Additional notes on the biology and ecology of the Cetoniinae fauna of Eastern Cape (EC) and KwaZulu-Natal (KZN) and remarks on captive breeding of these beetles (Coleoptera, Scarabaeidae, Cetoniinae)

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Abstract

We report the results of a short field trip to South Africa undertaken by the authors to investigate the biology and ecology of Cetoniinae *sensu stricto*. Between 30 December 2016 and 15 January 2017 we observed and collected over 40 species of Cetoniinae, some of which are considered relictual or enigmatic species. This brief survey extends and expands our work published in *Cetoniimania* n°9 (Malec & Šípek 2016) with new information obtained during a second expedition in the Eastern Cape and KwaZulu-Natal provinces. Further results from both field trips, including descriptions of immature stages and comments on ecology and phylogeny of observed species, will be presented in further scientific studies currently under preparation.

Résumé

Rapport sur les Cetoniinae *sensu stricto* observés ou récoltés lors d'une courte expédition menée par les auteurs dans les provinces d'Eastern Cape et du KwaZulu Natal, République Sud Africaine, du 30 décembre 2016 au 15 janvier 2017. Durant ce voyage nous avons observé ou récolté plus de 40 espèces, certaines considérées comme relictes ou énigmatiques. Ce travail est la continuation de celui publié par les mêmes auteurs en 2016 dans *Cetoniimania* NS 9, à la suite d'un précédent voyage. D'autres résultats, basés sur ces deux expéditions, incluant des descriptions de stades immatures et des commentaires sur l'écologie et la phylogénie des espèces concernées seront présentés dans des publications scientifiques actuellement en préparation.

Key Words

Cetoniinae, larvae, ecology, bionomy, Eastern Cape, KwaZulu-Natal, captive breeding

Abbreviations used

RSA provinces : EC: Eastern Cape, KZN: KwaZulu-Natal, FS: Free State.

Introduction

South Africa's landscape represents one of the most diverse ecosystems in Africa, featuring many fauna and flora species found nowhere else in the world. This is also the case for rose chafers (Scarabaeidae, Cetoniinae) which exhibit such a high species diversity that it is impossible to meet them all within a single expedition. Therefore, at the end of last year South Africa once again became our destination for a short excursion, again scheduled for the period of European winter, which seemed to be a convenient time for both of us regarding employment leave and also relatively promising season in terms of precipitation and first insect outbreak. Adult activity of many spring chafer species is related to the first big rains. The primary objective of the trip was to gather further data for the comprehensive study on phylogeny of the phytophagous scarab beetles (Coleoptera, Scarabaeidae, Pleurosticti) based on molecular, morphological and bionomic data of both larvae and adults. In addition to our effort to collect new fresh DNA samples, we also wanted to further document diversity of Cetoniine species in the study area and provide notes on their bionomy and ecology including immature stages. In addition to the faunal survey, captive breeding remarks for particular species are briefly reported.

Beetles of the subfamily Cetoniinae from South Africa

Cetoniinae beetles represent a very diverse group of Coleoptera. The majority of common species are diurnal, visit flowers for pollen and nectar or feed on fruits, and exhibit large ranges of occurrence. Some other species, however, have very restricted ranges, often associated with a particular habitat and vegetation type, and emerge only after good rain and are active only for few days. The biology of these more enigmatic species is often unknown.

In our first contribution (Malec and Šípek 2016) we emphasized the utility of the book of Holm and Marais (1992), as the first compendium describing and illustrating the Cetoniine fauna of southern Africa, even if the book does not cover the tribes Cremastocheilini, Trichini and Valgini.

Since the publication of the book (1992) and the type catalogue in the same year (Marais and Holm 1992) much new information on the Cetoniine fauna of southern Africa has accumulated through the efforts of numerous local and foreign collectors and several taxa have newly been described.

Substantial contributions to the taxonomic and biological knowledge of South African chafers have been made through the intensive field work and publication activity of Professor Renzo Perissinotto, with the invaluable contribution of his wife, Lynette Clennell. The following are very recent examples of new taxa described by Perissinotto:

Odontorrhina maraisi Perissinotto, 2012

Odontorrhina pubescens hantam Perissinotto, 2012

Trichostetha curlei Perissinotto, Šípek and Ball, 2014

Atrichelaphinis bomboesbergica Rojkoff and Perissinotto, 2015

Neoclita pringlei Perissinotto, 2017

Lamellothyrea isimangaliso Perissinotto, 2017

Figure 1. Professor Renzo Perissinotto near Willowmore (EC) at the locality of *Meridioclita capensis* Krikken, 1982.

Research objectives. – Trip itinerary.

Being familiar with the customs and the culture of the country we visited for the first time two years ago, we decided to organize a second trip that might be successful in both aspects of good field trip – comfort and ease of travel and diversity of Cetoniinae fauna observed. The Eastern Cape and KwaZulu-Natal provinces provide several different vegetation types and an almost unlimited number of localities to search for beetles.

Our plan was to concentrate on searching dry habitats in the Karoo region, then drive through the foothills of the Drakensberg Mountains and finally briefly visit forest habitats in KwaZulu-Natal. Our targeted group of interest were members of the enigmatic short-lived Cetoniinae which emerge only after major rainfall (e.g., Ichnestomini and Xiphoscelidini).

