

## Resolving the taxonomic status of *Hypochrysops hypocletus* Oberthür, 1880 (Lepidoptera: Lycaenidae)

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**Abstract:** Based on molecular as well as on morphological characters, it is concluded that *Hypochrysops hypocletus* Oberthür, 1880 has to be treated as separate species and not a synonym of *H. polycletus* (Linnaeus, 1758): *Hypochrysops hypocletus* Oberthür, 1880 **stat. nov.**

**Rangkuman:** Berdasarkan ciri-ciri molekuler dan morfologis, disimpulkan bahwa *Hypochrysops hypocletus* Oberthür, 1880 harus diperlakukan sebagai spesies tersendiri dan tidak merupakan sinonim dari *H. polycletus* (Linnaeus, 1758): *Hypochrysops hypocletus* Oberthür, 1880 **stat. nov.**

**Keywords:** Theclini, Indonesia, Waigeo, West Papua, *Hypochrysops polycletus*

### Introduction

*Hypochrysops polycletus* (Linnaeus, 1758) is the oldest known and most common species of the genus *Hypochrysops* C. & R. Felder, 1860, which is widely distributed from eastern Maluku to eastern New Guinea and northern Australia (Queensland). Current taxonomy of *H. polycletus* is mainly based on the revision of Sands (1986), who recognized 7 subspecies. Sands regards *H. polycletus* ssp. *rex* (Boisduval, 1832) as the race predominating in mainland New Guinea and in most of the subsequent publications this view has been accepted. As had to be expected, the various island races are comparably easy to define, but the mainland populations are still in need of a thorough revision based on sufficient material. Systematics of subspecies occurring in New Guinea is based much on the varying width of the discocellular red band on the hindwing underside. Sands also pointed out that a wide geographical variation exists within the mainland range of *polycletus*, and that even a separation of new subspecies may be needed. In case a more detailed separation of subspecies is needed, several names introduced by Fuhstorfer (1908: 91-92) are available: *menyllus* (TL = Halmaheira), *linos* (TL = Roon Isl.), *hylaithus* (TL = Mefor Isl.), *oineus* (TL = Dorey), *kaystrus* (TL = Deutsch Neu-Guinea, Friedrich Wilhelmshafen). Sands also noted that the subspecies-concept of the mainland races is unstable and this statement was repeated by Parsons (1998: 357), who did not attempt to clear the taxonomy and classification of *polycletus* in his monumental work about Papuan butterflies.

As has been noted by Sands (1986: 80) the separation of *polycletus* into two species, *hypocletus* Oberthür, 1880 from Waigeo and northern West Papua (TL = Andai/Manokwari, NE Birdshead Peninsula) and *rex* from other parts of mainland New Guinea goes back to Druce (1891: 183), who states that *hypocletus* is “abundantly distinct” and that the whitish undersides are a distinctive and reliable character to separate it from closely related *H. polycletus*.

D'Abrera (1977: 331) used the name *hypocletus* as a valid subspecies in combination with *polycletus* and mentioned its range to include Waigeo, Misool, Salawati and mainland West Papua. He also gave a short listing of characters of which this ssp. differs from *polycletus*, clearly referring to the broad, whitish discal area on the forewing undersides. The subspecific status of *hypocletus* was later rejected by Sands (1986) who synonymized it with *polycletus* and since then this synonymy has not been questioned.

Investigation of specimens of the "*hypocletus*"-phenotype from West Papua (Waigeo and Sorong) led to a reconsideration of its supposed status as synonym of *H. polycletus*.

### Depositories

**IAZ, SSC RAS** - Institute of Arid Zones, Southern Scientific Center of the Russian Academy of Science, Rostov-on-Don, Russia.

**CSSK** - Collection Stefan Schröder, Köln, Germany.

### Material and methods

Material used for DNA analysis: ♂, Indonesia, Waigeo, VI.2014, Collection Number ILL223 (IAZ, SSC RAS) – accession № GenBank KP453740 (COI), KP453742 (Ef-1a); ♀, Indonesia, W. Seram, V.2014, Collection Number ILL222 (IAZ, SSC RAS) – accession № GenBank KP453739 (COI), KP453741 (Ef-1a).

