of elytra: $13\frac{1}{2}$ mm long, 8 mm broad, and ca. $6\frac{3}{4}$ mm high.

DISTRIBUTION. North-eastern part of the Southern Namib, in Diamond Area no. 2: Tsauchab River, about 30 miles west of the farm Sesriem (Oct. 1957, C. Koch leg., a single holotype). This part of a cadaver was found in wind-blown detritus at the foot of the marginal dunes.

SYSTEMATIC POSITION. This new species is distinguished in an extraordinary

manner not only from all known *Pachynotelus* but also from all Horatomina of Cryptochilini in general, except for *Fossilochile*, by the absence of the five primary rows on each elytron, as well as by the very even, irregular and coarse granulation on both the dorsal and lateral (or pseudopleural) surfaces of elytra. In respect of the absence of the primary rows it agrees with *Fossilochile rufa* Koch, but in this species the elytra lack a marginal edge on sides, are densely punctured in longitudinal rows and there are no longitudinal stripes of white scales as developed in *kuchnelti*.

According to the length of elytra the new species must be the largest of all *Pachynotelus*, as so far *P. albonotatus* Haag, with a body length of 10-16 mm, has been considered the largest species of the genus.

DEDICATION. Named in honour of Professor Dr W. Kühnelt, Director of the Zoological Institute of Vienna University and eminent soil biologist.

ADESMIINI

To this large tribe belongs also the generally nocturnal genus *Epiphysa* which, until recently, has been regarded as an independent tribe†. The Adesmiini are, by an overwhelming majority, diurnal and frequently also heliotactic Tenebrionids, of a very wide Sahara-Sindic plus Tropic-African distribution. They are of a decidedly xerophilous disposition, and occur in all deserts which are situated within the range of their distribution (Sahara, Gobi, Thar, Somalia, Namib), and also in the arid areas of the circum-Guinean savannahs of equatorial Africa (Koch, 1944-48).

The primary adaptive structures, which are characteristic of the whole tribe, are, among others, the remarkably increased thickness of the sclerotization of the cuticle, the hermetic connation of the prothorax with the hind body and that of the pleurital and pleural margins between the sterna of the hind body and the elytra respectively, the atrophy of the elytral hypomera and any tactile sense bristles, the hypertrophy of the elytral convexity (implying augmentation of the volumen of the subelytral cavity),‡ the non-fossorial structure of the legs, and the very pronounced melanism of the cuticle.

With the unique exception of the 'white' *Onymacris* and *Stenocara eburnea* the degree of constancy of the characters mentioned is extraordinary and does not depend on the exertion of the quotidian rhythm (diurnal and nocturnal species), or on the factors of soil consistency (dune and petrophilous species), or other environmental features (e.g. ultra-desertic to tropical-savannah species, etc.).

The regional or secondary adaptive structures in the Adesmiini of the Namib dunes have become developed to a much greater extent than in the Adesmiini of the other deserts. The reason for this development may be considered an ultra-evolutionary fact, viz. the adaptation of the *Eustolopus* and *Onymacris* to the life in ever-shifting sand dunes, in association with extremely heliotactic habits, which was achieved only in the Namib; no known Adesmiini from either the Sahara or the Gobi have gained access to the sandy dunes.

In connexion with the quasi-fluid consistency of the dune sand, we find that—apart from minor adaptations such as a marked smoothening of sculptural structures or the slight indication of a somewhat snout-like prolongation of the

† The synonymisation of the Epiphysini with the Adesmiini, which was proposed on the basis of identical morphological structures in the adults (Koch, 1955*a*), has been recently confirmed also by the great morphological resemblance of the early stages (*in litteris*).

‡ According to Buxton (1924), the subelytral space usually contains fine droplets of water, whose temperature is commonly lower than that of the desert surface during hot days, and the air used for respiration passes first through it and is thus possibly cooled and moistened before entering the spiracles (Hafez & Makki, 1959).

epistome—most of these secondary modifications are confined to the locomotory organs, but this strictly within the limits of the phylogenetic constitution.

Although an extraordinary hypertrophy of the tactile bristles of the tibial coronula, and of the unguis and calcarial structures has taken place—in association with the initiation of an atrophy in the outer spur of claws, resulting in the unequal length and width of the unguis spurs—the fundamentally non-fossorial structure of the cursorial leg of *Adesmiini* has not changed. As suggested previously, the process of burrowing in dune sand is not so much a fossorial as a diving-surfacing activity, for which apparently the modification of the claws and tibial calcaria suffices, without involving the transformation of the whole tibia into the typically fossorial leg. It is this typically fossorial leg that is usually referred to in literature and is met with in many *Opatrini* and *Platynotini*, which do in fact have to dig into sand of various degrees of consolidation or other kinds of hard ground.

A further proof of the superordinate and unchangeable nature of the phylogenetic constitution follows also from the maintenance of the hairless cuticle in the dune *Onymacris* and *Eustolopus*, for the development of a lateral ciliation or tactile sense bristles on the discoidal surface of body has frequently been found associated with life in loose sand (cf. also Pierre).

Gebien considered the prolongation of the legs in the dune *Adesmiini* of the Namib to represent also an adaptation to life in dunes; he cited the *Onymacris* and in particular the extraordinarily elongate legs of some *Stenocara*, such as *S. phalangium* and *velox*.† These findings, however, have to be rejected, as the two *Stenocara* do not live in the dunes but on the grassy and often gravelly plains which are characterized by the compactness of the sandy soil, while, for example, in *S. desertica*, which is one of the few dune *Stenocara*, the legs are approximately three times shorter than those in *S. phalangium*; the legs of *Onymacris*, though certainly of an elongate type, are considerably shorter than those of many species of *Stenocara* which occur over the whole of the arid Kalahari-Namaqualand-Karoo region, not only on sand but also on rocks.

The *Onymacris* of the Namib dunes are to a great extent also differentiated from the other *Adesmiini* by special structures possessed by the ♂, and by the unique 'white' coloration of the species from the Northern Namib.

Usually in the *Adesmiini* the sex dimorphism is restricted to relative differences in body size and shape, length of legs, size of eyes, etc. Surprising exceptions to this rule, however, are met with in the ultra-psammophilous *O. unguicularis* and *O. plana*, the latter an errant plant-follower. In the former the front femora of the ♂ are slightly curved and have the ventral surface of the basal half adorned with a dense brush of erect brown setae, and the front tibiae have a row of moderately elongate setae on the ventral surface. In the latter species the elytra of the ♂ are strongly flattened and considerably broader than in the ♀, due to the umbrella-like expansion of the lateral margins, and the intermediate abdominal sternites are contracted and faintly telescoped. On account of this formation of the elytra in *plana*, the described case represents a remarkable deviation from the constitutional and otherwise constant hypertrophy of the elytral convexity.

The 'white' coloration of the *Onymacris* from the Northern Namib, *Stenocara eburnea* and *Calosis* has raised much speculation in literature. Kuehnelt (1957) found that the 'white' colour is not due to a pigment, but is caused by the unorientated reflexion of light by the numerous microscopical bubbles of air which are enclosed in the exocuticula; this is also the cause of the white colour in snow, white flowers, the white scales of butterflies and other insects, including Tenebrionids. Schmalzfuss & Barthmeyer, who studied the occurrence of melanogen and melanin in organisms, are quoted by Gebien to have recorded the

† In these species the hind legs stretch to more than three times the length of body.

absence of any *o*-dioxxybenzol in the entirely white elytra of *Stenocara eburnea*, a medium amount of these constituents in the yellowish elytra of *Onymacris marginipennis*, and a very high degree of *o*-dioxxybenzol in the entirely black *Onymacris* from the Namib south of the Kuiseb River.

We are at a loss to explain adequately the phenomenon of the convergent occurrence of the 'white' elytra in these Tenebrionids, which, in the whole world, are strictly localized to the small coastal area of the Northern Namib.† All hypotheses, such as protection from insolation (Gebien), or protection from enemies on account of the homochronous coloration (Peringuey, Gebien, and others) have to be rejected,‡ also on physiological grounds§ and particularly by the fact that these 'white' Tenebrionids do not differ ethologically from the normally 'black' desertic Tenebrionids of the world, nor is the environment of the Northern Namib fundamentally different from that of the Southern Namib (Koch, 1957). The 'white' coloration is also in no way associated with life on dunes, as *Stenocara eburnea* and all *Calosis* live exclusively on the grit and gravel plains, and not all 'white' *Onymacris* occur in the barchan dune areas.

The depigmentation in the 'white' species is very different from the depigmentation occurring in many nocturnal Tenebrionids, as in these species the original, yellowish to testaceous tint of the chitin shows.||

A whitish to violet coloration in some of the Adesmiini, which is produced by a chalky secretory substance on the surface of body, is not confined to the Namib Desert, as Gebien indicated. Such a pale and deciduous layer is developed not only in the Namib species such as *Stenocara phalangium* and *velox*, *Onymacris rugatipennis*, *lobicollis*, *subelongata*, etc., but is found also in widely diffused species as e.g. in the species of the *Stenocara gracilipes* group.

There are no nocturnal Adesmiini on the Namib dunes, as the semi-diurnal and nocturnal *Epiphysa* and some occasionally nocturnal *Physosterna* (e.g. *cribripes*) are confined to consolidated soils and rocks. The change from diurnal to nocturnal habits is a gradual one, and goes by degrees from highly heliotactic in the *Onymacris*, *Eustolopus* and some *Stenocara* (viz. *phalangium*, *velox* and *eburnea*), through semi-heliophilous and umbriphilous in most of the other *Stenocara*, *Physosterna* and *Renatiella*, to semi-diurnal (matutinal and vespéral)

† Gebien hinted that the absence of melanogen and melanin may be associated with factors of suppression, which may reign in the sole and very restricted area of occurrence of the 'white' Tenebrionids. However, on the one hand many 'black' Tenebrionids occur together with the 'white' ones, and on the other hand we have successfully reared *Calosis amabilis* from the egg to the full-grown larva in the insectarium at Pretoria under conditions which vary considerably from those of the original biotope (using as medium, e.g. Kalahari, instead of Namib, sand). In spite of this there may be some truth in Gebien's supposition, as all our many larvae of *Onymacris bicolor marshalli* (about 500 specimens) died, without any exception, in the small first instars, while the larvae of the 'black' *Onymacris* (viz. *multistriata*, *rugatipennis*, *unguicularis plana* and *laeviceps*) developed readily to the full-grown instars under the same deviating conditions of biotope.

‡ Koch (1957) cit.: 'The very black colour of the front of body and the purely white elytra (of *Onymacris candidipennis* and *Onymacris bicolor marshalli*) contrast strongly with the brown coloration of the sand of dunes.'

§ Kühnelt (1939) (Paulian cit.) proved that it is not the thickness of the sclerotization, but the layer of pigment, which keeps off the ultra-violet rays. Bodenheimer, who studied to what degree the rays of various wavelength in the solar spectrum are able to pierce the dead part of the integument of insects and reptiles, found the integument to be normally fairly well protected against penetration into its living tissues, irrespective of colour; furthermore, he found a striking similarity in the transmission trend through all colours and integumental structures, as well as the general non-transmittance of ultra-violet rays.

Experiments carried out by Bolwig showed that the 'white' *Onymacris* cannot support higher temperatures than the 'black' species of this genus.

|| Schmalzfuss (Gebien cit.) found that such yellowish to testaceous Tenebrionids (which usually are called 'depigmented' in literature) contain a great amount of melanogen in their cuticle (he examined various species of the Asiatic deserts, such as *Sphenaria elongata* and *karelini*, *Trichospheana suturalis* and the diaphanous *Dengitha lutea*).

in several *Physosterna* and a few *Epiphysa*, and finally to strictly nocturnal in all *Alogenius* and most of the *Epiphysa*.

The nocturnal *Epiphysa*, *Alogenius* and *Physosterna* do not differ essentially in their body formation from the diurnal *Adesmiini*, and lack also characters which can often be observed in other nocturnal Tenebrionids, such as depigmentation, softening of the integument, etc.

Onymacris visseri sp.nov.

(Pl. XXI)

This new species belongs to the so-called 'white' *Onymacris*, which are characterized by the white to pale yellowish structural colour of the elytra. This phenomenon is strictly localized to the small coastal area of the Northern Namib, where it occurs, in a convergent manner, in the three unrelated genera *Onymacris*, *Stenocara* and *Calosis*.

The *Onymacris* are highly heliatactic dune-runners and belong to the basic elements of the Namib, as they are to be found in the whole area. All *Onymacris* from the Northern Namib are 'white' species, while those from the Southern and Transitional Namib are black—as is usual in diurnal deserticolous Tenebrionids. Most of the *Onymacris* are errant plant-followers, but *O. unguicularis* Haag and *O. laeviceps* Gebien are decidedly ultra-psammophilous species dwelling in the vegetationless parts of the dunes. These ultra-psammophilous species differ from the errant plant-followers by the higher degree of hypertrophy of the contact armatures on the legs and the smoothed cuticle of body, while their larvae seem to be better provided with tactile sense bristles on the anterior legs, meso- and metanotum and first abdominal segment than those of the errant plant-followers. There are no essential morphological differences between 'white' and black species, either in their adult or early stages.

The description of the new and first known inland species of the group is given in the following key:

Key to the species of 'white' *Onymacris*

- 1 (12). Pseudopleural crest of elytra obsoletely indicated, indistinct or altogether absent.
- 2 (7). Claws strongly hypertrophic, subfoliaceous, with unequally elongate spurs; the longer spur more distinctly elongate than the ungual segment of tarsi. Elytra with longitudinal rows of tubercles on disc. Apical margin of epistome subtruncate; head above with very fine, sparse, often incipient punctures. Legs smooth, with very scattered punctation, the underside of intermediate and posterior femora evenly convex, not sulcate.
- 3 (4). The apical and caudate lobe of elytra with the sutural angle of each elytron produced into a sharp, curved short spine, both spines often overlapping one another apically. *O. brincki* Koch, 1952b
 This species was hitherto known in a few typical specimens from the sandy dunes near Rocky Point on the Skeleton Coast of the northern Kaokoveld. Later Dr L. K. Marshall collected a fine series of this species on the dunes west of the Hartmann Mountains, close to the Cunene River (Aug. 1956); the specimens of this series differ from the typical specimens by the unicolorous and pure white tint and finer tubercles of elytra, the distinctly marked lateral carina of the pronotum and the less prolonged caudate lobe of elytral apex.
- 4 (3). The apical and caudate lobe of elytra normal, broadly rounded or subtruncate, without spiniform sutural angles.

- 5 (6). The reflected lateral portion of elytra densely covered with strongly flattened, umbonate, papilliform tubercles, which are very distinct on apical third. *O. bicolor* Haag, f.t.
Known only in the single holotype, the patria of which has not been located. In fresh specimens the colour of elytra is probably of a uniform ivory to snowy white tint.
- 6 (5). The reflected lateral portion of elytra smooth, with the background of cuticle faintly and irregularly uneven but without any traces of a shallow tuberculation. *O. bicolor* subsp. *marshalli* Koch, 1952b
The elytra of a pure white colour, without traces of any design. This form is confined to the sandy dunes of Porto Alexandre and Baia dos Tigres (Koch, 1958) in Angola, where it occurs together with the identically coloured *O. candidipennis*.
- 7 (2). Claws moderately hypertrophic, not dilated and with equilong spurs which are about the length of the unguis segment of tarsi or slightly shorter. Elytra not tuberculate, but often with costiform sculpture. Apical margin of epistome triangularly emarginate at middle; head above with coarse and rather dense punctures. Legs densely sculptured, the underside of intermediate and posterior femora sulcate along midline.
- 8 (9). Head on vertex as coarsely and densely punctured as on frons. Pronotum with two prebasilar impressions which are rugosely punctured. *O. marginipennis* subsp. *palgravei* Peringuey, 1885
Collected at Walvis Bay, Swakopmund and Henties Bay (cf. also Koch, 1952b).
- 9 (8). Head on vertex with evanescent punctation, frons coarsely punctured.
- 10 (11). Body slender. Elytra with reddish brown ground colour, without or with rows of punctures, in the latter case the punctures fine; the white marginal stripe along pleural portion well marked. *O. marginipennis* (Breme, 1840), f.t.
Described from Cape Negro in Angola and re-collected at the Skeleton Coast (Koch, 1952b).
- 11 (10). Body stout. Elytra with greenish yellow ground colour and rows of coarse and black punctures; the white marginal stripe on pleural portion absent or indistinct. *O. marginipennis* subsp. *nigropunctata* Koch, 1952b
So far only the typical series of this form is known, coming from the Porto Alexandre desert in Angola.
- 12 (1). Pseudopleural crest of elytra sharp, complete and very well marked.
- 13 (14). Elytra pure white, without any design, the lateral portions rotundate with the discoidal surface, without any dividing ridge between the latter and lateral surface. Tarsi stout; the claws with distinctly unequal spurs of a somewhat foliaceous shape; all segments, with the exception of the unguis one, short, almost square and scarcely longer than broad; unguis segments dilated, those of the posterior tarsi distinctly broader than the upper surface of the posterior tibiae basally. *O. candidipennis* (Breme, 1840)
Confined to the desert of Porto Alexandre and Baia dos Tigres (Koch, 1952b, 1958).
- 14 (13). Elytra of a white to yellowish ground colour, but constantly with a design formed by yellowish, brownish or blackish longitudinal stripes; the discoidal surface demarcated from the lateral portions by a fine, sharp primary costa on sides. Tarsi slender; the claws with symmetrical, equilong and thin spurs; all segments considerably more elongate than broad; unguis segments slender, weakly dilated, and not broader than the upper surface of the posterior tibiae basally.
- 15 (16). Head with very dense, confluent, longitudinally rugose sculpture on vertex, pronotum with distinct punctation. Elytra with whitish ground colour also discoidally, which, in specimens with a well developed design,

can change to a pale brownish but not to yellow; all yellow portions of primary intervals constantly flanked by blackish secondary lines, which are in particular well marked along the sutural primary interval and that of sides on the perpendicular laterally reflected portion of elytra; the alternating primary intervals often distinctly costiform; the caudate apex moderately produced and broadly rounded. *O. langi* (Guerin, 1843)

This species, which exhibits an exceedingly variable design of elytra (cf. Koch, 1952*b*, 1958) appears to be strictly localized to blown sand of the surroundings of Mogaamedes.