After arrival, the first locality we visited was in the Camdeboo Mountains. The climate did not indicate any insect activity either in the air or on the ground. Daily temperatures close to 40°C and complete lack of moisture were conditions far from the European winter we had left behind a few day earlier. To dig in the hard soil to search cetoniine larvae was a tough job even for very eager entomologists! Farmers expected rains to be coming soon, but the sky was completely cloudless. On the second day, suddenly, as if by divine intervention, we were surprised to experience a heavy and persistent shower with nearly 50 mm of rainfall, an amount atypical for the Karoo region and that time of the year. At this point we needed to spring into action, given the short-lived activity of our targeted enigmatic rose chafers.

As in our first visit in 2014/2015, due to the short duration of our expedition, we practiced simple collection methods, mainly hand picking or capturing using a standard beetle net. Catching the very fast zigzag flying *Ichnestoma* sp. males requires great physical performance while spotting their dull-coloured apterous females on the ground requires sharp eyesight. In the forests of KwaZulu-Natal we set some fruit-baited traps, but they did not yield much due to rainy weather and limited exposure time.

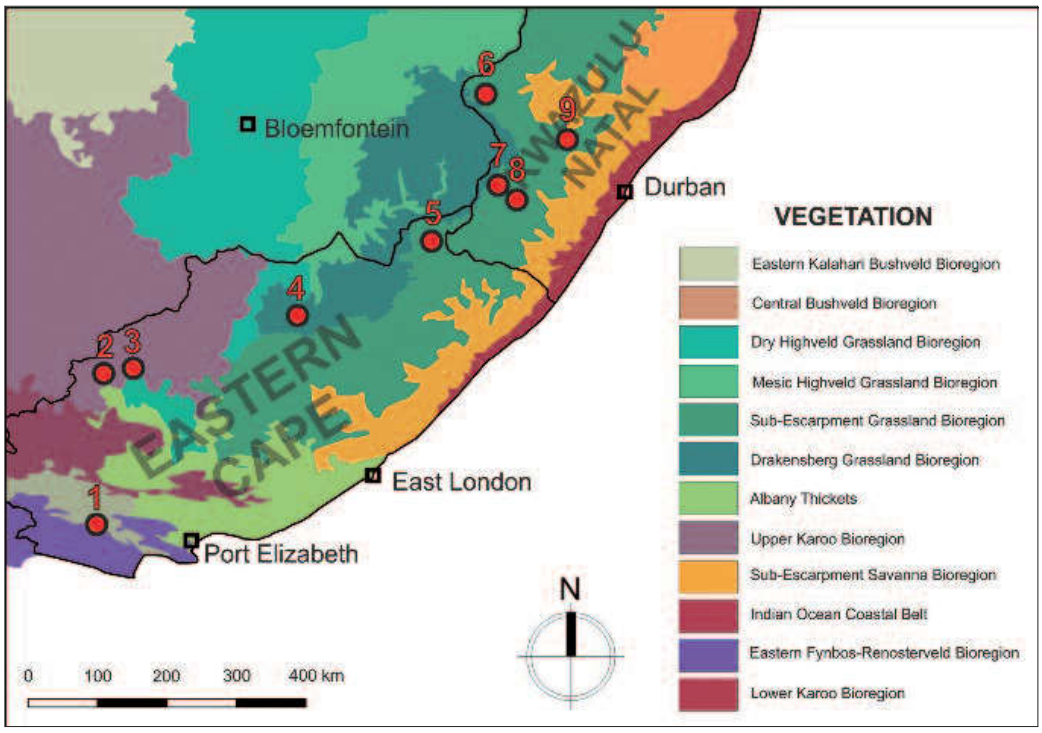

Figure 2. Schematic vegetation map of South Africa (Mucina and Rutherford 2006) showing the main and cited collecting locations visited during the expedition (1 – Willowmore env.; 2 - Sneeuberge Mts., Nieu-Bethesda env.; 3 – Lootsberg Pass; 4 - R56 between Dordrecht and Molteno; 5 – Matatiele Nature Reserve; 6 – "Little Switzerland" area; 7 – Cobham; 8 – Marutswa forest; 9 – Karkloof forest.

Captive breeding

Considerable efforts were made to find both live adult specimens and larvae in their wild habitat. Where larvae were found, we recorded the circumstances and collected a sample of larvae to raise to adults for identification and also to try further propagation. Beyond larvae/imago feeding demands, in the case of South African Cetoniinae developing in extreme habitats a crucial clue to successful breeding are factors of temperature and moisture. Simulation of natural conditions in home-based, non-laboratory settings for captive breeding is already difficult, and in the case of species adapted to highly specialized habitats, practically impossible! Based on our experience with raising South African Cetoniinae (Malec and Šípek 2016), we separated them into several groups based on how they cope with artificial breeding conditions. For each group some typical examples are given.

1) Species occuring at wide range of conditions throughout all seasons, with usual or only slightly altered Cetoniinae biology without the explicit need for dry and cold dormant periods: *Atrichelaphinis (Atrichelaphinis) tigrina* (Olivier, 1789), *Leucocelis (Leucocelis) adspersa* (Fabricius, 1801), *Leucocelis (Leucocelis) haemorrhoidalis* (Fabricius, 1775), *Rhabdotis aulica* (Fabricius, 1781), *Anisorrhina (Anisorrhina) flavomaculata* (Fabricius, 1798), *Dicronorrhina derbyana* (Westwood, 1843), *Eudicella tetraspilota euthalia* (Bates,1881), *Elaphinis (Micrelaphinis) irrorata* (Fabricius, 1798), *Anisorrhina (Melinesthes) umbonata* (Gory and Percheron, 1833), *Mausoleopsis amabilis* Schaum, 1844.

