

New species of *Euphaedra* HÜBNER of the *ceres* group from south-western Nigeria – with new evidence from female genital morphology  
(Lepidoptera: Nymphalidae: Limenitidinae)

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ABSTRACT. Two new species of *Euphaedra* are described from south-western Nigeria, *E. eshu* n. sp. from the forests of Ondo State and *E. yemalla* n. sp. from the Lekki Peninsula. *E. proserpina* HECQ is considered to be a subspecies of *E. phaethusa* BUTLER. *E. wojtusiaki* HECQ is reported for the first time from an area west of the river Niger. A comparative study of female genitalia is carried out for the first time for the genus *Euphaedra*. Several structures are found to be valuable for species discrimination, in particular the shape and size of corpus and ductus bursae, colliculum, lamella postvaginalis and von Siebold organ. The aim of this paper is to draw attention to the inherent value of rapidly shrinking pockets of forests in the Yorubaland and their importance in the preservation of African biodiversity, and to emphasize the need of their protection.

Key words: entomology, taxonomy, new species, *Euphaedra*, Nymphalidae, Limenitidinae, Lekki Peninsula, forest-savanna transitional zone, natural reserves, West African endemics.

#### INTRODUCTION

The genus *Euphaedra* with nearly 200 recognized species is one of the most diverse among Afrotropical diurnal Lepidoptera (ACKERY *et al.* 1995; HECQ 1982, 1997, 1999; AMIET 2004). In the last three decades the number of known species has doubled, and more new taxa are described every year, which is an indication that the diversity of *Euphaedra* is still underestimated. This is certainly related to the fact that most known species have narrow geographic ranges and many are specialized to specific habitats in the rain forests. In particular, many species were described from isolated or semi-

isolated areas of peripheral forests at the northern edge of the equatorial forest belt (HECQ 1993; LARSEN 2005).

Although Nigeria has one of the longest and more intense histories of research on Lepidoptera, and its fauna can be considered as one of the best studied, the country is large and many areas have still barely been sampled. Most material comes from the southern forest belt, renowned for its biotic diversity, in particular the Cross River basin, Okomu, Okwango and Oban range. Western forests situated in the Yorubaland have been sampled several decades ago, particularly shortly before or after Nigeria's independence. Since then, in this extremely overpopulated region of the country, the loss of natural habitats was probably more severe than anywhere else, and most forests have completely disappeared whereas other were reduced to small pockets. This process disconcerted most lepidopterists who focused their attention on the better preserved portion of the south-eastern forest block. New species of Nigerian *Euphaedra* have been described during the last decades from the south and south-east of the country (HECQ 1977, 1980a, 1980b, 1983, 1993, 1995; HECQ & JOLY 2003). Currently, the fauna of *Euphaedra* in Nigeria accounts for 60 species (LARSEN 2005; KNOOP *et al.* unpubl.). Recent field work of the senior author in the vanishing forests of western Nigeria revealed the presence of several undescribed taxa, in particular belonging to the forest understory dwelling groups, such as *Euphaedra*, *Bebearia* Hemming and *Euriphene* Boisduval (LARSEN *et al.* 2009, LORENC unpubl.). Their description is aimed at raising awareness and interest in preserving Nigerian biodiversity by safeguarding the last few existing forest pockets in the Yorubaland.

#### MATERIAL AND METHODS

Adults of *Euphaedra* were collected by the authors throughout southern Nigeria and in other West African countries. Entomological nets and baited traps were used. Type specimens deposited in major collections were examined. Male and female genitalia were examined. Standard protocols were applied, involving soaking the abdomens in a warm 10% KOH solution for 35 min., scales and internal organs were cleaned out in distilled water; genital organs were stained with chrolazole black; preparations were placed in glycerol; photographs were made under a Olympus stereomicroscope. Photographs of adults were taken with Olympus E-500 digital camera and microscopic structures were photographed under a Olympus SZX9 stereomicroscope equipped with an Olympus Camedia camera. Plates were composed with Adobe Photoshop 9. Abbreviations used: FW: forewing; HW: hindwing; D: dorsum; V: venter.

#### CONSULTED COLLECTIONS

BMNH: The Natural History Museum (formerly British Museum of Natural History), London, UK;

DK: Dieuwko KNOOP, Tel Aviv, Israel & Boyl, The Netherlands;

DS: Dariusz SKIBIŃSKI, Kraków, Poland;

HB: Hein BOERSMA, St. Nicolaasga, The Netherlands;

HWG: Haydon WARREN-GASH, London, UK;

MIIZ: Muzeum i Instytut Zoologii Polskiej Akademii Nauk, Warszawa, Poland;  
MRAC: Musée Royal de l'Afrique Centrale, Tervuren, Belgium (web page) ;  
MZUJ: Muzeum Zoologiczne Uniwersytetu Jagiellońskiego, Kraków, Poland;  
RW: Robert WARREN (currently in DK);  
SMTD: Staatliche Museum für Tierkunde, Dresden, Germany;  
TL: Torben LARSEN (data base);  
TWP: Tomasz Wilhelm PYRCZ (deposited at MZUJ).

## RESULTS

***E. eshu* PYRCZ & LORENC n. sp.**

(Figs. 17, 18, 25)

## MATERIAL EXAMINED

*Euphaedra eshu*: HOLOTYPE (male): Nigeria, Ondo State, Ajebandele, 50 m, 6°43'55"N, 4°21'30"E, 21.XI.1999, T. Pyrcz leg., prep. genit. 01, 01.03.2011/J. Lorenc, MZUJ; PARATYPE (female): same data as the holotype, prep. genit. 02, 29.10.2010/J. Lorenc, MZUJ.

## DIAGNOSIS

Can be readily distinguished from the closely allied *E. phaethusa* (Figs. 7, 8) by the intense bluish flush on both the FWD and HWD, diagnostic underside blue-green ground colour and particularly small HWV submarginal black dots.