We sequenced the 5' (barcode) section of the mitochondrial gene Cytochrome c Oxidase I (COI) and the nuclear Elongation Factor 1-alpha (Ef-1a). We used the following PCR primer pairs: forward, 5'-TAG CGA AAA TGA CTT TTT TCT A-3' with reverse, 5'-TTG CTC CAG CTA ATA CAG GTA A-3' were used to amplify COI. Ef-1a was amplified with forward, 5'- TGA AGG CCG AAC GTG AAC GTG G -3' and reverse, 5'- GCC ACC CCT TGA ACC AGG GCA T -3'.

The following cycling protocols were used: an initial 4 min denaturation at 94°C and 40 cycles of 40 s denaturation at 94°C, 40 s annealing at 58°C and 40 s extension at 72°C. Amplified fragments were separated using an automated sequencing machine (Applied Biosystems 3500).

The analysis of primary nucleotide sequences was made with the help of the application BioEdit Sequence Alignment Editor, version 7.0.5.3 (Hall, 1999).

### Morphology of specimens (Fig. 1-8, 15-16)

D'Abrera (1977: 331) has already summed up the main differences between *polycletus* and *hypocletus* which: "differs from the nominate race by the reduction in number and extent of the red markings of the f.w.v. and broader black borders to the red spots and bands of the h.w.v., in some cases the red is obliterated by the black. Female: recto surface with broader white discal area of f.w."

In general appearance, *hypocletus* specimens appear to have much darker undersides with less red markings as in *polycletus* (figs. 9-14), therefore appearing as predominantly metallic greenish-brown. Specimens without any trace of red markings on the forewing undersides are not uncommon. It has to be added to D'Abrera's note that the white on the forewing undersides of both males and females is reaching the wing base, which is never the case in *polycletus*, where a small brown subbasal area always remains. Specimens from western West Papua (Avona) are intermediate,, having the white extending widely into the cell, almost reaching the costa (fig. 14). The upper part of the forewing cell is usually outlined with red in *polycletus* (fig. 12), but this is not the case in *hypocletus*, where it is strongly reduced to a thin line or missing completely. On the forewing upperside of females, the

white discal patch is also reaching the wing base, whereas it is usually covered with metallic-greenish scales in *polycletus*. In addition, general hindwing shape of *hypocletus* females is more elongated and the tail at vein 3 is more strongly pointed than in *polycletus*.

### Genitalia structure

Male genitalia of *H. hypocletus* do not show any significant differences in comparison to *polycletus*. Valva are of the same pointed shape (fig. 17; compare Sands: 1986: fig. 60c-d) and the aedeagus has the cornutal spines developed in the same way (fig. 18). The significance of the differences observed in female genitalia (fig. 19-20) is not yet clear, but at least the *papilla analis* show considerable differences in size and the *ductus bursae* seems to be slightly longer in *hypocletus*.

### Distribution

*H. hypocletus* is known to occur sympatrically with *H. polycletus* on Waigeo and some smaller adjacent islands offshore West Papua and on mainland West Papua (Doberai Pensinsula: e.g. Sorong)