2) Species with a very long pre-pupal dormancy period: *Chondrorrhina (Plaesiorhinella) plana* (Wiedemann, 1821), *Scythropesthes bicolor* (Burmeister, 1842), *Xiphoscelis schuckardi* Burmeister, 1842, *Elaphinis (Elaphinis) cinereonebulosa* (De Geer, 1778).

3) Species requiring dormancy ("diapause") in adult stage: *Gametoides subfasciata* (Swederus, 1787), *Phonotaenia balteata balteata* (DeGeer, 1778), *Xeloma maura* (Boheman, 1860),

Acrothyrea (Acrothyrea) rufofemorata (Burmeister, 1842), *Cyrtothyrea (Cyrtothyrea) marginalis* (Swartz, 1817), *Anoplocheilus (Anoplocheilus) figuratus* (Boheman, 1857).

4) Species requiring a special larval feeding substrate composition: *Dischista cincta* (DeGeer, 1778), *Dischista rufa* (DeGeer, 1778), *Rhinocoeta (Rhinocoeta) sanquinipes* (Gory and Percheron, 1833), *Trichostetha fascicularis prunipennis* (Burmeister, 1842).

Note. – Beetles from Group 1 are generally thought to be easiest to keep and reproduce in captive breeding, even though the vitality of the population often decreases with increasing number of captive bred generations.

These groups should be considered tentative in nature, as individual species may have combined requirements, or their requirements may vary based on their geographical origin or season. Generally speaking, to keep species in artificial breeding successfully over multiple generations often requires simulation of certain period of dormancy at various stages of development. Dormancy periods help beetles to survive predictable, unfavourable environmental conditions in their natural environment, such as temperature extremes, drought, or reduced food availability. Not adhering to the natural demands of beetles often leads to breeding failure. Larvae and beetles raised in breeding containers were kept at a temperature of 20–22°C with minor seasonal fluctuations. There is no general recipe for larvae feeding substrate composition, but the mixture of dry cow dung, rotten wood and silty soil or fine grained sand with a ratio of approximately 1:1:1 has proved to be an acceptable general feed accepted by the majority of species coming from arid bioregions. Wild collected larvae, especially those of 2nd or 3rd instar, do get used to new conditions very well and often feed on any kind of organic matter and tend to pupate quickly, most likely as a reaction to the altered developmental conditions.

Systematic part

Records presented below are organized within the suprageneric classification after Krikken (1984) as modified by Šípek and Král (2012). We are aware of recent works presenting alternate concepts of suprageneric classification of the Cetoniinae family (Holm and Marais 1992, Scholtz and Grebennikov 2005, Ratcliffe *et al.,* 2002). However, in light of the findings of the recent phylogenetic study of Cetoniinae (Šípek *et al.,* 2016), this approach seems to be the most accurate to cope with the presumed future taxonomic rearrangement of groups. Unfortunately, no proper phylogenetic study has been published to date to resolve the position of problematic taxa, including many South African "relictual" genera. However, we do have the results of the first preliminary analyses based on the collected material already at hand. The new genus *Neoclita* Perissinotto, 2017 is placed under Goliathini, "*incertae sedis*".

Family: Scarabaeidae,
Subfamily: Cetoniinae,
Tribe: Cetoniini,
Subtribe: Cetoniina
Subtribe: Leucocelina
Tribe: Cremastocheilini
Subtribe: Oplostomina
Subtribe: Spilophorina

Tribe: Diplognathini
Tribe: Goliathini
Subtribe: Goliathina
Subtribe: Coryphocerina
Subtribe: Ichnestomina
Goliathini *incertae sedis*
Tribe: Xiphoscelidini
Subtribe: Xiphoscelidina

Subfamily: Cetoniinae

Tribe: Cetoniini

Subtribe: Cetoniina

***Elaphinis (Elaphinis) cinereonebulosa* (De Geer, 1778)**

Locality. – EC, Sarah Baartman District (Dr Beyers Naudé Municipality); 15 km NW of Willowmore; 900 m; 4-I-2017; several ♂ imagos caught in flight when landing on large goat manure midden under an acacia bush; one ♀ dug out from the soil.

Remark. – Species rather rare in collections, with the range of distribution restricted to the Eastern and Western Cape. Larvae seem to develop in dung substrates. Male were seen flying low around the dung, presumably to locate the females hidden in soil.

Breeding habits. – Very difficult species to breed and reproduce in captivity. Larvae progressed very fast to 3rd instar after being fed with substrate containing a substantial percentage of cow dung. Pupation successfully took place in sandy soil. The problematic phase is a very long pre-pupal dormancy. Even after eight months there are still larvae inside cocoons, some already dead.

Figure 3. Wild habitat of *Elaphinis (Elaphinis) cinereonebulosa* (De Geer, 1778).

Figure 4. Detail of the goat manure midden providing feeding nutrients to larvae.

Figure 5. *Elaphinis (Elaphinis) cinereonebulosa* (De Geer, 1778), Wild caught ♂ imago.

***Pachnoda sinuata calceata* (Harold, 1878)**

Locality. – FS, Xhariep District (Kopanong Municipality); 35 km NE of Colesberg; 30°35'0.55"S, 25°25'20.84"E; 1212 m; 31-XII-2016; 1 ♂ imago found on Acacia sp.