## DESCRIPTION

MALE (Fig. 17): *Head*: vertex black with dark brown scales; eyes chocolate brown with a white "collar"; palpi covered with short sandy yellow hairy scales; antennae three-fifths the length of costa, dorsally dark brown, ventrally pale orange, club formed gradually. *Thorax*: Tegulae covered with brown hair; dorsum black, naked; venter covered with sandy yellow scales, legs chestnut, covered with sandy yellow scales denser on tibiae and femora. *Abdomen*: Dorsally black, ventrally light gray with some orange scales on terminal segments. *Wings*: FW triangular, apex blunt. FWD black with a strong dark blue flush, particularly intense towards apex, blue green along anal margin and marginally into Cu2-1A; an oblique yoke-yellow subapical bar, approximately the same width along its length, some 4 mm, not reaching outer margin; fringes white. HW with a delicately undulated outer margin; tornus tapered to a point. HWD green with a dark blue overcast over the entire surface; darker green in basal and postbasal area; paler from median to submarginal area, turning darker, blackish towards outer margin; fringes black and white in the interveins. FWV ground colour pale bluish green, three black discal dots and a black bar at distal edge of discal cell; a series of five diffuse, roughly triangular black patches from costa to inner margin, three of which edging basally the postdiscal pale yellow bar, shaped as on the upperside, reaching submarginal area where totally subduing the series of black submarginal dots, apparent only towards tornus. HWV ground pale bluish-green with a strong, a series

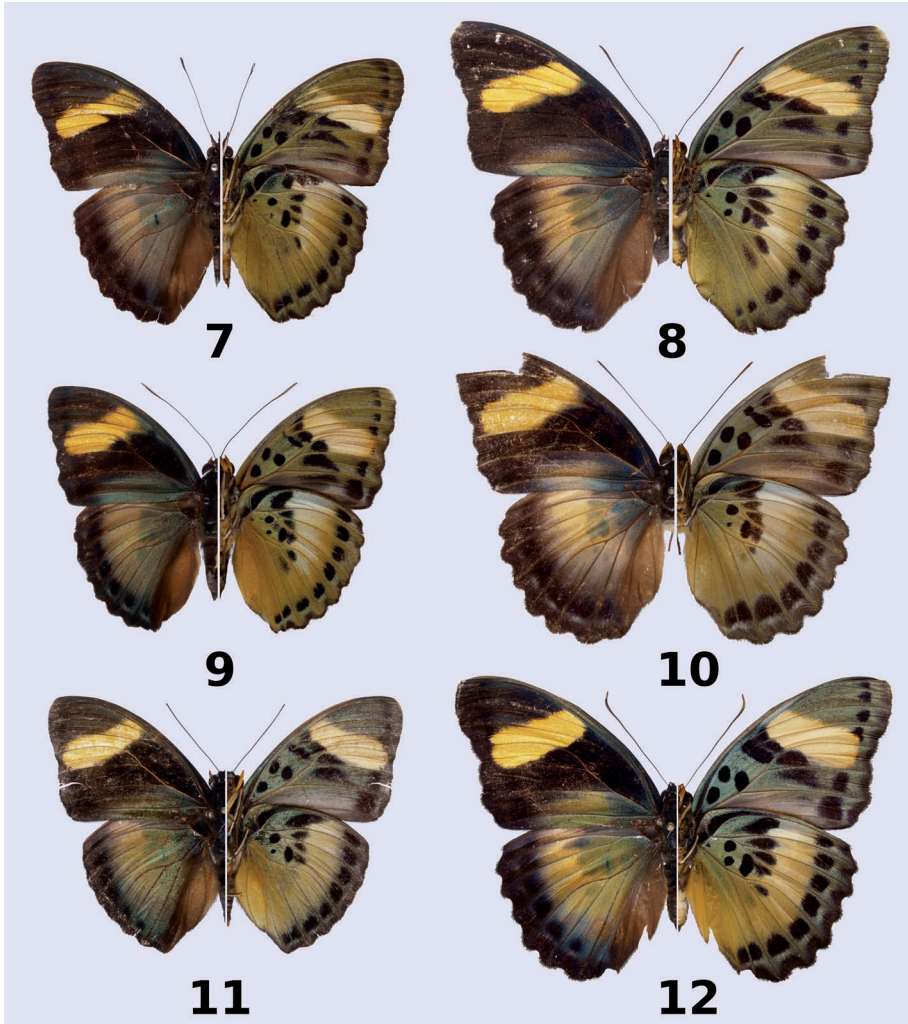
of black patches in basal, postbasal and median area, including one basal and three discal, roughly rounded dots, a streak extending from postbasal area to mid costa, an elongate one in Rs-M2, followed by three other, diffused and smaller patches in M1-M2, M2-M3 and M3-Cu1, all edged distally by a whitish suffusion extending from costa to Cu1-Cu2; the area distally strongly overcast with sandy yellow; the edge of submarginal black patches small, considerably smaller than in related taxa; outer area blackish. *Male genitalia* (Fig. 31): Compared to *E. phaethusa* (Fig. 32) and *E. ceres* (FABRICIUS, 1775) (Fig. 33) basal part of tegumen more produced; vinculum slightly longer from base of tegumen to base of pedunculus; saccus considerably larger; other



1-6. Habitus. 1 – *Euphaedra yemalla* female, Holotype, Nigeria, Epe; 2 – *Euphaedra villiersi* female, Guinea, Labé; 3 – *Euphaedra preussi*, female, Cameroun; 4 – *Euphaedra inanum*, female, Guinea, Labé; 5 – *Euphaedra wojtusiaki* male, Paratype, Nigeria, Nsukka; 6 – *Euphaedra wojtusiaki* male, Nigeria, Okomu

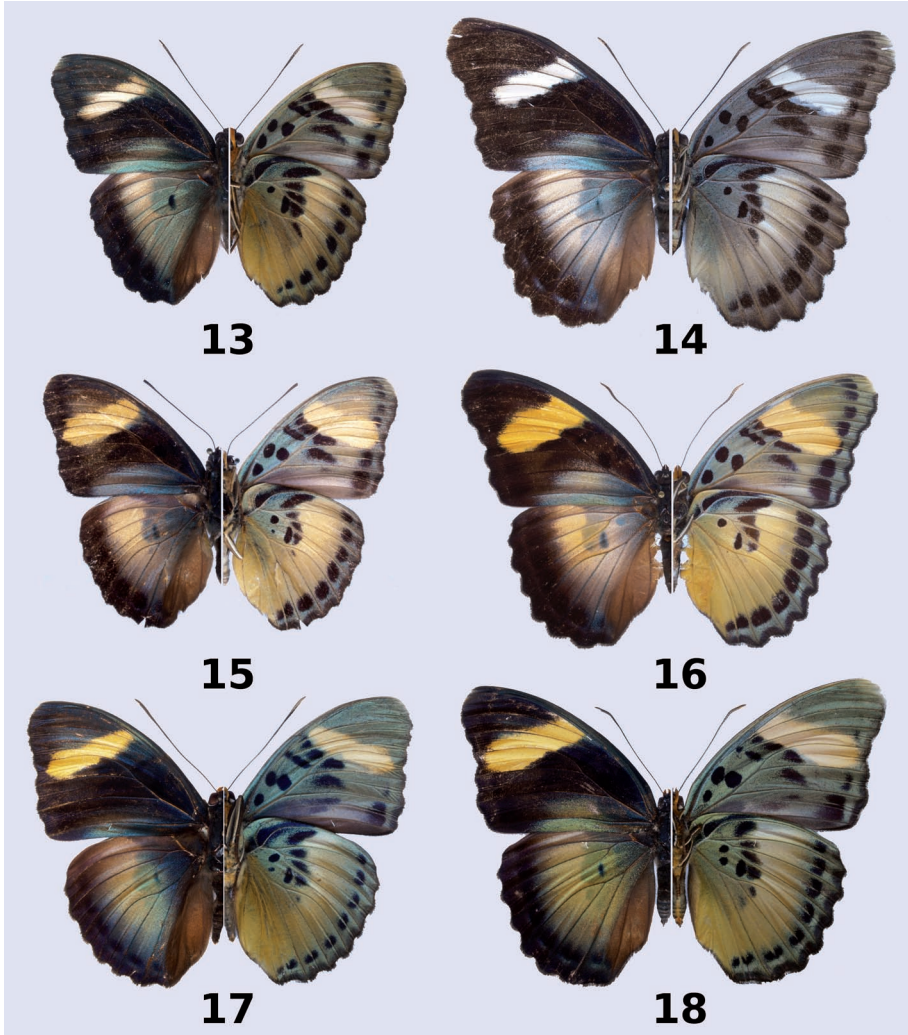
sclerites, in particular valvae, aedeagus and uncus similar; gnathos in *E. ceres* slender and shorter gnathos than in *E. eshu* and *E. phaethusa*.