### Results

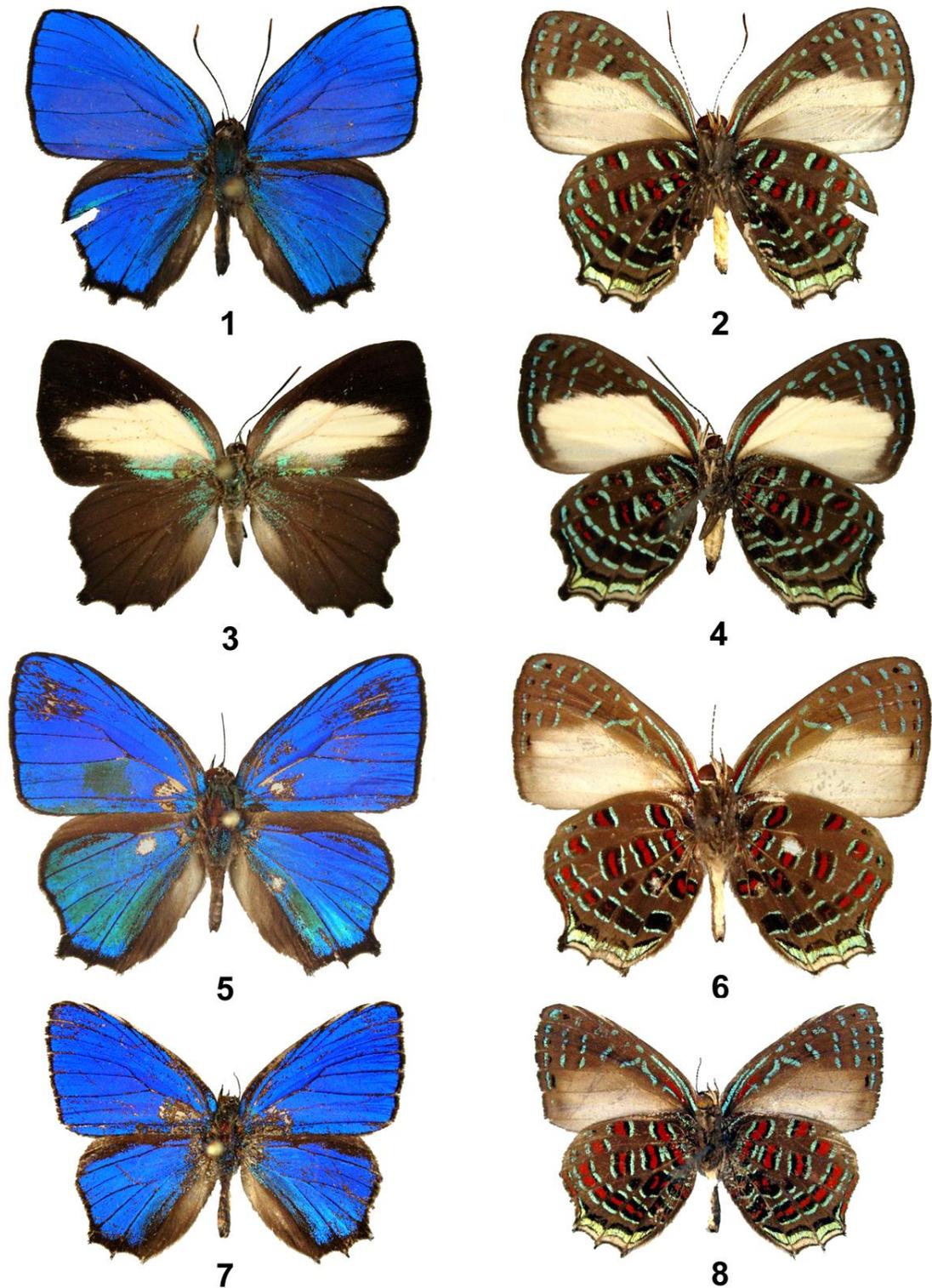
In addition to morphological characteristics of adult specimens, molecular data showed striking differences of DNA-sequences known from *polycletus*, supporting the view that *hypocletus* is a separate species.

Our study testifies that differences between nucleotide sequences of the COI gene obtained from *Hypochrysops polycletus* from western Seram and the specimen of *Hypochrysops* from Waigeo are significant and make up 3.65%. Differences of the COI gene average 2% for allied species of Lycaenidae (Wiemers & Fiedler, 2007). Differences in the more stable gene Ef-1a make up 1.9 %.

