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Studies on Afrotropical Zygaeninae I:

On the identity of *Sphinx caffra* LINNAEUS, 1764, and some other taxa that are currently placed in the genus *Neurosymploca* WALLENGREN, 1858, s. l. (Lepidoptera, Zygaenidae)

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Abstract

The name bearer of *Sphinx caffra* LINNAEUS, 1764 is deposited in the Museum of Evolution of Uppsala University (Evolutionismuseet, Uppsala Universitet, Sweden). There are two specimens in the Linnaean collection (Linnean Society, London) labelled as *Sphinx caffra* representing two distinct species; in the past they have been the reason for taxonomic misinterpretations. The female type-specimen and its associated genitalia structures are herein figured and the type-locality is concretised. Voucher material from more recent collecting which clearly refers to *Z. caffra* is presented and figured and a short redescription of species-specific characters is added.

Key words: Lepidoptera, Zygaenidae, *Neurosymploca*, *Sphinx caffra*, *pagana*, *hottentota*, Afrotropical fauna, type-specimen.

Zusammenfassung

Das namenstragende Tier von *Sphinx caffra* LINNAEUS, 1764 befindet sich im Museum of Evolution of Uppsala University (Evolutionsmuseet, Uppsala Universitet, Sweden). Zwei als *Sphinx caffra* etikettierte Tiere in der Linnean collection (Linnean Society, London) gehören zu zwei verschiedenen Arten und waren in der Vergangenheit die Ursache für taxonomische Fehlinterpretationen. Das weibliche Typusexemplar und die dazugehörigen Genitalstrukturen werden abgebildet, der Locus typicus wird präzisiert, Aufsammlungen neueren Datums, die unzweifelhaft *Z. caffra* zuzuordnen sind, werden aufgelistet und abgebildet, ergänzend hierzu eine kurze Beschreibung arttypischer Merkmale.

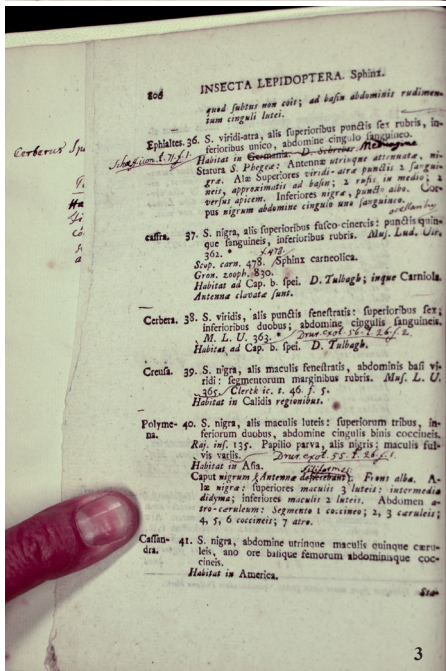
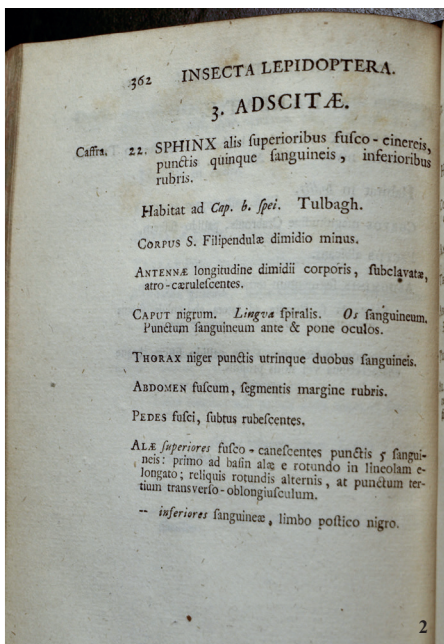
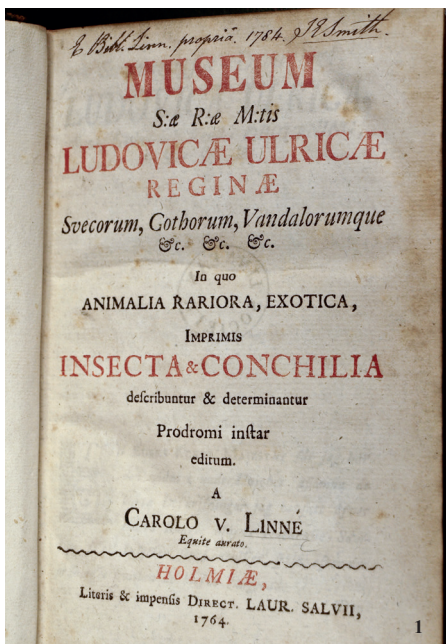
Introduction