**FEMALE** (Fig. 18): Differs from the male in the subdued blue flush on the upperside. HWD ground colour is green with some delicate blue sheen over the black submarginal and marginal area. FWD subapical yellow oblique bar is slightly wider. HWD black discal dot is more prominent. Underside colour pattern is similar except for the slightly wider HWV marginal band and somewhat more intense sandy yellow overcast. *Female genitalia* (Fig. 25): Not differing from *E. phaethusa* (Fig. 26). Bursa



7-12. Habitus. 7 – *Euphaedra phaethusa phaethusa*, male, Ghana, “Delagoa Bay”; 8 – *Euphaedra phaethusa phaethusa*, female, Ivory Coast, Banco; 9 – *Euphaedra phaethusa proserpina*, male, Nigeria, Isheri; 10 – *Euphaedra phaethusa proserpina*, female, Nigeria, Isheri; 11 – *Euphaedra phaethusa proserpina*, male, Nigeria, Nsukka; 12 – *Euphaedra phaethusa proserpina*, male, Nigeria, Nsukka

copulatrix large, oval; no signa; ductus bursae gradually widening; antrum, here referred as to colliculum (RAZOWSKI, 1996), wide, compressed in the middle, slat like with folded edges, strongly sclerotized; ductus seminalis joins the colliculum at the entrance of ductus bursae; lamella postvaginalis dome like, slightly sclerotized in central part (less prominent than in *E. ceres* (Figs. 29, 30); papillae anales twice as long as wide in lateral view, compressed in ventral view (shorter than in *E. ceres*); apophyse posteriores as long as the width of papillae anales (shorter than in *E. ceres*); von Siebold organ prominent (but considerably smaller than in *E. ceres*).



13-18. Habitus. 13 – *Euphaedra ceres ceres*, male, Ivory Coast, Zagné; 14 – *Euphaedra ceres ceres*, female, Ivory Coast, Zagné; 15 – *Euphaedra ceres lutescens*, male, Nigeria, Okomu; 16 – *Euphaedra ceres lutescens*, female, Nigeria; 17 – *Euphaedra eshu* male, Holotype, Nigeria, Ajebandele; 18 – *Euphaedra eshu* female, Paratype, Nigeria, Ajebandele

## ETYMOLOGY

This species is dedicated to Eshu, one of the gods of the Yoruba pantheon, the protector of travelers, deity of roads, with the power over fortune and misfortune, and the personification of death. This species was collected along one of the most important Nigerian roads in the south of the country, the Lagos – Onitsha highway.

## REMARKS

*E. eshu* belongs to the subgenus *Euphaedrana* HECQ (1976), within which LARSEN (2005) identified, among others, the “themis group” and the “ceres group” sharing similar HWV markings and differing solely by the presence/absence of ventral basal red patches. *E. eshu* belongs to latter group because it has no underside basal red patches. Furthermore, within the “ceres group” LARSEN (*op. cit.*) identified several sub-groups. For example, the species in the “inanim sub-group” are characterized by lightly marked undersides but if any strong markings are present, the black spot in cell Sc-Rs (space 7) of the HWV is not elongated as in the “ceres sub-group”. From this perspective, *E. eshu* cannot be placed in either sub-group because its patch is shorter than generally in *E. ceres* (Figs. 13-16), longer than in average *E. phaethusa*, and similar to *E. wojtusiaki* (Figs. 5-6) which was placed by LARSEN (*op. cit.*) in yet another arbitrary sub-group. It appears therefore that this subdivision relies on rather subtle characters. The establishing whether the characters pointed out by LARSEN (*op. cit.*) are good synapomorphies allowing the recognition of the “ceres complex” as a natural group is a matter of future studies.

*E. eshu* resembles most closely *E. phaethusa* and *E. proserpina* which are considered conspecific herein (see below). *E. phaethusa* was found both to the west (Isheri, Ilaro) and to the east (Okomu, Nsukka) of the type locality of *E. eshu*, and this widespread species is quite consistent phenotypically throughout southern Nigeria, with clear cut differences in the colour pattern compared to *E. eshu*. It would be therefore not founded to treat *E. eshu* as merely a local subspecies of *E. phaethusa* present within its distributional area. The female genitalia of *E. eshu* do not differ from *E. phaethusa* but do differ slightly from *E. ceres*, as pointed out in the description, and considerably from *E. wojtusiaki* (Fig. 23).

***Euphaedra yemalla* PYRCZ & LORENC n. sp.**

(Figs. 1, 2, 19)

## MATERIAL EXAMINED

*Euphaedra yemalla*: HOLOTYPE (female): Nigeria S/W, Lagos State, 5 km/Epe, 18.09.1999, T. Pyrcz leg., prep. genit. 02, 29.10.2010/J. Lorenc, MZUJ.

*Euphaedra inanim*: 3 ♂: Guinea, Labé, 1999, ex coll. H. Warren-Gash; 1 ♀: Guinea, Labé, 1999; prep. genit. 02, 07.12.2010/J. Lorenc, ex coll. H. Warren-Gash; 1 ♀: Guinea, Labé, 1999; prep. genit. 05, 07.12.2010/J. Lorenc, ex coll. H. Warren-Gash; 1 ♀: Guinea, Labé, 1999, ex coll. H. Warren-Gash; 1 ♀: Gold Coast, Amentia, 07.01.1955, MZUJ; 1 ♀: Ghana, Kakum National Park, 1500-200 m, 14.05.2011, ex. coll. ABRI, MZUJ.