- 16 (15). Head above with scattered punctures, which usually become more concentrated in the shallow, longitudinal depressions along supra-orbital crests; pronotum with very fine and sparse, incipient punctation. Elytra with an intense yellow ground colour on disc, but the perpendicular laterally reflected portion of elytra pure white; all primary intervals yellow, and all secondary intervals with a more or less distinct punctation of a pale reddish brown tint; the lateral and always costiform primary interval is not flanked by any secondary line on the laterally reflected portion; the alternating primary intervals plane to very weakly costiform; the caudate apex well produced backwards, slender and with rather sharply pointed apex. *O. visseri* sp. nov.

This very interesting new species is the first known South-West African species of the Angolan *candidipennis* and *langi* group, with which it agrees on account of the sharp and complete pseudopleural crest of elytra and the subtruncate apical margin of epistome. In spite of its very distant distribution area it is very closely related to *O. langi*, from which it differs only, apart from the characters mentioned above, by the stouter and larger shape of body, and the distinctly more elongate appendages; in all other particulars both species agree to a great extent.

The size of body varies in the new *visseri* from 16 to 23 mm in length and 8 to 11½ mm in width (against 14-18 mm length and 6½-10 mm width in *langi*). The very peculiar yellow tint of the disc of elytra immediately distinguishes *visseri* from all the other *Orymaeiris*; the design is very constant and formed by the unicolorous and pale reddish brown secondary rows, alternating with the yellow primary intervals. In some forms, which tend towards a luxuriant development of sculpture, there are four well indicated and rather broad, uneven primary intervals (the sutural, lateral and two intermediate intervals), while the alternating, even primary intervals are usually poorly indicated, thin and abbreviated posteriorly.

DISTRIBUTION. Northern Namib, in the Cunene area of the Kaokoveld; Junction of the eastern branch of the Marien River and the Cunene River (Aug. 1956; Visser Exped., holo- allo- and 10 paratypes).

HABITAT. On the sandy flats of the depression of the Marien River (N'gola flats) and those of the Cunene River which are situated below the 600 m. contour and are in communication with the low ground of the coastal area. Many specimens of this species were observed in bright sunshine running with considerable speed on the grit-like to wind-blown surface of the plains between low plants and grasses. This is the first *Orymaeiris* known which does not live on sandy dunes; among the 'white' *Orymaeiris* it is a species which has penetrated farthest into inland areas (some cadavers were found about 30 miles south of the junction of the Marien and Cunene Rivers).

DEDICATION. I have much pleasure in naming this new species in honour of Mr G. Visser, the generous sponsor of the 1956 Expedition to the lower Cunene country and south-western Angola.

EURYCHORINI

The Eurychorini share their xerophilous disposition and the wide circum-Guinean distribution in Africa with the Zophosini and Adesmini. They are, however, cryptic insects of a decidedly nocturnal disposition and very diversified habits. Many species are myrmecophilous (adelostomoid species) or petrophilous (eurychoroid species) to cavernicolous (*Symphochora* Koch), while the psammophilous species very often follow the burrows of rodents and reptilia or have

become adapted to the life in the shifting sand of the dunes (e.g. *Machlopsis* Pom. of the Sahara [cf. also Mellini] and most of the genera of the *Stips*-group in the Namib).

In conformity with the wide range of habitats they exhibit a very heterogeneous build of body which, nevertheless, keeps strictly to certain features of primary constitution. Such features are, for example, the usually only ten-segmented antennae, the divided eyes, the well protected oral cavity, but in particular the complanation of the whole body, the absence of true hypomera, and the hermetic closure of the pleurital and pleural margins of the hind body which, however, is not correlated with any connation of the prothorax and the sterna of the hind body, as is the case in the *Adesmiini* and *Zophosini*.

As the increase in the volumen of the subelytral cavity is frequently quoted in literature as an adaptive structure of deserticolous Tenebrionids (Gebien, Pierre, etc.), we emphasize the fact that in the Eurychorini the opposite development has taken place. The complanation of the body in some deserticolous species (e.g. in some species of the *Stips*-group and of *Eurychora*, etc.) reaches an extreme degree, which practically results in the absence of any subelytral cavity.

If we compare, for example, the width-height ratio of body in *Onymacris unguicularis* and *Stips stali*, which occur together in the barchan dunes of the Southern Namib, the former is to the latter as is 1-0.25. This ratio, however, only roughly indicates the volumen of the subelytral cavity, as the relative volume is still much higher in the *Onymacris*-species on account of the continuous convexity of the elytra, but still much lower in the compared *Stips*-species owing to the almost foliaceous complanation of the submarginal lateral zones of the elytra, which accounts for nearly one-half of the elytral width.

The lesser degree of the connation of body-parts in the Eurychorini may eventually be brought into some correlation with their nocturnal life habits and consequent almost complete absence of exposure to insolation and evaporation. While in all the predominantly diurnal to extremely heliotactic tribes not only the pleurital and pleural margins of hind body are hermetically connate but also the prothorax and the sterna of hind body, there is in the Eurychorini no connation of the front and hind body, which, on the contrary, are in most cases very loosely jointed to each other and have preserved independent mobility.

Of the many Southern African Eurychorini only the *Arthrochora*, *Lepidochora* and the two species *stali* and *dorsocostata* of the otherwise extra-dune genus *Stips* have entered permanently into the barchan dunes of the Namib. Hitherto the complanation of body has been interpreted as an adaptive response to petrophilous life habits. Hesse (1938) quotes as an example also *Stips* (olim *Steira*); however, in *Stips* the complanation of body does not at all indicate an adaptation to life under stones but represents a primitive organization feature occurring in both the petrophilous as well as the psammophilous, and even in the ultra-psammophilous species (*Lepidochora*).

Whereas the errant plant-followers of these dune Eurychorini (viz. *Stips stali* and *dorsocostata*, and *Arthrochora arenicola*) do not show any special signs of adaptation, we can record an extraordinary development of secondary adaptive structures in the ultra-psammophilous *Lepidochora* of the barren dunes. In this connexion we may mention only the peculiar formation of the legs, in which, in addition to the somewhat 'sand-shoe'-like but otherwise normal tarsi, supplementary webbed, 'sand-swimming feet' have developed by means of the multi-digitate modification of the tibial calcaria;† the hypertrophy of the claws coupled

† The multi-digitate formation of the intermediate and posterior calcaria in *Lepidochora* must be considered a singular morphological structure in the Tenebrionid family. A similar and convergent modification, however, is reported and figured by Pierre of *Dynamopus plicifrons*, a Scarabaeid beetle occurring in the dunes of the south-western Sahara.

with atrophic tendencies in the development of the outer ungual spur; the subfossorial dilation of the anterior tibiae; the complete smoothening of the sculptural structures on the surface of body (which structures are characteristic for the other, ascendent genera of the *Stips*-group); the hypertrophy of tactile sense bristles and lateral cilia; and the depigmentation but luxuriant development of squamiform to hair-like derivatives of the cuticle. In some of the species, e.g. *Lepidochora porti*, an augmentation of the discoidal convexity of the elytra has also taken place.

The combination of the two characters of a depigmentation and the development of a dense vestiture in the *Lepidochora* may readily be interpreted as an adaptation to nocturnal life. Many other nocturnal Tenebrionids of the Namib dunes are distinguished by a depigmentation of the cuticle, such as all *Dactylo-calcarina*, all *Vernayella*, *Uniungulum*, *Archinamibia*, *Namibismus*, etc., and of the errant plant-followers of the dune Eurychorini and also *Stips dorsocostata* and *Arthrochora arenicola*; exactly the same combination as stated for *Lepidochora* however, occurs in the *Vansonini* and *Fossilochile rufa*. In all cases, when a dense layer of hairs, (†), or more frequently scales, is present, the colour of these derivatives is constantly of a white to silverish tint, this being a further proof that the pale coloration of the vestiture of body is not at all a peculiarity of the diurnal insects of the desert.

The hygrophanicity of the *Lepidochora*, which seems to be correlated with the above combination of characters of the cuticle, deserves serious attention with regard to the possibility of moisture-storing properties of the depigmented cuticle and its special derivatives. We were able to observe the *Lepidochora* during the night displaying a different pattern of coloration from that found in dead or dried collection specimens; the elytra assume a somewhat bluish transparency and the whitish hairs and scales a distinct silverish sheen. Experiments, which we carried out with a species of *Aspidomorpha* (Cassidid beetles), ‡ indicated definite hygroscopic properties of the cuticle, as dry and dead collection specimens of a dull yellowish brown colour gradually assumed their original and intense metallic coloration when exposed to increasing air moisture (e.g. as produced in a relaxing box).

Moisture-storing properties may eventually be attributed also to the constantly black *Stips stali*, which we frequently observed during the night storing the wet sand on the dish-like sculptural cavities on the surface of the body.

We were unable to note in the dune Eurychorini any signs of the bluish pruinescence known from many adelostomoid Eurychorini, or the waxen to often elongately stringy, secretory substance, which is peculiar to many eurychoroid species.

Gen. *Lepidochora* Gebien

Gebien (1938)—Koch (1950, 1952c, 1958)

The *Lepidochora* include the most characteristic nocturnal dwellers of the barchan dunes of the whole of the True Namib; they are all ultra-psammophilous species of the barren parts of dunes, and photophobic.

Phylogenetically the *Lepidochora*, though undoubtedly descending from the Eurychorini of the *Stips*-group, are very sharply separated from all the other Eurychorini in their adult as well as early stages. The larvae are much broader

† Gebien's statement that, in the *Lepidochora*, the ♀, as the more primitive sex, bears hairs but the ♂ scales, has been proved to be based on erroneous conclusions and has been rectified (cf. Koch, 1950); Gebien's ♀♀ have turned out to represent a species proper (*Lepidochora pilosa*).

‡ The *Aspidomorpha* spec. in question has been collected in great numbers in the littoral sand zone of the south-eastern Cape Province, on *Ipomea pes-caprae*.

than those of the other Eurychorini reared in the insectarium (viz. *Arthrochora*, *Stips*, *Eurychora*, *Geophanus*, *Phytolostoma*, *Symphochora*, *Serrichora*, *Pogonobasis* and *Prunaspila*); they can be readily recognized by the broad, evenly rounded ninth abdominal tergite, the disc of which is covered with hook-like spines, while in the other Eurychorini this part of body is setiferous and of decidedly cordiform shape, pointed apically and terminating in a setiferous, spiniform tubercle curved upwards (cf. Schulze).

This striking morphological separation of *Lepidochora* from the other Eurychorini points to a considerable age for this genus, a supposition which seems to be confirmed by their quasi-explosive speciation and the sympatric occurrence of different species on the very same dune system. They show remarkably great proliferation of species, not only latitudinally and longitudinally in the geographic sense, but also vertically in respect to the height of the dunes. The species from the yellow-brown sublittoral dunes of Walvis Bay differ from the species found in the continental reddish sand of the same area; Kuiseb area species differ from those occurring in the Sossus Vlei and in the southern Bogenfels area. Still more remarkable was the discovery of four different species on one dune in the Kuiseb-knee area; one species was always found near to the top of the dune, two in the sand of the leeward side, and the fourth on the harder, grit-like sand at the bottom of the very same dune—truly remarkable instances of specialization and adaptation to the micro-ecologic diversity of biotope.

The distribution of *Lepidochora* ranges from the Orange River to the Coroca River. In close agreement with the habits of the characteristic reptile *Palmatogecko rangei*, they occur over the whole area of the dune systems, irrespective of the ecological division of this area into a fog-belt (outer Namib) and the inland zone (inner Namib); consequently *Lepidochora* are found in the coastal dunes, as well as in the far inland dunes which may be as far away from the coast as 80 miles.

Until recently there was thought to be a big gap in their distribution between the northernmost, Angolan species (*nocturna*), and the southern species from the Luderitz area, but we have now found parts of the intermediate region to be not only densely populated by *Lepidochora*, but more exactly this central area (northern portion of the Southern Namib) may even be regarded as the centre of evolution of the genus on account of the proliferation of mostly sympatric species.

Originally *Lepidochora* was described on the basis of the two species *eberlanzi* and *discoidalis* (Gebien, 1938); a few years later, in 1948, two further species from the same area were discovered, viz. *pilosa* and *diaphana* (Koch, 1950), while very surprisingly another species was discovered at Porto Alexandre in Angola (*nocturna* Koch, 1952b); finally, the first form known from the central area (Walvis Bay) was placed as subsp. *parva* Koch, 1958, to *L. eberlanzi*. Now three additional and new forms can be reported from the dunes of the Tsauchab and Kuiseb Rivers areas, which we discovered in 1957 and re-collected in 1959. As the new species, though readily recognizable on account of the characteristic colour pattern of their elytra, are rather homogeneous with regard to the remainder of body formation, I give their diagnoses in the following key:

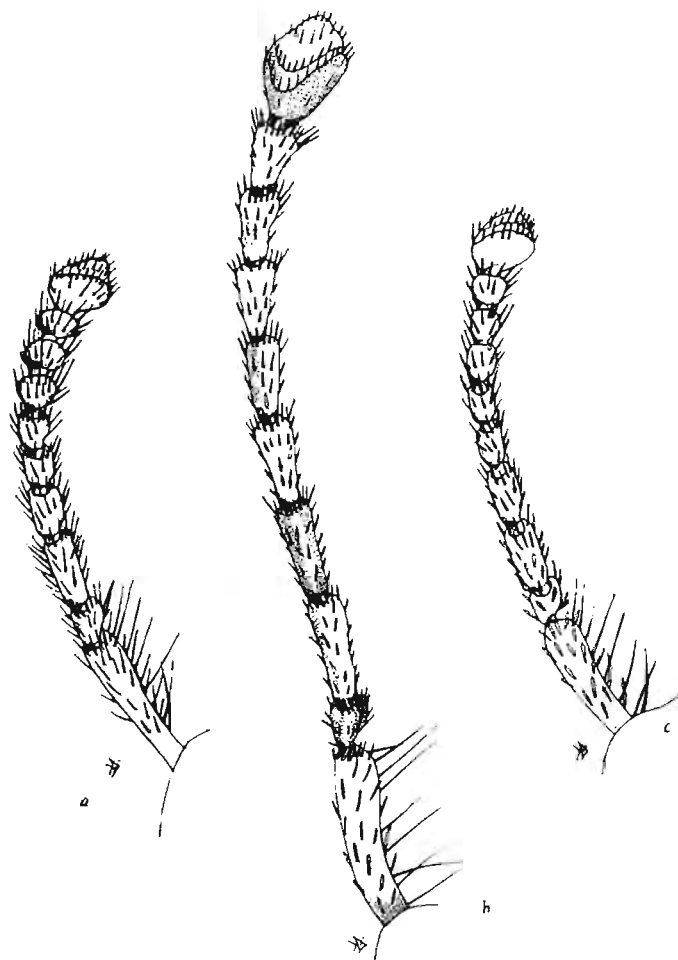
Key to the species of *Lepidochora*

- 1 (10). Elytra yellowish, without or with sutural to discoidal black patch, in the latter case this black patch of elongately oval to cordiform design, at the widest point not or only slightly broader than the discoidal convexity of pronotum and, at the most, on each elytron one-and-a-half times as broad as the respective portion of the yellowish sides of elytron.
- 2 (7). The black patch on elytra, if present, confined to the sutural portion, at the widest point much narrower than the discoidal convexity of pronotum, at the best of elongately oval design, on each elytron in no case

broader but much narrower than the extension of the yellow coloration on sides.

- 3 (4). On elytra only the suture blackened. Prosternal apophysis produced behind coxal cavities, very weakly sloping towards apex; mesosternal apophysis with diverging lateral edges. *L. diaphana* Koch, 1950

This species is closely allied phylogenetically to the two following forms; it is, however, readily distinguished from them by the evenly convex disc of pronotum, which is distinctly bi-callose in *eberlanzi* and *parra* on account of a longitudinal and sulciform depression along midline; it is smaller than these forms, with length of body $12\frac{1}{2}$ – $13\frac{1}{2}$ mm.



Text-fig. 4. Antenna of: a, *Lepidochora pilosa* Koch; b, *L. eberlanzi* Gebien, f.t.; c, *L. discoidalis* Gebien, f.t. (Drawings J. Drost.)

L. diaphana is known from the barchan dunes near Bogensfels (south of Luderitz), where it occurs together with *L. discoidalis*; a single cadaver was reported also from Haalenberg (Koch, 1952b).

- 4 (3). Elytra with an elongately oval, black patch on sutural portion. Prosternal apophysis bent steeply towards foramen; mesosternal apophysis with subparallel edges.

- 5 (6). Body of larger size, 15–16½ mm long. The black patch on elytra well defined and always oval. Disc of pronotum more distinctly bi-callose. The suture of elytra very distinctly raised and its contours clearly demarcated from those of disc (caudal view). Mesosternal apophysis narrower than the coxal cavities. **L. eberlanzi** Gebien, f.t.

This species had so far been recorded from the Luderitz area (surroundings of Luderitz, Charlottenthal and Grasplatz, according to Koch, 1952*b*). Two torsi (hind bodies), brought back by Dr R. Paulian from Sandwich Bay, agree well with this typical form from Luderitz and differ clearly in the above mentioned characters from *parva*.

- 6 (5). Body of smaller size, 12–15 mm long. The black patch on elytra on an average smaller, less well defined and often confined to the suture itself. Disc of pronotum faintly bi-callose. The suture of elytra less strongly raised and its contours poorly demarcated from those of the disc (caudal view). Mesosternal apophysis shorter, about as broad as coxal cavities.

L. eberlanzi subsp. *parva* Koch, 1958

Parva is very common on the barchan dunes of Walvis Bay, and Swakopmund, but we captured one specimen also at Rooibank, together with *L. kahani*. Since the occurrence of the typical *eberlanzi* at Sandwich Bay is probable (see above), the possibility cannot be excluded that *parva* may eventually represent a species proper.

The larva of this form belongs to the group of *porti* and *kahani* on account of the setiferous discoidal portion of the upper surface of body, but is specifically different from both mentioned species.

