

## A new troglobitic *Theridion* (Araneae: Theridiidae) from the Azores

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### Summary

A new species of *Theridion*, with reduced eyes and other morphological adaptations to cave life, is described from lava tubes on the island of Pico, Azores.

### Introduction

During the summer of 1987 a British/Spanish expedition sponsored by the National Geographic Society (USA) undertook the first investigation of the fauna of volcanic caves in the Azores archipelago. Although the oldest dated rocks on the island visited are less than one million years old (Feraud *et al.*, 1980), the expedition discovered a variety of arthropods with clear morphological adaptations to cave life. One of these was a new species of *Theridion* Walckenaer, 1805, with much reduced eyes, found in two caves on the island of Pico. This is only the second known troglobitic species of *Theridion*, the other being the completely eyeless *T. strepitus*, described by Peck & Shear (1987) from lava tubes in the Galápagos Islands.

### *Theridion pico*, sp. n. (Figs. 1-9)

*Male holotype* (all measurements in mm)

Total length 2.45. Carapace length 1.05, width 0.95. Carapace: Pale whitish yellow, rather broad and flattened, with a few long hairs in midline and in ocular region. Eyes greatly reduced: PME and ALE small, colourless, reflective spots, PLE absent, AME reduced to small pigment spots. Clypeus high. Abdomen: Pale grey with a faint paler mid-line and irregular paler blotches; sparsely covered with long, dark hairs; a stridulatory apparatus consisting of a row of 6-7 small sclerotised pegs on each side dorsolaterally. Colulus absent. Sternum: Very pale, almost white, sparsely covered with long hairs, broadly extended between coxae IV, rounded posteriorly. Chelicerae (Fig. 1): Pale yellow, with one large tooth on medial distal corner and one smaller tooth lateral to it. Legs: Pale yellow, covered with long hairs. Very long and thin, feI length/carapace length c. 2.7. Tibial spines 2-2-1-2, long (e.g. basal spine on tiII 4.5 times diameter of tibia at base of spine). TmI 0.24, TmIV absent. Measurements: Leg I: fe 2.85, pa + ti 3.0, mt 2.8, ta 1.05. Pa + tiII

2.25, pa + tiIII 1.55, pa + tiIV 2.3. Male palp (Figs. 2, 3): With a prominent, heavily sclerotised median apophysis, and curved distal end of embolus closely associated with a spatulate, membranous conductor.

*Female paratypes* (measurements taken from 4 specimens)

Total length 2.45-2.95. Carapace length 0.95-1.05, width 0.85-0.95. Colour and general form as male, except cheliceral teeth slightly smaller and legs slightly shorter, feI length/carapace length c. 2.5. Palps pale yellow. AME small pigment spots, other eyes all small and colourless, like male except PLE present. (Note that there is a trace of at least one PLE in a juvenile male, so their absence from the holotype male probably represents individual variation rather than sexual dimorphism.) Eye arrangement approximately as in Fig. 4, but variable, especially with regard to distance between PME, and distance between PLE and ALE. Tibial spines 2-2-1-2, long (basal spine on tiI about 4.4 times diameter of tibia at base of spine). Leg measurements: I: fe 2.25-2.65, pa + ti 2.35-2.75, mt 2.05-2.4, ta 0.8-1.05. Pa + tiII 1.65-1.95, pa + tiIII 1.15-1.45, pa + tiIV 1.85-2.15. TmI c. 0.25, TmIV absent. Epigyne (Fig. 5): Well sclerotised, with a clearly defined, deep, double atrium, the thickening of the posterior margin of which is variable. Vulva (Fig. 6): With broad coiled oviducts, which become narrower and darker towards the spermathecae.

### Diagnosis

Easily distinguished from all other species of *Theridion* by the reduced but not absent eyes, long legs, and form of the male palp and the epigyne.

### Etymology

The specific epithet is a noun in apposition and refers to the island on which the type series was obtained.

### Relationships

The species belongs in the *Theridion sexpunctatum* group, which was considered as a subgenus *Rugathodes* by Archer (1950: 24). Wunderlich (1987: 213) has given this taxon generic rank, but we do not feel that this is justified. Levi (1957: 20) pointed out that the various species groups in *Theridion* intergrade, and Levi & Levi (1962: 3-5) made a cogent plea for the treatment of the Theridiidae (and other comparable groups) in a few relatively large genera.

