The ant-lions of southern Africa: genus Pamexis Hagen (Neuroptera: Myrmeleontidae: Palparinae: Palparini)

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Abstract. Pamexis Hagen, 1866, is revised. Myrmeleon luteum Thunberg is designated as type species. A key is provided for the five species comprising the genus. Pamexis luteus (Thunberg, 1784), P. bifasciatus (Olivier, 1811) and P. contaminatus (Hagen, 1887) are redescribed: P. karoo and P. namaqua are new species. All are endemic to the Cape Province of South Africa.

Introduction

The genus Pamexis Hagen comprises five colourful species of diurnal Palparini endemic to the Cape Province of South Africa. Adults have short broad yellow wings (light-brown in one species) with dark-brown markings, and the head and eyes of all species are diagnostically small and black. They inhabit karroid and macchia vegetation, usually on rocky hillsides, and their wing colour and markings render them extremely cryptic when concealed amongst these plants. They are competent flyers and often use the wind to enhance their flight. There are no records of Pamexis in the Cape Province and the injudicious use of pesticides in most areas. It is hoped that remnant populations could be threatened by extensive habitat destruction prior to inadequate original descriptions by Thunberg (1784) and Burmeister (1839) and consequent synonymies by later authors. Three critical holotypes could not be traced, further aggravating the situation.

The present study has resolved the systematics of the genus through detailed investigation of the literature, in particular the works of Rambur (1842), Hagen (1860, 1866, 1887), McLachlan (1873) and Banks (1913), and reference to the available type specimens. Redescriptions and detailed systematic discussions are provided for the three hitherto documented species to clarify their identities, and the genus Pamexis is redescribed as the original diagnosis by Hagen (1866) is cursory and misleading.

The study is based on 171 specimens in the following collections: Albany Museum, Grahamstown, South Africa (AMGS); The Natural History Museum, London, England (BMNH); Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium (ISNB); Durban Natural Science Museum, Durban, South Africa (DMSA); Henning Collection, Johannesburg, South Africa (HCSA); H. & U. Aspock Collection, Vienna, Austria (HUAC); Lionel A. Stange Collection, Gainesville, Florida, U.S.A. (LASC); Museum of Comparative Zoology, Harvard University, Cambridge, U.S.A. (MCZC); Naturhistorisches Museum Wien, Vienna, Austria (NHMV); Robert B. Miller Collection, Project City, California, U.S.A. (RBMC); South African Museum, Cape Town (SAMC); National Collection of Insects, Pretoria, South Africa (SANC, accession code AcNE); Transvaal Museum, Pretoria, South Africa (TMSA).

Terminology and abbreviations are given in Figs 8–14, with the following additional terms: A1–A3, anal veins; Cu, cubitus; Cua, anterior cubitus; Cup, posterior cubitus; Mp, posterior median; Rs, radial sector; Sc, subcosta; T1–T5, tarsomeres. All measurements are in mm: mean measurements are given where possible, with ranges in brackets.

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This is the fifth contribution documenting the southern African Myrmeleontidae (Mansell, 1985, 1987, 1988, 1990) and the second dealing with the tribe Palparini.

A checklist of the valid species of *Pamexis* and their synonyms is provided in Appendix 1 to facilitate easy reference to the names pertaining to this genus.

**Pamexis Hagen**

_Pamexis_ Hagen, 1866: 372. Type species: _Myrmeleon luteum_ Thunberg, 1784, designated here.


_Panema_ Navás: Zoological Record (Insecta) 1913: 397. Incorrect subsequent spelling.

Redescription. Small diurnal Palparini with short broad yellow wings (light-brown in one species) extensively...
marked with dark-brown; head and eyes small, black; antennae short, clavate.

Size: forewing 24–37 mm; hindwing 22–33 mm; antenna 3.5–5.0 mm; body 23–32 mm.

Head (Fig. 6) shiny-black, small, same width as prothorax; clypeus, labrum, labium and articular membranes of antennae, mandibles, maxillae bright-yellow; vertex inflated, smoothly rounded with deep median groove; face below antennae with sparse setae. Palps short, shiny black, articulations pale-yellow, terminal labial palpomere slender, tapering to acute tip, sense organ with small rounded aperture (Fig. 7). Eyes characteristically small, surrounded by distinct ocular sclerite. Antennae short, only slightly longer than head-width across eyes, clavate, black.

Thorax: black, marked with yellow in some species. Prothorax short, wide, with long black setae along margins; intersegmental membranes bright-yellow.

Wings short, broad, yellow (light-brown in one species), with brown maculations, blotches and bands. Costal series single; several veins in some species incrassate; hypostigmal cell long. Forewings slightly longer than hindwings, usually yellow, maculated with brown; origin of Rs proximal of Cua fork; presectoral area with several crossveins and irregular double cells, Cup and 1 A separate. Hindwings usually pale-yellow, blotched and banded with brown; origin of Rs proximal fork to fork of Mp2; presectoral area with fewer crossveins than forewing, irregular double cells rarely present; Cua arches forward very strongly at junction with posterior branch of Mp2, forming the typical recurrent vein.