- 7 (2). The black patch on elytra broad and cordiform, covering a large portion of the disc; at the widest point distinctly broader than the discoidal convexity of pronotum, and on each elytron about one-and-a-quarter to one-and-a-half times as broad as the respective portion of the yellowish sides.
- 8 (9). Body of larger size, 12–16 mm long. Elytra normally convex, in caudal view and measured along suture about twice as high as breadth of the submarginal depression of sides; sides rounded and narrowing towards shoulders; submarginal depression very broad, at middle about one third the width of the discoidal convexity; the lateral edge, as usual, ending very closely above the epipleural edge of apex; the scales on disc large, very dense, slightly imbricate, in contact with one another and entirely concealing the granules underneath. Discoidal convexity of pronotum moderate, distinctly bi-callose, very densely covered with scales of practically the same size as on disc of elytra. Prosternal apophysis bent steeply towards foramen. **L. kahani** sp.nov. (Koch, 1959, col. plate; Pl. XXIV)

This new species is closely allied to *eberlanzi* and *parva*; it agrees with both in the larger size and the shape of body, the apically reflected prosternal apophysis, the blunt lateral edge of the mandibular lobe of postgenae, the moderate convexity of the discs of elytra and pronotum, the very similar structure of the apical construction of the elytra, as well as in the formation and density of the scaly vestiture of body. It is, however, readily distinguished from *eberlanzi* and *parva* by the large, cordiform, black patch on elytra, the basally rounded and slightly narrowing sides and the considerably broader submarginal depression of the latter. In the less raised suture and the broadly sinuate contours of the pre-caudal portion of elytra, it agrees quite well with *parva*, but exhibits the identical bi-callose discoidal convexity of pronotum and narrow prosternal apophysis as found in *eberlanzi*.

The larva of *kahani* differs specifically from that of *porti* and *eberlanzi parva*, but seems to be more closely related to the latter.

DISTRIBUTION. Northern part of the Southern Namib, in the areas of the Tsauchab and Kuiseb Rivers: Tsauchab River dunes, about 30 miles west of the farm Sesriem (Oct. 1957, C. Koch leg., holotype, sex not determined, and 10 paratypes); Sossus Vlei (do., several specimens); Gobabeb (do. and May 1959, Carp Exped., several specimens); Rooibank (May 1959, Carp Exped., numerous specimens).

HABITAT. In the barren portions of dunes, usually in the higher parts; in Rooibank a series of specimens was captured quite close to the crest of high dunes.

DEDICATION. Named in honour of Mr M. E. Kahan, Chairman of South-West African Industrial Diamonds Ltd., who kindly extended all possible assistance to our trips in Diamond Area no. 2.

- 9 (8). Body of smaller size, 10½–14 mm long. Elytra strikingly convex, in caudal view and measured along suture about four times as high as the submarginal depression of sides is broad; basal portion of sides subparallel and including a blunt, rectangular humeral angle with the base itself; submarginal depression narrower, at middle about a fifth the width of the discoidal convexity; the lateral edge ending at a much higher level than the epipleural edge of apex; the scales on disc small, elongately subparallel, moderately dense, not imbricate but separated from one another by intervening spaces which are as broad as the diameter of scales, leaving the granules of surface well exposed. Discoidal convexity of pronotum strongly raised, without distinct calli but with a transverse impression across middle section of pre-basilar portion; densely covered with sharp, small granules bearing very short, thin, hair-like scales, which are much smaller than those on elytral disc. Prosternal apophysis produced behind coxal cavities and only gradually sloping towards foramen.

L. porti sp. nov. (Pl. XXIII)

This new form is one of the best characterized species of *Lepidochiza* on account of the striking hypertrophy of the discoidal convexity of elytra and pronotum, but atrophy of the scaly vestiture of body.

Phylogenetically *porti* occupies quite an isolated position, showing relationship only with *L. nocturna*. The head and its appendages are formed as in the preceding species, but the anterior margin of the epistome lacks any kind of median emargination, and the lateral edge of the mandibular lobe of postgenae is faintly developed. The pronotum, except for the convexity and sculpture on disc, is similar to that in the preceding species, exhibiting also the same, very elongate, large scales on the sloping portions of the discoidal convexity and on the submarginal depression of sides. In the structure of the prosternal apophysis, *porti* is similar only to *L. diaphana*. In shape the elytra closely resemble those of the preceding species, but agree in the subparallel basal portion of sides with *eberlanzi* and *parva* and not with *kahani*; the submarginal depression is definitely narrower than in all these species; the pre-caudal emargination shows broadly sinuate contours, similar to those in *kahani*, but the higher level of the end of the lateral edge is peculiar to *porti*; in the cordiform, black design *kahani* and *porti* are quite similar. The underside of the hind body and the formation of legs are almost identical with the preceding species.

The larva of this new species, which occurs at the same dune as *L. kahani* but under different ecological conditions, is greatly differentiated from that of *kahani*.

DISTRIBUTION. Northern part of the Southern Namib, in the areas of the Tsauchab and Kuiseb Rivers, and sympatric with *L. kahani*: Rooibank (May 1959, Carp Exped., holotype, sex not determined, and 5 paratypes); Gobabeb (do., 5 paratypes); Tsauchab River dunes, 30 miles west of the farm Sesriem (Oct. 1957, C. Koch leg., some cadavers); Walvis Bay (July 1954, C. Koch leg., 1 old and bleached cadaver).

HABITAT. This new species has always been encountered either on the horizontal foot of the barchan dunes, or on small undulating dunes in front of them, often also in the grassy, marginal area. As strictly nocturnal as all the preceding species.

DEDICATION. Named after Mr A. E. Port, who recorded the occurrence of this species at Gobabeb for the first time in 1955.

- 10 (1). Elytra black and with a more or less broad, yellowish lateral margin, which is sometimes poorly defined or darkened; the black portion of circular design, at the widest point, considerably broader than the discoidal convexity of pronotum, and on each elytron at least two-and-a-half times as broad as the respective portion of the yellowish sides.
- 11 (12). Vestiture of body composed of fine hairs. Antennae shorter (Text-fig. 4a), the two preapical segments transverse. Epistome separated from genae by a shallow sinuosity of sides. The caudate process of elytra very short, with broadly rounded to subtruncate apex.

L. pilosa Koch, 1950 (Pl. XXII)

This is decidedly the most deviating of all *Lepidochora*. It differs from all the other species by the pilose and non-scaly vestiture of body, and the formation of the antennae, the epistome and the caudate process of elytra. In the colour pattern of elytra it is similar to *L. discoidalis* f.r., but is easily distinguished by various additional particulars such as the flattened and unraised suture, the very narrow submarginal depression of elytral sides, the even and moderate discoidal convexity of pronotum, the immarginate sides of the mandibular lobe of postgenae, etc.

L. pilosa is localized to the Luderitz area (surroundings of Luderitz, Charlottenthal, Haalenberg and Bogenfels).

- 12 (11). Vestiture of body composed of scales. Antennae normally elongate, two preapical segments longer than broad. Epistome separated from genae by a deep, subangular emargination of sides. The caudate process of elytra produced, sharply triangular.
- 13 (14). Head remarkably large, about a third the width of pronotum; mandibular lobes of postgenae plane, without lateral structures. Scales on the middle section of the disc of pronotum and elytra small, but those on the sloping lateral portion of the discoidal convexity of the pronotum very elongate and about three times as large as the small scales on middle of disc. The submarginal depression of elytra narrow, behind shoulders occupying only one-fifth to one-sixth of the respective width of the discoidal convexity of each elytron; discoidal convexity strongly raised; the black colour expanding to the inner margin of the submarginal depression. Prosternal apophysis produced behind coxal cavities and sloping only gradually towards apex. *L. nocturna* Koch, 1952b

This isolated species agrees with *L. diaphana* and *L. porti* in the posteriorly produced prosternal apophysis, but appears to be more closely allied to *porti* on account of the great convexity of elytral disc, the small and comparatively scattered scales on disc of pronotum and elytra, and the rather strongly raised suture of elytra. It is readily distinguished from *porti* by the black elytra with only a narrow yellowish margin at sides (cf. Koch, 1958, plate 23), the much narrower submarginal depression and the normal position of the end of the pseudopleural crest, which is situated close above the epipleural edge (as is the case with *eberlansi*, *kahani*, etc.).

The length of body varies from 10 to 13½ mm.

L. nocturna inhabits the sandy dunes of the Angolan Namib and has so far been collected at Porto Alexandre and Baía dos Tigres; in Porto Alexandre we observed it also on small and low dunes quite close to the seashore.

- 14 (13). Head small, less than a third the width of pronotum; the lateral margin of mandibular lobes of postgenae sharply separated from the surface by a costiform edge which is the continuation of the infra-orbital ridge. Scales on the disc of pronotum and elytra large and broadly oval, those on the sloping lateral portion of the discoidal convexity of pronotum neither in shape nor in size different from the scales on the middle of disc. The submarginal depression of elytra rather broad, behind shoulders occupying about one-fourth of the respective width of the discoidal convexity of each elytron; the latter moderately raised; the extension of the black coloration subspecifically variable, often not reaching the inner margin of the submarginal depression, but sometimes even expanding to the surface of the submarginal depression itself. Prosternal apophysis bent more distinctly towards foramen and the apex with lateral process on each side.

L. discoidalis Gebien, 1938 (Pl. XXII)

This species has the widest distribution of all *Lepidochora*, ranging all over the barchan dunes of the Southern Namib.

Although well distinguished from the other species on the basis of several peculiarities such as the sharp edge on the sides of the mandibular lobe of postgenae, the structure of the prosternal apophysis, the broadly oval and large scales, etc., it poses apparently insoluble problems on account of the development of numerous subtle geographic and even ecological forms.

The series from almost every one of the collecting stations differ constantly in the pattern of colour, as well as the density and shape of the scales. For example, all specimens from Sossus Vlei and Gobabeb exhibit a very dense

layer of whitish silvery and larger scales, which conceal the yellowish margin of elytra; in those from Gobabeb, the black colour of the elytral disc expands to the inner margin of the submarginal depression, and in many cases even on to the surface of this portion itself, whereby such specimens assume a peculiar, unicolorous bluish-silvery tint, differentiating them from all other *Lepidochora* (var. *argentogrisea* nov., Pl. XXIII). In most of the specimens of other localities, the black colour of elytral disc does not reach the inner margin of the submarginal depression.

The larva of *discoidalis*, although sometimes occurring sympatrically with *L. kahani*, *porti* and *eberlansii parva* and of very similar, ultra-psammophilous habits, is strikingly differentiated from the larva of these species by the atrophy of the tactile sense bristles on body, which are developed only on the pleural, lateral portions but lack the discoidal portion of upper surface. The occurrence of this atrophic structure, however, disproves the general belief that larvae of dune-l'enebrionids are adapted to the conditions of moving sand through a hypertrophy of tactile sense bristles.

The localities which are known to us are the following (cf. also Koch, 1950, 1952b):

(a) forma typica: surroundings of Luderitz, 15 miles north of Luderitz, Charlottenthal, Schmidfield, Haalenberg, Namib (70 miles north-west of Aus), Tsauchab River dunes (about 30 miles west of the farm Sesriem), and Rooibank.

(b) var. *argentogrisea* nov.: Gobabeb (Oct. 1957, C. Koch leg., and May 1959, Carp Exped., holotype, sex not determined, and several paratypes); Sossus Vlei (Oct. 1957, C. Koch leg., numerous specimens).

All the specimens of the dark var. *argentogrisea* were collected only on the top of dunes and very close to the crest; in Rooibank, however, all *discoidalis* belong to the typical form, whether they were collected at the foot of the dunes or on the crest.

L. discoidalis is the only species of *Lepidochora*, which was frequently observed as already active during the late hours of the afternoon, crawling around on the slopes of the leeward side of dunes in bright sunshine; when encountered at night, it did not quickly hide in the sand from artificial light. Most of our specimens of var. *argentogrisea* were captured just before sunset, running around gregariously underneath the 'smoking' crest of dunes—an area which is much exposed to strong whirlwinds and stirring up wind-borne debris and grains of sand.

Stips dohrni namibensis subsp. nov.

Constantly differing from the typical *Stips dohrni* (Haag, 1872) as follows:

dohrni dohrni

The discoidal space on elytra, between dorsal costae, uneven on account of an obsolete but coarse punctation, and sparsely covered with rather coarse granules, which are only moderately smaller than the granules on frons of head

Pronotum with the compressed lateral portions exhibiting a very uneven surface; the discoidal convexity with less dense and rather coarse granules, which are scarcely finer than the granules on frons of head

Supra-orbital carina almost angularly bent towards median carina of head anteriorly and continued to the latter

Dorsal costae on elytra curved gradually towards suture apically, but not transverse at the end

dohrni namibensis

The discoidal space on elytra, between dorsal costae, even, without or with only scattered and fine punctures, and very densely covered evenly with very fine granules which are several times smaller than the granules on frons of head

Pronotum with plane and very densely granulated compressed lateral portions; the discoidal convexity covered with the same granulation which is considerably finer than the granules on frons of head, but coarser than the granules on discoidal surface of elytra

Supra-orbital carina ending in front of eyes, without a transverse prolongation towards the median carina of head

Dorsal costae on elytra as in the typical form, but the apical part abruptly bent towards suture and running for a short distance in a transverse direction

DISTRIBUTION. Southern part of the Northern Namib: Cape Cross (Oct. 1957, C. Koch leg., holotype, sex not determined, 4 paratypes); Walvis Bay (July 1954,

Vernay Exped., 3 specimens); Gobabeb (May 1959, Carp Exped., 3 specimens); Swakopmund (3 specimens).

According to a few specimens preserved in the Transvaal Museum collection it seems that this subspecies occurs also in the western part of the Damaraland highlands. The respective localities are the following: Brandberg (E. R. Scherz leg.); Kaoko-Otavi (June 1951, C. Koch leg.); Quickborn, Okahandja Distr. (Dec. 1928, R. D. Bradfield leg.); Kalkveld, Otjiwarongo Distr. (Feb. 1948, S. Kretzschmar leg.).

HABITAT. Found during the night on sand and frequently between rocks.

SYSTEMATIC POSITION. This new form is remarkably differentiated from *Stips dohrni* by the uniform, very dense and fine granulation of body, but agrees with this species in all the specific characters by which *dohrni* is distinguished from all the other species of *Stips*. Such characters refer to the non-caudate elytra, the absence of a distinct epipleural crest apically, the position of the dorsal costae of elytra, which are situated closer to the sides than to the suture, the hypertrophic development of the dorsal and sutural costae and the presence of a rudimentary justa-humeral carinula.

The typical *dohrni* is known to us only from the Kalahari sands between the Orange River in the south and the Zambesi River in the north; all previous records from the South-West African highlands and the Namib seem to refer to the new *namibensis*.

ZOPHOSINI

This large tribe agrees to a great extent in its pattern of distribution, ethology and even evolution with the Adesmiini. The Zophosini, which are also widely diffused over the whole of extra-Guinean Africa and the Sahara-Sindic area, are of a predominantly diurnal and generally heliotactic disposition; their evolution is very similar to that of the Adesmiini, in that they have also developed a nocturnal branch (*Dactylocalcarina*) and have become adapted to life on shifting sand dunes exclusively in the Namib Desert.

The primary adaptive characters, although very similar to the Adesmiini in the hermetic connation of sutures, pleurital and pleural margins of body, the absence of hypomera, the non-fossorial, cursorial legs and the atrophy of tactile sense bristles, differ however in many other essential ways, such as a rather remarkable complanation of the body (which results also in a diminution in the volumen of the subelytral space), the striking enlargement of the metasternum,† and the great constancy in the production of a fine, secretory pulverululence on the surface of body.

The secondary adaptive structures of the dune Zophosini of the Namib, however, have undergone a quite extraordinary development, which, in fact, surpasses all that is generally known in this respect of other deserticolous Tenebrionids.

The diurnal Zophosini, which are formed by the subtribe of Zophosina, are confined outside the Namib to the single and remarkably homogeneous genus *Zophosis*. Several hundred species of this genus occur all over extra-Guinean Africa, the Mediterranean area, Arabia and north-western India, but are abruptly stopped by the barchan dunes of the Namib. All the species of Zophosina, however, which have become adapted to the dune biotope are generically differentiated from the ascendent *Zophosis* and offer a very high degree of secondary specialization. In agreement with Pierre's findings in connexion with the south-west Saharan Tenebrionids, we can observe the tendency towards

† The large size of the metasternum, in association with the constant apterism in the Zophosini, is a remarkably abnormal combination, as the loss of wings is usually coupled with a contraction of the metasternum.

increasing the cavity of the hind body by swollen elytra, and often also swollen abdomen, the development of tactile sense bristles on pseudopleura of elytra and, in the case of *Cardiosis* and *Ophthalmosis*, also of bristles on the discoidal surface of elytra.

As has been mentioned in the Adesmiini, the legs have become transformed into 'diving-surfacing', but not into typically fossorial, legs on account of the hypertrophy of the tactile sense bristles of the tibial coronula and of the unguis and calcarial structures; the atrophy of the outer calcarial spur has progressed to a much higher degree (e.g. in *Cardiosis*, *Anisosis*, *Tarsosis*, *Cerosis*, etc.).

Further peculiarities are found in the sometimes striking prolongation of the legs, particularly of the intermediate and posterior tarsi ('gliding legs' of *Cardiosis*); the almost unique shifting of the position of the metacoxae towards the centre of body which is usually associated with a telescopic contraction of the abdomen but hypertrophic enlargement of the metasternum (*Cardiosis*, *Onychosis*); the formation of pseudo-humeral angles of elytra (*Tarsosis*); the prolongation of the antennae; etc.