*Euphaedra villiersi*: 1 ♂: Guinea, Labé, 1999, ex coll. H. Warren-Gash; 1 ♀: Guinea, Labé, 1999; prep. genit. 03, 07.12.2010/ J. Lorenc, ex coll. H. Warren-Gash; 2 ♀: Guinea, Labé, 1999, ex coll. H. Warren-Gash, MZUJ.

*Euphaedra preussi*: 1 ♂: Central African Republic, Bangui, 197?; 1 ♀: Cameroun, Lolodorf; 1 ♀: no data, prep. genit. 01, 29.10.2010/J. Lorenc; 1 ♀: Central African Republic, Bangui, 1980, MZUJ.

*Euphaedra viridicaerulea*: 1 ♂: Central African Republic, Bangui, 1980, T. Pyrcz leg.; 1 ♂: same data but 197?; 1 ♀: same data, prep. genit. 01, 09.11.2010/J. Lorenc; 1 ♀: same data, MZUJ; 1 ♂: Cameroun, Barombi, Conradt leg., MIIZ.

#### DIAGNOSIS

Upperside predominantly grayish green with a FW white subapical oblique bar. *E. yemalla* is most closely allied to *Euphaedra villiersi* CONDAMIN (1964) (Fig. 2) and *E. inanum* BUTLER (1873) (Fig. 4) from which it differs in the ventral ground colour, lilac instead of light green, and the larger, conspicuous FWV black discal dots.

#### DESCRIPTION

MALE: So far unknown.

FEMALE (Fig. 1): *Head*: vertex black with dark brown scales, collar dark brown; eyes black with a white "collar"; palpi covered with short sandy yellow hairy scales; antennae blackish brown, three-fifths the length of costa, club formed gradually. *Thorax*: Tegulae covered with brown hair; dorsum black; venter covered with sandy yellow scales, legs brown, covered with sandy yellow scales denser on tibiae and femora. *Abdomen*: Dorsally black, ventrally light gray with some orange scales on terminal segments. *Wings*: FW outer margin slightly produced between apex and vein M3; length 4.4 cm. FWD black with a dark green overcast in discal cell and distal half, dark green in basal area, light green along inner margin to Cu1-Cu2; an oblique white subapical bar compressed along vein M3 and with a notch in M3-Cu1, not reaching outer margin. HW squarish; HWD dark green in basal and post-basal area, pale green distally, heavily suffused with gray and dark green distally from a faint blackish submarginal band. FWV ground colour lilac, three black discal dots and a distal edge discal cell black bar; white subapical bar shaped as on dorsum, finely edged with black; a faint black submarginal line, barely noticeable from M3 to tornus; apex dusted with white; outer margin dusted with black HWV ground colour lilac, a black post-basal streak, one discal black dot and two small postdiscal patches at mid-costa and along distal edge of discal cell; a wide postmedian pale blue area extending from mid costa to M3-Cu1, with a diffuse outer edge; a black intermittent submarginal line, better marked than on the FW; outer margin dusted with black. *Female genitalia* (Fig. 19): Bursa copulatrix: large, oval (rounded in *E. preussi* STAUDINGER (1891) (Fig. 20); no signa; ductus bursae wide, approximately the same width all over (narrow in *E. preussi*); colliculum wide, straight, slightly bent, slit like with folded edges, strongly sclerotized; ductus seminalis joins the colliculum at the entrance of ductus bursae; lamella postvaginalis small, dome like, with well sclerotized central part; papillae anales twice as long as wide in lateral view, compressed in ventral view; apophyse posteriores present, as long as the



width of papillae anales; von Siebold organ massive, approximately the size of papillae anales, in *E. preussi* large but smaller than in *E. yemalla*, compressed in bottom part, in *E. viridicaerulea* BARTEL (1905) (Fig. 24) large but considerably smaller than in *E. yemalla*, mushroom shaped.

#### ETYMOLOGY

This species was found a short distance from the seashore. It is dedicated to the Yoruba goddess of the sea and the moon, the mother archetype and the provider of wealth.

#### REMARKS

*E. yemalla* belongs to the “ceres group” of the subgenus *Euphaedrana* HECQ (1976) as defined by LARSEN (2005). The subdivision of this group into smaller “ceres” and “inanum” sections, as we have seen with *E. eshu*, does not stand. However, *E. yemalla* is clearly most related to *E. villiersi* and *E. inanum*, both confined to the forests west of the Dahomey gap (HECQ 1979, 1984). LARSEN (2005) states that they are locally sympatric. *E. villiersi* is a forest-savanna transitional band species and is one of the very few *Euphaedra* to occur in the patchy forests of Basse Casamance in Senegal. LARSEN (*op. cit.*) mentions populations from Fouta Djallon related to *E. villiersi* but possibly representing a separate species. *E. yemalla* is possibly an ecological vicariant of *E. villiersi* occurring in the western Nigerian forest-savanna transitional zone. Taking in consideration the differences evidenced in genitalia and a widely disjunctive distribution its separate specific status appears to be well founded.

*E. yemalla* was collected in a remnant of rain forest on the Lekki Peninsula, which during the sampling process was completely logged by local people. Larger trunks were used for furniture manufacturing, others for cooking wood. In the same spot another new species of Nigerian butterfly was discovered, *Euriphene epe* PYRCZ & LARSEN (LARSEN *et al.* 2009). However, contrary to *E. yemalla*, *Euriphene epe* was collected in a number of localities in western and central-western Nigeria, which indicates it has a wider distribution and is not immediately threatened of extinction. Despite of the efforts of the senior author no other specimen of *E. yemalla* was collected, even in the quite well sampled Chevron Lekki Forest Conservation Area, situated further west on the peninsula, which is however mostly a swampy palm forest, while *E. yemalla* comes from firm land situated towards the centre of the peninsula, floristically and faunistically considerably richer than the Lekki forest. There is urgent need for the creation of a forest protected area in this heavily populated part of Nigeria especially considered the already evidenced and the potential endemism of Lekki Peninsula lepidopterous fauna.

