



Species Conservation Profile

Species conservation profile of the cave spider *Turinyphia cavernicola* (Araneae, Linyphiidae) from Terceira Island, Azores, Portugal

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Abstract

Turinyphia cavernicola Wunderlich, 2008 is one of the two endemic cavernicolous spiders known from the Azorean archipelago (Portugal). In spite of relatively intensive searches, this species is known from only three caves, but with a single sustainable subpopulation restricted to the Algar do Carvão show cave. With an observed extent of occurrence (EOO) of 2 km² and an area of occupancy (AOO) around 0,75 km², it presents a restricted range, severe fragmentation, and continuing decline in EOO, AOO, habitat quality, number of locations and subpopulations caused by the ongoing threat from pasture intensification and tourist activities in the cave systems.

Keywords

Cave species, islands, IUCN, red list, tourism, troglobiont

Species information

Taxon Name: *Turinyphia cavernicola* Wunderlich, 2008

Common names

Algar do Carvão cave spider

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Arachnida	Araneae	Linyphiidae

Taxonomic notes

This species was described based on males only. This is a pale spider with long legs and large eyes. Male pedipalpus: tibia with single trichobothrium, paracymbium with tooth-shaped distal hook, embolus basally wide (Borges and Wunderlich 2008) (Figs 1, 2)



Figure 1.

Male of *Turinyphia cavernicola* from Algar do Carvão (Terceira, Azores) (Credit: Paulo Henrique Silva).

Region for assessment:

- Global



Figure 2.

Female of *Turinyphia cavernicola* from Algar do Carvão (Terceira, Azores) (Credit: Pedro Cardoso)

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records (image): Fig. 3

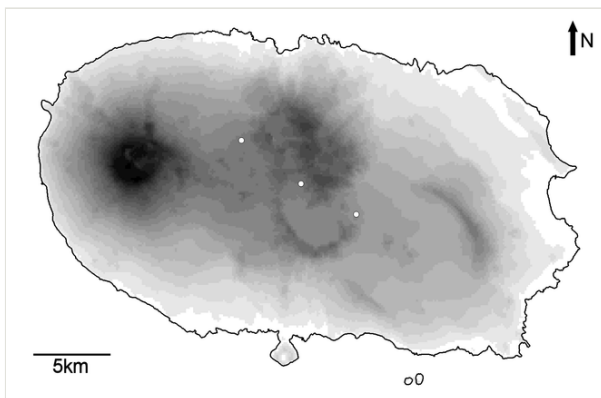


Figure 3.

Map of Terceira (Azores, Portugal) with the three caves where the species is known to live (white dots). Darker colours represent higher altitudes.

Map of records (Google Earth): Suppl. material 1**Basis of EOO and AOO:** Observed**Basis (narrative)**

Relatively intensive searches have located the spider in Algar do Carvão, Gruta da Malha and Furna de Santa Maria, all in Terceira Island (Pereira et al. 2015) (Figs 3, 4)



Figure 4.

The volcanic pit Algar do Carvão (Terceira, Azores), the main location of the species *Turinyphia cavernicola*.

Min Elevation/Depth (m): 460

Max Elevation/Depth (m): 583

Range description

This is a single island endemic restricted to the Island of Terceira, Azores, Portugal. The species was originally described from a single cave, the volcanic show pit Algar do Carvão, and later also found in two lava tubes: Gruta da Malha and Furna de Santa Maria, that are located nearby.