An as yet unsolved problem concerning the diurnal Zophosina is the phenomenon of a peculiar layer of variously coloured, fine pulverescence, which often completely conceals the black cuticle of the body. Although it is true that the colour of this layer often corresponds to the tint of the environmental soil and in such cases may be interpreted as mimicry, nevertheless, this colour very often contrasts with the colour of the sand (e.g. the latericeous tint of pulverescence in *Zophosis sexcostata*, occurring on the whitish blown sand of the Porto Alexandre desert, or the brimstone-coloured patches of pulverescence on pronotum and elytra in *Cardiosis fairmairei*, living on the barren dunes of the Southern Namib, which vary in tint from brownish to reddish, etc.). Paulian, following reports by Gebien, refers to this pulverescence, and defines it as a 'coloration of the integument, which disappears with the death of the individual'. This statement must be rejected, as, if proper methods of preservation are used, collection specimens will keep forever the original colour of pulverescence which even if rubbed off in living specimens is renewed. The frequent quoting of this pulverescence as being a further instance of 'whitish desert' coloration is also incorrect. The range of colour varies from an intense orange-red (*Zophosis mniszewski* from western Damaraland) through latericeous (*Zophosis sexcostata* from the Porto Alexandre desert) and all tints of brown to pale colours, such as brimstone, yellowish and greyish and finally whitish. A pure, chalky white was found only in *Zophosis dorsata*, which lives together with the 'white' *Calosis amabilis* and the bluish *Zophosis devexa* on the quartz plains of the Northern Namib, between Nadab and Anigab. Although the secretory pulverescence is found to occur in many species of the whole distribution area of the Zophosini (e.g. also in the Saharan *Zophosis viridilimbata*, cf. Koch, 1937; L'iori, 1956), it seems that the ability to produce this secretory substance is confined to certain phylogenetic groups, and is usually absent in tropical species. There is a more distinct probability that the pattern of colour is specifically constant and is certainly not dependent on the coloration of the environmental soil.

A case of very efficient homochromous mimicry, however, can be reported of *Heliophosis kalaharica* from the blown-sand dunes of the south-western Kalahari; in this species, owing no doubt to an adhesive secretory substance, particles of the dune sand stick to, and entirely conceal, the black cuticle of the body.

A parallel development to that of the 'white' Adesmiini has taken place in the Zophosini, in which the elytra of the peculiar genus *Calosis*† exhibit a similar range of pale to white coloration of a structural nature, as has been discussed in

† A misprint has occurred in Brinck's paper on page 131; instead of '*Cardiosis*' read '*Calosis*'.

the *Onymacris* and *Stenocara eburnea* (Adesmiini) of the Northern Namib. While, however, the 'white' species of Adesmiini do not differ, except specifically, from their generic allies *Onymacris* and *Stenocara*, the *Calosis* are sharply and generically differentiated from the remainder of Zophosini also on the basis of the completely deviating structure of the aedeagus (Koch, 1958).

The few nocturnal Zophosini, which belong to the subtribe Dactylocalcarina, are extremely specialized by the hypertrophy of tactile sense bristles, claws and tibial calcaria, the depigmentation of the integument, the increase in the convexity of the hind body, and the contraction of the appendages and transformation of the cursorial legs into typically fossorial legs. This development, starting with the *Protodactylus*, has reached its peak in the anophthalmous and perhaps permanently 'under-sand' *Dactylocalcar caecus* of the high barchan dunes of the Southern Namib. In this species the hypertrophy of the sense bristles, claws and tibial calcaria is as extraordinary as is the almost globular convexity of the hind body, and the metasternum is exceedingly enlarged at the cost of the abdomen, which is contracted and telescoped to such a degree that it consists practically only of the hypertrophic anal sternite; the legs are transformed entirely into the typical fossorial legs, which we know in many psammophilous Opatrini, Platynotini and Trachyscelini; the antennae are also remarkably contracted and resemble much more closely this formation in the littoral and unrelated Opatrini than in the ascendent Zophosina. The modification of most of these secondary adaptive structures is due to an ultra-evolutionary development with reversed tendencies, as compared with like structures in the heliotactic Zophosina of the dunes. In these genera the eyes are particularly enlarged, the antennae prolonged, and the high degree of melanism of the cuticle remains unchanged as also the cursorial legs, which are non-fossorial but 'diving-surfacing'. In spite of the entirely different and hypogaecic life habits in *Dactylocalcar*, however, the constitutional, phylogenetic characters are strictly maintained, although the secondary adaptive changes are very great and strikingly convergent with the unrelated, likewise anophthalmous *Syntyphlus subterraneus* of Stizopina (Opatrini) of sympatric occurrence.

ZOPHOSINI, DACTYLOCALCARINA

Gebien (1938) erected the tribe Dactylocalcarini for the ultra-evolutionary and monotypical genus *Dactylocalcar* Gebien, which is distinguished from all the genera of the subfamily Tentyriinae of the world by its anophthalmy. Subsequent to the discovery of the ophthalmous genus *Protodactylus* Koch, 1952*b*, some doubts were expressed in regard to the tribal rank of Dactylocalcarini, since *Protodactylus* exhibits intermediate characters and obscures the systematic limits between the Zophosini and Dactylocalcarini (Koch, 1955*a*). Finally, when revising the genera of Zophosini (Koch, 1958), based on new findings, I placed *Dactylocalcar* and *Protodactylus* as components of a subtribe (Dactylocalcarina) to the Zophosini.

The definition of this subtribe was based on the following combination of characters:

- (a) Oblique lateral sulci on metasternum absent.
- (b) Prosternal apophysis bent towards foramen.
- (c) Metasternum without pre-metacoxal structures.
- (d) Mesosternal apophysis slender, much narrower than coxal cavities.
- (e) Spurs of claws of equal length.
- (f) Antennae short and stout; second segment enlarged, broader than the following segments and about equal to the combined length of the third and

fourth segments; all the distal segments, from the third on, short, more or less transverse and subcylindrically fitting one into the other.

(g) Tibiae short, strongly dilated towards apex, with the contours appearing as if widely serrate or crenulate, owing to a few granular and projecting punctures from which arise strong, stiff spinulae; coronula composed of strong and rather elongate spines; calcaria of anterior tibiae robust, foliaceous to spoon-like, much longer than the basal segment of anterior tarsi.

(h) Posterior angles of pronotum not produced backwards.

(i) Mesosternum without separated anterior peduncle.

(j) Body at least ciliate below, on anterior angles of pronotum and apical declivity of elytra.

With the recent discovery of some very remarkable forms of *Protodactylus* affinity, further insight has been gained into the close inter-relationship of both subtribes. Based on the morphology of these new forms the above definition for *Dactylocalcarina* has to be widened considerably, since no less than five characters of the indicated combination [viz. (a), (b), (d), (f) and (h)] cease to be associated with the remaining peculiarities of *Dactylocalcarina*. The new subgenus *Zophosodactylus* of *Protodactylus* shows *Zophosina*-like features such as oblique lateral sulci on metasternum (a), a produced prosternal apophysis (b) and sharply produced posterior angles of pronotum (h), while the strikingly deviating, new genus *Carpicella* is distinguished by an extraordinary dilation of the mesosternal apophysis (d) and the formation of the antennae, which are slender and composed of elongate segments (f).

Protodactylus (s.str.) *giessi* sp.nov.

In size and shape of body closely resembling *P.* (s.str.) *opticus* Koch, 1952b (and 1958), but readily distinguished as follows.

<i>opticus</i>	<i>giessi</i>
Upper surface of body shiny, with an additional metallic sheen, of dark colour, the front of body black, the elytra not diaphanous, blackish to dark brownish	Upper surface of body dull, without metallic sheen, reddish brown, the elytra of a distinctly diaphanous pale reddish to dark testaceous
Ciliation dark to blackish, poorly developed; moderately elongate and scattered on sides of pronotum, except for the anterior angles, where there is a concentration of cilia, very short and sparse on sides of elytra	Ciliation pale, straw-coloured and luxuriant; very elongate and dense on sides of pronotum, less elongate and dense also on sides of elytra, including the apical declivity
Epistome with fine, scattered punctures; its lateral outlines not separated from those of genae.	Epistome densely granular; its lateral outlines separated from those of genae by a distinct sinuosity
Sides of pronotum not narrowing in front of posterior angles, the anterior angle moderately produced, and the sloping lateral portions with only incipient punctation	Sides of pronotum tending to become very slightly rounded and narrowed in front of posterior angles, the anterior angle strongly produced, and the sloping lateral portions with comparatively coarse and rather dense punctation
The very fine punctures on disc of elytra distinct, but the scattered sculpture on apical declivity less granular	The disc of elytra almost unsculptured, as the extremely fine and sparse punctures are scarcely detectable; on apical declivity with sharp, round granules
Mesosternal apophysis very narrow, about the width of prosternal apophysis	Mesosternal apophysis broader than prosternal apophysis.
Metasternum smaller, not quite as long as the four proximal sternites of abdomen taken together	Metasternum large, at least the combined length of the four proximal sternites of abdomen

opticus (cont.)

Calcaria of anterior tibiae slightly smaller, about one-and-a-half times as broad as the basal segment of tarsi apically, and the combined length of the basal plus second segments

Length of body: $2\frac{1}{2}$ -3 mm.

DISTRIBUTION. Southern part of the Northern Namib, in the Kuiseb River area: Gobabeb (May 1959, Carp. Exped., holotype, sex not determined, and 3 paratypes).

HABITAT. Found during the night crawling around between wind-blown debris accumulated under overhanging rocks on the sandy plains on the northern bank of the Kuiseb River.

SYSTEMATIC POSITION. This new species is the first known South-West African representative of *Protodactylus*, which hitherto was known exclusively from the Moçamedes desert in Angola. It is very closely related to *P. opticus*.

P. opticus is a more or less stationary plant-follower of blown sand, but seems to be absent from the barchan dunes proper. After the discovery of the two typical specimens in the neighbourhood of Moçamedes, we collected a fine series south of the Coroca River, between Pedibas and the river (June 1954, Vernay Exped.).

DEDICATION. Named in honour of Mr W. Giess of the Botanical Section, South-West African Department of Agriculture.

giessi (cont.)

Calcaria of the anterior tibiae large, almost twice as broad as the basal segment of tarsi, and the combined length of the latter plus the two following segments

***Protodactylus* (*Zophosodactylus* subgen. nov.)**

Though placed with *Protodactylus* on account of the characteristic formation of the appendages and shape of body, this new group is sharply distinguished from the *Protodactylus* s.str. by the presence of oblique lateral sulci on metasternum, the *Zophosina*-like structure of the posterior angles of pronotum, which are acute, produced backwards, and embrace the humeral portion of elytra, the horizontally produced intercoxal portion of the small prosternal apophysis and the striolate sculpture on the sides of elytra.

TYPE SPECIES. *Protodactylus* (*Zophosodactylus*) *sanctae-mariae* sp.nov.

***Protodactylus* (*Zophosodactylus*) *sanctae-mariae* sp.nov.**

Body small, oval, shiny above, of a dark brown to black, but the elytra paler, usually reddish brown, the underside and appendages testaceous to reddish brown, the upper surface often with a faint metallic sheen.

Head shaped as in *P. opticus*, but of larger size. Upper surface plane, rather densely covered with very fine, somewhat asperous punctures on anterior portion; epistome shallowly emarginate, its lateral outlines in line with those of genae. Underside, oral organs and the short antennae identical with *P. opticus*; the antennae likewise considerably shorter than the width of head, the enlarged second segment broader than the following intermediate segments and about combined length of the two following segments, but the three distal segments more strongly enlarged and form a distinct club.

Pronotum very similar in shape and sculpture to *P. opticus*, but the anterior angles a little more strongly prolonged, the sides gradually dilating towards posterior angles, and the base deeply bi-sinuate, owing to the sharply acute posterior angles which are produced backwards beyond level of the middle section of base to embrace the humeral portion of elytra. The very fine, slightly asperous punctation is sparse on the discoidal portion, but becomes concentrated

on lateral portions. Along the lateral carina there are some dark, moderately elongate cilia emerging from a fine submarginal canaliculation; a very shallow, transverse pre-basilar depression can be observed on lateral portions. Prosternum as in *P. opticus*, except for the intercoxal apophysis, which is produced backwards horizontally beyond coxal cavities and forms a right angle with the prominent and perpendicular apical declivity.

Elytra oval, very similar to *P. opticus*, but scarcely broader than pronotum, a little more elongate and less convex, slightly flattened on disc, with the sides almost subparallel anteriorly and narrowing only incipiently in front of base. The fine sculpture is considerably more concentrated, rather dense and composed of fine, roundish, asperous punctures on disc, scattered, round, slightly coarse granules on apical declivity, but very fine, brief, oblique and dense striae on the convex lateral portions. The pseudopleural carina is very fine, complete, a little more distinctly arcuate and the pseudopleura consequently broader medially than in *P. opticus*. The ciliation of the sides is confined to a few short bristles basally and apically.

Mesosternum identical with *P. opticus*, with the same median carinula on basal portion, but the intercoxal apophysis distinctly narrower than the prosternal apophysis. Metasternum sparsely punctured, only slightly longer than the three proximal sternites of abdomen taken together; with two sharply impressed, oblique lateral sulci which reach the level of middle of metasternum as also does the prolonged and rather broad median impression; a sharply impressed, curved, rudimentary portion of the episternal suture is visible in front of the epimeron. Abdomen as in *P. opticus*, but the anal sternite without margination apically.

Legs of the same characteristic structure as in the *Protodactylus* s.str., with hypertrophic, foliaceous calcaria of the anterior tibiae, exceedingly elongate tarsi, but the intermediate tibiae still more abbreviate than in the compared species and distinctly less than half the length of the intermediate tarsi.

Length of body $2\frac{1}{2}$ – $3\frac{3}{4}$ mm.

DISTRIBUTION. Northern Namib, in the Cunene area of the Kaokoveld: Junction of the eastern branch of the Marien River† and the Cunene River (Aug. 1956, Visser Exped., holotype, sex not determined, and 10 paratypes).

HABITAT. This species appears to be an almost stationary plant-follower of wind-blown sand; although numerous specimens were dug out from underneath dry tufts of grasses during the night, we were unable to find any specimens at the same sites during the day.

SYSTEMATIC POSITION. *P. sanctae-mariae* is closely related to the other *Protodactylus*. However, when classified according to the revisional key to the genera of *Zophosini* (Koch, 1958), it would now fall within the genus *Zophosis*, on account of the presence of oblique lateral sulci on metasternum.

The only South-Western African *Zophosis*, which, to a certain degree, would be comparable, is the likewise very small *Z. kunenensis* Koch, 1958, agreeing with *P. sanctae-mariae* superficially by the elongate shape of the second antennal segment. This species, which belongs to the *burkei*-allied groups, is, however, a typical *Zophosis*. It thus differs at first sight from the compared *Protodactylus* by a remarkably great number of characters, of which we may mention only the cuneate, elongate and complanate shape of body, the large and heliophilous eyes, the lanceolate and very prominent apex of prosternal apophysis which is received by a cavity of mesosternum, and, in particular, the *Zophosis*-like structure of the elongate legs, which lack the hypertrophic development of the tarsi and the calcaria of the anterior tibiae, in association with the contraction of the armatus

† This river is the Rio de Sta Maria of the Portuguese, the Marienfluss of the German cartographers, or the Otjinyange of the indigenous Ovahimba.

tibiae. Also ecologically this species is a typical *Zophosis*, whose heliotactic habits we were able to observe on the wind-blown sand of the sublittoral area at Lucira (south-western Angola).

Gen. *Carpabella* nov.

Body very small, oval, convex above, ciliate at sides, of dark to reddish colour.

Head large, with small, roundish eyes. Antennae slender, with eight small, elongate proximal segments and three enlarged distal segments; the second segment prolonged and longest. Mentum transverse, with truncate apical margin; oral margin of postgenae simple and inermous. *Pronotum* strongly transverse; the base distinctly broader than elytral base and the lateral outlines not in line with the sides of elytra, but separated by a distinctly re-entrant angle. Prosternal apophysis bent steeply towards foramen. *Elytra* with the sides distinctly narrowing in front of base, and with perpendicular apical declivity. Pseudopleural crest extremely fine, often evanescent on middle section and entirely ventral in position; in ventral view a large portion of the ventrally reflected part of elytral surface is exposed. *Mesosternal* apophysis strikingly broad, almost one-third broader than mesocoxal cavities, almost square and truncate apically. *Metasternum* plane, large, grown together with the episternum, without episternal sutures, oblique sulci nor any pre-metacoxal structures, very briefly impressed along midline apically. Apical segment of abdomen marginate at least apically. *Legs* slender; the femora smooth; the tibiae dilating apically, spinose, with large, digitate calcaria on anterior tibiae; the tarsi thin, with very elongate basal segment of posterior tarsi; the claws symmetrical, with equilong spurs.

DIAGNOSIS. This very striking new genus belongs to the *Dactylocalarina* (sensu Koch, 1958) on the basis of the absence of the oblique sulci on metasternum, the deflected prosternal apophysis, the enlarged second segment of antennae, the apically dilated, spinose and subreticulate tibiae, the hypertrophy of the calcaria of the anterior tibiae and the ciliation of the sides of body.

Within the *Dactylocalarina* it is related to *Protodactylus* because of the well-developed eyes, the identical formation of the flat and sparsely pilose metasternum, the normal, horizontal and non-telescoped abdomen, as well as the brownish colour of the small body, which exhibits a more or less distinct metallic sheen.

For the remainder, however, the new genus not only differs extraordinarily from *Protodactylus*, but introduces a quite new phylogenetic line within the general systematics of the *Zophosini*. Its most striking morphological features are the exceedingly wide mesosternal apophysis, which is about four times as broad as in *Protodactylus* and recalls certain *Caenocrypticini* rather than any of the *Zophosini*; the loosely jointed pronotal base, the lateral outlines of which are clearly separated from those of elytra; the absence of the median carinula on the basal portion of mesosternum (which is strongly developed in *Protodactylus*); the entirely different formation of the elongate antennae, particularly characterized by the very elongate but not dilated shape of the second segment; the deviating construction of the armatures on legs, etc.

TYPE-SPECIES. *Carpabella latisternum* sp. nov.

DEDICATION. Named in honour of Mr B. Carp, Cape Town, as a modest token of appreciation for his continuous assistance to research in Natural Science.

Carpiella latisternum sp. nov.

(Pl. XXV)

Reddish to dark brown, the appendages paler, above with more or less distinct bronzeous to violaceous sheen of the otherwise dull cuticle.

Head amplexed in the prothorax, distinctly broader than half the width of the latter. Upper surface even, with micro-shagreened background of cuticle and well spaced, round, rather strong punctures which become very fine towards the epistome. Neither clypeal nor supra-orbital structures. Apical margin of epistome almost subtruncate. Antennae slightly longer than the head is broad; the second segment about as long as the two following segments taken together; the third segment twice as long as broad; the following segments growing gradually shorter towards the apex, but the eighth segment still a trifle longer than broad; the three enlarged distal segments roundish.