#### *Euphaedra wojtusiaki* HECQ

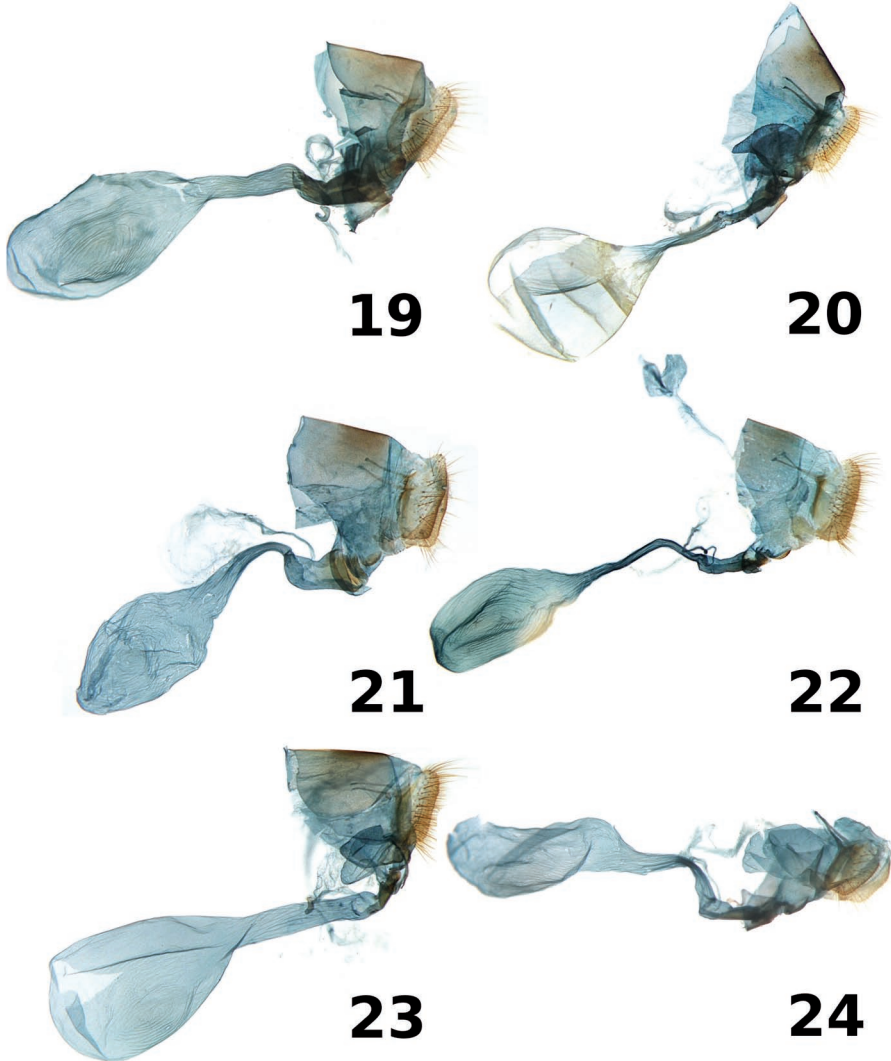
(Figs. 5, 6, 23)

*Euphaedra wojtusiaki* HECQ, 1993: 246-247, pl. 7, 8.

*Euphaedra wojtusiaki* HECQ; LARSEN, 2005 (vol.1): 430, (vol. 2): 99-100.

## MATERIAL EXAMINED

*Euphaedra wojtusiaki*: 1 ♂: Nigeria, Nsukka, 28.VIII.1982, J. Wojtusiak leg.; 1 ♂: same data but 04.XII.1982; 1 ♂: same data but 18.V.1982; 1 ♂: same data but 28.X.1982; 1 ♂: same data but 29.X.1982; 1 ♂: same data but 05.XI.1982; 1 ♂: same data but 28.IV.1982; 2 ♂: same data but 29.X.1982; 1 ♂: same data but 01.X.1982; 1 ♂: same data but 15.VII.1982; 1 ♂: same data but 17.VI.1985; 1 ♂: same data but 27.IX.1982; 1 ♂: same data but 28.IX.1982; 1 ♂: same data but 29.IX.1982; 1 ♀: same data but 17.VI.1985; 1 ♀: same data but 10.II.1986; 1 ♀: same data but 19.XI.1982; 4 ♀: same

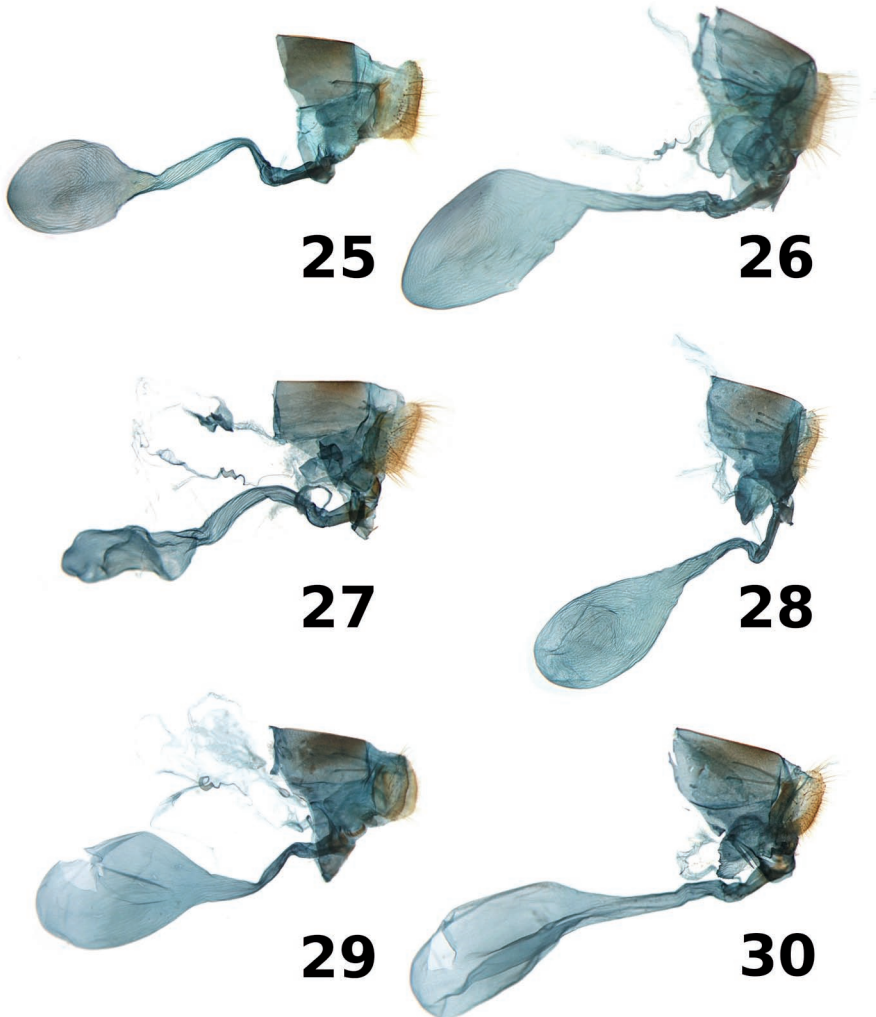


19-24. Female genitalia. 19 – *Euphaedra yemalla*, Holotype, Nigeria, Epe; 20 – *Euphaedra preussi*, no data; 21 – *Euphaedra villiersi*, Guinea, Labé; 22 – *Euphaedra inanim*, Guinea, Labé; 23 – *Euphaedra wojtusiaki*, Nigeria, Nsukka; 24 – *Euphaedra viridicaerulea*, Central African Republic, Bangui

data but 14.IX.1982; 1 ♀: same data but 08.XI.1982, prep. genit. 04, 03.12.2010/J. Lorenc; 2 ♀: same data but 05.XI.1982; 1 ♂: Nigeria, Okomu Forest Reserve, X.1984, J. Wojtusiak leg., MZUJ.