Legs long, black; hindlegs extending to abdominal segment 5; tibiae longer than tarsi in all legs, tibial spurs robust, curved, extending to middle of T2; T1–T4 short, T5 long, approximately equal to combined length of T1–T4; pretarsal claws longer than T1, black, slightly curved.

Abdomen stout, shorter than hindwings, covered with short black setae. Males with tergite 9 divided, sternite IX short with membranous, rounded apex. Ectoprocts curved, cylindrical, longer than tergite 8, with slender spines distally; gonarcus and parameres sclerotized, fused into a rigid cone-shaped structure; parameres well developed, shiny black; a distinct median hump present anterior to parameres; hypandrium internum small, shaped as in Fig. 30. Female with rounded ectoprocts bearing stout fossorial spines; lateral gonapophyses with stout fossorial spines; anterior gonapophyses with long slender setae; pregenitale triangular, sclerotized. Spermatheca slender, tube-like.

Larvae. Unknown.

Distribution (Fig. 45). Endemic to the Cape Province of South Africa.

Systematic position. The small black head and eyes is an autapomorphic feature which clearly delimits the genus Pamexis. It is closely related to Pamares Mansell, being the sister-genus of this group. Pamexis and Pamares share the synapomorphy of small eyes and large ocular sclerites. Other similarities include the morphology of the male genitalia in which the gonarcus/parameres complex is sclerotized into a rigid cone-shaped structure, the parameres are well developed and shiny-black, a distinct median hump is present anterior to the parameres and the hypandrium internum is small and delicate. Females of both genera have anterior and lateral gonapophyses, small sclerotized pregenitale, stout fossorial spines on the ectoprocts and lateral gonapophyses and a slender tube-like spermatheca. The labial sense organ is small and rounded in both genera and the palps are short. The two genera may be distinguished from one another by the form of the wings which are short and broad in Pamexis, long and narrow in Pamares. The origin of Rs is proximal to Cu fork in the forewings and to the Mp2 fork in the hindwings in Pamexis but originates at the same level as these forks in Pamares. In Pamexis the head is very small, about the same width as the prothorax, whilst in Pamares it is large, being distinctly wider than the prothorax. The legs of Pamexis are also longer than those of Pamares.

Pamexis may be distinguished from other Palparini by the small head and eyes and the short broad wings.

Myrmeleon luteum Thunberg is designated as type species of Pamexis as no type was fixed by Hagen (1866) or subsequently. Myrmeleon luteum is selected as the type as it was the first described species in the group and clearly typifies the genus Pamexis.

Four species, Myrmeleon conspurcatus Burmeister, M. contaminatus (nomen nudum), Myrmeleon luteus Thunberg and an undescribed species illustrated by Seba, were originally included in Pamexis by Hagen (1866). He considered M. venosus Burmeister and Myrmeleon translatus Walker to be synonyms of P.luteus and P.conspurcatus respectively.

Key to the species of Pamexis

1 Thorax pitch black. ........................................ 2
   – Thorax marked with yellow. ......................... 3
2 Subcosta of forewing incrassate. ............... luteus
   – Subcosta not incrassate. ......................... karoo
3 Wings brown, with brown blotches and bands. bifasciatus
   – Wings yellow, marked with brown. .......... 4
4 Abdomen with extensive yellow markings. namaqua
   – Abdomen black. .................................. contaminatus

Pamexis karoo sp.n. (Figs 1, 6–15, 45)

Description. Based on male holotype, fifty-five male and fifty-eight female paratypes. Characterized by pitch black head and body, yellow forewings with coarse brown maculations, hindmargin of wing curving sharply towards the wing apex and lack of incrassate subcosta.
Figs 6–15. Pamexis karoo sp.n. 6, head; 7, labial palp; 8, male terminalia, lateral; 9, gonarcus/paramere complex, dorsal; 10, same, lateral; 11, same, caudal; 12, sternite 9, ventral; 13, female terminalia, lateral; 14, same, ventral; 15, spermatheca. Abbreviations: Epr, ectoproct; Ga, anterior gonapophyses; Gl, lateral gonapophyses; Gs, gonarcus; Pa, paramere; Prg, pregenitale; 8, tergite 8; 9, tergite 9; IX, sternite 9.
Size: body length male 25.2 mm (22.0–31.0 mm); female 24.2 mm (20.0–27.0 mm); forewing length male 27.8 mm (25.0–32.0 mm); female 31.4 mm (24.0–35.0 mm); hindwing length male 25.6 mm (22.0–29.0 mm); female 28.2 mm (22.0–32.0 mm); antenna 4.0 mm (3.5–4.5 mm); holotype male 30.0 mm; 32.0 mm: 29.0 mm; 4.5 mm.

Head as in genus. Thorax: prothorax shiny-black, anterior margin raised; pterothorax shiny-black with sparse soft white and black hairs.