Pronotum convex, broadest basally, three times as broad as long, shiny on disc and with micro-shagreened cuticle on sloping sides, with scattered, partially elongate cilia along sides and on anterior angles. Anterior margin shallowly emarginate, with rudimentary margination at each side of middle; lateral angles obtuse and moderately produced. Sides faintly rounded and narrowing from base towards anterior margin, with sharp and fine marginal carina; base very slightly arcuate, carinate on lateral portions and with almost rounded posterior angles. Integument covered with comparatively strong and round punctures which become very fine and very scattered on sides. Prosternum sloping towards the carinate anterior margin, in front of coxal cavities not quite half the length of same, dull on account of a dense, granular sculpture; episterna concave and smooth; intercoxal apophysis a little less than half the width of coxal cavities.

Elytra slightly broader than, but three-and-a-half times as long as, the pronotum, elongately ciliate along sides, with densely micro-shagreened background of cuticle. The sides almost subparallel at middle, broadly rounded apically and rotundate with the large, ventrally reflected portion. Integument with very scattered, coarse but shallow punctures, becoming evanescent on the steep apical declivity: these punctures bearing very fine, erect bristles posteriorly and on sides. The large ventrally exposed part of the reflected portion, if measured at level of the basal sternite of abdomen, one-and-a-half times as broad as the respective portion of pseudopleura. The fine pseudopleural crest narrowing in a straight line from shoulders to apex, but usually obsolete to absent on middle section; the epipleural crest developed only apically. Both the ventrally reflected portion of elytral surface and the pseudopleura set with sparse, fine, round granules bearing elongate cilia.

Mesosternum flat and smooth, without median carinula basally; episterna punctured; intercoxal apophysis unusually wide, flat, smooth, with the apical margin truncate in a straight line, approximately one-third broader than mesocoxal cavities and about three times as broad as prosternal apophysis. Metasternum almost equal to the combined length of the three proximal sternites of abdomen, with scattered, round and setiferous punctures on disc, smooth on episternal sides. Abdomen with scattered, fine, setiferous punctures; the anal segment transversely impressed in front of apical margination.

Femora smooth, shiny and entirely inermous; the underside of anterior femora without lateral carinae. Tibiae distinctly shorter than femora, the anterior and posterior tibiae slightly shorter than the respective tarsi, the intermediate tibiae almost one-third shorter than the respective tarsi. Anterior tibiae strongly, subtriangularly dilated towards the apex, with acute and sharp outer apical angle; the outer contours appearing as if serrate, as the upper surface of tibia is armatus by four short, subtuberculiiform spines, of which the most distal one is inserted

on the extreme apex of tibia; both the calcaria are large and subfoliaceous, with the longer spur almost equalling the combined length of the three proximal segments of the anterior tarsus. The intermediate and posterior tibiae are slender, moderately dilated towards the apex, and bear a short, pointed spine situated close to the base of tibia; the intermediate tibiae with two to three additional, short spines on proximal half; the calcaria very thin and fine, those of intermediate tibiae about twice the length of the second segment of the respective tarsus, those of posterior tibiae only as long as the second segment of the posterior tarsus. The basal segment of all tarsi elongate and longest, in the anterior tarsi only a little longer than the unguis segment, in the intermediate tarsi one-and-two-thirds times as long as the unguis segment, and in the posterior tarsi slightly more than twice as long as the unguis segment. Claws very fine, shorter than the unguis segment.

Dimensions. $2\frac{1}{4}$ - $3\frac{1}{4}$ mm long, $1\frac{1}{2}$ -2 mm broad.

DISTRIBUTION. Southern part of the Northern Namib: Roessing Mountains (Oct. 1957, C. Koch leg., holotype, sex not determined, and 20 paratypes).

HABITAT. On the sandy flats which are enclosed in the shape of a horseshoe by mountainous ranges; living in cushion-like accumulations of dry, wind-blown, grassy fragments; most of the specimens collected were found gregariously during the day in these superficial strata of debris; observations carried out during the night did not disclose any nocturnal activity.

ZOPHOSINI, ZOPHOSINA

Gyrosis moralesi sp.nov.

Body roundish, very convex, shiny, bare, but with the elytra ciliate at sides, black throughout, except for the reddish brown tibial calcaria and claws.

Head large, transverse; upper surface plane, with curved clypeal lines on each side, and coarsely punctured; in many specimens (♂♂?) the punctures are less concentrated and almost absent from the posterior portion of vertex, while in others (♀♀?) the punctation is extremely dense, aggregated and covers the whole of vertex in equal density. Eyes large, roundish, non-appendiculate, with fine, cariniform supraorbital margin. Mentum strongly transverse, smooth, with triangular incision at middle of apical margin; mandibular teeth of oral margin of postgenae moderately developed and triangular. Antennae thin, elongate, a trifle longer than the width of head, bare and shiny; the third segment the longest and about one-and-a-half times as long as the second or the fourth segments; all the following segments more elongate than broad, the two penultimate segments triangular, the apical segment small and transversely oval.

Pronotum strongly transverse, broadest between posterior angles, almost five times as broad as long, sparsely punctured, and with broad, subulate submarginal depressions at sides. Anterior margin with complete marginal carina and strongly produced, lobiform anterior angles. Sides strongly rounded and narrowing from posterior angles towards anterior margin, with extremely fine marginal carina. Base deeply sinuate at each side and close to the acute and produced posterior angles; the fine marginal carina confined to lateral portions. Discoidal convexity strong and very well demarcated from the sides by broad, horizontally complanate submarginal depressions, of which each occupies about one-fifth of half the width of pronotum. Integument with fine and very scattered punctures on middle of disc and submarginal depressions, but coarse and rather concentrated punctation on the sloping portions of disc. Prosternum bare, rugosely punctured; episternum smoothed, but with longitudinal plicae on middle section; intercoxal apophysis large, very strongly produced horizontally,

sharply carinate peripherally, of lanceolate shape and with very sharply pointed apex.

Elytra strongly convex, broadly oval to almost roundish, broadest before middle, only slightly broader than pronotum, with the rounded shoulders embraced by the posterior angles of pronotum. Integument covered with a shallow, superficial, rather dense punctation anteriorly, becoming obsolete and the cuticle rugosely uneven on middle section, but more or less smoothed on apical declivity; along pseudopleural crest with a narrow area of rather scattered, round and comparatively coarse granules. Apical declivity with briefly perpendicular outlines in front of the minutely caudate and horizontally demarcated apex (lateral view). Pseudopleural crest entirely lateral in position, consequently exposed dorsally, with rather elongate, black cilia which are concentrated and dense on humeral portion, but become scattered and considerably shorter towards the apex (these cilia are easily rubbed off and often missing, except for the humeral portion of sides). Pseudopleura very broad, occupying the whole of the ventrally reflected portion of elytra, at level with metasternal episternum, quite three times as broad as the latter; with uneven and superficially vermiculate cuticle and some coarse punctures underneath the pseudopleural crest, from which originate the lateral cilia. The fine epipleural crest developed only around anal sternite of abdomen.

Mesosternum in front of intercoxal apophysis with a tuft of elongate, erect, black bristles; the intercoxal apophysis slightly broader than the prosternal one, narrowing towards apex, blunt to subtruncate apically, roughly sculptured, and sulcate along midline. Metasternum comparatively short, slightly less than the combined length of the three proximal segments of abdomen, with sharply impressed oblique lateral sulci, well pronounced episternal sutures posteriorly and the deep median sulcus attaining a little more than one-third of metasternal length; the discoidal portion between oblique lateral sulci covered with very coarse and dense punctures, the remainder polished. Abdomen horizontal, smooth, with only single, fine punctures.

Legs of the typical *Zophosis*-like shape, elongate. The outer surface of femora smooth, except for a few, single, coarse punctures, the lower edge of the inner surface of intermediate and posterior femora with a brush of very elongate and stiff bristles of a reddish to dark brown tint, the lower edge of the outer surface of intermediate femora minutely and densely pectinate, bearing a row of short, black spinulae. Tibial calcaria longer than the claws, thin and sharply pointed, those of anterior tibiae about the length of the two proximal segments of anterior tarsi taken together. Claws short, composed of unequally long spurs, of which the inner spur is about one-quarter shorter than the outer one; the outer spur of posterior claws approximately the length of the second segment of respective tarsi.

Dimensions. $6\frac{1}{2}$ – $9\frac{3}{4}$ mm long, $4\frac{1}{2}$ –7 mm broad, $3\frac{1}{2}$ –5 mm high.

DISTRIBUTION. Northern part of the Southern Namib, in the Kuiseb River area: Gobabeb (Oct. 1957. C. Koch leg., ♂ holotype and 20 paratypes).

HABITAE. Confined exclusively to the grassy plain of grit-like sand in front of the barchan dunes at the southern side of the river. This new species was observed in 1957 in great numbers, running with great speed, together with *Stenocara phalangium rufifemorata*, during the early morning hours and again in the late afternoon, often just before sunset. It strictly avoids the wind-blown sand of the barchan dunes, but also that which invades the rocky bank of the river, where, on the other hand, *Gyrosis orbicularis*, *Onymacris rugatipennis* and *Physosterna globosa* are very common.

SYSTEMATIC POSITION. As was pointed out in my generic revision of *Zophosini* (Koch, 1958), the genus *Gyrosis* Gebien cannot be sharply defined or separated

from *Zophosis* Latreille, except for the peculiar structure of the penis (inner lobe) of aedeagus. As in the new species the hook-like apex of penis closely resembles this structure in *Gyrosis orbicularis*, I place *moralesi* with this genus, until the doubtful status of the latter is clarified by a new revision of the complex systematics of *Zophosis*.

G. moralesi agrees with *G. orbicularis* Deyrolle in the roundish shape of body, the formation of head and pronotum, the ciliate pseudopleura and the lateral position of pseudopleural crest of elytra, and the sulciform structures on metasternum.

G. orbicularis is very sharply differentiated from the new species by the following characters: The mesosternal apophysis is very broad, raised and plane, but provided with a deep excavation anteriorly for the reception of the apex of the prosternal apophysis; it reaches almost half the width of the coxal cavities (only one-third of this width in *moralesi*). The discoidal portion of the metasternum is distinguished by a very characteristic, sharply raised, extremely dense and longitudinally confluent rugose sculpture. The abdomen is strikingly convex and the middle section of the three proximal sternites exhibits a peculiar sculpture of dense, subparallel, longitudinal plicae which are strongly elevated on the basal and second segments. The submarginal depression of pronotal sides is narrower and less sharply demarcated from the discoidal convexity. The integument of elytra is peculiarized by the strongly raised, vermiculate and irregularly confluent sculpture on posterior four-fifths (this sculpture being indicated very slightly and superficially in *moralesi*). The third segment of antennae is slightly less elongate and the legs considerably more robust, with the longer spur of the intermediate calcaria equalling in length the basal segment of the intermediate tarsi (distinctly shorter than that in *moralesi*).

The aedeagus is very similar, with practically identical formation of the tegmen; the penis is more slender and exhibits a characteristic, sharply pointed, hook-like apex; in *moralesi* the penis is stout, with subparallel sides, but the apex is also hook-like, though smaller and blunt at the extreme end.

DEDICATION. Named in honour of my friend, Mr Eugenio Morales Agacino, Secretary of the Instituto Español de Entomología and an authority on the fauna of the Spanish Sahara.

CAENOCRYPTICINI†

This tribe, of which up to a few years ago only a single species from the Damaraland highlands was known to science, has turned out to represent one of the most typical elements of the dune fauna of the Namib Desert. Of extremely xerophilous and strictly nocturnal disposition, it is distinguished by the great proliferation of genera and species, which are localized in South-West Africa, south-western Angola and Little Namaqualand.

The particular characteristics of constitutional adaptation are, among others, the independently movable thorax and hind body, the non-connate sterna and elytra, the well-developed hypomera of elytra, the absence of inter-segmental membranes between the third and fourth abdominal sternites, the cuneate Crypticini or *Zophosini*-like body, and the subfossorial, apically dilated anterior tibiae.

Most of the genera are petrophilous (viz. *Lornamus*, *Cryptocarpes* and *Caenocrypticus* s.str.), *Fitzsimonsium* also myrmecophilous, but the *Thorictophasis* of *Caenocrypticus* and the very recently discovered *Vernayella* are highly psammo-

† Cf. Koch (1958) concerning the separation of the Caenocrypticini from Crypticini, as well as definition and composition of the former. Since *Fitzsimonsia* Koch, 1955b (Coleoptera, Tenebrionidae, Caenocrypticini) is homonymous with *Fitzsimonsia* De Witte, 1943 (Reptiles, Scincidae), I propose changing the former to *Fitzsimonsium*, nom.nov.

philous, occurring with many species in the blown sand and dunes of the Namib Desert and the Kalahari.

Endemic to the barchan dunes of the Namib are some species of *Caenocrypticus* (*Thorictophasis*), viz. *deserticus*, *peezi* and *phaleroides*, and all species of *Vernayella*. While the former belong to the category of the stationary plant-followers, the *Vernayella* are extremely fast nocturnal runners and ultra-psammophilous species of the barren, 'quasi-fluid' leeward slopes.

In conformity with the results obtained by the analysis of those tribes in which ultra-psammophilous species occur (viz. Adesmiini, Zophosini and Eurychorini) and also in the Caenocrypticini, the highest degree of secondary adaptive modifications is found in the ultra psammophilous species, viz. *Vernayella*. This genus deviates remarkably from the *Thorictophasis* by the hypertrophy of the tibial calcaria and claws, a considerable atrophy of the outer spur of the latter, prolongation of the legs, particularly of the tarsi which, in the intermediate legs of *Vernayella* **delabati*, stretch to almost twice the length of the respective tibiae, the fine ciliation of the pleural margins of the elytra, the hygrophanous consistency of the more or less strongly depigmented elytral cuticle which, in *Vernayella* **delabati*, is coupled with a remarkable softening and a high degree of transparency.

The extraordinary elongation of the tarsus, but shortening of the tibia ('gliding legs') in *Vernayella*, represents a striking deviation from the usual formation of the cursorial legs of Tenebrionids in which the reversed ratio prevails. This formation is certainly closely connected with the very rapid and somewhat gliding movements of the *Vernayella* on the surface sand of the quasi-fluid leeward slopes of the dunes; it occurs to a lesser degree also in the *Cardiosis* of Zophosini, which inhabit the identical biotope. Movements, as well as the elongation of legs, recall very much the water-living Heteroptera Veliidae, Gerridae and Hydrometridae, which all move rapidly on the undulate surface of water. By way of comparison we may mention also *Stenocara phalangium* of Adesmiini, whose exceedingly elongate legs are composed of very elongate femora and tibiae, but shortened tarsi; the likewise very rapid movements of this species are not a gliding but a typical running process, executed on horizontal surfaces of more or less consolidated sand.

In the stationary dune-*Thorictophasis* the claws are composed of symmetric and equally long spurs, and the cuticle is depigmented; a high degree of hygrophanicity of the elytra, however, is peculiar only to *Caenocrypticus* (*Thorictophasis*) *phaleroides*.

Mention should be made of the small body size of the Caenocrypticini in connexion with the results of investigations into the phenomenon of transpiration. The nocturnal Namib Caenocrypticini belong to the smallest Tenebrionids, varying in size from $1\frac{1}{2}$ to $5\frac{1}{2}$ mm. It was assumed that only large and medium-sized Tenebrionids can live in an arid milieu, while the small species depend exclusively on an environment of a high degree of humidity (cf. also Ednev and Marcuzzi). In the Namib, however, small body size is not limited only to the nocturnal Caenocrypticini, but occurs also in many diurnal Zophosini, such as *Microsis*, *Protodactylus* and *Carpicella*, which vary in size from 1 to 4 mm.

Gen. *Vernayella* Koch, 1958

In 1954, during the Vernay Expedition to the Kaokoveld and the Angolan Namib, we captured three specimens of a peculiar, very small Tenebrionid in Baia dos Tigres and Walvis Bay; these specimens were found during foggy nights, running with great speed on the surface of the loose sand of the barchan dunes. After careful study they proved to belong to two different species but to

an identical, entirely new genus of Caenocrypticini, viz. *Vernayella*, which differs from all other Caenocrypticini by the unequal length of the unguinal spurs.

Having discovered that such tiny Tenebrionids can be found at night in the barren bareham dunes— insects which are very difficult to detect on account of such features as great speed combined with hygrophanous and remarkably homochromous properties of cuticle—we concentrated later on searching for them during our nocturnal explorations. Thus we not only discovered other new species of this genus, but were also able to recognize that *Vernayella* represents one of the most common nocturnal elements of the fauna of the vegetationless parts of the dunes.

Vernayella delabati sp.nov.

(Pl. XXVI)

Body flattened, elongately oval, dull, impigmented, of a pale, yellowish sandy coloration. *Head* large, slightly less than half the width of pronotum; above plane, with a shallow, transverse impression at each side of clypeus. Clypeal sutures linearly impressed, oblique; anterior margin of epistome subtruncate, without detectable median emargination. Eyes small, their lateral contours overlapped by those of the angular genae. Antennae very slender, pubescent, extending backwards beyond pronotal base; the second segment shorter and thinner than the basal segment, but a trifle more elongate and considerably stouter than the third segment; segments three to seven elongate; the three preapical segments triangular, but the eighth segment longer than broad, the ninth square and the tenth transverse; the apical segment transversely oval, closely attached to the preceding segment.

Pronotum two-and-a-half times as broad as long, with subparallel sides from about middle to base and strongly narrowing anteriorly towards the considerably produced anterior angles. Depth of anterior emargination less than half the length of pronotum if measured along midline. Base straight, unmarginate, with rectangular lateral angles. Sloping lateral portions obsolete, depressed, but without any trace of a submarginal canalization along the lateral carina. Integument with very fine, scattered punctures only on sides. Prosternum in front of coxal cavities slightly shorter than the latter; intercoxal apophysis distinctly broader than coxal cavities, about the width of mesosternal apophysis, and with the apex bent towards the foramen.