New occurrences

Materials

- a. scientificName: *Turinyphia cavernicola*; kingdom: Animalia; phylum: Arthropoda; class: Arachnida; order: Araneae; family: Linyphiidae; taxonRank: species; vernacularName: Algar do Carvão cave spider; genus: *Turinyphia*; specificEpithet: *cavernicola*; scientificNameAuthorship: Wunderlich, 2008; islandGroup: Azores; island: Terceira; country: Portugal; stateProvince: Azores; municipality: Praia da Vitória; locality: Gruta da Malha; verbatimLatitude: 4289017; verbatimLongitude: 477951; decimalLatitude: 38.749568; decimalLongitude: -27.253739; geodeticDatum: WGS84; coordinateUncertaintyInMeters: 10; georeferenceProtocol: GPS; habitat: Cave; individualCount: 1; sex: male; lifeStage: adult; recordedBy: Paulo A. V. Borges; identifiedBy: Paulo A.V. Borges; institutionID: University of the Azores; collectionID: Entomoteca Dalberto Teixeira Pombo; basisOfRecord: PreservedSpecimen
- b. scientificName: *Turinyphia cavernicola*; kingdom: Animalia; phylum: Arthropoda; class: Arachnida; order: Araneae; family: Linyphiidae; taxonRank: species; vernacularName: Algar do Carvão cave spider; genus: *Turinyphia*; specificEpithet: *cavernicola*; scientificNameAuthorship: Wunderlich, 2008; islandGroup: Azores; island: Terceira; country: Portugal; stateProvince: Azores; municipality: Angra do Heroísmo; locality: Algar do Carvão; verbatimLatitude: 4286675; verbatimLongitude: 481200; decimalLatitude: 38.728071; decimalLongitude: -27.215393; geodeticDatum: WGS84; coordinateUncertaintyInMeters: 10; georeferenceProtocol: GPS; eventDate: 1999-11-19; habitat: Cave; individualCount: 1; sex: male; lifeStage: adult; recordedBy: Fernando Pereira, P.A.V.Borges; identifiedBy: Paulo A.V. Borges; institutionID: University of the Azores; collectionID: Entomoteca Dalberto Teixeira Pombo; basisOfRecord: PreservedSpecimen
- c. scientificName: *Turinyphia cavernicola*; kingdom: Animalia; phylum: Arthropoda; class: Arachnida; order: Araneae; family: Linyphiidae; taxonRank: species; vernacularName: Algar do Carvão cave spider; genus: *Turinyphia*; specificEpithet: *cavernicola*; scientificNameAuthorship: Wunderlich, 2008; islandGroup: Azores; island: Terceira; country: Portugal; stateProvince: Azores; municipality: Angra do Heroísmo; locality: Furna de Santa Maria; verbatimLatitude: 4285000; verbatimLongitude: 484200; decimalLatitude: 38.713502; decimalLongitude: -27.181735; geodeticDatum: WGS84; coordinateUncertaintyInMeters: 10; georeferenceProtocol: GPS; habitat: Cave; individualCount: 1; sex: male; lifeStage: adult; recordedBy: Isabel Amorim, Fernando Pereira; identifiedBy: Paulo A.V. Borges; institutionID: University of the Azores; collectionID: Entomoteca Dalberto Teixeira Pombo; basisOfRecord: PreservedSpecimen
- d. scientificName: *Turinyphia cavernicola*; kingdom: Animalia; phylum: Arthropoda; class: Arachnida; order: Araneae; family: Linyphiidae; taxonRank: species; vernacularName: Algar do Carvão cave spider; genus: *Turinyphia*; specificEpithet: *cavernicola*; scientificNameAuthorship: Wunderlich, 2008; islandGroup: Azores; island: Terceira; country: Portugal; stateProvince: Azores; municipality: Angra do Heroísmo; locality: Algar do Carvão; verbatimLatitude: 4286675; verbatimLongitude: 481200; decimalLatitude: 38.728071; decimalLongitude: -27.215393; geodeticDatum: WGS84; coordinateUncertaintyInMeters: 10; georeferenceProtocol: GPS; eventDate: 1999-11-19; habitat: Cave; individualCount: 8; sex: unknown; lifeStage: Juveniles; recordedBy: Fernando Pereira, P.A.V.Borges; identifiedBy: Paulo A.V. Borges; institutionID: University of the Azores; collectionID: Entomoteca Dalberto Teixeira Pombo; basisOfRecord: PreservedSpecimen