The taxonomy of the Afrotropical Zygaeninae, especially of the genus *Neurosymploca* s.l., is complicated. Some types have never been figured and subsequently described taxa were misidentified. GAEDE (1926) in the worldwide distributed SEITZ opus 'Die Schmetterlinge der Erde' described and figured a specimen with the longitudinal red streak as spot 2 and referred it to "*Neurosymploca caffra*", a decision taken from KIRBY (1892) and followed by subsequent authors. However, there can be no doubt that this specimen is not conspecific with the name bearer in the Evolutionsmuseet in Uppsala (Sweden). From the beginning onwards and even after validation of the generic name *Neurosymploca*, subsequent descriptions seemingly were not based on comparison with the older type-material. Replacement names were created that were based on figures with the wrong identification.

The type-locality of *Sphinx caffra* LINNAEUS, 1764

The eldest name within the Afrotropical Zygaeninae is *Sphinx caffra* LINNAEUS, 1764, the original specimen allegedly emanating from the 'Cape of Good Hope' (as cited by HOFMANN & TREMEWAN, 1996: 31) in the vicinity of Cape Town. In fact LINNÉ gave a more concrete description of the provenance. The original citation reads as follows: '*ad Cap. b. spei. Tulbagh*', but the indication 'Tulbagh' was completely ignored by all subsequent scientists. In 2007 FITTON & HARMAN (2007: 54) mention 'Unknown collector (possibly C. R. Tulbagh)'. However, it is much more probable that this indication does not refer to an informant or collector but to a settlement of Dutch and Huguenot settlers, founded at the beginning of the XVII century. And even if it did refer to a person, then it was a

Figs 1,2: Title page and page 362 of the original description of *Sphinx caffra* in LINNÉ's publication "Museum Ludovicae Ulricae Reginae" (1764). Copy from original in the bibliothec of Carolus Linnaeus in the Linnean Society (London). **Fig. 3:** Page 806 of the 12th edition of Systema Naturae (1776) with editings in LINNÉ's handwriting. **Fig. 4:** Near the type-locality (see Habitat in the original description above). **Fig. 5:** In the 'holy halls' of LINNÉ's collection and bibliothec (London). Mike Fitton (mid) and Gerry Tremwan (right) are regarding under the observation of LINNÉ (left) his drawer with types (and others) of burnet moths (15.3.2009). Photos: A. Hofmann.



person who lived in Tulbagh who therefore got this name. A town named Tulbagh lies in the winelands of the western Cape, in ca.150 m altitude at the foot of the great South African escarpment, a part of the Cape Fold Belt, around 100 km north-east of Cape Town.

L o c u s t y p i c u s : South Africa, Western Cape Province, Malmesbury ca. 50 km NW., Tulbagh vic.

The plains in this area are nowadays intensively used as vineyards, but natural or semi-natural mountain fynbos vegetation still occurs on the surrounding slopes and steep embankments.

The type-specimen of *Sphinx caffra* LINNAEUS, 1764

There can be no doubt that the specimen which LINNÉ described in 1764 as *Sphinx caffra* was deposited in the Queen Lovisa Ulrika Museum in Uppsala (Sweden), as can be deduced from the title of this publication (see Figs 5, 6). In the subsequent 12th edition of LINNÉ's Systema Naturae (1(2): 806, *caffra*. 37.) the locality of origin is repeated word by word as in the original description two years before.

