

SHORT COMMUNICATION

## Intersexuality in the holotype of *Photina gracilis* (Mantodea: Mantidae: Photininae) and its taxonomic implications

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**ABSTRACT.** Parasitism by horsehair worms (Nematomorpha) in Mantodea is well known, but only a few cases of intersexuality were reported in the literature. In the present study, intersexuality of the holotype of *Photina gracilis* Giglio-Tos, 1915 is documented as a possible consequence of nematomorph parasitism. *Photina gracilis* and *Photina laevis* Giglio-Tos, 1915 are established as new subjective junior synonyms of *Photina vitrea* (Burmeister, 1838). The female holotype of *Mantis* (*Cardioptera*) *gymnopyga* Burmeister, 1838, which was associated and synonymized with *P. vitrea*, is recognized as a member of the genus *Coptopteryx* and the combination *Coptopteryx gymnopyga* (Burmeister, 1838) is revalidated. The substitute name *Photina gymnopyga* (Burmeister, 1838), instead of *Mantis* (*Photina*) *vitrea* Burmeister, 1838 (nec *Mantis vitrea* Stoll, 1813), is discarded and established as a new synonym of *Coptopteryx gymnopyga*. The name *vitrea* Burmeister, 1838 must be maintained until ruling by the International Commission on Zoological Nomenclature.

**KEY WORDS.** *Coptopteryx*; Nematomorpha; parasitism; *Photina*; praying mantises.

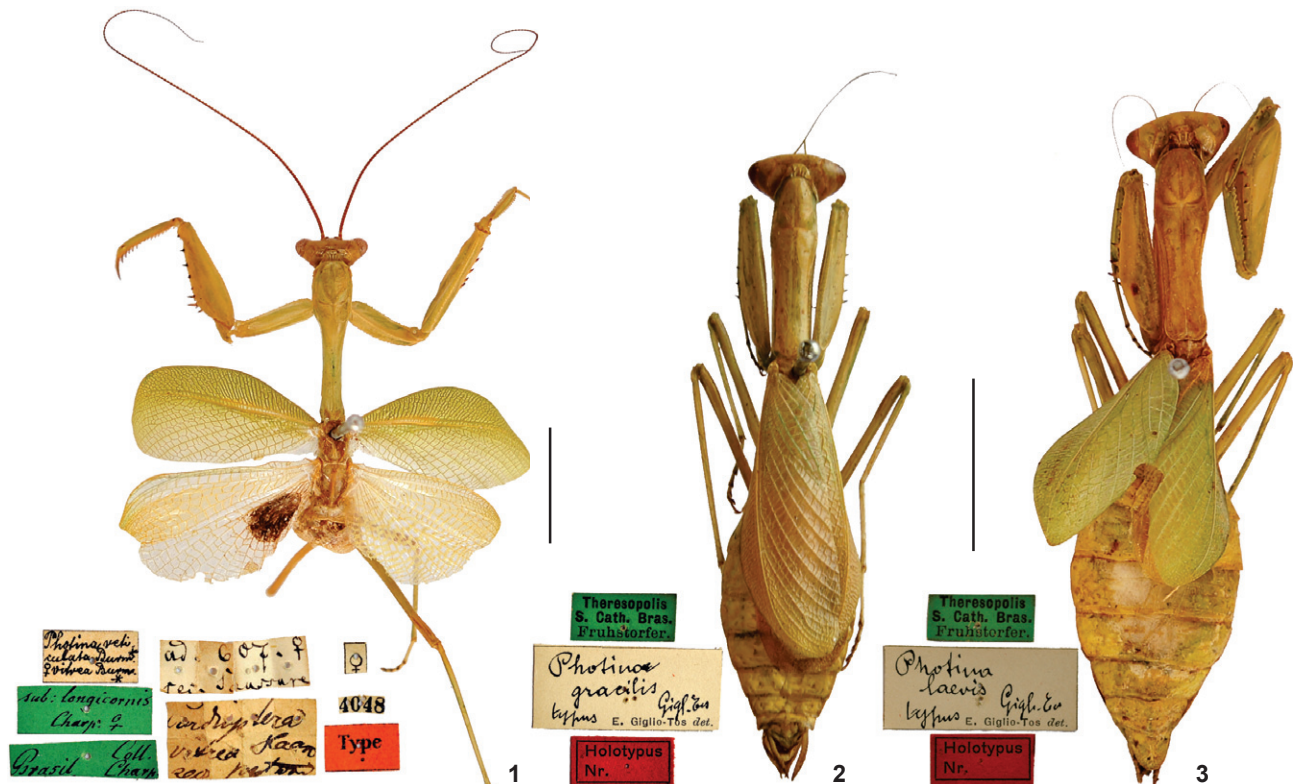
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In nature, individuals do not always show a clearly defined sexual dimorphism. When there is no morphological differentiation between male and female the organisms are usually called gynandromorphs or intersexes and, in many cases, the choice is arbitrary (NARITA *et al.* 2010). Intersexuality has been documented for several groups of Arthropoda. NARITA *et al.* (2010) reviewed many cases of gynandromorphism and intersexuality in arthropods and commented on the meaning and differences between these terms. In Hexapoda, the occurrence of individuals having both male and female phenotypes is supported by numerous references, especially in Coleoptera (VASKO 2008), Diptera (SCHUTT & NÖTHIGER 2000), Hymenoptera (PEREIRA *et al.* 2003), Lepidoptera (KUSNEZOV 1926), and Orthoptera (CAPPE DE BAILLON 1924). As it might be expected, the most studied organisms when sexual development is concerned are in *Drosophila* (Diptera) (SCHUTT & NÖTHIGER 2000), which have served as a paradigm for understanding the mechanisms of sexual differentiation, at least in Hexapoda. There are few reported cases of sexual phenotypic combinations in Mantodea individuals: ROY (2003) reported intersexuality in individuals of *Prohierodula* Bolívar, 1908 (Mantidae), and LOMBARDO & UMBRIACO (2011) in the holotype of *Parastagmatoptera abnormis* Beier, 1963 (Mantidae). In both cases, intersexuality was associated with parasitism by nematomorphs. BÉTHOUX (2010) presented a particular case of “feminization” as a result of alteration in the organization of a developmental module in *Creobroter gemmatus*

