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Notes on the genus *Phycosoma* Cambridge, 1879, senior synonym of *Trigonobothrys* Simon, 1889 (Theridiidae: Araneae)

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ABSTRACT: *Phycosoma* Cambridge, 1879 is confirmed as the senior synonym of *Trigonobothrys* Simon, 1889. Additionally, an examination of specimens of several species and illustrations of others has resulted in the transfer of *Dipoena alta* Keyserling, 1886, *D. lineatipes* Bryant, 1933, *D. jamesi* Roberts, 1979, *D. menustya* Roberts, 1983, and *Theridion inornatum* Cambridge, 1861 to *Phycosoma.* A list of all the species included in *Phycosoma* is given. Lastly, on the basis of genitalic characters, two species originally described by Hickman (1951) as *Trigonobothrys aculeatus* and *T. setosus* are presently retained in the genus *Dipoena* Thorell, 1869, as placed by Levi & Levi (1962).

KEYWORDS: *Phycosoma*, *Trigonobothrys*, *Dipoena*, Theridiidae, corrected synonymy, new combinations.

Introduction

In an earlier paper (Fitzgerald & Sirvid 2003), we incorrectly placed *Phycosoma* Cambridge, 1879 as a junior synonym of *Trigonobothrys* Simon, 1889. That placement was incorrect on the basis of priority, as noted by Platnick (2004). We also left two issues unresolved: first, we believed Yoshida's (2002) unconfirmed placement of Levi's (1953b) *Dipoena lineatipes* group in *Trigonobothrys* needed further research; second, we did not resolve the placement of two Tasmanian species described by Hickman (1951) as *Trigonobothrys* but later transferred by Levi & Levi (1962) to *Dipoena* Thorell, 1869.

Institutional acronyms used are MCZ (Museum of Comparative Zoology, Harvard University, USA), MHN (Muséum National d'Histoire Naturelle, Paris), and MONZ (Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand).

Systematics

Family **Theridiidae**

Genus ***Phycosoma* Cambridge**

***Phycosoma* Cambridge, 1879**: 692, Plate 52, Fig. 6.

Type species: *P. oecobioides* Cambridge, 1879. Holotype in the Hope Entomological Museum, Oxford, UK [examined].

***Trigonobothrys* Simon, 1889**: 231.

Type species: *T. excisus* Simon, 1889. Holotype in the Muséum National d'Histoire Naturelle, Paris, France [seen].

Fitzgerald & Sirvid (2003) mistakenly treated *Trigonobothrys* as the senior synonym of *Phycosoma*. We now consider *Phycosoma* to be the senior synonym of *Trigonobothrys* on the basis of priority. Cambridge's (1879) description was rather brief and uninformative. The generic description given here expands upon our earlier work (Fitzgerald & Sirvid 2003) and is based in part on Yoshida's (2002) description of *Trigonobothrys*. While we