Elytra of a remarkably soft and hygrophanous consistency of cuticle; owing to the high degree of transparency the intestines with their contents often visible. Elongately oval, broadest in front of middle and distinctly broader than pronotum, with the sides evenly rounded and moderately narrowing towards the base, but attenuate towards the apex. Cuticle with an obsolete, superficial and irregular punctation; the background occupied by an extremely fine, slagreened micro-sculpture and becoming deeper and somewhat iridescent on lateral and apical portions. Apical declivity flattened, the sides not ciliate. Pseudopleural carina fine, exposed dorsally, but evanescent on apical portion. Mesosternal apophysis flat, large, about one-half broader than the mesocoxal cavities. Metasternum large, at least as long as the basal sternite of abdomen, between the meso- and metacoxal cavities about one-third longer than the latter. Abdomen flat, smooth, the anal sternite not marginate.

Legs extremely elongate, with combined length of tibia and tarsus in the intermediate and posterior legs identical in length to elytra if measured along suture. Anterior tibiae compressed, with subcarinate upper surface; all tibiae sparsely spinose. The very thin and elongate tibial calcaria and unguinal spurs hair-like, in thickness scarcely differentiated from the long, fine bristles of tarsal segments.

Intermediate tarsus very elongate, quite twice the length of the respective tibia; the basal segment longer than that of the posterior tarsi.

Length of body $2\frac{3}{4}$ – $3\frac{1}{4}$ mm.

DISTRIBUTION. Northern part of the Southern Namib, in the Kuiseb River area: Rooibank (May 1959, Carp Exped., holotype, sex not determined, and 10 paratypes).

HABITAT. The first specimen of this striking new species was sighted one dry night by our preparator, M. Ramonageng, when we stepped down the quasi-fluid sand on the leeward side of a high, barren dune at Gobabeb; it was racing over the moving sand and unfortunately escaped when we became bogged down in the masses of loosened sand. Later we captured a fine series during a stormy night on the 'smoking' crest of high dunes at Rooibank; at the same sites further specimens, together with *Vernayella ephialtes*, were dug out from the sand just underneath the knife-sharp crest during the morning of the next day.

SYSTEMATIC POSITION. See key p. 156.

DEDICATION. Dedicated to Mr B. J. M. de la Bat, Chief Game Warden of South-West Africa, at Okaukuejo.

Vernayella pauliani sp. nov.

This new species is very reminiscent of *Vernayella noctivaga* Koch, 1958, because of the unicolorous tint of body and the somewhat cuneate shape of pronotum, the sides of which narrow gradually from the base towards anterior margin. It differs from this species as follows: The body is smaller, varying in length from $3\frac{1}{4}$ to $4\frac{1}{2}$ mm. The lateral contours of genital canthus are sharply rectangular in front of eyes. The pronotum is longer, possesses lobiform anterior angles, and the discoidal convexity reaches the lateral carina (it is separated from the latter by a narrow, smoothed, submarginal depression on median section in *noctivaga*). The underside of prothorax is sparsely punctured. The elytra are broadest in front of middle and distinctly broader than pronotum. The punctation on body, except for the densely punctured head, is less concentrated though quite strong, and evenly scattered on the whole of the underside. The appendages are slightly more elongate.

The new species differs from *Vernayella ephialtes* Koch, 1958, by the unicolorous, testaceous to castaneous tint of body, the concentrated punctation on anterior half and the dense, coarse granulation on apical portion of the elytra, as well as by the shape of the rather strongly punctured pronotum. The latter is much less transverse, broadest at the base, evenly convex and not depressed on sloping lateral portions, with the sides gradually narrowing from the base towards the anterior angles, and the lateral contours being in line with those of the elytra.

DISTRIBUTION. Northern part of the Southern Namib, in the areas of the Tsauchab and Kuiseb Rivers: Gobabeb (Oct. 1957, C. Koch leg., holotype, sex not determined, and 10 paratypes); Tsauchab River dunes, about 30 miles west of the farm Sesriem (do., numerous specimens).

HABITAT. Nocturnal and ultra-psammophilous species of the barren part of the barchan dunes.

SYSTEMATIC POSITION. See key, p. 156.

DEDICATION. Named in honour of Dr R. Paulian, Director of the 'Institut d'Etudes Centre-africaines', Brazzaville, who accompanied the Carp Expedition to the Kuiseb River and Sandwich Bay.

Key to the species of Vernayella

- 1 (2). Upper surface of body dull, unpigmented, of a pale, yellowish sandy coloration. Size very small, ranging from $2\frac{3}{4}$ to $3\frac{1}{4}$ mm in length. Sculpture incipient; head and pronotum with very fine, scattered punctures, elytra with obsolete, sparse and extremely fine granules on apical portion. Elytra diaphanous, not ciliate at sides; basal carina marked only on the middle section of each elytron; pseudopleural carina evanescent on apical portion. Intermediate tarsus fully twice as long as the respective tibia; the basal segment longer than that of posterior tarsi.

V. delabati Koch, *supra cit.* (Pl. XXVI)

- 2 (1). Upper surface of body very shiny, more or less depigmented, but of various and different colour patterns. Size larger, ranging from $3\frac{1}{4}$ to $5\frac{1}{2}$ mm in length. Sculpture well developed; on head with strong, dense punctures, on pronotum with well-indicated punctuation at least on lateral portions, and the elytra with densely granulate apical portion. Elytra not diaphanous, with briefly ciliate sides; basal carina sharp, complete, reaching the humeral angle and coalescent with the pseudopleural carina; the latter complete and also sharp apically. Intermediate tarsus very elongate, but distinctly less than twice, and at the best one-and-a-half times, as long as the respective tibia; the basal segment equalling in length that of posterior tarsi.

- 3 (4). Body broadest exactly at the base of pronotum and elytra, the latter consequently not broader than the pronotum; of larger size, $3\frac{3}{4}$ – $5\frac{1}{2}$ mm long. Emargination of the anterior margin of pronotum distinctly shallower than one-half the length of pronotum if measured at midline; anterior angles moderately produced, of normal shape and not lobiform. Underside of prothorax with very dense, coarse and rugosely confluent punctuation. Lateral contours of genal canthus rounded in front of eyes.

V. noctivaga Koch, 1958 (Pl. XXVI)

This is the largest species not only of *Vernayella*, but of all Caenocrypticini in general. The body is coarsely punctured throughout and recalls *V. pauliani* because of the bright and unicolorous castaneous colour.

Described from Baía dos Tigres; numbers of this species were recollected in the barchan dunes of Walvis Bay (Oct. 1957, C. Koch leg.), Gobabeb (May 1959, Carp Exped.) and as far south as the Tsauchab River dunes at about 30 miles west of the farm Sesriem (Oct. 1957, C. Koch leg., a slightly differing specimen).

Several specimens have been observed feeding on droppings of rodents during the night, while one specimen was found under a dead sea-bird lying on the slope of a barren dune.

- 4 (3). Body, as usual, broadest behind base of elytra, the latter therefore broader than the pronotum; of smaller size, $3\frac{1}{4}$ – $4\frac{1}{2}$ mm long. Emargination of anterior margin of pronotum remarkably deep, with the depth almost equalling half the length of pronotum if measured along midline; anterior angles very strongly produced and of lobiform shape. Underside of prothorax sparsely punctured. Lateral contours of genal canthus sharply rectangular in front of eyes.
- 5 (6). Pronotum short and more strongly transverse, broadest at middle, thence with subparallel sides at posterior half, depressed on sloping lateral portions; the lateral contours not in line with those of elytra but meeting the latter in a distinct, obtuse angle. Granulation on apical portion of elytra fine and comparatively scattered. Front of body red, the elytra yellowish, but with darkened to blackish, triangular patch on middle of anterior half.

V. ephialtes Koch, 1958

V. ephialtes agrees with *noctivaga* in the shiny cuticle of body, the stouter appendages, the shallowly emarginate course of the pronotal base, but is of smaller size, measuring $3\frac{1}{4}$ –4 mm in length. Some characters are common to it and *delabati*, such as, for example, the basally constricted elytra and the sub-

parallel portion of the pronotal side. The elytra are broadest in front of middle, the sloping lateral portions of pronotum are shallowly depressed, and the body exhibits a sparse and even punctation, with the exception of the densely punctured head.

This species has been described from the dunes near Walvis Bay, on the basis of a single holotype. It was recaptured in large numbers at Rooibank and Sandwich Bay (May 1959, Carp Exped.). Like all the other *Ternayella*, *ephiates* is an ultra-psammophilous and nocturnal runner of the vegetationless part of the bareham dunes.

- 6 (5). Pronotum longer, much less transverse, broadest at base, with the sides gradually narrowing from base towards anterior angles, evenly convex and not depressed on sloping lateral portions; the lateral contours in line with those of elytra and not demarcated from the latter. Granulation on apical portion of elytra coarse and dense. The whole of body of a unicolorous, testaceous to castaneous colour. *V. pauliani* Koch, *supra cit.*

REFERENCES

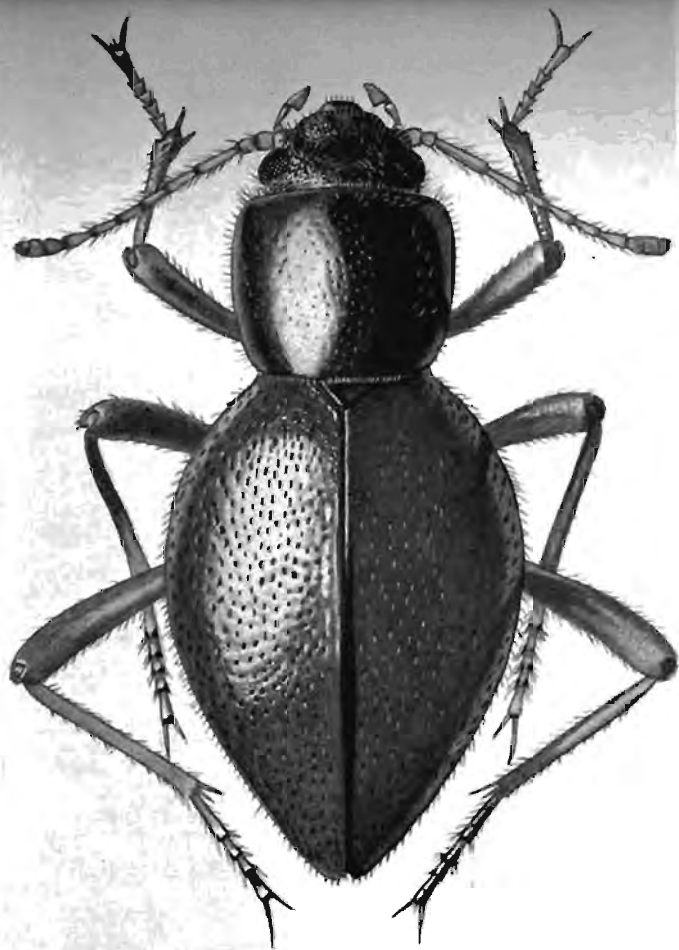
- BODINHEIMER, F. S. (1952). Problems of physiology and ecology of desert animals. *Biol. Deserts, London*, pp. 162-7.
- BOLWIG, N. (1957). Experiments on the regulations of the body temperature of certain Tenebrionid beetles. *J. Ent. Soc. S. Afr.* 20, 454-8, 4 figs.
- BRÈME, F. DE (1840). Description de deux nouveaux Mèlasomes du genre *Adesmia*. *Rev. Zool.* 3, 112-13.
- BRINCK, P. (1950-57). The food factor in animal desert life. *B. Hanström, Zool. Pap., Lund*, pp. 120-37, 8 figs.
- BUXTON, P. A. (1924). Heat, moisture, and animal life in deserts. *Proc. R. Soc. B*, 96, 123-31.
- EDNEY, E. B. (1960). The survival of animals in hot deserts. *Publ. Smithson. Inst.* no. 4403, 407-25.
- FIORI, G. (1956). Appunti ecologici ed etologici sull'entomofauna estiva della Hamada el-Hamra. *Boll. Ist. Ent. Univ. Bologna*, 21, 277-96, 9 figs., 5 pls.
- GEBIEN, H. (1910) *Coleopterorum Catalogus, Tenebrionidae*, 1, 15, 166 pp. Berlin: W. Junk.
- GEBIEN, H. (1920). Käfer aus der Familie Tenebrionidae, gesammelt auf der 'Hamburger deutsch-südwestafrikanischen Studienreise 1911'. *Abh. Auslandsk., Univ. Hamburg*, 5, no. 2, 168 pp., 69 figs., 2 pls., 6 maps.
- GEBIEN, H. (1937). Katalog der Tenebrioniden, 1. Teil. *Pubbl. Mus. Pietro Rossi, Duino*, 2, 381 pp.
- GEBIEN, H. (1938). Die Tenebrioniden der Namibwüste in Südwestafrika. *Abh. nat. Ver. Bremen*, 30, 20-107, 30 figs.
- GUERIN-MENEVILLE, F. E. (1843). Notes sur quelques Coleopteres melasomes. *Rev. Zool.* 261.
- GUERIN-MENEVILLE, F. E. (1836). Calognathe. *Mag. Zool. Ins.* 9, 1-4, pl. 172.
- HAAG-RIESENBERG, G. (1872). Monographie der Eurychoriden. *Arch. Nat.* 38, 359-428.
- HAEZ, M. & MAKKI, A. M. M. (1959). Studies on desert insects in Egypt. III. On the bionomics of *Adesmia bicarinata*. *Bull. Soc. Ent. Egypt*, 52, 89-113, 7 figs.
- HESSE, A. J. (1938). Some adaptive responses of insect life to semi-arid conditions in South Africa. *S. Afr. J. Sci.* 35, 69-91.
- KOCH, C. (1937). Wissenschaftliche Ergebnisse der Entomolog. Expedition S.D. Fürst C. A. Della Torre e Tasso nach Libyen. Tenebrionidae. *Pubbl. Mus. Pietro Rossi, Duino*, 2, 1-220, 20 figs.
- KOCH, C. (1944-48). Die Adesmini der tropischen und subtropischen Savannen Afrikas. *Rev. Zool. Bot. Afr.* 38 41, 139-91, 133-201, 18 figs., 4 pls.
- KOCH, C. (1950). S.A. Tenebrionidae. I. Account of the Tenebrionidae collected on the University of California - Transvaal Museum Expedition. *Ann. Transv. Mus.* 21, 273-367, 18 pls.
- KOCH, C. (1952a). S.A. Tenebrionidae. XIII. Vorstudien zu einer Monographie der Molurini. *Ent. Arb. Mus. Frey*, 3, 214-349, 5 pls.

- KOCH, C. (1952*b*). S.A. Tenebrionidae. XII. Supplementary notes to preliminary articles nos. I, III, V and VIII. *Ann. Transv. Mus.* 22, 79-196, 42 figs., 11 pls., 3 maps.
- KOCH, C. (1952*c*). S.A. Tenebrionidae. VIII. Materials for a monographic study on Eurychorini. *Bull. Soc. Fouad Ent.* 36, 1-125, 101 figs., 13 pls., 3 maps.
- KOCH, C. (1955*a*). Monograph of the Tenebrionidae of Southern Africa. Vol. 1: Tentyriinae, Molarini, Trachynotina, *Somaticus*. *Transv. Mus. Mem.* 7, 242 pp., 158 figs., 24 pls., 2 maps.
- KOCH, C. (1955*b*). S.A. Tenebrionidae. XVIII. A new genus of Crypticini from Namaqualand. *Ann. Transv. Mus.* 22, 415-18, 1 fig.
- KOCH, C. (1957). Angaben über Verbreitung und Lebensweise der 'weissen' Wüstentenebrioniden. In KÜHNELT, S.B. *Öst. Akad. Wiss. (math.-nat.)*, 1, no. 166, 108-12.
- KOCH, C. (1958). Tenebrionidae of Angola. *Publ. Cult. Diamang*, 39, 231 pp., 195 figs., 43 pls., 3 maps.
- KOCH, C. (1959). Die Namibdünen und ihre Tierwelt ('Der Kreis', Windhoek, 6, 198-200, 1 fig., 1 pl.).
- KOCH, C. (1960). The Tenebrionid beetles of South-West Africa. *S.A. Mus. Ass., Durban*, 7, 73-85, 3 figs., 1 map.
- KOCH, C. (1960*b*). Zweiter taxonomischer Beitrag zur Kenntniss der Tenebrioniden Somalias. *Ent. Arb. Mus. Frey*, 11, 325-415, 31 figs., 1 pl., 1 map.
- KOCH, C. (1961). Some aspects of abundant life in the vegetationless sand of the Namib dunes: Positive psammotropism in Tenebrionid beetles. *J. S. W. A. Scient. Soc.* xv, 8-34, 77-92, 8 figs., 2 maps, 10 pls.
- KOCH, C. (1962). The Tenebrionidae of Southern Africa. XXX. Comprehensive notes on the Tenebrionid fauna of the Namib Desert. *Ann. Transv. Mus.* 24, 61-106, 7 maps, 7 pls.
- KÜHNELT, W. (1957). Weiss als Strukturfarbe bei Wüstentenebrioniden. *S.B. Öst. Akad. Wiss., math.-nat.*, 1, 166, 103-12, 1 pl.
- MARCUZZI, G. (1960). Rapporti tra equilibrio idrico e ambiente nei Coleotteri Tenebrionidi. *Arch. Zool. Ital.* 45, 325-42.
- MELLINI, E. (1956). Aspetti estivi della entomofauna dello Uádi Sofeggin e suoi affluenti. *Boll. Ist. Ent. Univ. Bologna*, 21, 243-76, 13 figs., 6 pls.
- PAULIAN, R. (1943). *Les Coléoptères*, 396 pp., 164 figs., 14 pls. Paris.
- PERINGUEY, L. (1885). First contribution to the South African coleopterous fauna. *Trans. S.A. Phil. Soc.*, 3, 74-149, 4 pls.
- PERINGUEY, L. (1899). Fifth contribution to the South African coleopterous fauna. *Ann. S.A. Mus.* 1, 240-330, 2 pls.
- PERINGUEY, L. (1908). Zool. u. anthropol. Ergebnisse einer Forschungsreise im westlichen und zentralen Südafrika, ausgeführt von Dr L. Schultze. Tenebrionidae und Curculionidae. *Denkschr. med.-nat. Ges. Jena*, 13, 393-424.
- PIERRE, F. (1958). Ecologie et peuplement entomologique des sables vifs du Sahara nord-occidental. *Publ. Centr. Rech. Sc. Biol., Paris*, 1, 332 pp., 140 figs., 16 pls.
- SCHULZE, L. (1962). The Tenebrionidae of Southern Africa. XXXIII. Descriptive notes on the early stages of *Onymacris rugatipennis* Haag and *Lepidochora discoidalis* Gebien and keys to genera and species of Adesmiini and Eurychorini. *Ann. Transv. Mus.* 24, 161-180, 28 figs., 15 pls.