(Stoll, 1813) (Hymenopodidae), and treated it as a case of mixed gynandromorphy.

As part of an ongoing review of the types of Neotropical Mantodea in the main entomological collections and museums of Europe, particularly the types of Photininae, I found three cases of intersexuality. The first had been previously reported by LOMBARDO & UMBRIACO (2011) in the holotype of *P. abnormis*, which is deposited in the Biozentrum Grindel und Zoologisches Museum (ZMH, Hamburg, Germany). In the same work, *P. abnormis* was considered a junior synonym of *Parastagmatoptera flavoguttata* (Serville, 1839). The second case pertains the holotype of *Mantis longicornis* Charpentier, 1841 (Mantidae) (Fig. 1), which was synonymized by SAUSSURE (1871) with *Photina vitrea* (Burmeister, 1838); the specimen is deposited in the Museum für Naturkunde der Humboldt Universität, Berlin (MNHB), and is labeled as a female, but it is likely a feminized male with some female characteristics, for instance short wings; unfortunately, the abdomen of this specimen is lost, which does not allow associating intersexuality with parasitic induction. The third case was discovered in the holotype of *Photina gracilis* Giglio-Tos, 1915 (Fig. 2), also deposited in the MNHB, which required the detailed re-evaluation of its taxonomic status presented here.