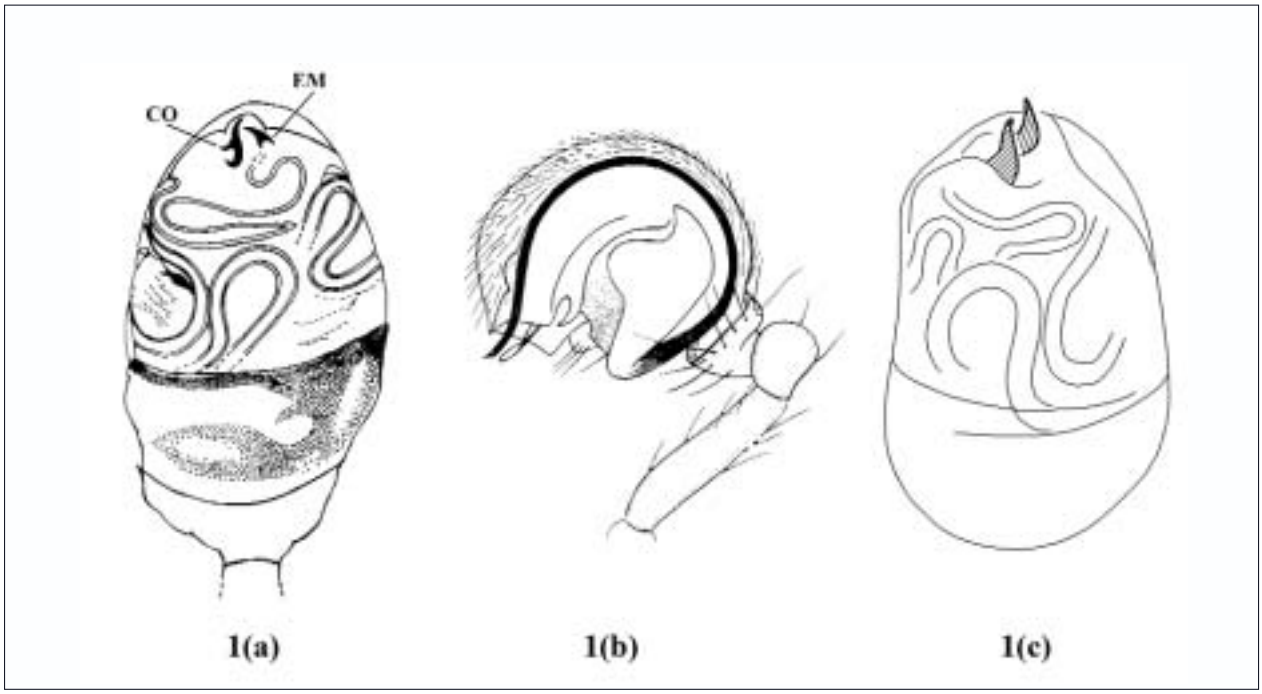

Fig. 1 Male palpi: (**a**) *Phycosoma oecobioides* Cambridge, 1879, right palp, showing the position of the conductor (CO) and embolus (EM) (reprinted from Fitzgerald & Sirvid 2003); (**b**) *Dipoena aculeata* (Hickman, 1951) (as *Trigonobothrys acculeatus*; reprinted with permission from Hickman 1951); (**c**) *Phycosoma excisum* (Simon, 1889), left pedipalp (reprinted with permission from Levi & Levi 1962).

are loath to add to the plethora of genitalic terminology that has plagued spider taxonomy, we feel that the epigynal terminology of Roberts (1979) does not adequately convey the information we require with respect to the positioning of the seminal receptacles. We designated the receptacle nearest the epigastric furrow as the posterior receptacle (equivalent to Roberts' (1979) first seminal receptacle), while the receptacle furthest from the epigastric furrow is the anterior receptacle (equivalent to Roberts' (1979) second seminal receptacle). We regard these terms as more useful, particularly when discussing Hickman's (1951) original descriptions of two Australian *Trigonobothrys* and their relationship to *Phycosoma.*

Description

Male carapace is often very high, near cylindrical when viewed from above, and is marked with dorsal grooves and depressions; female carapace, if high, is only so anteriorly. Eye region often projects beyond clypeus, which is often slightly concave. Chelicerae are very small, without teeth; fangs long and flat. Legs 4 1 2 3, with leg 4 slightly the longest. Female palpal claw is simple, not palmate as in other hadrotarsines (*see* 'Additional comments' below). Abdomen often partially covered by a dorsal scutum. Colulus absent (*see* 'Additional comments' below). The male palp lacks a median apophysis, and the conductor and embolus are small. The general arrangement of the palpal components appears to be consistent across the genus (*see* Figs 1a and 1c). Female has two pairs of seminal receptacles. The epigynal opening leads to a pair of ducts that connect to the posterior receptacles. A second pair of ducts connects the posterior receptacles to the anterior receptacles. Epigynum has small scape (*see* Fig. 2a). An illustration of the dorsal view of the male carapace and a habitus drawing of the type species *Phycosoma oecobioides* Cambridge, 1879 appear in Fitzgerald & Sirvid (2003).