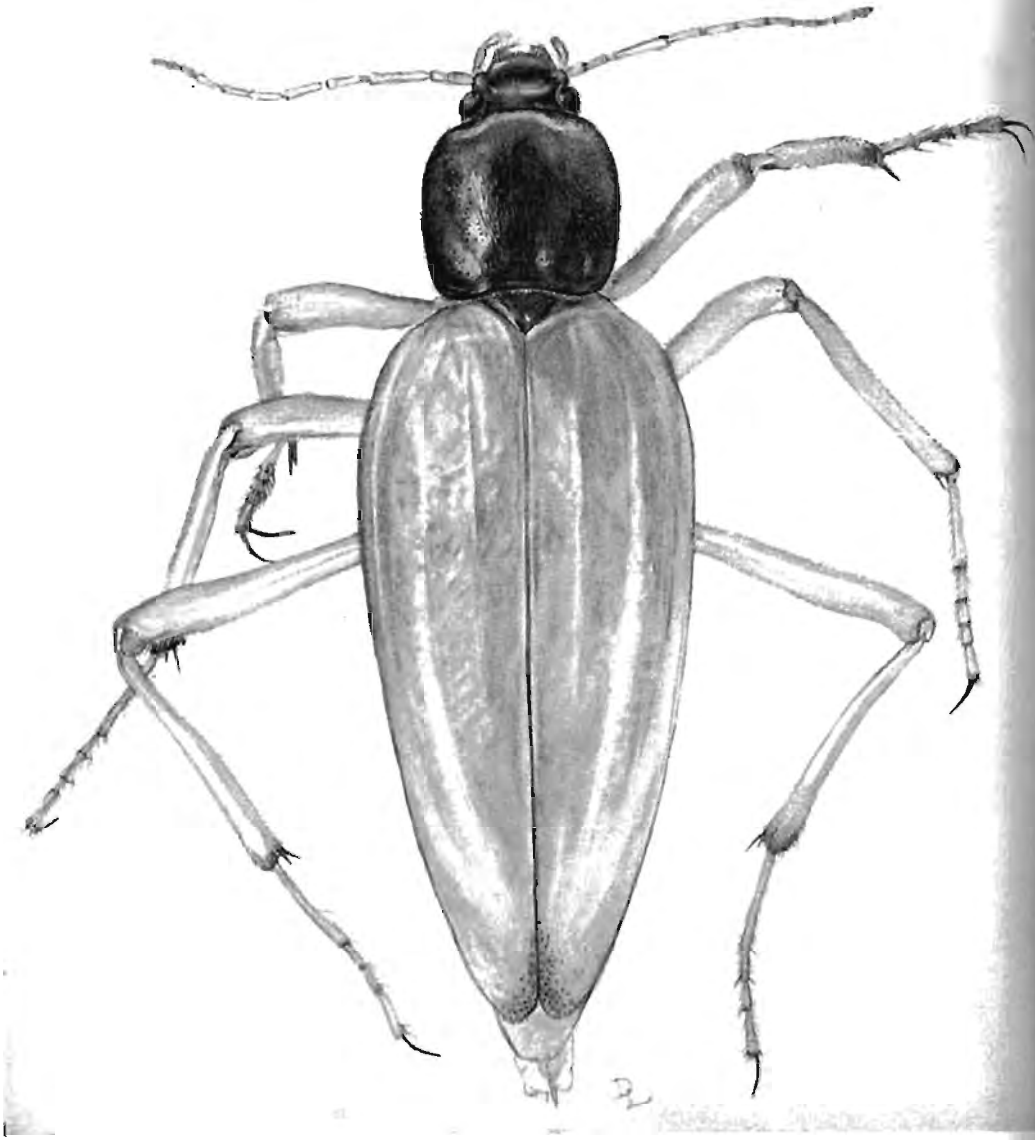
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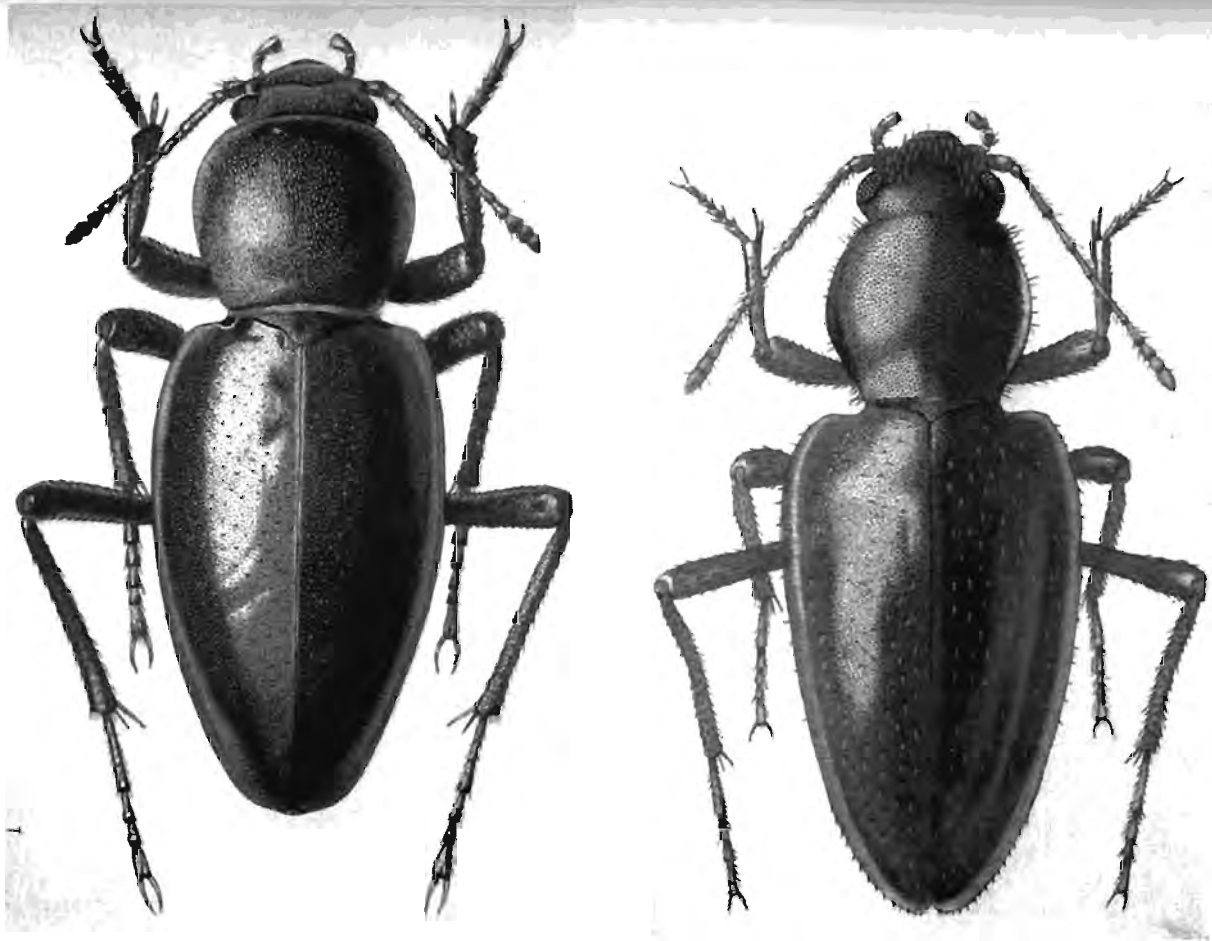
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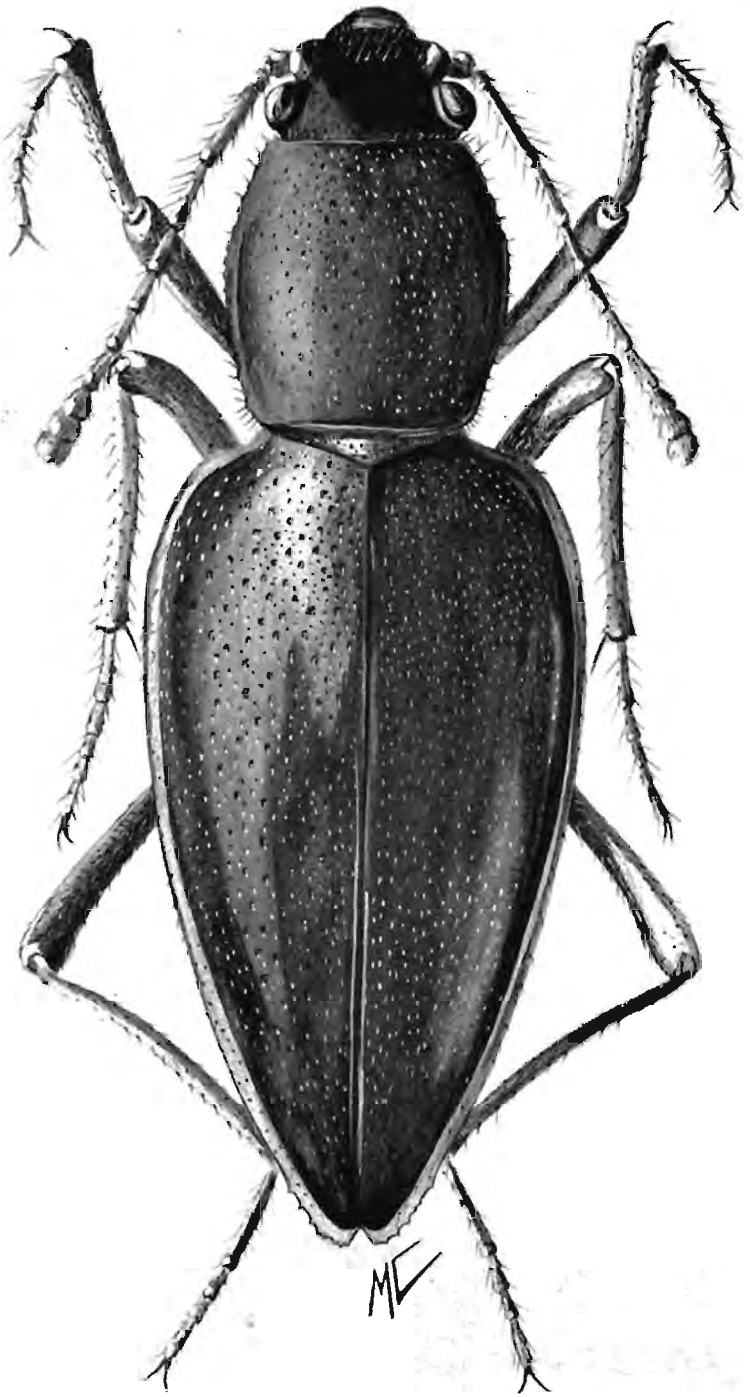
LEFT: *Namibomodes rubra* sp. nov., $\times 11.5$, RIGHT: *Psammodes diabolica* Koch, forma typica, $\times 4.2$. (Paintings by Mr A. von Peez, Bressanone.)



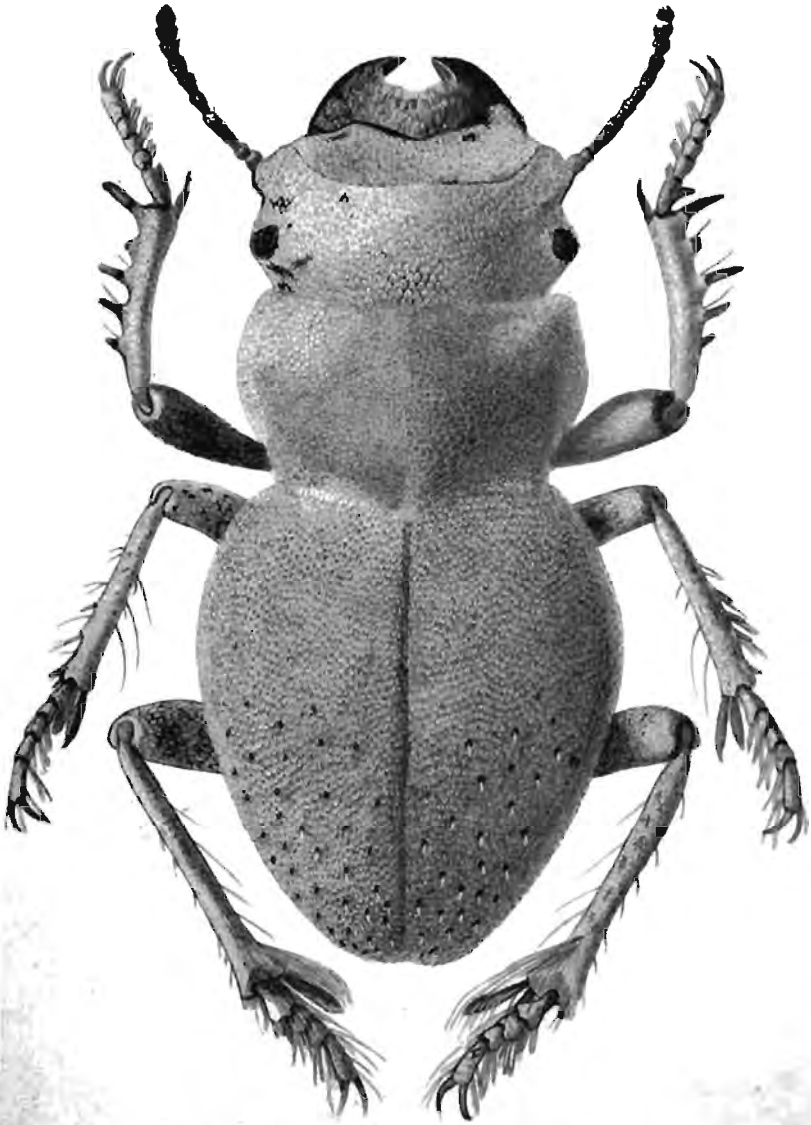
Umungulum hoeschi, g. et sp.nov.; note the uni-partite formation of claws on intermediate and posterior legs, as well as the diaphanous and soft consistency of cuticle of hind body and appendages. (Painting by Miss Dawn Leggat, Transvaal Museum.) $\times 7$.



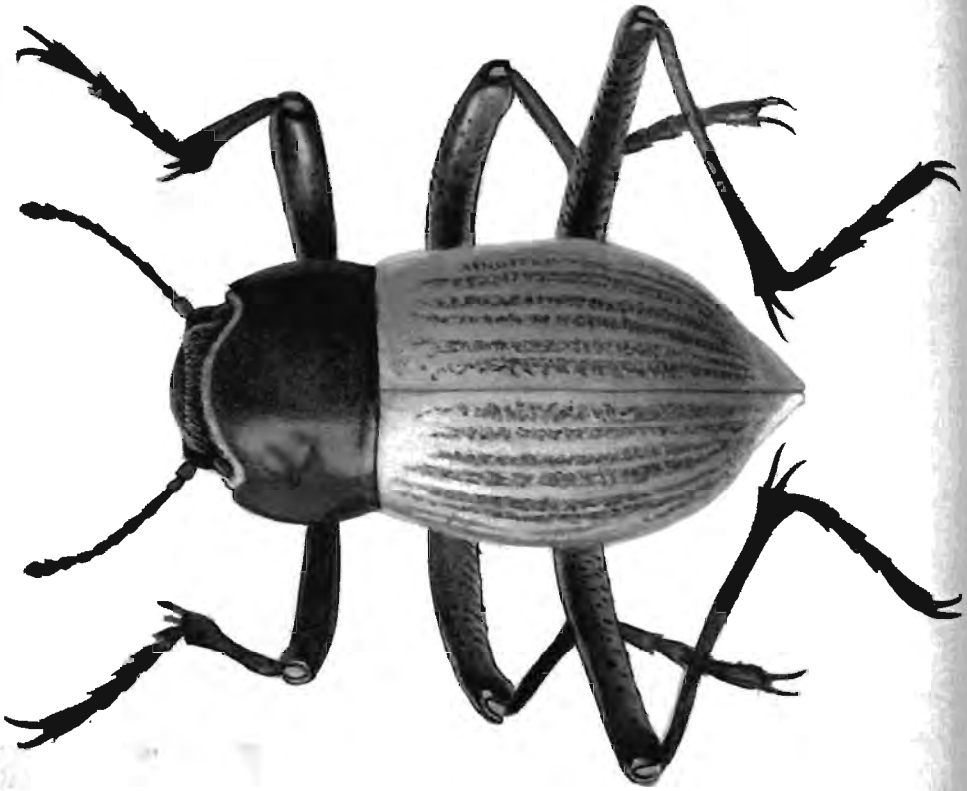
LEFT: *Brinckia debilis* (Peringuey), $\times 7.7$. RIGHT: *B. oograbiesensis* sp.nov., $\times 10.3$ (Paintings by Mr A. von Pecz, Bressanone.)