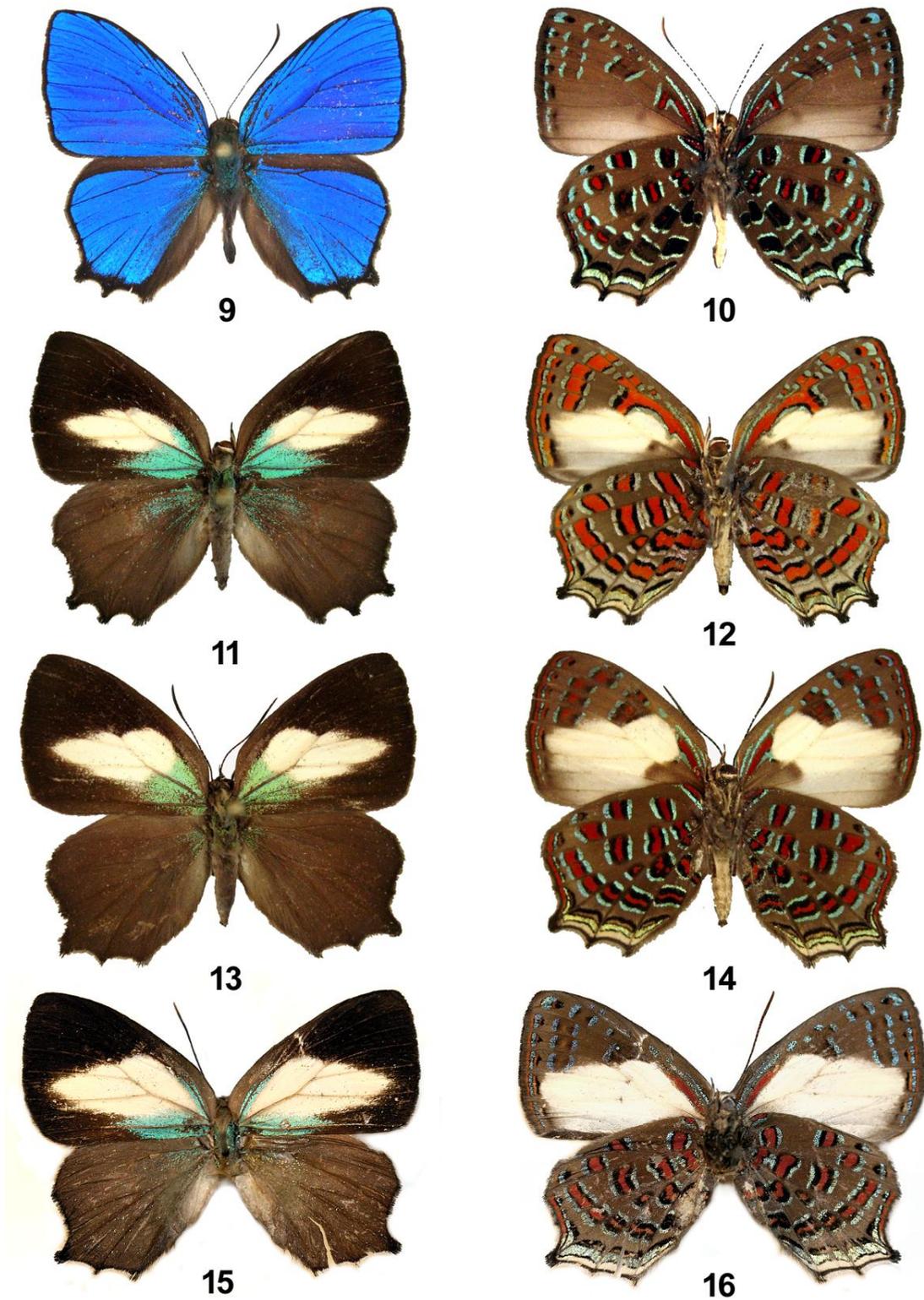
It is most likely that even more separate species are involved in the current subspecies-concept of *H. polycletus* s.l. and DNA analysis should be undertaken for all the various races.