Diagnosis

These spiders are separated from other hadrotarsines by the following set of characters. Male carapace is high, almost cylindrical, with dorsal grooves. Male palp has small embolus and conductor, and lacks median apophysis. General form of male palp is very consistent across the genus (*see* Figs 1a and 1c). Female palpal claw is simple, not

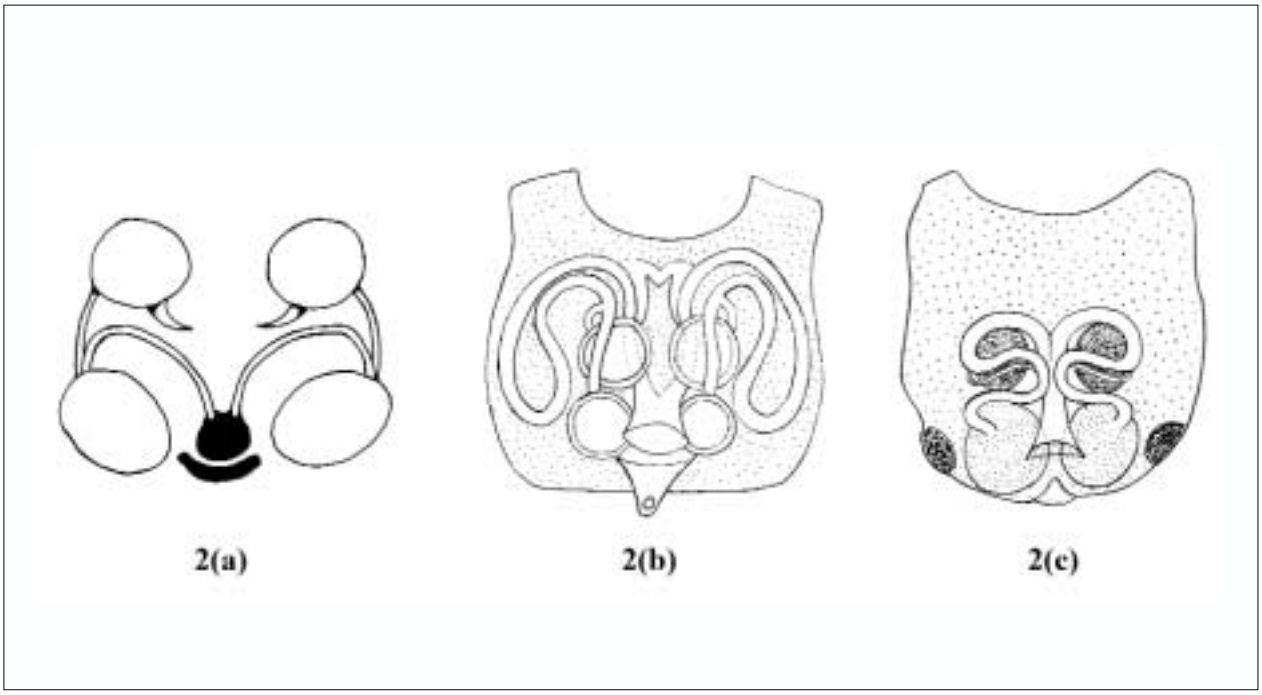

Fig. 2 Female internal genitalia: (**a**) *Phycosoma oecobioides* Cambridge, 1879 (reprinted from Fitzgerald & Sirvid 2003); (**b**) *Dipoena aculeata* (Hickman, 1951) (as *Trigonobothrys aculeatus*; reprinted with permission from Hickman 1951); (**c**) *Dipoena setosa* (Hickman, 1951) (as *Trigonobothrys setosus*; reprinted with permission from Hickman 1951).

palmate. On each side, the anterior seminal receptacle links to the corresponding posterior receptacle, which in turn connects to the epigynal opening (*see* Fig. 2a). Epigynum has small scape. Colulus is absent.