The spider fauna of the Azores is incompletely known, but much of the earlier published information has been summarised by Denis (1964) and Machado (1982); a revision is currently being undertaken by J. Wunderlich (pers. comm.). The members of *Theridion* and closely related genera previously described from the Azores are *Achaearanea acorensis* (Berland) and *A. tepidariorum* (C. L. K.), *Theridion rufipes* Lucas, *T. melanurum* Hahn, *T. bellicosum* Simon and *Enoplognatha mandibularis* (Lucas). In

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addition, Denis (1964: 76) mentions the presence of some juvenile *Theridion* — probably representing additional species — in the collections of the Lund University Expedition. Of the identified species, only *T. bellicosum* belongs to the *Theridion sexpunctatum* group. However, the only published Azores record for *T. bellicosum* is from the island of São Miguel (Denis, 1964), and according to J. Wunderlich (pers. comm.) these specimens represent a new species of *Rugathodes*. This species is probably the stock from which *T. pico* evolved. Wunderlich (1987: 213) described from Madeira "*Rugathodes*" *madeirensis* (he used *R. madeirensis*, but *Rugathodes* is masculine): in the synonymy of this species Wunderlich included the specimens recorded from Madeira by Denis (1962) as *Enoplognatha bellicosa* (emended to *Theridium bellicosum* in Denis, 1963: 48).

#### Material examined

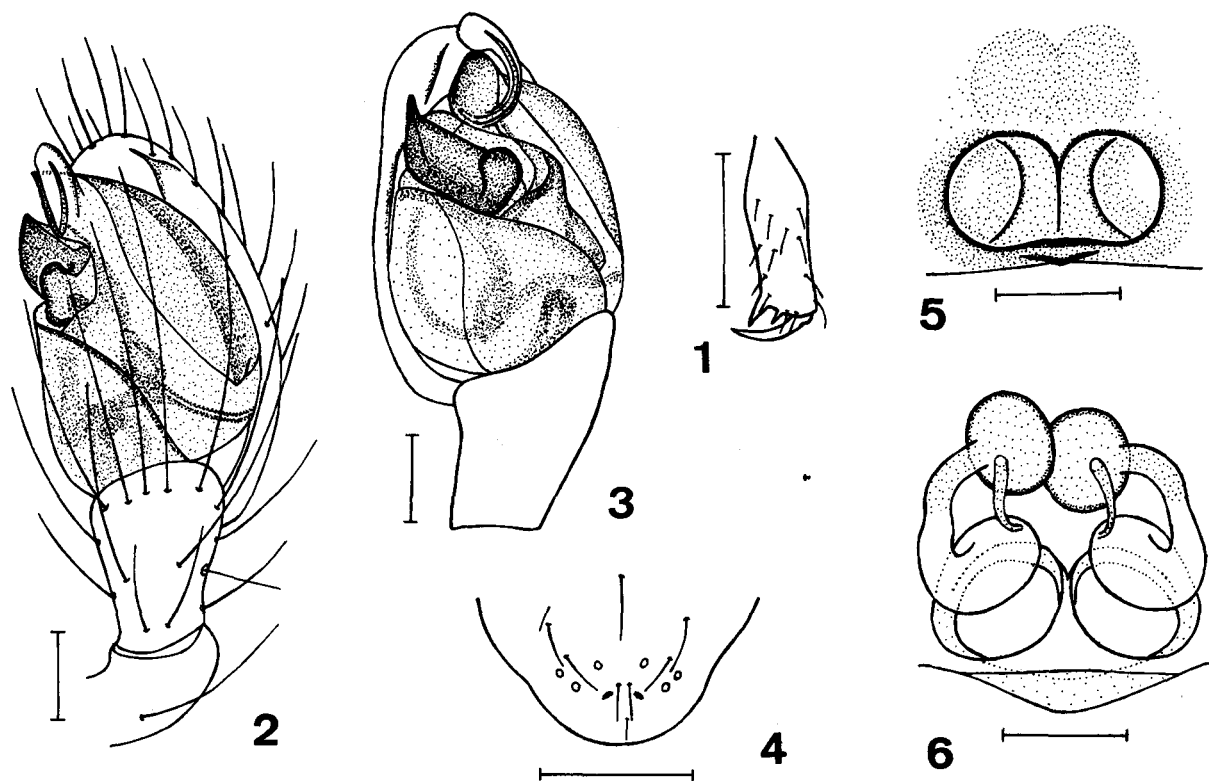
Male holotype: Azores, Pico, Cueva Agostina (UTM ref. 26S LH733677, altitude 60 m a.s.l.), 8 August 1987, in web on underside of large rock in dark zone of a humid lava tube, coll. N. P. Ashmole. Paratypes: Azores, Pico, 2 females in Cueva Agostina, 8 August 1987, coll. J. L. Martín, N. P. Ashmole; 2 females in Cueva Soldão (UTM ref. 26S LH851527, 30 m a.s.l.), 6 and 10 August 1987, coll. P. Oromí, J. L. Martín. Also 6 juveniles including both sexes. Holotype male and allotype female from Cueva Agostina deposited in collection of Departamento de Biología Animal, Universidad de La Laguna, Tenerife,