## REMARKS

*Euphaedra wojtusiaki* was assigned to the “ceres group” as identified by LARSEN (2005). It has all the distinctive features of this group, in particular the fully developed



25-30. Female genitalia. 25 – *Euphaedra eshu*, Paratype, Nigeria, Ajebandele; 26 – *Euphaedra phaethusa phaethusa*, Ivory Coast, Sangouiné; 27 – *Euphaedra phaethusa phaethusa*, Ivory Coast, Banco; 28 – *Euphaedra phaethusa proserpina*, Nigeria, Okomu; 29 – *Euphaedra ceres ceres*, Ivory Coast, Zagné; 30 – *Euphaedra ceres lutescens*, Nigeria, Okomu

HWV pattern of basal-submedian black patches, and no red basal patch, as compared to the related “themis group”. It was described from a long series of specimens of both sexes collected by J. Wojtusiak in a relic forest near Nsukka in the Anambra State in south-eastern Nigeria and so far was considered as a likely endemic of this region. However, a male of *E. wojtusiaki* coming from Okomu Forest in Edo state in south-central Nigeria was identified in the collection of MZUJ. It was curated previously as *E. nigrocilia* LATHY (1903). It presents all the characters of *E. wojtusiaki* compared to other species, such as *E. nigrocilia* or *E. ceres*, in particular the large size the broad orange rectangular FWD oblique band, and a diagnostic HWV colour pattern. It differs however in the even broader FWD yellow band and a strong bluish flush of both the fore and hindwings, particularly noticeable on the HW. We refrain for the time being from naming the Okomu population even though it most probably represents a valid subspecies. S. Szabolcs (pers. comm.) observed an individual of what he identified as *E. wojtusiaki* in Omo forest, Ondo State. Our data show that *E. wojtusiaki* is not an endemic of the Nsukka area but a widespread species throughout southern Nigeria although apparently uncommon in most areas.

Female genitalia (Fig. 23) differ consistently from all other species of the “ceres group” by the very short colliculum, broad ductus bursae and massive corpus bursae.

***E. phaethusa proserpina* HECQ, n. stat.**

(Figs. 9, 10, 28)

*Romaleosoma phaethusa* BUTLER, 1866: 670, fig. 4.

*Euphaedra proserpina* HECQ, 1983: 58, pl. 3.

*Euphaedra proserpina tisisiphona* HECQ, 1983: 60, pl. 3, fig. 14.

*Euphaedra phaethusa tisisiphona* HECQ, 1983, n. stat.

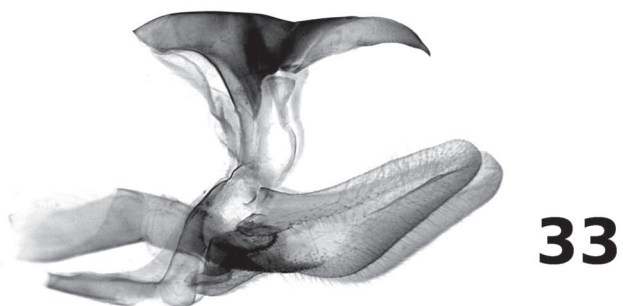
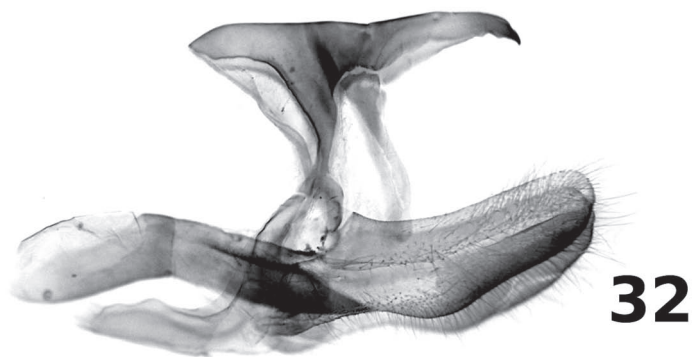
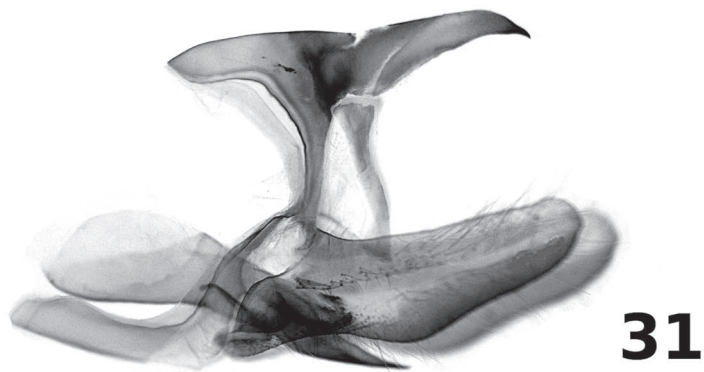
*Euphaedra phaethusa aurea* HECQ, 1983: 47.

MATERIAL EXAMINED

*Euphaedra phaethusa phaethusa*: 6 ♀: Ivory Coast, P.N. Banco, IX.1983, T. Pyrcz leg.; 1 ♀: Ivory Coast, P. N. Banco, IX.1983, T. Pyrcz leg., prep. genit. 03, 03.12.2010/J. Lorenc; 1 ♀: “Delagoa Bay” incorrect, most likely Ghana; 1 ♂: Ivory Coast, P.N. Banco, IX.1983, T. Pyrcz leg., MZUJ. 3 ♂: Ivory Coast, MAN-Sangouiné, 10-15.XI.1999, D. Skibiński leg., DS; 1 ♀: same data, DS; 1 ♀: same data, prep. genit. 03, 22.02.2011/J. Lorenc, DS; 1 ♂: same data but 12.-16.VII.1999, prep. genit. 02, 22.02.2011/J. Lorenc, DS.