Additional comments

While Yoshida's (2002) key to Japanese Hadrotarsinae suggests that *Phycosoma* (as *Trigonobothrys*) has a colulus in the form of two setae, his description makes no mention of this character. We found no evidence of a colulus in the species we examined (*P. oecobioides*, *P. alta*, *P. lineatipes*, and *P. excisum*). We note that in descriptions of these species (e.g. Levi 1953a, Roberts 1979) a colulus is either not mentioned, or, for *P. oecobioides* and *D. lineatipes*, the colulus is stated as being absent or not visible (Levi 1953b, Fitzgerald & Sirvid 2003). The four species we studied also conform to the observation of Forster *et al.* (1990) that females of some *Dipoena* (sensu Levi) have a reduced palpal claw in contrast to the hadrotarsine norm of a palmate palpal claw. Given that *Phycosoma* (as *Trigonobothrys*) has been removed only recently from synonymy with *Dipoena* (Yoshida 2002), it is unsurprising that the conformity of genitalic characters has not been recognised previously.

Species included in *Phycosoma*

Yoshida (2002) resurrected the genus *Trigonobothrys* from synonymy with *Dipoena*, and he explicitly placed six species in the genus. He also stated that the *Dipoena lineatipes* group of Levi (1953b) (consisting of *Dipoena alta* Keyserling, 1886, *D. lineatipes* Bryant, 1933, and *D. inornata* (Cambridge, 1861)) also belonged in *Trigonobothrys*. Platnick (2004) transferred Yoshida's (2002) six species of *Trigonobothrys*, plus *T. oecobioides*, to *Phycosoma*, but did not accept the inclusion of the *D. lineatipes* group, as Yoshida provided no evidence for his assertion. Having examined specimens of this species group (*D. lineatipes* and *D. alta*), we found they possessed the diagnostic characters for *Phycosoma* listed above. On this basis, we agree that Yoshida's placement is correct. We also examined specimens (including the type) of *Trigonobothrys excisus* Simon, 1889 from Madagascar, and conclude that it, too, must be included in *Phycosoma* for the same reason. We agree that

all species transferred by Platnick (2004) from *Trigonobothrys* to *Phycosoma* are correctly placed. Further, we herewith transfer *Dipoena lineatipes* and *D. alta* to *Phycosoma* and, on the basis of genitalic illustrations in Palmgren (1974), we also transfer *D. inornata* (Cambridge, 1861) – the third member of Levi's (1953b) *D. lineatipes* group – to *Phycosoma*. Lastly, the excellent illustrations (both somatic and genitalic) by Roberts (1979, 1983) clearly show that the species *Dipoena jamesi* Roberts, 1979 and *D. menustya* Roberts, 1983 also belong in *Phycosoma.*

Material examined

***Phycosoma oecobioides* Cambridge, 1879**

Holotype ♀ of *Phycosoma oecobioides* O.P. Cambridge, 1879, New Zealand, A.S. Atkinson, date unknown. Hope Entomological Collections, Oxford University Museum of Natural History, Oxford, UK [examined for Fitzgerald & Sirvid 2003]; 2 ♂, 2 ♀, Moutohora (Whale Island), 2–10 Feb. 1999, New Zealand, B.M. Fitzgerald (MONZ) [compared with type (Fitzgerald & Sirvid 2003)]

***Dipoena alta* Keyserling, 1886**

1 ♂, 1 ♀, Barro Colorado Island, Canal Zone, Panamá, May, 1964. A.M. Chickering – MCZ 54616 (MCZ) [specimens also examined by Roberts (1979)].

***Dipoena lineatipes* Bryant, 1933**

5 ♂, 4 ♀, summit, Canal Zone, Panamá, 16–17 Aug. 1950, A.M. Chickering – MCZ 54617 (MCZ) [specimens also examined by Roberts (1979)].

***Trigonobothrys excisus* Simon, 1889**

6 ♂, 2 ♀, Fianaratsoa, Ramafana National Park, Madagascar [21°S, 47°30'E], April 1992, Kariko-Roth expedition – MCZ 54614 (MCZ).

***Trigonobothrys excisus* Simon, 1889**

Holotype ♀, Madagascar [no collector or date]. E. Simon collection. AR 2012 (MHN); 1 ♂, same data [stored with holotype]; 6 ♂, 2 ♀, Fianaratsoa, Ramafana National Park, Madagascar, 21°S, 47°30'E, April 1992, Kariko-Roth expedition – MCZ 54614 (MCZ).