- e. scientificName: *Turinyphia cavernicola*; kingdom: Animalia; phylum: Arthropoda; class: Arachnida; order: Araneae; family: Linyphiidae; taxonRank: species; vernacularName: Algar do Carvão cave spider; genus: *Turinyphia*; specificEpithet: *cavernicola*; scientificNameAuthorship: Wunderlich, 2008; islandGroup: Azores; island: Terceira; country: Portugal; stateProvince: Azores; municipality: Angra do Heroísmo; locality: Algar do Carvão; verbatimLatitude: 4286675; verbatimLongitude: 481200; decimalLatitude: 38.728071; decimalLongitude: -27.215393; geodeticDatum: WGS84; coordinateUncertaintyInMeters: 10; georeferenceProtocol: GPS; eventDate: 1999-08-10; habitat: Cave; individualCount: 1; sex: unknown; lifeStage: Juveniles; recordedBy: Fernando Pereira, P.A.V.Borges; identifiedBy: Paulo A.V. Borges; institutionID: University of the Azores; collectionID: Entomoteca Dalberto Teixeira Pombo; basisOfRecord: PreservedSpecimen
- f. scientificName: *Turinyphia cavernicola*; kingdom: Animalia; phylum: Arthropoda; class: Arachnida; order: Araneae; family: Linyphiidae; taxonRank: species; vernacularName: Algar do Carvão cave spider; genus: *Turinyphia*; specificEpithet: *cavernicola*; scientificNameAuthorship: Wunderlich, 2008; islandGroup: Azores; island: Terceira; country: Portugal; stateProvince: Azores; municipality: Angra do Heroísmo; locality: Algar do Carvão; verbatimLatitude: 4286675; verbatimLongitude: 481200; decimalLatitude: 38.728071; decimalLongitude: -27.215393; geodeticDatum: WGS84; coordinateUncertaintyInMeters: 10; georeferenceProtocol: GPS; eventDate: 1999-12-29; habitat: Cave; individualCount: 5; sex: unknown; lifeStage: Juveniles; recordedBy: Fernando Pereira, P.A.V.Borges; identifiedBy: Paulo A.V. Borges; institutionID: University of the Azores; collectionID: Entomoteca Dalberto Teixeira Pombo; basisOfRecord: PreservedSpecimen

Extent of occurrence

EOO (km2): 2

Trend: Decline (inferred)

Justification for trend

The species is a specialized troglobite living in constant humidity conditions. Many caves in Terceira Island are being impacted by pollution due to the intensive cattle production in the island of Terceira, with the changes in ecological conditions of caves in the last 50 years, namely the change of the N,P abiotic cycles and changes in the water pH (Hathaway et al. 2014). The addition of fences around the cave will be an important mitigation measure.

Past decline (%): 0

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: Yes

Area of occupancy

AOO (km²): 0,75

Trend: Decline (inferred)

Justification for trend

In Terceira Island there are 15 well-surveyed caves and we found subpopulations in only three. The trend of decline is partly based on the assumption that this species can occur in all these caves and that the absence is due not only to biological reasons (type of cave; age of the lava flow) but mainly to anthropogenic disturbance on caves during the last 50 years. Most of the caves were in the past covered by dense humid native forest, and forest clearance promoted changes in humidity and resource availability in cave environment.

Past decline (%): 20

Future decline (%): 5

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: Yes

Locations

Number of locations: 3

Justification for number of locations

After a detailed survey of 15 caves in Terceira island the species was only found at Algar do Carvão, Gruta da Malha and Furna de Santa Maria. Each is affected by different threats, mainly touristic pressure in the first and cattle production with consequent deforestation and nutrient input into caves in the latter two.

Trend: Decline (inferred)

Justification for trend

After a detailed survey of 15 caves in Terceira island the species was only found at Algar do Carvão, Gruta da Malha and Furna de Santa Maria, which is a small number of locations for a predictably larger range (up to 5 times larger) just 50 years ago.