Wings: forewing yellow (greenish-yellow in living specimens), usually with translucent areas, coarsely black hairs. Pale-yellow, variously marked with large brown blotches by virtue of its pitch-black body, but is easily appear to stridulate by rubbing the pterostigmatic areas of the forewings over one another. If flushed they fly for a short distance before settling, but when alarmed will fly off rapidly and utilize the wind to effect their escape. Pamexis karoo has been recorded in early summer, appearing on the wing between October and late December. Nothing is known about the immature stages, mating or oviposition behaviour.

Material examined. SOUTH AFRICA, Cape Province. Holotype δ, 16, 69 paratypes, AcNE 1229, Karoo National Park, 32.17S 22.28E, 1200m, 22.xii.1989 (Mansell) (SANC); other paratypes: 1δ, 2♀, same data but (Aspöck) (HUAC); 1δ, 2♀ same data but (NHMV); 1δ, 4♀, AcNE 1137, same locality but 12.xii.1988 (Mansell) (SANC); 1♀, Willowmore, Capland [33.18S 23.30E, 750m] 25.xi.1909 (Brauns) (TMSA); 1♀, same data but x.1916 (TMSA); 1♀, same data (TMSA); 1♀, same data but xi.1916 (TMSA); 2♀, 2♂, x.1916 (TMSA); 1♂, same data but 25.xi.1916 (TMSA); 1♂, 1♀, same data but xi.1916 (TMSA); 1♀, same data but no date (TMSA); 2♂, same data but 25.x.1920 (TMSA); 1♂, 2♀, same data but 1 Nov. (MCZC); 2♂, Ceres Div., Matroosberg, 3500ft [33.22S 19.40E] xi.1917 (Lightfoot) (SANC); 2♂, AcNE 1134, Ceres Dist., Gydo Pass, 13.14S 19.19E, 1000m, 8.xii.1988 (Mansell) (SANC); 1♀, 25km NE Ceres [33.16S 19.31E, 1000m] 18.xi.1984 (Ball) (SANC); 1♀, Gamka Pass, Calitzdorp [33.30S 21.37E, 450m] xii.1925 (Brauns) (TMSA); 2♂, Resolution, Albany District [33.10S 26.37E, 370m] 20.xii.1928 (Walton) (TMSA); 1♂, 1♀, Resolution, Fort Brown [33.10S 26.37E, 370m] no date, no. 4953 (Walton) (AMGS); 1♀, same data but 15.i.1928, no. 5763 (AMGS); 1♂, Resolution, Grahamstown [33.10S 26.37E, 370m] xii.1929 (Walton) (AMGS); 3♀, 1♂, same data but x/xi.1928 (SANC); 3♀, 1♀, 7-Weeks Poort [33.24S 21.24E, 600m] 17.xi.1940 (Van Son) (TMSA); 1♀, Montagu [33.47S 20.07E, 250m] x.1941 (Van Son) (TMSA); 2♂, AcNE 300, Montagu, 33.47S 20.07E, 250m, 21.xi.1983 (Pinhey) (SANC); 2♂, De Wet [33.37S 19.31E, 250m] 21–30.x.1941 (Van Son) (TMSA); 1♂, near Haarlem [33.44S 23.18E, 900m] 26.xi.1953, ‘swiftly flying from short dry grass of Karoo hill’ (Cottrell) (SANC); 1♀, same data (TMSA); 1♂, Richmond [31.25S 23.57E, 1400m] 29.x.1954 (Van Son) (TMSA); 1♀, Ladismith [33.29S 21.16E, 600m] 2.xii.1970 (Whitehead) (SANC); 1♂, Graaff Reinet [32.15S 24.32E] x.1971 (Kroon) (TMSA); 1♀, AcNE 1327, Erasmus Kloof, Graaff Reinet, 32.13S 24.40E, 1000m, 1.xii.1989 (Coetzer) (SANC); 1♀, Schoemanspoort nr Cango Caves, Oudtshoorn Dist., 1500ft [33.29S 22.14E, 850m] 1–3.xii.1975 (Bampton) (HCSA); 1♀, Schoemanspoort [33.29S 22.14E, 850m] 31.xii.1977 (Bampton) (HCSA); 5♀, AcNE 1238, Oudtshoorn, Rooiheuwel, 33.38S 22.15E, 496m, 3–6.xii.1989 (Coetzer) (SANC); 2♂, Fraserburg, Bothmsbad [32.22S 21.48E, 800m] 26.xi.1978 (Whitehead) (SANC); 1♀, 11km E Fraserburg, 31.52S 21.36E, 1280m 15.xii.1989 (Aspöck) (HUAC); 1♀, Sutherland [32.24S 20.40E, 1600m] 17.xii.1979 (Quickelberge) (DMSA); 2♂, 32km ex Loxton–Carnarvon road [31.13S 22.15E] 1530m, 13.xi.1986 (Quickelberge) (DMSA); 2♂, AcNE 1135,
Figs 16–24. *Pamexis namaqua* sp. n. 16, male terminalia, lateral; 17, right ectoproct, ventral; 18, gonarcus/paramere complex, dorsal; 19, same, lateral; 20, same, caudal; 21, sternite IX, ventral; 22, female terminalia, lateral; 23, same, ventral; 24, spermatheca. Structures as in Figs. 8–15.
Farm Perdefontein, Williston Dist., 31.45°S 20.44°E, 1120 m, 11.xii.1988 (Mansell) (SANC); 1♂, AcNE 1136, Farm Gideonfontein, Williston Dist., 31.49°S 20.59°E, 1170 m, 11.xii.1988 (Mansell) (SANC); 2♀, Snyder's pass, 32.00°S 20.40°E, 1300 m, 1.i.1989 (Miller) (RBMC); 11♂, 6♀, AcNE 1276, same data but 17.xi.1990 (Mansell, Miller, Stange) (SANC); 4♀, AcNE 1273, Farm Vlieëkraal, Williston Dist., 31.49°S 20.47°E, 1170 m, 13.xi.1990 (Mansell, Miller, Stange) (SANC, RBMC, LASC); 1♂, 1♀, AcNE 1275, Farm Bonekraal, Williston Dist., 31.49°S 20.37°E, 1120 m, 14.xi.1990 (Mansell, Miller) (SANC, RBMC); 1♂, Cedarberg Mts, nr Sleepad Hut [32.23°S 19.09°E, 1370 m] 17.xi.1990 (Clemminshaw) (SANC).