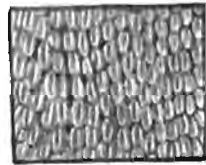
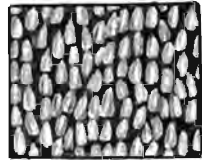
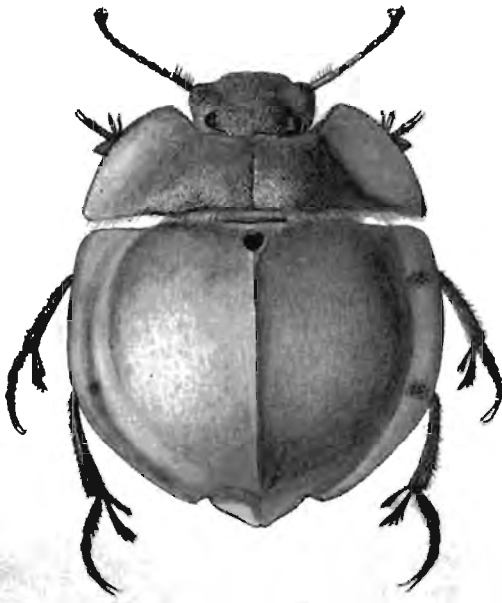
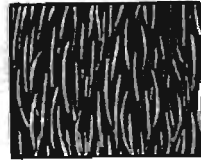
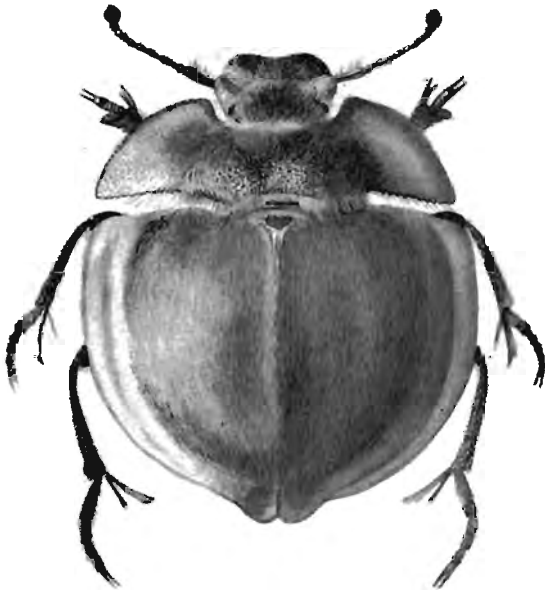
Brinckia serratina sp. nov. (Painting by Dr (Mrs) M. C. Ferreira, Lourenço Marques.)
× 23



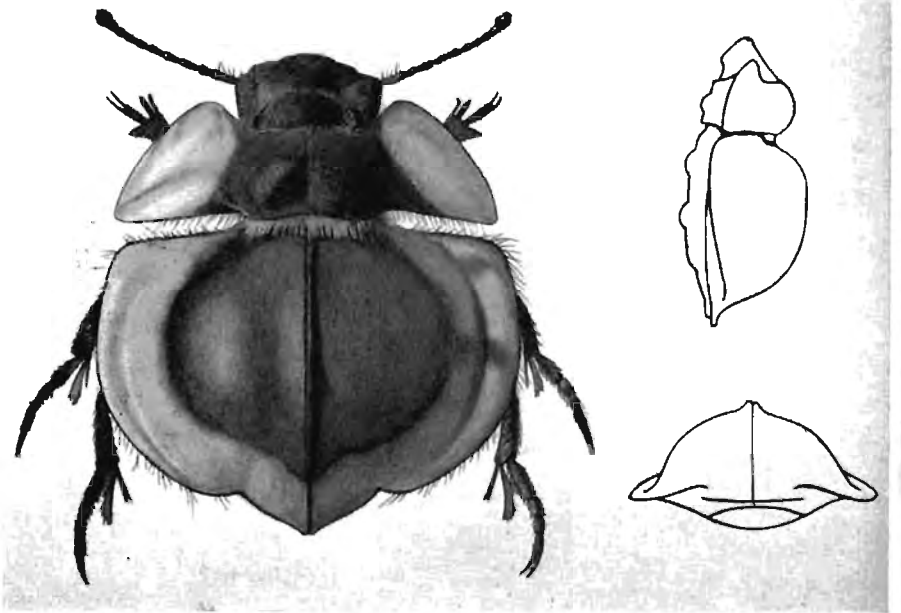
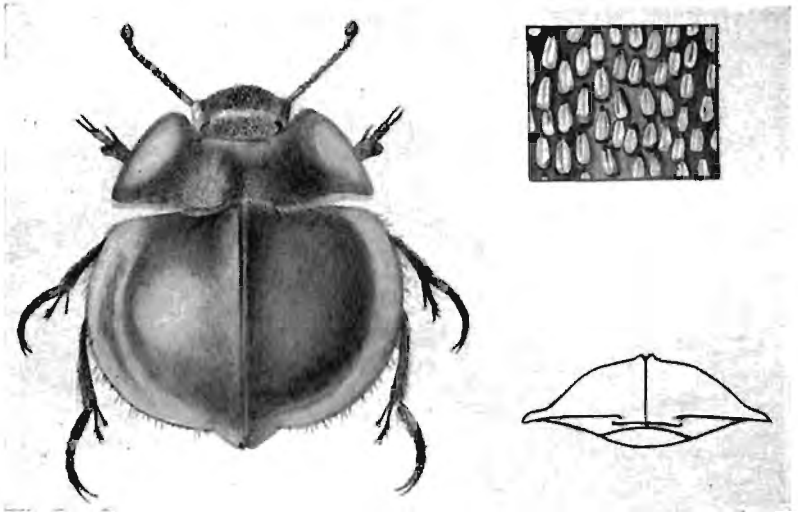
Vansonium bushmanicum subsp. *namibense* nov. ; note the extremely dense layer of imbricate, pale secondary scales concealing entirely the background of cuticle, 'sand-shoes' on posterior legs, and the only 9-segmented antennae. (Painting by Mr A. von Peez, Bressanone.) $\times 14$.



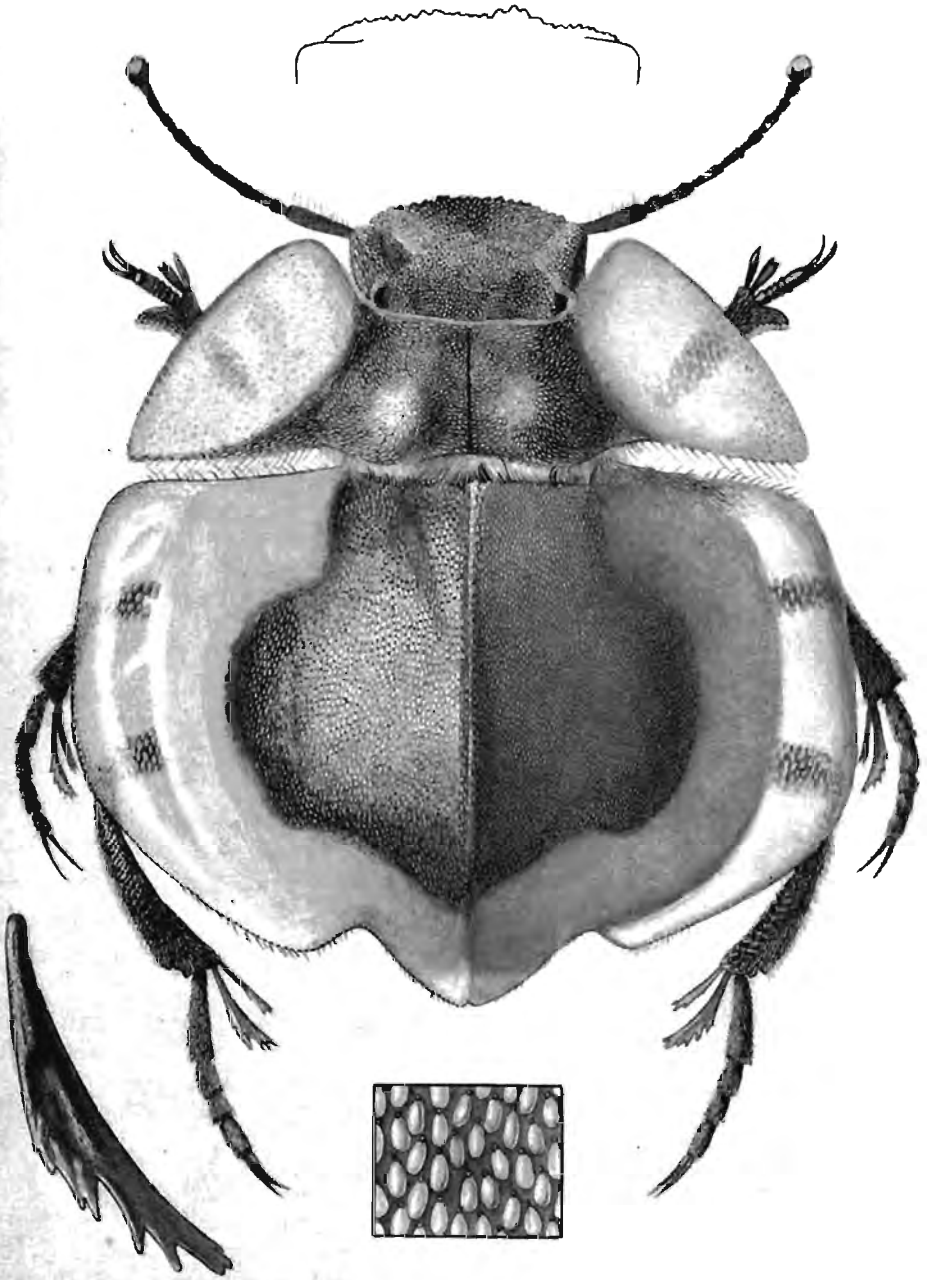
Onymacris visseri sp. nov. (dorsal and lateral aspects), one of the species of the 'white' *Onymacris*. (Painting by Mr. A. von Peez, Bressanone.) $\times 4.2$.



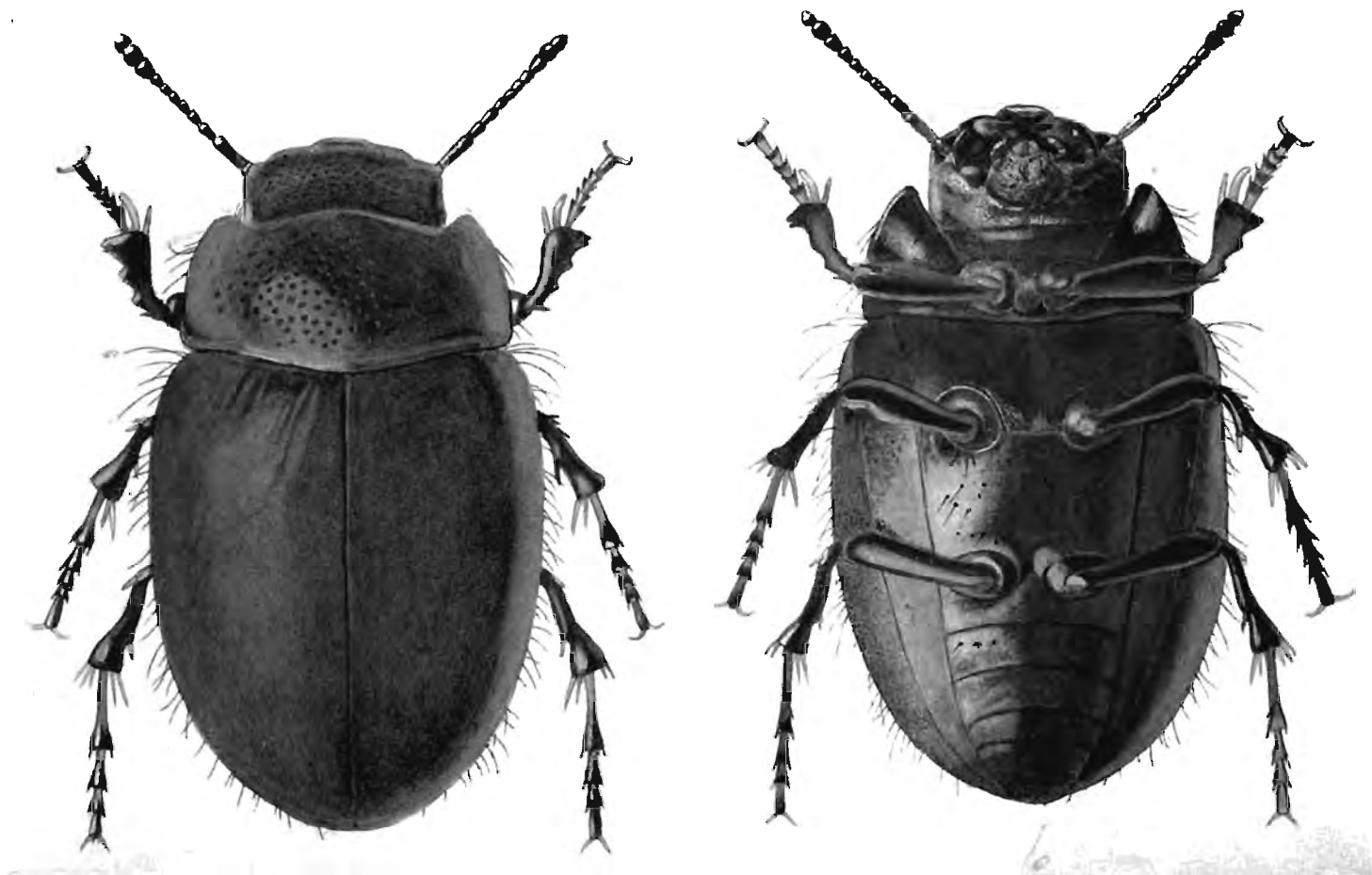
ABOVE: *Lepidochora pilosa* Koch; at right, the setiferous sculpture of discoidal portion of elytra, strongly magnified. BELOW: *L. discoidalis* Gebien, forma typica; at right, the squamiferous sculpture of discoidal portion of pronotum (above) and of lateral, depigmented portion of elytra (below), strongly magnified. (Painting by Mr. A. von Pez, Bressanone.) $\times 6$.



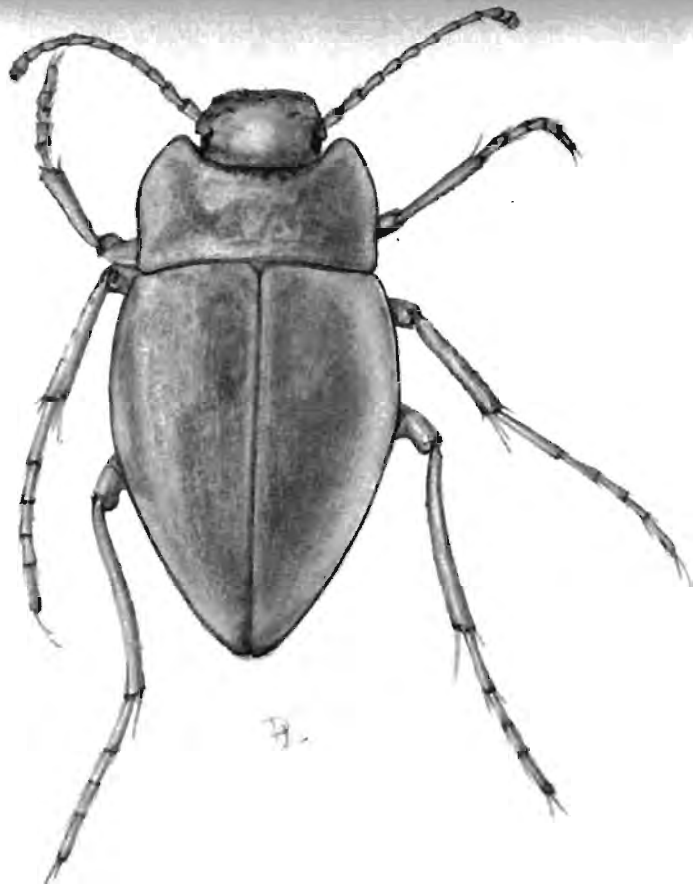
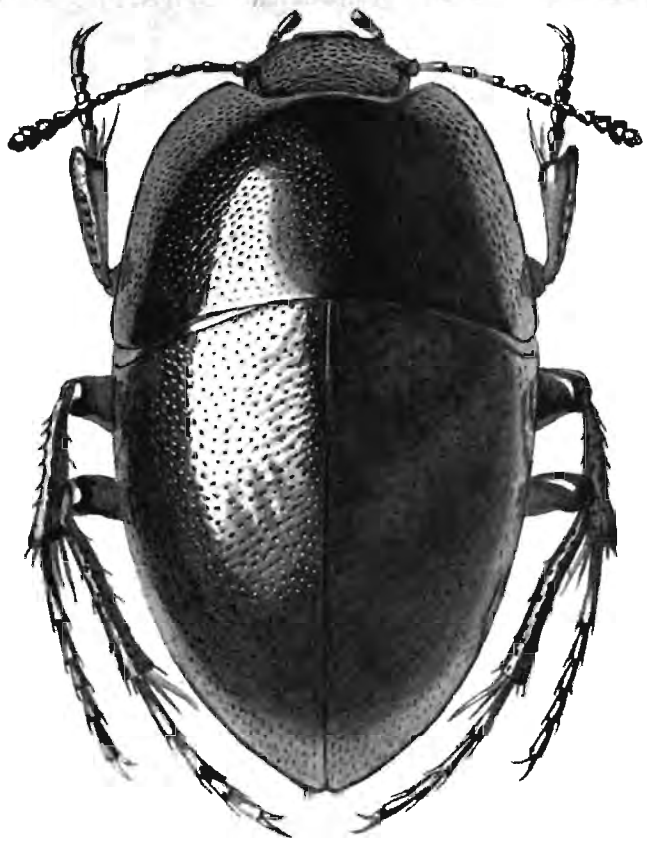
ABOVE: *Lepidochora discoidalis* var. *argentogrisea* nov., an ecological subspecies of *discoidalis*; at right, the squamiferous sculpture of discoidal portion of elytra, strongly magnified (above), and outlines of body, in caudal view (below). BELOW: *L. portii* sp. nov.; at right, outlines of body, in lateral view (above), the same in caudal view (below); note the remarkable convexity of body. (Painting by Mr A. von Peez, Bressanone.) $\times 6$.



Lepidochora kahani sp. nov.; note the transparency of depigmented portions of pronotum and elytra; above, outlines of anterior margin of head; below, one of the longer, multi-digitate spurs of tibial calcaria of posterior legs, strongly magnified (at left), and the squamiferous sculpture of discoidal portion of elytra, strongly magnified (at middle). (Painting by Mr A. von Peez, Bressanone.) $\times 65$.



Carpiella latisternum g. et sp. nov. (dorsal and ventral aspects). $\times 32$. (Painting by Mr A. von Pecz, Bressanone.)



LEFT: *Vernayella noctivaga* Koch; note the brightness of integument, strong development of sculpture, margination of articulation face of pronotum on elytral base and the less elongate intermediate tarsi (painting by Mr A. von Peez, Bressanone). Right: *Vernayella delabati* sp. nov.; note the small size of body, the strongly depigmented, soft, opaque, diaphanous and scarcely sculptured cuticle, the reduction of the margination of the articulation face of pronotum on elytral base, and the remarkable elongation of intermediate tarsi (painting by Miss Dawn Leggat, Transvaal Museum). $\times 23$.