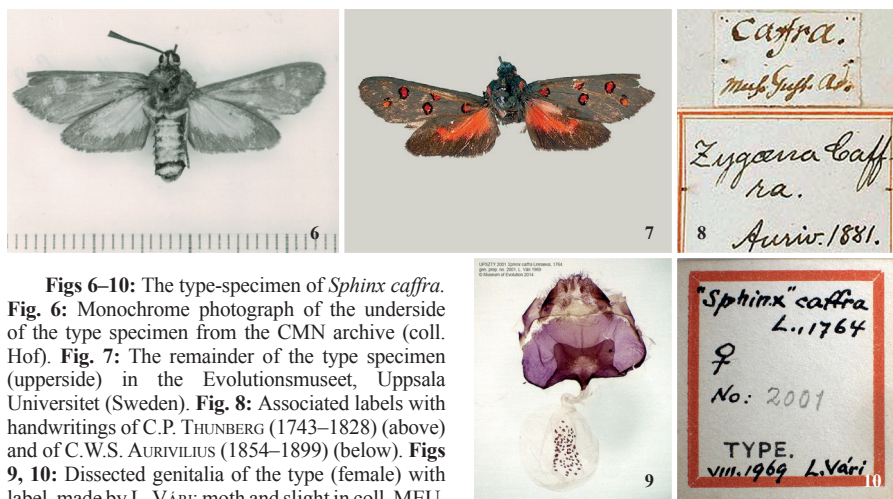
In the earliest, subsequent publications (CRAMER [1779], ERNST & ENGRAMELLE 1782, BOISDUVAL [1828]) the correct identity and taxonomic reference were retained, although parts of the descriptions ('Les antennes ... sont filiformes') and the figure in CRAMER's plate 248 (Fig. H) cannot be based on a specimen that he personally saw himself (see Fig. 20 cf. Fig. 6, 11–13). He probably had a painted draft with an incomplete description which he used for his text and figure. He correctly mentioned the sex ('C'est une Femelle'), the forms of the spots and wings and the colouration on the underside of body and wings, but misfigured and wrongly described the antennae as filiform. Also the red abdominal cingulum on one segment cannot be correct, and red tegulae are absent in his figure. Apart from that, the identification is without ambiguity. Easily recognizable are the two uncoloured figures in ERNST & ENGRAMELLE (plate 100, figs. 143a, 143b); these authors based their description on a distinct specimen from the collection HERMANN (Straßbourg). They correctly reproduced the clubbed antennae, the three segmented cingulum and the tegulae (see Fig. 21); all in all a perfect reproduction, although in black and white.

FUESSLY (1778) mentions '*Sph. caffra* L.' and refers it to '*Sph. carniolica* Scop.'. However, the descriptions of the moth and cocoon clearly all referred to *Z. carniolica*. There can be no doubt that FUESSLY did not have a specimen of *N. caffra* before his eyes.

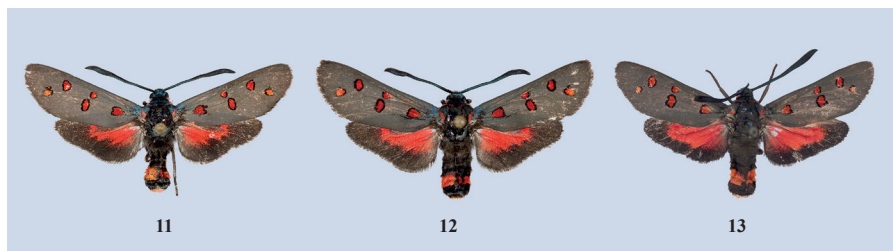
FABRICIUS (1793: 390) cites *caffra* now under *Zygaena* and refers to LINNÉ's description.

BOISDUVAL [1828] gives a detailed description of *Zygaena caffra*. But the water-coloured figure is less instructive and comprises slight shortcomings, e.g. the narrow hindwing border (even reduced in the anal field) and the red cingulum just on one segment.

WALLENGREN (1858) establishes the new genus *Neurosymploca* with *N. concinna* (DALMAN, 1823) as the type-species.