**Pamexis namaqua sp.n.** (Figs 2, 16–24, 45)

*Description.* Based on male holotype, eight male and thirteen female paratypes. Characterized by pale-yellow forewings heavily maculated with brown, lack of incrassate subcosta, thorax and abdomen extensively marked with yellow and male with yellow ectoprocts.

Size: body length male 24.5 mm (24.0–25.0 mm); female 22.4 mm (20.0–25.0 mm); forewing length male 27.5 mm (27.0–28.0 mm); female 28.7 mm (23.0–33.0 mm); hindwing length male 26.0 mm (26.0 mm); female 26.1 mm (21.0–30.0 mm); antenna 3.7 mm (3.5–4.0 mm); holotype male 25.0 mm; 28.0 mm; 26.0 mm: 3.5 mm.

Head as in genus.

Thorax: prothorax yellow, with broad central Y-shaped brown area and brown posterior margin: pterothorax black with large yellow patches on mesoscutum; mesoscutellum black with long white hairs; metascutum velvety-yellow; brown area and brown posterior margin: pterothorax black maculated and clouded with brown; Sc and R not sometimes coalescing into bands; presectoral area with subcosta, thorax and abdomen extensively marked with thirteen female paratypes. Characterized by pale-yellow

on the abdomen. It is distinguished from *P.karoo* and *P.luteus* by the yellow markings on the body and especially from *P.luteus* by the lack of the incrassate subcosta in the forewings.

**Ecology.** Similar to that described for *P.karoo*. A striking feature of the habitat in which the most recent series of *P.namaqua* was taken is the number of lichen-covered rocks against which these insects, with their pale-yellow wings with brownish suffusions, blend almost perfectly.

**Material examined.** SOUTH AFRICA, Cape Province. Holotype ♂, 6♂, 3♀ paratypes, AcNE 1272, Steinkopf, 29.18°S 17.43°E, 1084 m, 10–22.xi.1990 (Mansell, Miller, Stange) (Holotype SANC, RBMC, LASC); 1♂, 1♀, AcNE 1275, Farm Bonekraal, Williston Dist., 31.49°S 20.37°E, 1120 m, 14.xi.1990 (Mansell, Miller) (SANC, RBMC); 1♂, Cedarberg Mts, nr Sleepad Hut [32.23°S 19.09°E, 1370 m] 17.xi.1990 (Clemminshaw) (SANC).

**Pamexis luteus** (Thunberg) (Figs 3, 25–33, 45)

*Myrmeleon luteum* Thunberg, 1784: 78.


*Pamexis lutea* (Thunberg): Hagen, 1866: 443.

*Myrmecoleon conspurcus* Burmeister, 1839: 997.


*Pamexis conspurcus* (Burmeister): Hagen, 1866: 433; 1887: 112 (Syn.).

*Myrmecoleon venosus* Burmeister, 1839: 998.


*Palpares venosus* (Burmeister): Rambur, 1842: 376; Hagen, 1860: 362 (Syn.).


*Pamexis translata* (Walker): McLachlan, 1873: 130 (Syn.).


*Redescription.* Based upon fifteen males and sixteen females. Characterized by distinctly incrassate subcosta (and occasionally radius) in distal half of the forewing, oval-shaped wings, forewing with evenly distributed fine maculations, and pitch-black body.