Remark. – One of the most widespread fruit chafers in South Africa, although the specimen found belong to a scarcer subspecies found principally in arid regions. The Eastern Cape represents its easternmost extension within South Africa.

Breeding habits. – Unknown.

Figure 6. Wild habitat of specimen observed on Acacia tree near the bridge of N1 highway over the Orange River, just before reaching the EC border with the FS.

***Tephraea dichroa* (Schaum, 1844)**

Locality . – KZN, Uthukela District (Okhahlamba Municipality); near R74 between Winterton and Bergville; 14-I-2017; one imago observed on unidentified vegetation.

Remark. – Very common and variable savannah rose chafer although only rarely seen within area we have visited.

Breeding habits. – Unknown.

Figure 7. *Pachnoda sinuata calceata* (Harold, 1878).

Figure 8. *Tephraea dichroa* (Schaum, 1844).

Subtribe: Cetoniina

Mausoleopsis amabilis (Schaum, 1844)

Locality . – FS, Mangaung Metropolitan Municipality; Kloofeind Caravan Park; 29°9'55.82''S 26°3'48.54''E; 1448 m; 31-XII-2016; one imago collected on unidentified plant.

Remark. – Very common, floricolous species, with a very wide distribution, but probably too early in the season to see them in quantity.

Breeding habits. – Populations from Zambia and Tanzania have been repeatedly reproduced in captivity. This species does not show any tendency to diapause in any phase of development and thus it is an easy species to breed in captivity. Life span usually takes 3–4 months. Larvae prosper in rather dry substrate containing a mixture of rotten wood, leaf litter and soil.

Figure 9. *Mausoleopsis amabilis* (Schaum, 1844).

Tribe: Cremastocheilini

Subtribe: Oplostomina

Scaptobius caffer Schaum, 1841

Locality : EC – Sarah Baartman District (Dr Beyers Naudé Municipality); Willowmore env.; 3/5-I-2017; several ♂ imagos caught in flight or seen with association with ants attempting to drag adults to their nests.

EC – Sarah Baartman District (Dr Beyers Naudé Municipality); 5 km S from Willowmore; 33°20'33.26''S 23°30'38.30''E; 966 m; 3-I-2017; several 3rd instar larvae found on roots of *Salsola* sp. (?) where they seem to feed on organic detritus.

Remark. – *Scaptobius caffer* Schaum, 1841 appears to dwell in ant nests. The species was seen quite commonly, especially in the neighbourhood of Willowmore after heavy rain, easy to spot by looking on the ground for a group of ants (*Anoplolepis steingroeveri*). For egg laying, they may use any accumulation of organic matter. During the previous trip, larvae of *Scaptobius capensis* (Gory and Percheron, 1833) were found frequently in dung of herbivores (Malec and Šípek, 2016).

Breeding habits. – Larvae develop quickly, pupate and reach adulthood within the span of two months. In nature the progress can be even faster. Unfortunately no further reproduction was achieved due to adult mating inactivity and short imago lifespan.

Figure 10. Adults of *Scaptobius caffer* found near Willowmore on sandy iron-rich soils.

Figure 11. Ants (*Anoplolepis steingroeveri*) attempting to drag adults to their nests.

Figure 12. Sampling larvae in roots of *Salsola* sp. (?).

Figure 13. Freshly hatched imagines.

Subtribe: Spilophorina

Spilophorus (Spilophorus) lugubris (Fabricius, 1775)

Locality. – EC, Sarah Baartman District (Dr Beyers Naudé Municipality); 15 km NW of Willowmore; 870 m; 5-I-2017; two ♂ adults found in the bird nest (finch?).

Remarks. – The biology of the genus was described in the revision published by Holm and Perissinotto (2010). Larvae development is linked to birds' nests, where larvae presumably feed on bird droppings and refuse.

Breeding habits. – Unknown.

Figure 14. The nest seemed to be inaccessible set deep in the thorny Acacia tree…

Figure 15 …but was completely disintegrated ...

Figure 16 ...and we were surprised to find an adult *Spilophorus (Spilophorus) lugubris* (Fabricius, 1775).

Tribe: Diplognathini

Porphyronota variegata (Boheman, 1857)

Locality. – EC, Alfred Nzo District (Matatiele Municipality); Matatiele Nature Reserve; 30°23'55''S 28°48'17''E; 2037 m; 9.I.2017; one adult ♀ found in the large cowpat, good number of 3rd instar larvae found inside cow dung.

Remark. – The biology of this species, previously grouped under *Porphyronota carnifex* (Fabricius, 1781), was described by Perissinotto (2012). The species is a typical high altitude beetle, occuring between approximately 1500–2000 m and has been collected in most cases under cow dung. Like the majority of South African Cetoniinae species also *Porphyronota* undergo a period of dormancy, adults bury under ground for the dry season and emerge after rains. The life cycle is very fast, usually 1–2 months, just as with other *Porphyronota* species.

Breeding habits. – Several 3rd instar larvae were collected in cow dung and pupated within the next few weeks. Pupal phase was short (1–1,5 months, depending on temperature) with 100% rate of hatching. Imago is long-lived and may be kept up to two years in captivity. Oviposition was not achieved.