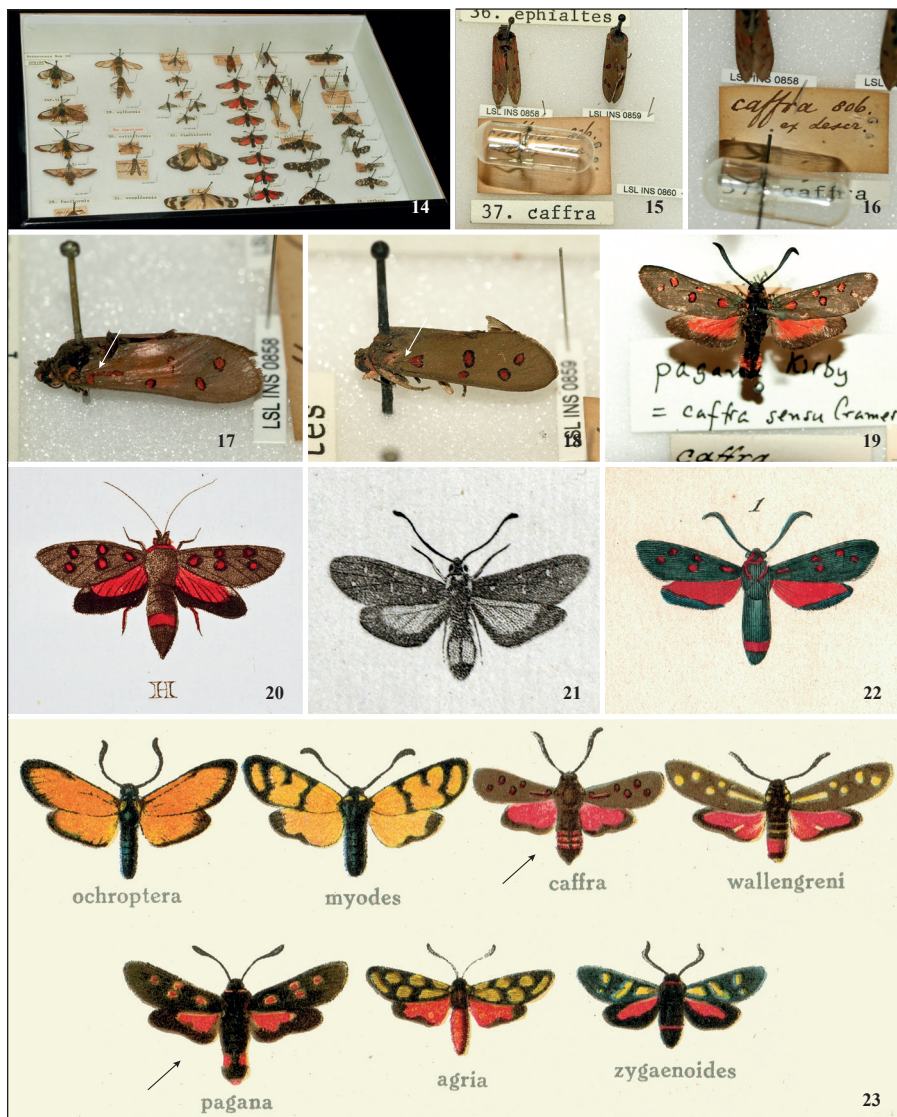


Figs 6–10: The type-specimen of *Sphinx caffra*. **Fig. 6:** Monochrome photograph of the underside of the type specimen from the CMN archive (coll. Hof). **Fig. 7:** The remainder of the type specimen (upperside) in the Evolutionsmuseet, Uppsala Universitet (Sweden). **Fig. 8:** Associated labels with handwritings of C.P. THUNBERG (1743–1828) (above) and of C.W.S. AURIVILIUS (1854–1899) (below). **Figs 9, 10:** Dissected genitalia of the type (female) with label, made by L. VÁRI; moth and slight in coll. MEU.



Figs 11–13: *Neurosymploca caffra*, recent collectings. **Figs 11, 12:** ♀♀, "REP. SOUTH AFRICA, Western Cape Province, vic. Cape Town, Orange Kloof, 200–400 m, 21.12.1984, leg. C. Naumann, coll. Nr. 2188, coll. Naumann", coll. ZFK. **Fig. 13:** ♀ "Kalk Bay Mnt., CAPE PROVINCE, 28.11.54, A. J. Duke", coll. DMP. Photos: A. Hofmann.