Size: body length 28.0 mm (25.0–32.0 mm); forewing 30.0 mm (28.0–37.0 mm); hindwing 28.0 mm (26.0–33.0 mm); antenna 5.0 mm (4.0–5.0 mm).

Head as in genus.

Thorax: prothorax pitch black, anterior margin raised: pterothorax pitch-black with sparse soft white and black hairs.
Figs 25–33. Pamexis luteus (Thunberg). 25, male terminalia, lateral; 26, gonarcus/paramere complex, dorsal; 27, same, lateral; 28, same, caudal; 29, sternite IX, ventral; 30, hypandrium internum, ventral and lateral; 31, female terminalia, lateral; 32, same, ventral; 33, spermatheca.
Wings: forewings finely maculated with brown, rarely with sparse coarse maculations; costal area wide, tapering towards base and pterostigma, with distinctive striations over Sc and R; Sc characteristically incrassate near pterostigma, R incrassate in some specimens; presectoral area with 1–2 crossveins and 1–3 irregular double cells; Rs with 6–8 branches. Hindwings variously blotched with large brown spots, sometimes coalesced into two distinct bands; Cup distinctly incrassate, Sc, Mpl, and rarely 1 irregular double cell. 

Legs as in genus, covered with short and long black bristles and short white setae on femora.

Abdomen black, densely covered with short black setae; extremities of tergites yellow, sternites black, intercalary membranes bright-yellow. Male and female genitalia as in Figs 25–30, female as in Figs 31–33.

Distribution. Recorded only from the southwestern Cape Province, from Swellendam in the southeast to Ceres in the north.

Systematic position. This species is most closely related to *P. karoo* as both species have a pitch-black thorax and abdomen with bright-yellow intersegmental membranes. The wing patterns are also superficially similar. The ranges of the two species overlap in the Worcester/Robertson Valley where karroid elements intrude into the macchia vegetation.

Taxonomic discussion. The accurate determination of *Myrmeleon luteum* Thunberg, and subsequent synonyms, was the key to this study, but the identification was complicated by inadequate descriptions and missing holotypes of *M. luteum*, *Myrmecoleon conspurcus* Burmeister and *Myrmecoleon venosus* Burmeister.

A specimen in Uppsala, Sweden, was regarded as the holotype of *M. luteum* (Tjeder, pers. comm.) and a photograph of this specimen (a copy also in BMNH) shows a male in good condition with the wings spread. Comparison of this photograph with the original illustration by Thunberg (1784, Fig. 90), however, indicates that the photograph and drawing do not depict the same specimen. The insect in the photograph is not the holotype of *M. luteum*, but a specimen of *P. karoo*. Thunberg's illustration shows a species with a wide costal area with distinct striations, finely and evenly maculated forewings, an anastomosis of several major veins in the forewing and a characteristically oval-shaped wing. Thunberg also mentions that the raised veins are striated ('Venis elevatis lineatae striataeque'). These features are manifest in the species in which the subcosta of the forewing is also uniquely incrassate. This important feature is characteristic of only one of the five species and is not a generic character as stated by Hagen (1866: 372). Although not evident in Thunberg’s figure, several authors (McLachlan, 1873: 130; Banks, 1913: 186) mention that the subcosta is thickened in *Pamexis luteus*. The identity of *Myrmeleon luteum* Thunberg could thus be clearly established.

Burmeister (1839) described *Myrmecoleon conspurcus* and *Myrmecoleon venosus*, indicating that these species had no yellow on the body, an important fact in precluding *P. contaminatus* and *P. namaqua* from this discussion. Burmeister's holotypes are not in Halle (Hölzel, pers. comm.) and Hagen (1887: 112) stated that they were in the Winthem Collection. According to Horn & Kahle (1937) the Neuroptera of W. von Winthem (1799–1847) went to Hagen who placed them in MCZC. These two holotypes are not in this museum (Vogt, pers. comm.) and must be considered lost.

Rambur (1842: 376) provided a detailed description of *Palpares venosus* (Burmeister), mentioning the incrassate veins, and Hagen (1887: 112), who studied Burmeister's types, maintained that Rambur's description of this species was correct. Hagen (1860: 362) synonymized *M. venosus* with *M. luteum*, a view uncontested by later authors including himself (Hagen, 1862: 96; 1866: 434; 1887: 112; McLachlan, 1873: 130; Banks, 1913: 186). The synonymy of *M. conspurcus* and *M. venosus* Burmeister with *Pamexis luteus* was thus also clearly established.

Walker (1853) described *Myrmeleon translatus* which was synonymized with *M. conspurcus* Burmeister by Hagen (1860: 362; 1866: 449) and McLachlan (1867: 281) agreed with this synonymy. McLachlan (1873: 130) then synonymized *M. translatus* and *P. venosus* with *P. luteum* and Hagen (1887: 112) confirmed this by listing *P. conspurcus*, and hence *M. translatus*, as a synonym of *P. luteus*.