Canary Islands; paratype from same cave deposited in British Museum (Natural History), London; two female paratypes and one juvenile in collection of N. P. Ashmole (Edinburgh); remaining material in Museo Insular de Ciencias Naturales de Sta Cruz de Tenerife.

#### Discussion

Troglobitic animals are those that are obligately associated with the subterranean (hypogean) environment: they occur in caves and in inaccessible interstitial spaces (Juberthie, 1983; Howarth, 1983) and often show morphological and physiological adaptations to cave life (Barr, 1968; Jefferson, 1976; Ahearn & Howarth, 1982). *Theridium pico* appears to be such a species. Six hours of searching in the dark zone of the two caves where populations of *T. pico* were found, led to the capture of 11 individuals, but none was seen during the same length of search in the threshold zone of the same caves, although spiders of several other families were found there.

The reduced eyes of *T. pico* imply life in the dark, but as the species builds webs in open spaces it is unlikely to occupy dark surface habitats like the small litter-dwelling theridiids *Comaroma* and *Styopsis*, in which the anterior median eyes are often reduced or absent (Levi, 1964; Peck & Shear, 1987). In order to confirm the reduced visual capability of *T. pico* we examined two specimens from Cueva Soldão microscopically. Figure 7 shows a scanning electron micrograph of the prosoma of an adult female, and Fig. 8



Figs. 1-6: *Theridium pico*, sp. n. **1** Male left chelicera, anterior view; **2** Left male palp, ectal view; **3** Left male palp, ventral view, hairs omitted; **4** Typical eye arrangement (female), antero-dorsal view; **5** Epigyne, ventral view; **6** Vulva, dorsal view. Scale lines = 0.5 mm (1, 4), 0.1 mm (2, 3, 5, 6).