KIRBY (1892) unites seven *Zygaeninae* taxa from South Africa (including *Sphinx caffra*) under the genus *Neurosymploca* and establishes a replacement name (*Neurosymploca pagana*) for what he thought was the unnamed *Sphinx caffra* LINNAEUS, 1764 sensu CRAMER [1779]. Such taxonomic problems arose because of two unset specimens which are deposited under the name *Sphinx caffra* in the Linnaean collection in London, labelled in SMITH's handwriting "*caffra* 806. ex descr.". According to MARTIN HONEY (London) these specimens are not syntypic and were subsequently added to LINNAEUS' collection by JAMES EDWARD SMITH (1759–1828), the owner of LINNÉ's collection after 1784. Further information about their ownerships and their route to The Linnean Society of London is found in GARDINER & MORRIS (2007), a publication containing an article by FITTON & HARMAN (2007), which is very helpful for the recognition and identification of labels, handwritings and taxa in the Linnaean collections:



Figs 14–23: The steps to taxonomic confusion. **Fig. 14:** Drawer of the Linnean collection containing type specimens of Sesiidae, Sphingidae, Zygaenidae and others; in the uppermost line those of *Zygaena filipendulae* and *Z. ephialtes*. **Figs 15,16:** Below *Z. ephialtes* there are two specimens labelled "*caffra* 806 ex descr." in SMITH's handwriting; one with a stroke-like basal spot (white arrow) and far distanced spots 2+3 (**Fig. 17**), the other with a triangular basal spot (white arrow) and nearly attached spots 3+4 (**Fig. 18**). **Fig. 19:** Since the times of KIRBY, the latter was regarded as *Neurosymploca pagana* (*caffra* sensu Cramer); here such a determined specimen in the BMN collection. **Figs 20–22:** Correctly referred taxonomy by early authors. **Fig. 20:** CRAMER, [1779]. **Fig. 21:** ERNST & ENGRAMELLE (1782). **Fig. 22:** BOISDUVAL [1828]. **Fig. 23:** Confused taxonomy in the Seitz-Werk (GAEDE, 1926). Photos: A. Hofmann.

"...Linnaean 'types' bear on the pin a narrow label in his own or his son's handwriting which shows the trivial name and often the number given to the species in the 10th edition of the *Systema Naturae*. Many specimens with these Linnaean labels also bear larger, nearly square labels prepared by Smith giving the name of the species and the page number in the 12th edition of the *Systema*. These are in Smith's neat copperplate handwriting, as are similar labels such as "A-us bus ex. descr." Which Smith added to what appear also to be the original Linnaean specimens."

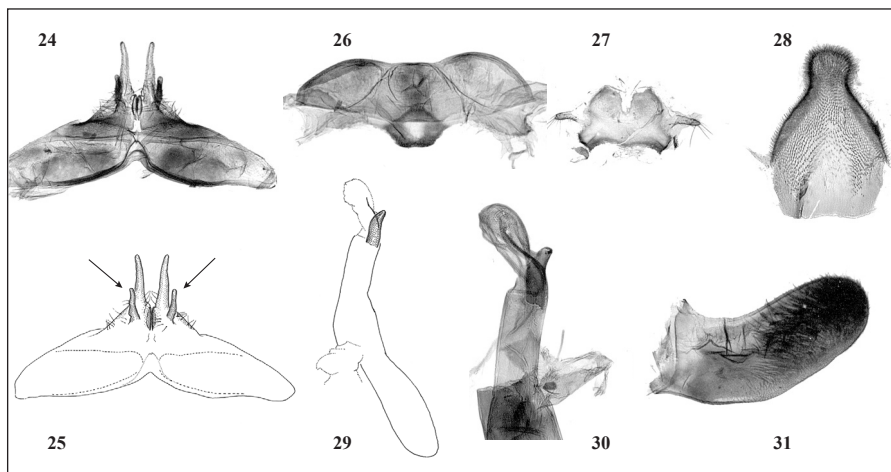
William F. KIRBY (1844–1912), a follower of J.E. SMITH, who intensively worked on the collection, must have seen differences between the two specimens in the Linnaean insect collection (which he regarded as the 'type-specimens'). In the one with the stroke-like basal spot KIRBY must have seen (or designated) the type for *Sphinx caffra*, which is why he introduced a new name for the second specimen (*Neurosymploca pagana* KIRBY, 1892). But this was in contrast to the early figures in CRAMER [1779], ERNST & ENGRAMELLE (1782) and BOISDUVAL [1828], all of which were correctly based on the true type specimen. However, this collection of LINNÉ was at the time of KIRBY (1892) already in Uppsala.