I have examined the three syntypes of *Myrmeleon translatus* Walker, designated 'a', 'b' and 'c' in his description (Walker, 1853: 398) and confirm that they are conspecific with one another. The subcosta and radius of the forewing in specimens ‘a’ and ‘b’ are incrassate, confirming the synonymy of this species with *Pamexis luteus*. Specimen ‘c’ is a poorly preserved teneral specimen with an apparently unthickened radius. The thickening of the radius is a variable character in the long series of specimens available for this study, indicating that the unthickened condition in specimen ‘c’ does not imply the possible existence of another species. Specimen ‘b’ of Walker’s type series of *Myrmeleon translatus* is designated here as lectotype and the other two are paralectotypes.

Navás (1913: 483) ignored the synonyms of Hagen and McLachlan and designated *Myrmeleon translatus* Walker as type species of his genus *Pamema*. This genus is a synonym of *Pamexis* (Markl, 1954: 216). Navás (1925: 206) described *Pamema insperatus* and I have examined the holotype. It is in poor condition and badly discoloured, but is certainly conspecific with *P. luteus* and is synonymized accordingly.

Material examined. SOUTH AFRICA, Cape Province. Holotype ?, *Pamema insperatus* Navás, Jan du Toits Kloof, Waaihoek Berge, Worcester Dist. [33.34 S 19.20 E, 400 m] 16.xii.1921 (*Andrae*) (Halle); Lectotype ?, *Myrmeleon translatus* Walker (designated here) with the labels: 'Named
at sight by W.F.K., one of Walkers series so named M. transpl.'/Type (round label with a green border)/Ex Milne Coll. 39-6-19-1729 (on a round label); paraplectotype ♂ with the labels: ‘Named at sight by W.F.K., one of Walkers series so named M. transpl.'/♀ Type (round label with a green border); paraplectotype ♂ , with the labels: ‘Named at sight by W.F.K., one of Walkers series so named M. transpl.'/Type (round label with a green border)/Pamema translatus ♂ Walker, Long. Navás det.' (BMNH).

Additional specimens: 14 ♂ and 13 ♀ from the following localities: Stellenbosch (33.56 S 18.51 E, 100 m), Hex River (33.29 S 19.36 E, 450 m), Hottentot's-Holland Mountains (34.00 S 19.02 E, 1212 m), Matroosberg (33.23 S 19.40 E, 1060 m), Franschoek (33.55 S 19.06 E, 400 m), Franschhoek Pass, 8 km SE Franschoek (33.55 S 19.07 E, 500 m), Kadouwshoogte nr Vissershok (33.47 S 18.33 E, 50 m), Somerset West (34.05 S 18.52 E, 50 m), Wit Rivier Valley, Bain's Kloof (33.33 S 19.10 E, 400 m), Ceres (33.22 S 19.19 E, 500 m), Farm Vlakfontein, Malmesbury Dist. (33.37 S 18.45 E, 220 m), Wellington (35.38 S 19.00 E, 200 m), Bontebok National Park, Swellendam (34.04 S 20.27 E, 150 m), Stettynskloof Dam, Worcester Dist. (33.50 S 19.15 E, 400 m), Villiersdorp (33.59 S 19.17 E, 400 m), Du Toit's Kloof, Worcester Dist. (33.43 S 19.09 E, 400 m), Shaw's Pass, Caledon Dist. (34.19 S 19.24 E, 300 m). Collected between: i.1887 and 30.xi.1899, collection dates from 20 November to 7 January. Collectors: Barnard, Cowley, Dickson, Hanekom, Kroon, Müller-Dobliers, Oberprieler, Péringuey, Picker, Pringle, Simmonds, Smithers. Depositories: BMNH, MCZC, SANC, SANC, Stellenbosch University Coll.

Pamexis bifasciatus (Olivier) comb.n. (Figs 4, 34–41, 45)

Myrmeleon bifasciatum Olivier, 1811: 122.
Myrmeleon bifasciatum Olivier: Walker, 1853: 405.
Palpares bifasciatus (Olivier): Banks, 1913: 185.
Myrmeconeolus pardalinus Burmeister, 1839: 997.
Palpares pardalinus (Burmeister): Rambur, 1842: 377 (misidentification).
Palpares pardalinus (Burmeister): Hagen, 1860: 361; Van der Weele 1903: 168.
Palpares brachypterus McLachlan, 1867: 275; Hagen, 1887: 111.

Redescription. Based on one male and two females. A small species characterized by light-brown wings with darker brown bands and spots, hindwings more heavily marked than forewings and body extensively marked with yellow. The only known Pamexis with brown wings.

Size: body length male 22.0 mm; female 26 mm; length of forewing male 25.0 mm; female 30.5 mm (30.0–31.0 mm); length of hindwing male 25.0 mm; female 29.0 mm; antenna 5.0 mm.

Head as in genus.