*Euphaedra phaethusa proserpina*: 1 ♂: Nigeria, Oban Hills, Awsamba, 20.IV.1985, J. Wojtusiak leg.; 1 ♂: Nigeria, Nsukka, 12.XI.1982, J. Wojtusiak leg.; 1 ♂: same data but 27.IX.1982; 2 ♂: same data; 1 ♀: same data but 05.XI.1982; 1 ♂: Nigeria, Okomu Forest, 19.XII.1984, J. Wojtusiak leg.; 4 ♂: same data but 19.X.1984, 1 ♂: same data but 15.XI.1983, 1 ♂: same data but 21.XI.1984; 1 ♂: same data but 23.XI.1983; 1 ♀: same data but 17.X.1985, prep. genit. 01, 25.01.2011/J. Lorenc; 2 ♀: same data but 21.XI.1984; 1 ♀: same data but 18.X.1984, 1 ♂: Nigeria, Okomu Forest, T. Pyrcz leg.; 2 ♂: no locality, MZUJ; 1 ♀: Nigeria, Isheri, 18.II.1990, D. Knoop leg.; 1 ♂: same data but 27.I.1991, MZUJ; 1 ♂: Nigeria, Mkpote, X.2004, D. Knoop leg.; 1 ♂: Nigeria,

Erin Ijesha, I.1990, D. Knoop leg.; 2 ♂: Nigeria, Isheri, II.1989 & I.1990, D. Knoop leg.; 1 ♀: Nigeria, Ore, IV. 1982, D. Knoop leg.; 1 ♀: Nigeria, Okomu Forest, V.1990, D. Knoop leg., DK; 1 ♂: Cameroun, MIIZ.



31-33. Male genitalia. 31 – *Euphaedra eshu*, Holotype, Nigeria, Ajebandele ; 32 – *Euphaedra phaethusa phaethusa*, male, Ivory Coast, Sangouiné; 33 – *Euphaedra ceres ceres*, male, Ivory Coast, Bouaflé

*Euphaedra ceres lutescens*: 1 ♂: Nigeria, Nsukka, 02.VI.1985, J. Wojtusiak leg.; 1 ♂: same data but 10.XII.1984; 1 ♂: same data but 28.X.1982; 1 ♀: same data but 28.XII.1984; 1 ♀: same data but 14.XI.1982; 1 ♀: same data but 05.XII.1985; prep. genit. 02, 03.12.2010/J. Lorenc; 1 ♀: same data but 12.X.1983; 1 ♀: same data but 07.XII.1985; 1 ♀: Nigeria, Benin City, J. Wojtusiak leg.; 1 ♂: same data but 25.VI; 1 ♂: Nigeria, Okomu Forest, 19.X.1984, J. Wojtusiak leg.; 1 ♀: same data but 18.X.1984; 1 ♂: same data but 20.X.1984; 1 ♂: same data but 20.XI.1984; 1 ♂: same data but 15.XI.1983; 1 ♂: same data but 18.X.1984; 1 ♀: same data but 21.XI.1984; 1 ♀: same data but 19.X.1984; 1 ♀: same data but 19.X.1984, prep. genit. 01, 18.01.2011/J. Lorenc; 1 ♂: Nigeria, Ajebandele, T. Pyrcz leg.; 1 ♀: same data but 12.XII.1999; 1 ♀: same data but 02.I.2000; 1 ♀: Nigeria, Oshogbo, 11.XI.1999, T. Pyrcz leg.; 1 ♀: same data; 1 ♂: Nigeria, Olokomeji, 23.X.1990, D. Knoop leg.; 1 ♂: Nigeria, Ibadan, 26.XII.1999, T. Pyrcz leg.; 1 ♂: Nigeria, Isheri, II.1991, D. Knoop leg.; 1 ♂: same data but 28.II.1990; 1 ♀: same data but 08.V.1988; 1 ♀: same data but 28.II.1990; 2 ♂: no locality, MZUJ; 2 ♂: Nigeria, Isheri, I & II.1991, D. Knoop leg.; 1 ♂: Nigeria, Erin Ijesha, IV.1990, D. Knoop leg.; 2 ♂: Nigeria, Omo Forest, VIII.1998, D. Knoop leg.; 2 ♀: same data; 1 ♀: same data but V.1998; 1 ♀: Nigeria, Okomu Forest, V.1990, D. Knoop leg.; 1 ♀: Nigeria, Cercopan, Lokali River, XII. 2004, D. Knoop leg.; 1 ♀: Nigeria, Pandrillus, Mt. Afi, XII.2004, D. Knoop leg. DK; 2 ♂: Cameroun, MIIZ.

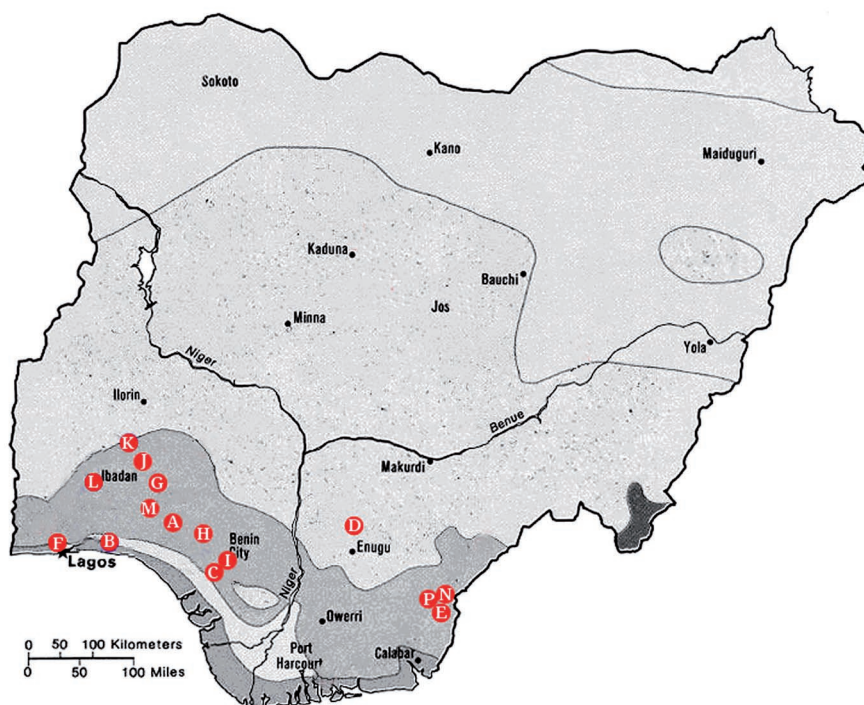
*Euphaedra ceres ceres*: 2 ♂: Ivory Coast, P.N. Banco, IX.1983, T. Pyrcz leg., MZUJ; 2 ♂: Ivory Coast, Zagné-Tai, 11-17.VIII.1997, D. Skibiński leg., DS; 1 ♀: same data, prep. genit.01, 10.02.2011/J. Lorenc, DS; 3 ♂: Ivory Coast, MAN-Sangouiné, 03-09.VIII.1997, D. Skibiński leg., DS; 1 ♀: same data, prep. genit. 04, 22.02.2011/J. Lorenc, DS; 1 ♂: same data but 11-12.VII.1997, DS; 1 ♂: same data but 7-14.XI.1999, DS; 3 ♀: same data, DS; 1 ♂: same data but 12-16.VII.1997, DS; 1 ♂: Ivory Coast, Bouafé, 11-12.VII.1997, prep. genit. 01, 22.02.2011, J. Lorenc, DS; 1 ♀: Ivory Coast, MAN-Mt. Tonkouli, 16.VII.1997, D. Skibiński leg., DS.