In subsequent publications (GAEDE 1926, PINHEY 1975, HOFMANN & TREMWAN 1996) the authors uncritically followed KIRBY's opinion, regarding from now on *Neurosymploca pagana* KIRBY, 1892 as an objective replacement name for *Sphinx caffra* LINNAEUS, 1764, sensu CRAMER [1779] and the specimen with the stroke-like basal spot in the collection of the Linnaean Society in London as the type of *Neurosymploca caffra*. Obviously neither W.F. KIRBY, M. GAEDE, D.S. FLETCHER nor C.M. NAUMANN or J. VÁRI based "their" taxonomy on the actual type-specimen. The systematic arrangements of Afrotropical Zygaeninae in the important collections which contain collectings of these species (British Museum, Transvaal Museum, C.M. NAUMANN etc.) were made according to this system. The correct specimens of *Neurosymploca. caffra* LINNAEUS, 1764, in the British Museum were labelled "*caffra* Cramer = *pagana* Kirby" obviously by D.S. FLETCHER, those in the NAUMANN collection remained unnamed while the name "*N. caffra*" in his collection actually referred to an undescribed species, conspecific with the one specimen in the Linnaean collection (London) which exhibits a stroke-like spot 2, reminiscent of a walking stick with a short kink at the base (HOFMANN, 2016).

However, based on phenotypic comparison, the specimen with the triangular basal spot may be conspecific with the true type-specimen of *Sphinx caffra* in Uppsala, while the second with the stroke-like spot definitively is not conspecific. But this discussion about hetero- or conspecific becomes taxonomically unimportant as neither the one nor the other specimen in London can be the name bearer.

It seems that J. VÁRI later realised this fact but never published a revision to or any explanation of the systematic order used in the Southern African Lepidoptera (VÁRI & KROON, 1986). Herein a new Zygaeninae genus, named *Callosymploca*, containing *C. affinis*, *C. caffra*, *C. hottentota* and *C. meterythra*, was split-off from the remaining *Neurosymploca* species (*N. concinna*, *N. wallengreni*). As one can see the replacement name *pagana* KIRBY, 1892 has disappeared, viz. VÁRI based his decision and the creation of the new genus on the true *Sphinx caffra* LINNAEUS, 1764 with the triangular basal spot. The species with a stroke-like spot remained under *Neurosymploca* s.str. HOFMANN & TREMWAN (1996: 32) overlooked this discrete taxonomic decision and kept *Neurosymploca pagana* KIRBY, 1892 as a distinct species in their catalogue.

Actually *Sphinx caffra* was described in 1764, "so that the type or syntypes must be in Queen Ulrica's collection in Sweden" (W.G. TREMEWAN, pers. comm.). Fortunately the labels and the upperside of the Linnaean type of *Sphinx caffra*, now deposited in the Museum of Evolution of Uppsala University (Evolutionsmuseet, Uppsala Universitet, Sweden), were illustrated some years ago in the internet. H. MEJLON (Uppsala University) very kindly provided more information and pictures of the moth and the genitalia. Meanwhile the specimen has lost the antennae and is without its abdomen because of the genitalia dissection. But there is a black-white colour print of the underside of a prepared



Figs 24–31: Male genitalia structures of *Neurosymploca caffra*. **Fig. 24, 25:** Uncus with Zygaeninae typical double lobes; in *N. caffra* two minor lobes are attached. **Figs 26–28:** Vinculum, laminae-homologous structures. **Figs 29, 30:** Phallus with cornutus. **Fig. 31:** Valva. ("Above Llandudno, Cape Peninsula, Cape Province, 8.11.1965, N. Mus. S. Rhodesia", slide no. 3469, archive CMN). Photos: C.M. Naumann.

specimen in CMN's personal systematic book entitled "Type ♀ - Linn. Soc. London" and there can be no doubt that this specimen is the specimen that in fact is deposited in Uppsala, although in the meanwhile the rest of the right antenna and the complete abdomen are lost. The combination of both figures allows a more detailed description and concretisation.

Redescription of *Sphinx caffra* LINNAEUS, 1764

Type ♀, 33 mm. Ground colour of forewings different from ground colour of hindwings. Forewings dark grey, anthracite, with 5 more or less rounded red spots (homologous spot 2 to 6), spot 1 missing; spot 2 triangular, spot 4 and 5 oval, completely black surrounded, 2 and 3 distal, 6 proximal black bordered. Spots 2, 4, 5 bigger than 3 and 6. On the underside spots without surroundings, singly placed without confluence. Ground colour

on the underside black-brown as on the hindwings. Hindwings with broad, parallel black-brown border from apex to anal area, occasionally reducing the red colour to an oval field only slightly larger than the discoidal cell. The black surrounding along the outer margin not thinner in the anal field. Translucent areas absent. Underside without tooth from costa to base. Head black, collar on both sides slightly reddish, tegulae red at the basal part of forewings, abdomen (upperside probably with two red segments) underside light whitish (or reddish white) with darkened segment (probably after the red cingulum). Antennae black, legs light inside.