Population

Trend: Decline (inferred)

Justification for trend

Inferred from decrease in AOO and habitat quality.

Past decline (%): 20

Future decline (%) (over 10 years or 3 generations, whichever the longer): 5

Basis for decline:

- (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: Yes

Population Information (Narrative)

Three subpopulations are known in the island, but two of them are very small and located in disturbed lava tubes. The single large subpopulation is located in the show cave Algar do Carvão, which is under intensive pressure due to increasing levels of visitation in the last ten years.

Subpopulations

Number of subpopulations: 3

Trend: Decline (inferred)

Justification for trend

The species original distribution was potentially 70 km², probably including most of the 15 caves surveyed in the Terceira Island, the current range representing a reduction of 93%. However considerable searching efforts around the current caves where the species occurs have failed to find additional subpopulations.

Severe fragmentation?: Yes

Justification for fragmentation

The large system of lava tubes in Terceira island is fragmented both naturally and artificially. Natural fragmentation is due to the occurrence of several independent historical lava-flows in the island. Artificial fragmentation is due to recent destruction of caves for road construction and intensive pasture implementation. Two out of three subpopulations are considered non-sustainable.

Habitat

System: Terrestrial

Habitat specialist: Yes

Habitat (narrative)

The species is a troglobite specialist occurring only in humid lava tubes and volcanic pits. The sheet webs are built in small holes and crevices in the lateral walls of the caves.

Trend in extent, area or quality?: Decline (estimated)

Justification for trend

The intensive cattle production in the island of Terceira increased a lot in the last twenty years and creates high disturbance and pollution in cave systems. This might be the cause for inferred recent reduction in AOO. Touristic pressure might also be a threat in the single show-cave within its geographic range, through reduction in habitat quality.

Habitat importance: Major Importance

Habitats:

- 7. Caves and Subterranean Habitats (non-aquatic)
- 7.1. Caves and Subterranean Habitats (non-aquatic) - Caves

Ecology

Size: 2 mm

Generation length (yr): 1

Dependency of single sp?: No

Ecology and traits (narrative)

The species builds sheet-webs across small holes in volcanic basaltic rock. Usually occurs from twilight conditions near cave openings to deep parts of the caves (Borges and Wunderlich 2008, Martín et al. 2008, Martín et al. 2010). In the main pit-cave of Algar do Carvão the construction of the lateral walls of the stairs with stones from the cave allowed the creation of additional supports for the webs.

Threats

Threats

Threat type: Ongoing

Threats:

- 2. Agriculture & aquaculture
- 2.3. Agriculture & aquaculture - Livestock farming & ranching
- 2.3.2. Agriculture & aquaculture - Livestock farming & ranching - Small-holder grazing, ranching or farming
- 6. Human intrusions & disturbance
- 6.1. Human intrusions & disturbance - Recreational activities

Conservation

Conservation actions

Conservation action type: In Place

Conservation actions:

- 1. Land/water protection
- 1.1. Land/water protection - Site/area protection

Conservation action type: Needed

Conservation actions:

- 3. Species management
- 3.3. Species management - Species re-introduction

Justification for conservation actions

An area of 40.5ha around Algar do Carvão was classified as “Regional Natural Monument” by the Regional Decree nr 9/2004/A, of March 23rd 2004, due to its unique volcanic features and its environmental importance. Since pasture intensification is one main threat, this might be important to safeguard the species survival in the future and should be extended beyond the current area, possibly allowing the recovery of other caves to original conditions where the species might be reintroduced.

Other

Research needed:

- 3. Monitoring
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Acknowledgements

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Supplementary material

Suppl. material 1: Extent of Occurrence of *Turinyphia cavernicola*.

Authors: Paulo A.V. Borges, Pedro Cardoso

Data type: Geographic range

Filename: Turinyphia.kml - [Download file](#) (1.37 kb)