Thorax: prothorax yellow with broad brown median stripe and lateral margins; mesoprescutum yellow with broad brown median stripe widening anteriorly, mesoscutum yellow with brown centrally and laterally, mesoscutellum yellow with broad brown median stripe and long white hair; metascutum brown with two large triangular velvety-yellow areas, metascutum brown with long white hair: sternites and pleurites black with long white hair.

Wings narrower than other Pamexis species, membrane light-brown; forewings with diffuse pale-brown markings usually coalesced into two bands; costal area uniformly narrow; veins not thickened; Rs arises on the same level or slightly proximal to fork of Cua; presectoral area with 1–5 crossveins and 0–2 irregular double cells; Rs with 3–6 branches: hindwings more heavily marked than forewings, with large distinct spot over Mp2 fork and two brown bands beyond this; costal area uniformly narrow; Rs arises before Mp2 fork; presectoral area with 1–5 crossveins and 0–2 irregular double cells; Rs with 4–7 branches.

Abdomen: tergites 1–2 brown with soft white pubescence; tergites 3–6 yellow with dense black setae; 7–9 brown; sternites brown. Male ectoprocts yellow, terminalia as depicted in Figs 34–38. Female as depicted in Figs 39–41.

Distribution. Southwestern Cape Province, with only one exact locality record.

Systematic position. The autapomorphic feature of small head and eyes, together with the wing venation, morphology of the labial palps and sense organ and genitalia, place this species unequivocally in Pamexis. It differs from the other four members of the genus in the lack of yellow pigment in the wings and Rs arising closer to the forks of Cua and Mp2 in the fore- and hindwings respectively, attributes it shares with Pamares and most other Palparini. Pamexis bifasciatus is thus probably not as closely related to the other four as they are to one another and may share a sister-group relationship with them.

Taxonomic discussion. This species has a long and complex taxonomic history dating back 179 years. Olivier (1811) described Myrmeleon bifasciatum from ‘Cap de Bonne-Esperance’ (Cape Province, South Africa). The head, thorax and wings of this holotype are still in the Rijksmuseum, Leiden, Netherlands: a photograph is available.

Burmeister (1839) described Myrmeconeolus pardalinus from ‘Süd-Afrika, von Orange-Fluss’ (Orange River, South Africa) from the Drege Collection in Halle. This specimen is still in good condition in Halle (Tjeder, pers. comm.) and a photograph is available. Burmeister’s description is very superficial but Tschangenberg (1879) has provided a description of the specimen in the Halle collections.

Rambur (1842) transferred M.pardalinus Burmeister to Palpares Rambur, and provided a detailed description of a specimen which he identified as this species. However, Rambur misidentified the specimen (Hagen, 1887) and his description does not apply to M.pardalinus Burmeister, but to the species dealt with below as Pamexis contaminatus Hagen.
Hagen (1860) placed *M. pardalinus* Burmeister in the genus *Palpares*. Hagen (1866) listed *P. pardalinus* (Burmeister) together with *P. pardalinus* det. Rambur in the genus *Palpares*.

Walker (1853) identified and described a specimen in BMNH as *Myrmeleon pardalinus* Burmeister, but McLachlan doubted this identification and proposed the name *Palpares brachypterus* for *M. pardalinus* det. Walker. Hagen (1887) maintained that Walker’s interpretation was correct and that *P. brachypterus* McLachlan was a synonym of *M. pardalinus* Burmeister.

Van der Weele (1903) also indicated that *P. brachypterus*
was *M. bifasciatum* Olivier and that *P. pardalinus* Burmeister could be the same. This was confirmed by Banks (1913) who also transferred *M. bifasciatus* to *Palpares*. I have compared the holotype of *P. brachypterus* McLachlan with photographs of *M. bifasciatum* Olivier and *M. pardalinus* Burmeister and confirm this synonymy.

This species is apparently extremely rare and may be endangered or already extinct. A total of only nine very old damaged specimens are known, and only one has accurate collection data. This was the only specimen to have been collected during this century. The rediscovery of *P. bifasciatus* would be a major entomological event and every endeavour must be made to establish its exact conservation status.

**Material examined.** SOUTH AFRICA, Cape Province. Holotype ♀ (photograph), *Myrmeleon bifasciatum* Olivier, no further data (Rijksmuseum, Leiden); holotype ♀ (photograph), *Myrmeleon pardalinus* Burmeister, no further information (Zoological Museum, Halle); holotype ♀, *Palpares brachypterus* McLachlan, labelled: named at sight by W.F.K./80-46/(BMNH); 1♂, Farm Vlakfontein, Malmesbury District, 33.37 S 18.45 E, 200 m, xii.1961 (Cowley) (SANC); 1♀, 'Cape Col., P. brachypterus' (Purcell) (SAMC); 1♀, '56, Palpares brachypterus McLaugh.' (SAMC).

**Pamexis contaminatus Hagen** (Figs 5, 42–44, 45)

*Myrmeleon contaminatus* Hagen, 1860: 362 *Nomen nudum*.