### References

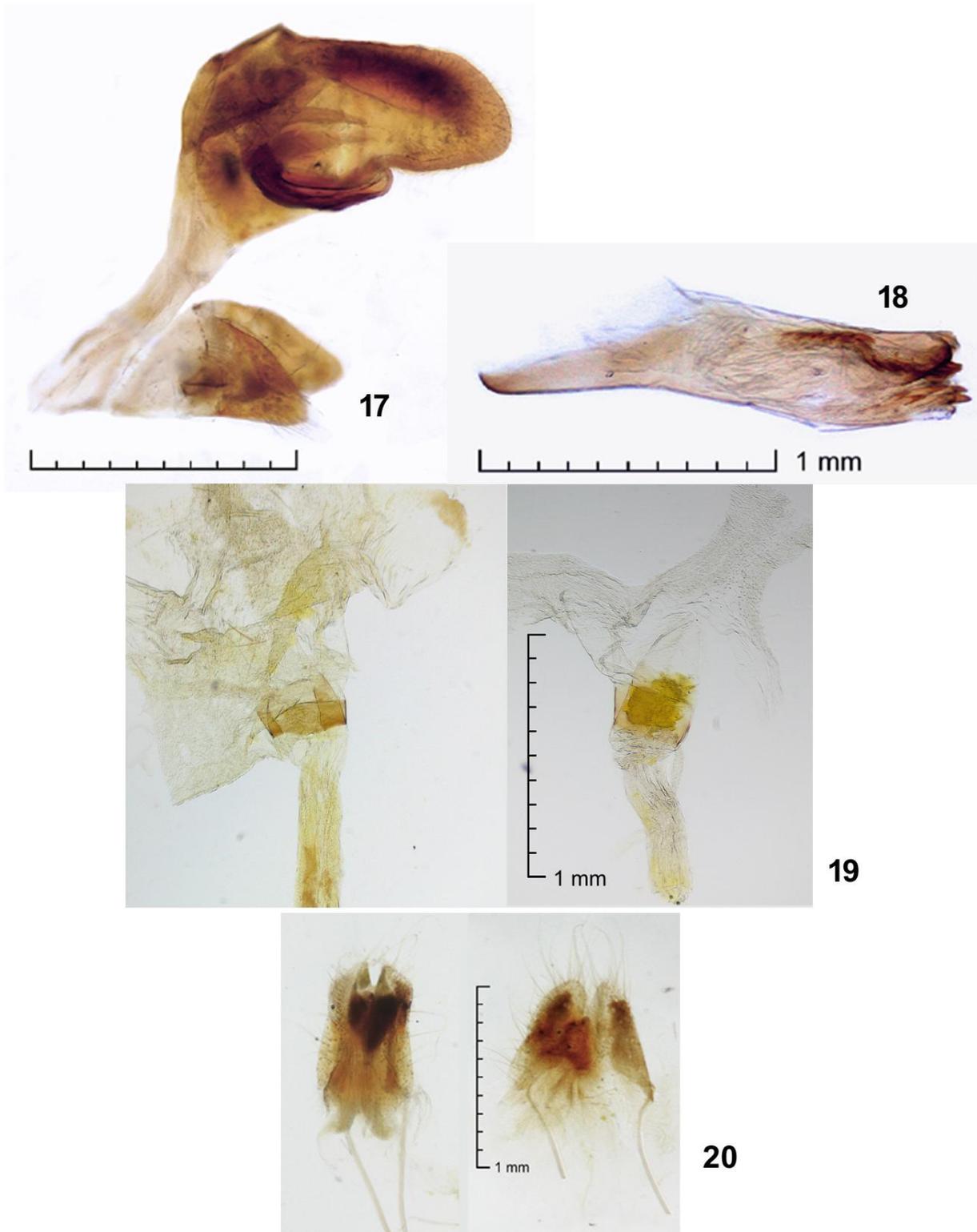
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**Figs. 1-8.** *H. hypocletus* (West Papua): 1-2. ♂ Sorong; 3-4. ♀ Sorong; 5-6. ♂ Waigeo; 7-8. ♂ Waigeo. All x 1,3 natural size [all in CSSK]



**Figs. 9-16.** *H. polycletus* (West Papua). 9-10. ♂ Sorong; 11-12. ♀ Sorong; 13-14. ♀ Avona; 15-16. *H. hypocletus* (West Papua), ♀ Waigeo. All x 1,3 natural size [all in CSSK].



**Figs. 17-20.** *H. hypocletus*: **17.** Male genitalia in lateral view; **18.** Aedeagus; **19.** *Ductus bursae* and *Antrum* of *hypocletus* (left) and *polycletus* (right); **20.** *Papillae analis* of *H. hypocletus* (left) and *H. polycletus* (right).