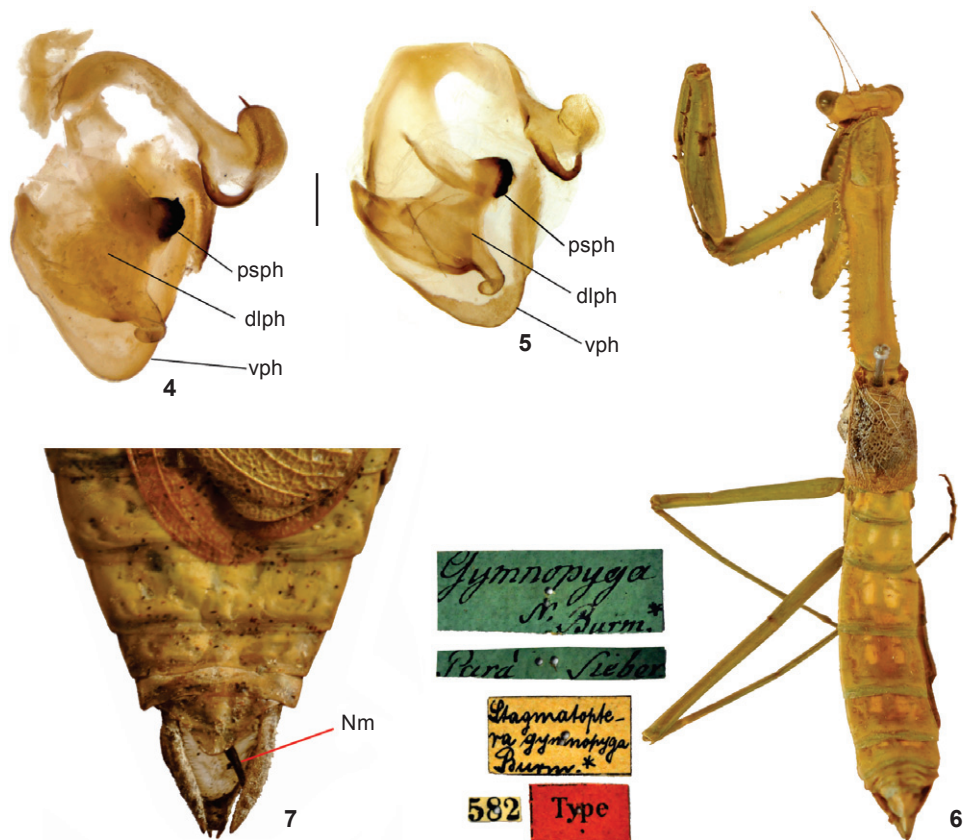
The holotype of *P. gracilis* from the old colonial village of Teresópolis, currently municipality of Águas Mornas in the state of Santa Catarina, Brazil, is well preserved. The interpre-



Figures 1-3. *Photina vitrea*. (1) Intersexed holotype of *Mantis longicornis* in dorsal habitus and collection labels (MNHB); (2-3) Specimens from Águas Mornas (old colonial village of Teresópolis), Santa Catarina, Brazil, in dorsal habitus (MNHB): (2) intersexed holotype of *P. gracilis* **syn. nov.**, and collection labels; (3) female holotype of *P. laevis* **syn. nov.** and collection labels. Scale bars: 10 mm.

tation of GIGLIO-TOS (1915) that it is a distinctive “female” of *Photina* may be justifiable, since the general habitus of the holotype, under the naked eye, is that of a typical female of the genus. However, a careful examination of the posterior part of the abdomen revealed the developed external male genitalia. I had the opportunity to dissect the external genitalia of the holotype in order to compare with the male genitalia of the type species of *Photina* (Fig. 4). The external male genitalia of *P. gracilis* (Fig. 5) are similar to the genitalia of the holotype of *Mantis (Photina) vitrea* Burmeister, 1838 (now *Photina vitrea*), which allows the conclusion that the holotype of *P. gracilis* is a feminized form of *P. vitrea*. In addition, the external black color of the set of posteroventral spines of the forefemora is a distinctive characteristic present in both specimens, and which helps to demonstrate their conspecific status. GIGLIO-TOS (1915) also described another *Photina* female under the name *Photina laevis* Giglio-Tos, 1915 (Fig. 3) from the same locality of *P. gracilis*, and argued that the “female” of *P. gracilis* differed from *P. laevis* by its smaller size and the size of the mesothoracic wings. The observation of the female holotype of *P. laevis* deposited at MNHB allows me to infer that the features used by GIGLIO-TOS (1915) to distinguish *P. laevis* from *P. gracilis* are just a prod-