List of known species of *Phycosoma*

It should be noted that the new generic combinations made by Platnick (2004) in the online 'World Spider Catalog' are not available names in the sense of the International Commission on Zoological Nomenclature's (1999) *Code* (see Art. 8.6). However, we fully endorse these changes and include them as new combinations below, along with the distributions given in Platnick (2004).

Phycosoma alta (Keyserling, 1886)
New combination Panamá to Brazil, Hawaii
Phycosoma amamiensis (Yoshida, 1985)
New combination China, Korea, Japan, Ryukyu Is
Phycosoma excisum (Simon, 1889)
New combination Madagascar
Phycosoma flavomarginatum (Bösenberg & Strand, 1906)
New combination China, Korea, Japan
Phycosoma inornata (Cambridge, 1861)
New combination Europe
Phycosoma japonicum (Yoshida, 1985)
New combination Korea, Japan
Phycosoma jamesi (Roberts, 1979)
New combination Jamaica, Panamá
Phycosoma lineatipes (Bryant, 1933)
New combination USA to Brazil
Phycosoma martinae (Roberts, 1983)
New combination Aldabra Is, China, Korea, Ryukyu Is, Philippines
Phycosoma menustya (Roberts, 1979)
New combination Aldabra Is
Phycosoma mustelinum (Simon, 1889)
New combination Russia, China, Korea, Japan, Krakatau I.
Phycosoma nigromaculatum (Yoshida, 1987)
New combination Taiwan, Japan, Ryukyu Is
Phycosoma oecobioides Cambridge, 1879
New Zealand, Chatham Is

We suggest that revisory work on the genus *Dipoena* is likely to reveal other species that should be transferred to *Phycosoma.*

Notes on Hickman's Tasmanian '*Trigonobothrys*'

Hickman (1951) described two Tasmanian species in the genus *Trigonobothrys*, namely *T. setosus* and *T. aculeatus.* These species were later transferred to *Dipoena* when Levi & Levi (1962) synonymised *Trigonobothrys* under *Dipoena*, stating that Hickman's 'excellent drawings however, show that *Trigonobothrys* is a *Dipoena*'.

While Hickman's species bear some resemblance to *Phycosoma excisum* (the type species of *Trigonobothrys*) in terms of somatic characters (e.g. the male cephalothorax and abdominal sclerotisation), they differ with respect to genitalic characters (*see* Figs 1b, 2b, and 2c). Note that *Trigonobothrys* was subsequently resurrected from synonymy with *Dipoena* by Yoshida (2002), only to be made a junior synonym of *Phycosoma* (Platnick 2004, this paper). Although Hickman's species have four seminal receptacles as in *Phycosoma,* they differ in the arrangement of ducts connecting the receptacles. In *Phycosoma*, the ducts lead directly to the posterior receptacles and a second pair of ducts links the posterior and anterior receptacles (*see* Fig. 2a). In Hickman's drawings, the posterior receptacles do not link directly to the corresponding anterior receptacles. Instead, both the posterior and anterior receptacles connect to a shared main duct, with the duct to each anterior receptaculum branching off prior to the termination of the main duct in the posterior receptaculum (*see* Figs 2b and 2c). Additionally, the male palpal configuration within *Phycosoma* appears to be reasonably consistent (*see* Figs 1a and 1c) and differs quite markedly from those depicted by Hickman (*see* Fig. 1b). Likewise, the typical hadrotarsine palmate form for the female palpal claw as depicted by Hickman in his two *Trigonobothrys* descriptions is at odds with the simple claw characteristic of *Phycosoma*.

We conclude that both of Hickman's *Trigonobothrys* species do not belong in *Phycosoma* and suggest that they are best left in *Dipoena* at present. To our knowledge, no members of *Phycosoma* are as yet known from Australia. However, we would not be surprised to learn of their discovery there in future, as genera represented by single species in New Zealand are often represented by multiple species in Australia. Examples of such distributions are found in the genera *Oxyopes* Latreille (Oxyopidae; see Vink & Sirvid 2000), *Arachnura* Vinson (Araneidae; see Raven *et al.* 2002, Sirvid *et al.* in press), and *Leucauge* White (Tetragnathidae; see Raven *et al.* 2002, Sirvid *et al.* in press).

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