Figures 17, 18. *Porphyronota variegata* (Boheman, 1857), adult ♀ and larvae as found in situ in the natural habitat in the cow dung.

Figure 19. Species exhibits extreme sexual dimorphism with males being very dark (captive raised imagines).

Tribe: Goliathini

Subtribe: Goliathina

Hypselogenia geotrupina (Billberg, 1817)

Locality. – EC, Sarah Baartman District (Dr Beyers Naudé Municipality); 15 km NW of Willowmore; 870 m; 4-I-2017; few ♀ found in the rock hyrax ("dassie") *Procavia capensis* midden.

Remark. – Another genus with taxonomic position subject to debate. Biology and ecology of the species (development in dung, very fast progressing larval and pupal stage) indicate certain affinities with the tribe Diplognathini. Krikken (1979) mentions their association with manure heaps, near cattle kraals with adults feeding on Acacia gum. A description of their larvae is currently under preparation.

Breeding habits. – Larvae are very fast growing, and progressed to the 3rd instar within 1–2 months in captivity (in temperature 22–24°C). Pupation is usually also relatively short (approx.1,5 months) with problem-free emergence. Unfortunately, all attempts to make adults mate and oviposit in artificial conditions have been unsuccessful. Undergoing diapause will probably be necessary for mating stimulation and consequent egg laying.

Figure 20. Rock crevices with accumulations of hyrax droppings – preferred feeding substrate of Hypselogenia larvae.

Figure 21. *Hypselogenia geotrupina* (Billberg, 1817), adult ♂ as found in wild habitat.

Figure 22. Freshly hatched captive bred male and female imagines feeding on banana.

Subtribe: Coryphocerina

Gnathocera (Gnathocerida) hirta Burmeister, 1842

Locality. – EC, Alfred Nzo District (Matatiele Municipality); Matatiele Nature Reserve; 9-I-2017; few specimens observed on grasses.

Remark. – The biology of this species is linked to wet montane grasslands (Holm and Marais, 1992). Adults are usually found on flower heads of various grasses.

Figure 23. Natural habitat of *Gnathocera (Gnathocerida) hirta* Burmeister, 1842, montane grassland in Matatiele Nature Reserve.

Figure 24. *Gnathocera (Gnathocerida) hirta* Burmeister, 1842, adult ♂.

Subtribe: Ichnestomina

Ichnestoma albomaculata Gory et Percheron, 1833

Locality. – EC, Sarah Baartman District (Dr Beyers Naudé Municipality); 15 km NW of Willowmore; 900 m; 4-I-2017; several imagos observed flying, 2 ♂ imago recovered from a farm trough where they had recently drowned.

Remark. – In the traditional view, the genus is considered as "relictual and primitive", however the presumed "primitive", or better plesiomorphic morphologic characters, may be the result of adaptation to an extreme habitat and life-cycle. The genus has its core of occurrence in the Cape, Karoo and South African montane sub-biomes, but some species extend into southern Namibia or in to the vicinity of Johannesburg (Holm and Marais 1992, Deschodt *et al.*, 2009). Females are apterous. Adults are active above ground for few days after substantial rains (>15 mm) although there might be more than one emergence after subsequent rains, if the first shower was not extensive enough (Perissinotto *et al*., 1999). Adults of both sexes lack functional mouth parts and are unable to feed. Currently 13 species are known to science. The biology and ecology of the genus was well described in the example of *Ichnestoma pringlei* (Perissinotto, Smith, Stobbia 1999). In the Winterberge moutains, larvae of this species were found in the soil composed of fine sandstone at an altitude of 1300 m in vegetation classified as Karooid *Merxmuellera* Mountain Veld. Larvae were dug up from depth of 1–12 cm around and under a variety of grass and scrub species (Perissinotto *et al*., 1999). They feed on organic detritus. Deschodt *et al.* (2009) mention *Ichnestoma stobbiai* Holm, 1992 larvae to be free-living in dolomitic to cherty, rocky, well-drained soils where they might be found up to 50 cm deep.

Figure 25. Willowmore surroundings – habitat of many remarkable cetoniine beetles.

Breeding habits. – Unknown. Adults are virtually impossible to transport alive over longer distances due to their extremely short lifespan. Laboratory breeding experiments described by Deschodt *et al.* (2009) showed very fast larval progress to the 3rd instar within two months, which was unfortunately followed by very high mortality.

Figure 26. *Ichnestoma albomaculata* Gory et Percheron, 1833, adult ♂.

***Ichnestoma struempheri kikvorsti* Holm & Perissinotto, 2011**

Locality. – EC, Sarah Baartman District (Dr Beyers Naudé Municipality); Lootsberg Pass;; 1785 m; 31-XII-2016; several imagos found freshly dead on the small spot 30 x 15 meters near the main road N9 crossing Lootsberg Pass, some live females observed crawling among the grass with males patrolling around flying low to the ground.

Remark. – Determination of this little *Ichnestoma* population is a bit doubtful, but the mophology does not differ significantly from the ssp. *kikvorsti* (Holm and Perissinotto, 2011) and may represent a micro-population derived from the nominal form. The collecting place is situated in the heart of Great Karoo, only 80 km SSW from the type locality near Kikvorsberg at approximately the same altitude.

Breeding habits. – Unknown.

Figure 27. View point at Lootsberg Pass – habitat of *Ichnestoma struempheri kikvorsti* Holm & Perissinotto, 2011.