uct of the feminization of the intersexed holotype of *P. gracilis*. Therefore, *P. gracilis* and *P. laevis* are hereby established as **new junior synonyms** of *P. vitrea*. I also compared *P. gracilis* with the holotype of *Mantis (Cardioptera) gymnopyga* Burmeister, 1838 from the questionable locality of Pará (Brazil), deposited in MNHB (Fig. 6), which was treated as the female of *P. vitrea* by CHARPENTIER (1841). The female type of *M. (C.) gymnopyga* is clearly a representative of *Coptopteryx*. However, the possibility that *M. (C.) gymnopyga* is a junior synonym of the original nominal species of *Coptopteryx* was ruled out, because *M. (C.) gymnopyga* was described before the other species of *Coptopteryx* and thus has priority over other available names (ICZN principle of priority, art. 23), whereby the suggestion of KIRBY (1904) to use the combination *Coptopteryx gymnopyga* (Burmeister, 1838) should be revalidated. Therefore, the suggestion of KOÇAK & KEMAL (2008) to use the substitute combination *Photina gymnopyga* (Burmeister) instead of *Mantis (Photina) vitrea* Burmeister, 1838, nec *Mantis vitrea* Stoll, 1813, should be discarded (ICZN, art. 60.2.1) and established as a **new synonym** of *Coptopteryx gymnopyga*. The possible homonymy of *Mantis (Photina) vitrea* and *Mantis vitrea* is being reviewed by the International Commission on Zoological Nomenclature (Case 3402,



Figures 4-7. *Photina vitrea*. (4-5) External genitalia in dorsal view: (4) phallic complex of male holotype (MNHB); (5) phallic complex of intersexed holotype of *Photina gracilis* **syn. nov.** (MNHB). (6) Female holotype of *Coptopteryx gymnopyga* **stat. rev.** (= *Mantis* (*Cardioptera*) *gymnopyga*) in dorsal habitus and collection labels (MNHB). (7) Intersexed holotype of *Photina gracilis* **syn. nov.**, distal part of the abdomen after genital dissection, dorsal view. (psph) Pseudophallus, (dlph) dorsal left phallosome, (vph) ventral phallosome, (Nm) apex of parasitic nematomorph. Scale bars: 4-5 = 1.0 mm, 6 = 10 mm.

ICZN 2007). The Commission was asked to use its plenary powers to place the name *vitrea* Burmeister, 1838 on the official list of specific names in Zoology with the endorsement that it is not invalid (SVENSON & BRANHAM 2007). The case 3402 is awaiting a decision from the commission. While the case is under consideration, the use of the junior name (*vitrea* Burmeister, 1838) is to be maintained (ICZN, art. 82).

After dissecting the external genitalia of *P. gracilis* I discovered a nematomorph specimen inside its abdomen, which protruded between the supranal and subgenital plates (Fig. 7). This suggests that the intersexuality of the type specimen of *P. gracilis* was influenced by the presence of the nematomorph, as in the case of *P. abnormis* and *Prohierodula* (ROY 2003, LOMBARDO & UMBRIACO 2011). Although there are only a few cases of intersexuality in Mantodea, the records of parasitism caused by Nematomorpha, especially by members of the horsehair worms of the genus *Chordodes* Creplin, 1847, were well documented by SCHMIDT-RHAESA & EHRMANN (2001). These nematomorphs sel-

dom kill their hosts, but usually reduce their reproductive capacity (WELCH 1965) and have the ability to interfere in the differentiation of sexual characters, acting as one of the main epigenetic factors of intersexuality in Insecta (WÜLKER 1975). Although WÜLKER (1975) suggested some mechanism of parasitic primary influence, the regulation and process of how the parasitism becomes an intersexual phenotypic expression in the host are not well understood.

Summary of the nomenclatural acts in this paper. *Photina gracilis* Giglio-Tos, 1915 and *Photina laevis* Giglio-Tos, 1915 are subjective junior synonyms of *Photina vitrea* (Burmeister, 1838) (ICZN, art. 23). The substitute name *Photina gymnopyga* (Burmeister, 1838), instead of *Mantis* (*Photina*) *vitrea* Burmeister, 1838 (nec *Mantis vitrea* Stoll, 1813), suggested by KOÇAK & KEMAL (2008), is discarded (ICZN, art. 60.2.1) and established as a new synonym of *Coptopteryx gymnopyga* (Burmeister, 1838), combination suggested by KIRBY (1904). The name *vitrea* Burmeister, 1838 must be maintained until the commission ruling (ICZN, art. 82).

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