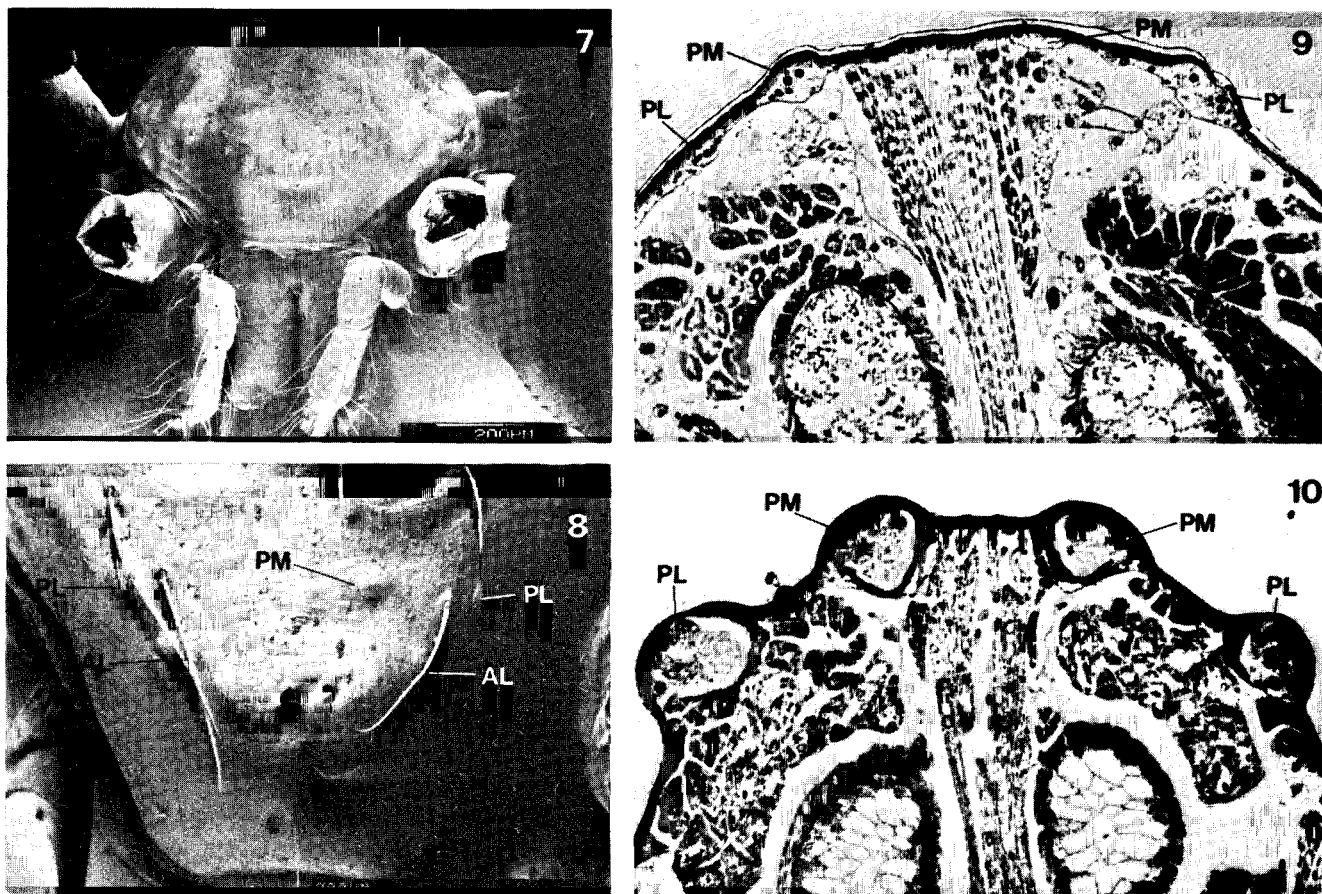
shows the eye region at higher magnification. The remnants of the anterior median eyes do not show in these photographs, although they were visible with the light microscope as faint dark marks at the top of the clypeus, between the uppermost of the two median bristles and the paired (broken) bristles above it. The anterior and posterior lateral eyes can be seen, the apparently double structure of the right anterior lateral perhaps being an artefact. The left posterior median eye is visible, and the one on the right could also be seen with the light microscope. In addition, we made serial sections through the head region of a subadult female, and comparable sections of a female *Theridion bellicosum* from the Cairngorm Mountains in Scotland. Figure 9 shows a vertical section through the posterior eyes of *T. pico*, showing the remnants of posterior median eyes (especially on the left of the picture) and of the posterior lateral eyes (especially on the right); Fig. 10 is a comparable section of *T. bellicosum*. The eyes of the latter species are large and heavily pigmented, and the receptor cells are visible, while the eyes of *T. pico* appear to lack receptor cells and to consist only of connective tissue.

Other morphological features of *T. pico* probably related to cave life are the very pale colour, the long spines and hairs, and the extreme length of the legs.

The last feature is characteristic of many cave animals (Barr, 1968), including spiders (Bristowe, 1939; Poulson, 1981). Different authors publish different leg measurements, but a comparison is possible using the ratio of the length of leg I femur plus patella-tibia to carapace length. This is 5.1 in the largest female *T. pico*, about 3.1 in a male *T. madeirense* (Wunderlich, 1987), 3.8 in a female *T. bellicosum* from the Lofoten Islands, and 4.5 in a female of the troglobitic *T. strepitus* from the Galápagos (Peck & Shear, 1987). Overall leg length is probably the most ecologically significant dimension, and the ratio of total leg I length to carapace length in the holotype male *T. pico* is 9.2, more than double the ratio of about 4.4 in a male of its presumed close relative *T. madeirense* (Wunderlich, 1987).

#### Acknowledgements

Primary thanks are due to the National Geographic Society, Washington, D.C., for financial support. Generous hospitality and practical help were provided by Os Montanheiros (Angra do Heroísmo, Terceira) while the Câmara Municipal de Madalena (Pico) provided a vehicle on several occasions. J. Avila Martins kindly made arrangements for us and gave valuable advice. The scanning electron micrographs were made by John Findlay, and the sections were cut by Derek



Figs. 7-8: *Theridion pico*, sp. n., female, scanning electron micrographs. 7 Prosoma, general anterior view; 8 Eye region. Scale lines = 0.2 mm. AL = anterior lateral eye, PL = posterior lateral eye, PM = posterior median eye.

Figs. 9-10: 9 *Theridion pico*, sp. n., vertical section through eye region showing remnants of posterior eyes; 10 *Theridion bellicosum*, vertical section through posterior eyes. PL = posterior lateral eye, PM = posterior median eye.

Penman; Jaleel Miyan suggested and arranged for the cutting of sections, and helped in their interpretation.

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