Figure 28. *Ichnestoma struempheri kikvorsti* Holm & Perissinotto, 2011, adult ♂ locating female's pheromones.

Figure 29. *Ichnestoma struempheri kikvorsti* Holm & Perissinotto, 2011: ♀ are not capable of flight and are often of uniform matt black or dark brown colour.

***Ichnestoma rostrata* Janson, 1878**

Localities. – EC, Chris Hani District (Inxuba Yethemba Municipality); under Lootsberg Pass; 31°19'17''S 24°57'54''E; 1470 m; 31-XII-2016; one pronotum of dead ♂ found under the stone.

EC, Sarah Baartman District (Dr Beyers Naudé Municipality); Naudésberg Pass 1445 m; 2-I-2017; one dead ♂ and 2 ♀ pronota found along the roadside.

EC, Chris Hani District (Inxuba Yethemba Municipality); Sneeuberge Mountains, 5 km NW from Nieu-Bethesda; 1500 m; 7-I-2017; several male imagos observed flying and copulating on the ground with females.

Remark. – Large *Ichnestoma* species, males unmistakeable with elongated clypeus, very good flyers that may remind a Scarabeus in flight. Like other members of genus, adult beetles are attracted to moisture and can often be found drowned in water bodies such as dams, streams, pools and farm troughs.

Breeding habits. – Unknown.

Figure 30. Sneeuberge Mountains near Nieu-Bethesda - wild habitat of *Ichnestoma rostrata* Janson, 1878.

Figure 31. *Ichnestoma rostrata* Janson, 1878, adult ♂.

Figure 32. Mating couple.

Incertae saedis

Neoclita pringlei Perissinotto, 2017

Localities. – EC, Chris Hani District (Enoch Mgijima Municipality); on R56 between Dordrecht and Molteno; 1815 m; 8-I-2017; few adults ♂ collected in the grass, some specimens retrieved from the farm trough.

EC, Alfred Nzo District (Matatiele Municipality); Matatiele Nature Reserve; 2037 m; 9-I-2017; few adults ♂ collected flying in grassland area

Remark. – A recently described monospecific genus (Perissinotto 2017). Like *Ichnestoma* the genus has a very short period of adult activity after heavy rainfall in the late spring or early summer. Unlike *Ichnestoma*, females of *Neoclita* have fully developed wings nonetheless they are most probably unable to fly. Perissinotto (2017) mentions two populations where type series were collected – Matatiele Nature Reserve and Dordrecht Mountain. We discovered them about 40 km W of Dordrecht. A few individuals there were attracted to moisture and were found drowned in the farm trough. It seems the species might be more widespread in the peri-Drakensberg area.

Breeding habits. – Unknown.

Figure 33. Dense grassland of southern Drakensberg Highland – typical habitat of *Neoclita pringlei* Perissinotto, 2017 (in the distance you can see a wind pump and the farm trough where a few specimens were found drowned).

Figure 34. View from the type locality.

Figures 35. *Neoclita pringlei* Perissinotto, 2017 - adult ♂.

Figures 36. *Neoclita pringlei* Perissinotto, 2017 - adult ♀.

Tribe: Xiphoscelidini

Subtribe: Xiphoscelidina

Rhinocoeta (Rhinocoeta) armata Boheman, 1860

Localities. – EC, Chris Hani District (Inxuba Yethemba Municipality); Sneeuberge Mountains, 5 km NW of Nieu-Bethesda; 1500 m; 7-I-2017; one adult ♂ found on the ground.

Remark. – Small sized *Rhinocoeta* species with the distribution from Cape and Karoo habitats to savanna areas of Namibia and Zimbabwe (Holm, 1992). The placement of the genus within the tribe Xiphoscelidini remains controversial and some authors reject this classification. Holm and Marais (1992) considered this genus as a rather "primitive" member of the tribe Cetoniini.

Breeding habits. – Unknown, as well as biology of this species.

Figure 37. *Rhinocoeta (Rhinocoeta) armata* Boheman, 1860 ♂.

Rhinocoeta (Rhinocoeta) cornuta (Fabricius, 1781)

Localities. – EC, Sarah Baartman District (Dr Beyers Naudé Municipality); 15 km NW of Willowmore; 900 m; 4-I-2017; one adult male caught in flight.

EC, Sarah Baartman District (Dr Beyers Naudé Municipality); 5 km NW of Willowmore; 812 m; 3-I-2017; several 3rd instar larvae collected.

Remark. – Holm (1992) considers this species as the most common member of the genus, which varies much in size, with small specimens smaller than the average *Rhinocoeta (Rhinocoeta) armata* Boheman, 1860. The species occurs in sandy coastal areas and in the southern Karoo region of the Eastern and Western Cape provinces. Adults have very limited activity period after substantial rainfall only.

Breeding habits. – Few wild collected larvae have been successfully raised to ♂ imago.

Figure 38. Wild habitat of *Rhinocoeta (Rhinocoeta) cornuta* (Fabricius, 1781).

Figure 39. *Rhinocoeta (Rhinocoeta) cornuta* (Fabricius, 1781), captive bred ♂ imago.

***Rhinocoeta (Rhinocoeta) sanguinipes* (Gory and Percheron, 1833)**

Locality. – EC, Sarah Baartman District (Dr Beyers Naudé Municipality); 7 km N of Willowmore; 33°14'06"S 23°27'33"E, 1408 m; 4-I-2017; one adult ♀ found in the dung midden of small antelope (*Raphicerus* or *Madoqua* sp.?).