*Pamexis contaminatus* (Hagen): Hagen, 1866: 433 *Nomen nudum*; 1887: 112.

*Palpares pardalinus* (Burmeister): Rambur, 1842: 377 (misidentification); Hagen, 1887: 111.

**Redescription.** Based upon 1♂ and 1♀. Characterized by relatively narrow wings; forewings uniformly dark yellow, opaque, with fine maculations; subcosta and radius not incrassate; costal area distinctly narrowed at pterostigma in fore- and hindwings; meso- and metathorax marked with yellow.

- **Size**: body length 24.0 mm; forewing length 31.0 mm; hindwing length 28.0 mm; antennae defective.
- **Head**: as in genus.
- **Thorax**: prothorax shiny-black, with anterolateral margins narrowly yellow; pterothorax black with meso- and metanota yellow.

- **Wings**: forewings opaquely dark-yellow maculated with greyish-brown; costal area wide, tapering markedly at pterostigma; Sc and R not incrassate; presectoral area with 3–4 crossveins and 1 irregular double cell; Rs distinctly thickened, with 8 branches: hindwings pale-yellow sparsely marked with brown blotches; costal area wide, tapering markedly at pterostigma; presectoral area with 2 crossveins and 0 irregular double cells; M1, M2 and Cup distinctly thickened.
- **Legs**: as in genus.
- **Abdomen**: shiny-black, densely covered with short black setae; posterior margins of tergites 4–9 yellow; sternites black. Male defective. Female terminalia as for genus.

**Distribution.** Only one record, from coastal Namaqualand.

**Systematic position.** This taxon is probably the sister species of *P. namaqua* by virtue of the yellow markings on the thorax, but more material needs to studied before its precise position can be determined.

**Taxonomic discussion.** Much confusion also pertains to this species, due mainly to Hagen (1860, 1866). In 1860 Hagen published the name *M. contaminatus* Burmeister from 'Orange-fluss' (Orange River, South Africa) without
description. In 1866 Hagen stated that *M. contaminatus* Burmeister was in ‘coll. Winthem’, and transferred it to *Pamexis* Hagen, again without description. McLachlan (1873) indicated that there was an error in Hagen’s (1860, 1866) papers as the *M. contaminatus* of Burmeister was a North American species, quite different from *Pamexis*. Hagen (1887) explained that the *M. contaminatus* to which he had referred was not the *M. contaminatus* described by Burmeister (1839), but a specimen that was only labelled by Burmeister in the collection of Von Winthem. This latter specimen was never named or mentioned in Burmeister’s work. In both of Hagen’s above-mentioned papers this name only refers to a specimen in a collection making it unavailable in terms of Article 12c of the International Code of Zoological Nomenclature (1985). Hagen (1887) then stated that this specimen was identical to the one misidentified and described as *Palpares pardalinus* (Burmeister) by Rambur (1842). As Rambur’s description was adequate, and the fact that the insect that he described was not *M. pardalinus* Burmeister, but the same as that identified by Burmeister in the Von Winthem collection he (Hagen, 1887) believed that the name could be accepted. This would constitute an indication in terms of Article 12b(1), making it available. The name *Pamexis contaminatus* Hagen (1887) was therefore validated with Rambur’s specimen as the holotype.

The specimen originally labelled as ‘contaminatus’ by Burmeister in Von Winthem’s collection is still in MCZC, but all that remains is the head, thorax and two wing tips. The prothorax is black with a yellow tinge on the raised anterior margin, and the mesonotum is also marked with yellow, distinguishing it from *P. karoo* and *P. luteus*. It is distinguished from *P. namaqua* and *P. bifasciatus* by the lack of extensive yellow markings on the prothorax.

The holotype of *Pamexis contaminatus* Hagen (*P. pardalinus* det Rambur, nec. Burmeister) is still in reasonably good condition in ISNB, where I have studied and photographed it. It is clearly different from the other four *Pamexis* species, especially in lacking incrassate veins and the other features mentioned above. The identity of *P. contaminatus* Hagen could thus also be satisfactorily determined. The specimen from Graafwater mentioned above is conspecific with the specimen in ISNB and was identified accordingly.

**Material examined.** Holotype ♂ *Palpares contaminatus* Hagen (genitalia and head defective), no data labels but with following determination labels: ‘*Palpares pardalinus* Burm.’ [det. Rambur?] ‘*Palpares pardalinus* Br.* Rbr.* *contaminatus* Burm.’ ‘Collection SELYS Pamena contaminatus Hag. Révision Esben Petersen 192’ ‘*Pamexis conspurcatus*’ (ISNB); 1♀, AcNE 1269, Graafwater, Namaqualand, Farm Mariendale, 32.08°S 18.35°E, 130 m, 7.xii.1985, (Picker) (SANC).

**Appendix 1. Checklist of the valid species of *Pamexis* with synonyms**

*Pamexis bifasciatus* (Olivier, 1811).

= *Myrmecoleon pardalinus* Burmeister, 1839.
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References


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