Recent records of *Sphinx caffra* LINNAEUS, 1764

There are eight specimens in the BMN, six specimens in the DMP and eight specimens in the CMN collection that all fit well with this phenotype, i.e. all show these characters. Those in the BMN are from the XIX century and do not exhibit useful, geographically close referable information on the labels (e.g. "Cap", "Cape Town, 1879", "Cape Town, Jan. 1862", "Cape Colony, Rondebosch" or "Z. *Caffra*, coll. Ch. Oberthür"). The other specimens with more recent data derive from at least five different sites which are all in the close vicinity westerly and south-westerly of Cape Town:

- 2 ♂♂, "Kalk Bay Mnt., Cape Province, 28.11.54, A.J. Duke", coll. DMP.
- 1 ♀, "Llandudno, C. P., 15.11.1953, A.J. Duke" [second label "*Neurosymploca pagana* KIRBY, det. L. Vari 1954], ", coll. DMP.
- 3 ♂♂, "Devils Peak, Cape, 24.12.1977, N.J. Duke", ", coll. DMP.
- 1 ♂, "Cape Town, 28. XI. 1964, C.G.C. Dickson"; 1 ♂, "Rep. South Africa, Cape Province, Cape Town, 22.XI.1962, leg. C.G.C. Dickson", coll. CMN in coll. ZFK.
- 3 ♀♀, "Rep. South Africa, Western Cape Province, vic. Cape Town: Orange Kloof, 200-400 m, 21.12.1984, leg. C. Naumann, coll. Nr. 2188"; 1 ♂, ibidem, 19.12.1984, coll. CMN in coll. ZFK.
- 2 ♂♂, "Rep. South Africa, Western Cape Province, Cape Peninsula, 100 m, Muizenberg, 15.XII.1984, leg. C. Naumann, coll. Nr. 2179" coll. CMN in coll. ZFK.

Comparing the specimens listed above with all other *Neurosymploca* s. l. specimens, there can be no doubt that these are true *N. caffra*.

Synonymic remarks

Neurosymploca caffra (LINNAEUS, 1764)

Neurosymploca pagana KIRBY, 1892, described with a "(?)" by its author is clearly just an unnecessary replacement name for *Sphinx caffra* (sensu CRAMER, [1779]).

***Neurosymploca concinna* (DALMAN, 1823)**

Although no figure is provided in the original publication the description by J.W. DALMAN is distinctive. Consequently no confusion occurred in the standard works. The only shortcoming is the information of its provenance "Hab. ad Promontor. Cap. Bon. Spei."; promontory or foreland of the Cape can be a wide area.

***Neurosymploca hottentota* (HERRICH-SCHÄFFER, [1854])**

Although there was no description given by G.A.W. HERRICH-SCHÄFFER for *Zygaena hottentota* the fig. 218 is without doubt referable to a different *Neurosymploca* species of small size and with significantly small forewing spots and an unusual, yellowish spot 6.

***Neurosymploca* WALLENGREN, 1859** with *Zygaena concinna* DALMAN, 1823 is the type-species of this genus

***Callosymploca* VÁRI, 1986** with *Sphinx caffra* LINNAEUS, 1764 as the type-species of this genus.

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Abbreviations of collections

HOF..... Axel Hofmann, Linkenheim-Hochstetten (Germany)

CMN Clas M. Naumann (now in ZFK, Germany).

MEU.....Museum of Evolution of Uppsala University (Evolutionsmuseet, Uppsala Universitet, Sweden)

DMP..... Ditsong National Museum of Natural History, Pretoria (Republic of South Africa)

ZFK Zoologisches Forschungsmuseum Alexander Koenig (Bonn, Germany).

BMN The Natural History Museum, London (formerly British Museum of Natural History, UK).

LIN..... Linnean Society, London (UK)

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