Figure 40. *Rhinocoeta (Rhinocoeta) sanguinipes* (Gory and Percheron), adult ♀.

***Xiphoscelis schuckardi* Burmeister, 1842**

Locality. – EC, Sarah Baartman District (Dr Beyers Naudé Municipality); 15 km NW of Willowmore; 870 m; 5-I-2017; two adults cought in flight, one landing on the ground in the shrub of *Psilocaulon* sp. (Mesembryanthemaceae) where further specimens were dug from the ground together with larvae.

Remark. – Genus generally believed to be "basal" or plesiomorphic within the Cetoniinae *sensu stricto*, however direct evidence for this is absent. A remarkable feature of the genus is the hypertrophic growth of metatibial internal spine and spurs which the beetles probably use to hold females during mating. A taxonomic revision of the genus was published by Perissinotto *et al.*,(2003) including biology and ecology of both adults and larvae. *Xiphoscelis schuckardi* Burmeister, 1842 is reported to be associated with termites *Macrotermes viator* (Latreille, 1804) and within the Karoo region prefers to inhabit areas with an altitude not exceeding 1000 m. Holm and Stobbia (1995) reported that the species breeds in the black discarded food stores of *Microhodotermes* (syn. *Macrotermes*) *viator* (Latreille, 1804), with the males active on the surface in very cold weather, but females buried underground.

Breeding habits. – Several fully grown larvae were collected at the site (Fig. 44). Larvae pupated after 1–2 months in captivity being kept in dry soil, partly original substrate, occasionally being given lettuce leaves as a source of moisture. Pupal phase took approximately 6–7 months. The imagos were extricated from their cells a few weeks after they completed metamorphosis. They showed only little activity, neither flying nor mating.

Figure 41. Author (P.M.) at the collecting site of *Xiphoscelis schuckardi* Burmeister, 1842.

Figures 42, 43. *Xiphoscelis schuckardi* Burmeister, 1842, adult ♂, ventral and dorsal view.

Figure 44. Freshly hatched specimen from captive breeding.

Additional notes, records and biology/breeding remarks

The following list includes species described in our preceding work (Malec and Šípek 2016), based on the expedition undertaken between 27 December 2014 and 12 January 2015. Species are listed alphabetically.

Acrothyrea (Acrothyrea) rufofemorata (Burmeister, 1842)

KZN, uMgungundlovu District (uMngeni Municipality); Karkloof forest; 1700 m; 11-I-2017; 2 ♀ and 1 ♂ found inside *Protea* sp. flower heads.

The species has been reproduced through rearing, however no oviposition of captive bred generation was achieved.

Figures 45, 46. *Acrothyrea (Acrothyrea) rufofemorata* (Burmeister, 1842) – colour aberrations obtained through rearing .

***Anisorrhina (Anisorrhina) flavomaculata* (Fabricius, 1798)**

EC, Alfred Nzo District (Matatiele Municipality); Matatiele Nature Reserve; 9-I-2017, several imagos found inside *Protea* sp. flower heads.

Very common South African chafer occurring mainly in the wet savannah biome. Beetle can be bred and reproduced in captivity with no special requirements.

Figure 47. *Anisorrhina (Anisorrhina) flavomaculata* (Fabricius, 1798) – species very easy to breed in the culture.

***Anisorrhina (Melinesthes) umbonata* (Gory and Percheron, 1833)**

KZN, uMgungundlovu District (uMngeni Municipality); Karkloof forest; 1700 m; 13-I-2017; several imagos observed on unspecified flora.

It is possible to breed and reproduce in captivity this species. Larvae have abnormally long third instar stage and were kept in dry substrate containing 50% inorganic compounds. Development in captivity takes 10–12 months.

Figure 48. *Anisorrhina (Melinesthes) umbonata* (Gory and Percheron, 1833) – mating couple in wild habitat.

***Anoplocheilus (Anoplocheilus) globosus* (Schoch, 1897)**

EC, Chris Hani District (Enoch Mgijima Municipality); on R56 between Dordrecht and Molteno; 31°23'32"S 26°37'35"E; 1815 m; 8-I-2017; one dead ♀ pronotum with elytra found along the roadside.

***Atrichelaphinis (Atrichelaphinis) tigrina* (Olivier, 1789)**

Species found frequently in quantity specially within KwaZulu-Natal localities.

***Chondrorrhina (Plaesiorhinella) plana* (Wiedemann, 1821)**

Species met occasionally at numerous locations. Breeding habits as described in Malec and Šípek (2016).

Figure 49. *Atrichelaphinis (Atrichelaphinis) tigrina* (Olivier, 1789), beetles feeding on giant pineapple lily (*Eucomis* sp.), Marutswa Forest

Figure 50. Attracting Cetoniinae in Karkloof Forest using banana/fruit trap

***Chthonobius conspersus* Burmeister, 1847**

KZN, Harry Gwala District (Dr Nkosazana Dlamini-Zuma Municipality); 5 km W from Cobham campsite; 10-I-2017; one ♀ specimen found in organic detritus in a rock crevice.

Figure 51. *Chthonobius conspersus* Burmeister, 1847, excavated from organic detritus accumulated in rock crevice.