#### REMARKS

*E. proserpina* HECQ (1983) (Figs. 11-12) was described from Calabar in SE Nigeria. LARSEN (2005) lists it from southern Nigeria between Okomu (Edo State) and the Cameroun border. *E. proserpina* resembles closely *E. phaethusa*, both belonging to the “ceres group” as defined by LARSEN (*op. cit.*) and discussed above. *E. phaethusa* was described from Ghana (“Ashantee”) (BUTLER 1866). It was reported before this study only from the forests west of the Dahomey Gap, although LARSEN (*op. cit.*) considered it could also occur in Nigeria based on a series of specimens from Kagoro. We examined the Kagoro specimens (HB) and their females clearly do not match *E. phaethusa*, hence this population probably represents an undescribed taxon. Larsen (*op. cit.*) explained that *E. ceroides* HECQ (1983) is a junior synonym of *E. phaethusa*, as well as *E. artaynta* MÖSCHLER (1887). There are also some other names considered junior synonyms of *E. phaethusa*, namely *E. adelica* BARTEL (1905) described from Togo, *E. vespasia* MÖSCHLER (1887) from Ghana and *E. scrupulosa* HECQ (1997) from Benin (ACKERY et al. 1995). The origin of the type of the latter taxon is doubtful since

*Euphaedra* are strictly associated with rain forests and such habitats do not exist in the Republic of Benin (formerly Dahomey).

We examined a series of *E. proserpina* from various south Nigerian localities, and found that the length of the costal (space 7) black patch on the HWV, which is supposed to be a specific character of *E. proserpina* (LARSEN 2005), is quite variable. There are specimens in which it is nearly as elongated as in *E. ceres*. However the wider FW subapical bar, the overall more greenish colour of the upperside, and the more pointed FW apex indeed allow separating *E. phaethusa* from *E. ceres lutescens* in Nigeria. On the other hand the only apparent distinguishing character between *E. phaethusa* and *E. proserpina* is the somewhat wider FW subapical bar in the latter taxon. Other specific characters do not stand. In particular the underside pattern is virtually identical in the two taxa, especially the shape and relative position of the black HWV basal-median spots, and the diagnostic lighter, in some specimens whitish, area distal to the row of black median patches. We therefore consider here *proserpina* as a subspecies of *E. phaethusa*, consequently *E. phaethusa proserpina* n. stat. *E. phaethusa aurea* HECQ is the western subspecies found in Sierra Leone and Guinea (LARSEN 2005), while *tisiphona* HECQ described as a subspecies of *E. proserpina* from Cameroun is considered consequently



34. Map of Nigeria : localities referred to in the text: A. Ajebandele; B. Epe; C. Okomu; D. Nsukka; E. Awsamba; F. Isheri; G. Erin Ijesha; H. Ore; I. Benin City; J. Oshogbo; K. Olokomeji; L. Ibadan; M. Omo; N. Mkpot; P. Pandrillus

as the eastern subspecies of *E. phaethusa*, *E. phaethusa tisiphona* n. stat. Our standpoint on this issue is reinforced by the finding of a population in Isheri in western Nigeria which matches the type of *E. proserpina*. It shows that *E. proserpina* extends widely throughout southern Nigeria, hence there is no biogeographical gap between the two taxa except for the Dahomey savannas, and refutes LARSEN'S (2005) suggestion that *E. proserpina* could be an ecological vicariant of *E. phaethusa* in the wetter areas.

Female genitalia (Fig. 26, 27, 28) of *E. phaethusa* differ to a lesser degree from *E. ceres* than from *E. eshu* and, especially *E. wojtusiaki*. It indicates possible close phyletic relations between the two taxa. This observation refers in particular to the length of colliculum and the length and shape of ductus bursae. The colliculum of *E. phaethusa proserpina* is slightly longer than in the nominate subspecies and both subspecies of *E. ceres*. Contrary to *E. inanum*, *E. villiersi* and *E. yemalla* the comparison of solely female genitalia does not allow to discriminate between the two species without recurring to wing colour patterns and shapes.

#### DISCUSSION

It has to be pointed out that so far the species level taxonomy of the genus *Euphaedra* has been nearly totally relying on the external morphology, with a strong emphasis on colour patterns (HECQ 1999; D'ABRERA 2004; VANDE WEGHE 2010). HECQ (1976) proposed a subdivision of the genus into subgenera based on colour pattern and male genitalia, in particular the presence and the position of cornuti on the aedeagus and the development, shape and position of valval processes. However LARSEN *et al.* (2009) reported that male genitalia within the group of Limenitidinae including *Euphaedra*, *Bebearia* and *Euriphene* do not provide any strong characters allowing species discrimination. The same author indicates elsewhere that only minor differences separate *Euphaedra* from the putative sister genus *Bebearia* (LARSEN 2005). We identified some minor differences in the male genitalia between the species belonging to the "ceres group". However, they are mostly quantitative not qualitative, therefore their taxonomic value remains inconclusive. AMIET (2004) presented evidence that the morphology of immature stages can be taxonomically very useful. He used characters of larvae and pupae, and the choice of host plants to verify whether the subgenera of *Euphaedra* raised by HECQ (1976) are valid - natural entities - by identifying possible synapomorphies. He also pointed out that the morphology of early stages is helpful in discriminating between the species (AMIET, *op. cit.*).

The female genitalia of *Euphaedra*, to our best knowledge, have not been examined rigorously and compared before. This is quite unexpected for a genus with such a long history of research, and considered that female genitalia provide extremely important characters for alpha taxonomy and synapomorphies in phylogenetical studies of butterflies. All the examined species present common characters, in particular the absence of signa of the bursa, the presence of a sclerotized slat-like colliculum, elongated apophyses posteriors, and prominent glands of the von Siebold organ at the base of ovipor. The examination of the genitalia of other species of *Euphaedra* (PYRCZ *et al.* unpubl.) show that these features are not exclusive of the "ceres group" but are present



in other groups of the genus as well. On the other hand, it clearly appears that female genitalia of the species closely resembling in wing colour patterns present noticeable morphological differences of some sclerites which play an important functional role during copulation, such as the colliculum (antrum) and vaginal lamellae. These differences may play a crucial role in interspecific sexual isolation mechanisms. Hence, we believe that the evidence we have presented here makes it clear that the female genital morphology is important for species level taxonomy and should therefore be more intensely studied when dealing with the systematics of *Euphaedra* and other Afrotropical Limenitidinae nymphalids.

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