***Cyrtothyrea (C.) marginalis* (Swartz, 1817)**

Very common species found at numerous locations. Typical flower feeder that has been observed on a large variety of plants, often in quant

Figure 52. *Cyrtothyrea (C.) marginalis* (Swartz, 1817), specimen collected in dry Karoo bioregion, feeding on *Selago* sp.

***Dischista cincta* (DeGeer, 1778)**

Species met occasionally at numerous locations especially in dry habitats of the Eastern Cape while feeding on flowers of *Acacia* sp.

Figure 53. *Dischista cincta* (DeGeer, 1778) feeding on flowering *Acacia karroo* Hayne.

Figure 54. Feeding aggregation of typical *Protea* chafers.

***Dischista rufa* (DeGeer, 1778)**

Another rather abundant species with widespread distribution, fruit and flower feeder. Eastern Cape dry habitat populations typically exhibit with reddish brown matt dorsum while beetles seen in peri-Drakensberg area (near Matatiele) have rather "*cincta*" appearance with elytra yellowish and glossy.

***Elaphinis (Micrelaphinis) irrorata* (Fabricius, 1798)**

KZN, Harry Gwala District (Dr Nkosazana Dlamini-Zuma Municipality); Marutswa Forest; 11-I-2017; several adults seen on *Carduus* sp.

***Gametoides subfasciata* (Swederus, 1787)**

KZN, Uthukela District (Okhahlamba Municipality); near R74 between Woodford and Langkloof; 14-I-2017; a few imagos observed on flowering *Heteromorpha* arborescens (Spreng.) Cham. & Schltdl.

***Genuchus dealbatus* Distant, 1897**

KZN, uMgungundlovu District (uMngeni Municipality); Karkloof Forest; 1700 m; 11-I-2017; few specimens found inside *Protea* sp. flower heads.

KZN, Uthukela District (Okhahlamba Municipality); 1 km NE from Little Switzerland Resort forest; 1680 m; 14-I-2017; few specimens found inside *Protea* sp. flower heads.

Figure 55. Flower chafers feeding on *Berkheya* sp.

***Leucocelis (Leucocelis) adspersa* (Fabricius, 1801)**

EC, Sarah Baartman District (Dr Beyers Naudé Municipality); 15 km NW of Willowmore; 33°15'24.13"S 23°20'1.95"E 870 m; 4-I-2017; one adult found in pellets of hyrax (dassie) *Procavia capensis* (Pallas, 1766).

***Leucocelis (Leucocelis) haemorrhoidalis* (Fabricius, 1775)**

Very common species found at numerous locations. Typical flower feeder that has been observed on a large variety of plants, often in quantity.

***Leucocelis (Leucocelis) rubra* (Gory and Percheron, 1833)**

KZN, Uthukela District (Okhahlamba Municipality); near R74 between Woodford and Langkloof; 14-I-2017; a few imagos observed on flowering *Heteromorpha arborescens* (Spreng.) Cham. & Schltdl.

***Parelaphinis moesta* (Gory and Percheron, 1833)**

EC, Sarah Baartman District (Dr Beyers Naudé Municipality); Naudésberg Pass 1445 m; 2-I-2017; one dead specimen found along the roadside.

***Phonotaenia balteata balteata* (DeGeer, 1778)**

KZN – Uthukela District (Okhahlamba Municipality); near R74 between Woodford and Langkloof; 14-I-2017; a few imagos observed on flowering *Heteromorpha arborescens* (Spreng.) Cham. & Schltdl.

***Porphyronota hebreae hebreae* (Olivier, 1789)**

KZN – Uthukela District (Okhahlamba Municipality); near R74 between Winterton and Bergville; 14-I-2017; observed in quantity on *Berkheya* sp.

Figure 56. *Porphyronota hebreae hebreae* (Olivier, 1789).

***Rhabdotis aulica* (Fabricius, 1781)**

Species met occasionally at numerous locations. Breeding habits as described in Malec and Šípek (2016).

***Scythropesthes bicolor* (Burmeister, 1842)**

KZN, uMgungundlovu District (uMngeni Municipality); Karkloof Forest; 1700 m; 11-I-2017; several imago caught in banana/beer baited trap, also seen on *Protea caffra*.

KZN, Uthukela District (Okhahlamba Municipality); 1 km NE from Little Switzerland Resort forest; 1680 m; 14-I-2017; a few specimens found inside *Protea* sp. flower heads.

Figure 57, 58. Typical *Protea* chafers - *Scythropesthes bicolor* (Burmeister, 1842) and *Trichostetha fascicularis prunipennis* (Burmeister, 1842)

***Trichostetha fascicularis prunipennis* (Burmeister, 1842)**

KZN, uMgungundlovu District (uMngeni Municipality); Karkloof forest; 1700 m; 11-I-2017; several imago observed on *Protea caffra*.

KZN, Uthukela District (Okhahlamba Municipality); 1 km NE from Little Switzerland Resort forest; 1680 m; 14-I-2017; found on *Protea* sp.

***Xeloma maura* (Boheman, 1860)**

EC, Alfred Nzo District (Matatiele Municipality); Matatiele Nature Reserve; 9-I-2017, several 3rd instar larvae and adults found in dung midden (indigenous antelope species).

KZN, Harry Gwala District (Dr Nkosazana Dlamini-Zuma Municipality); 5 km W from Cobham campsite; 10-I-2017; several 3rd instar larvae found in dung midden (indigenous antelope species).

Figure 59. Freshly emerged imago of *Xeloma maura* from Drakensberg grassland bioregion

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