A new species of *Peponocranium* (Araneae: Linyphiidae) from the Alps

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Abstract. Detailed examination of material of *Peponocranium orbiculatum* (O. Pickard-Cambridge, 1882) from different private and museum collections disclosed a new species for science. We here describe *Peponocranium ambrosii* sp. nov. and provide drawings and photographs of the diagnostic characters of the species. In addition, we present data on its ecology, conservation and distribution, encompassing montane habitats in Switzerland, Italy and Austria.

Keywords: faunistics, new species, taxonomy

Zusammenfassung. Eine neue Art der Gattung *Peponocranium* (Araneae: Linyphiidae) aus den Alpen. Eine umfassende Untersuchung von Material der Art *Peponocranium orbiculatum* (O. Pickard-Cambridge, 1882) aus verschiedenen Privat- und Museumssammlungen enthüllte eine bisher wissenschaftlich unbeschriebene Art. In dieser Arbeit wird *Peponocranium ambrosii* **sp. nov.** beschrieben sowie Zeichnungen und Fotos der diagnostischen Merkmale der Art präsentiert. Zusätzlich werden Daten zur Ökologie, zum Arterhalt sowie zur Verbreitung, welche montane Habitate in der Schweiz, Italien und Österreich umfasst, vorgestellt.

The linyphiid spider genus *Peponocranium* Simon 1884 presently includes *P. ludicrum* (O. Pickard-Cambridge, 1861), *P. orbiculatum* (O. Pickard-Cambridge, 1882) and *P. praeceps* Miller, 1943 being primarily distributed in Europe and Russia, *P. simile* Tullgren, 1955 solely recorded from Sweden, *P. fallax* Gnelitsa, 2024 recorded from Ukraine, and *P. dubium* Wunderlich, 1995 which is the only non-European species, being found in Mongolia (World Spider Catalog, 2025). Among these, *P. simile, P. fallax*, and *P. dubium* are known from one sex only. *Peponocranium* spiders are small (body length: 1.3–2.3 mm), with a yellowish-brown coloration. Males have a characteristic large, globular cephalic lobe, with a deep groove in the median part and two eyes at the top of the bulge. Specimens are generally found in leaf-litter or among the vegetation at ground level.

Concerning phylogeny, there is general agreement in placing the genus in the Erigoninae subfamily. More specifically, Merrett (1963) placed *Peponocranium* in Group E while Millidge (1977) placed it in the *Pelecopsis* group. Recently, Breitling (2021) recognized the affinity of the genus to *Trichopterna*, *Hypselistes* and *Lophomma* within the so-called "higher Erigonines". In the late eighties, Hänggi (1989) pointed out that some specimens from the canton of Ticino (Southern Switzerland), exhibited some slight differences compared to *Peponocranium orbiculatum*, suggesting the existence of a putative new species. Re-examination of material previously identified as *P. orbiculatum* from the Alps and stored in private and museum collections, confirmed this hypothesis, disclosing a new species for science. We here describe *P. ambrosii* **sp. nov.** and present its known distribution pattern, along with some considerations on its ecology and conservation.

Material and methods

Specimens were mostly collected with pitfall traps and preserved in 70% ethanol. Photographs are multifocus Z-stack images taken with a Flexacam C1 camera mounted on a Leica Stereozoom S8 APO stereoscopic binocular microscope. Specimens were examined and measured using a Leica M80 stereoscopic binocular with up to 60x magnification connected to an EC3 camera. All measurements are given in millimetres. The female vulva was removed and treated with 10% KOH prior to examination. After observation and drawings, the vulva was washed in acetic acid (5%) and successively stored in 70% ethanol in a micro-vial in the same tube containing the specimen. All illustrated male structures are from the left side.

We follow Hormiga (2000) for describing the parts of the male and female copulatory organs.

The holotype is deposited at the Museo Civico di Scienze Naturali "E. Caffi" (Bergamo, Italy) (MCSNB). Paratypes and other materials are stored at the same institution, in Marco Isaia's collection at the Department of Life Science and Systems Biology of the University of Torino (CI), at the Museo cantonale di storia naturale of Lugano (MCSNL), and at the Naturhistorisches Museum of Basel (NMB).

We assembled data on the distribution and the habitat of the new species based on the literature and unpublished records. The calculation of the range extent and altimetric range is based on available occurrences, successively elaborated in a GIS environment. We evaluated the extinction risk of the species by assessing it against all five IUCN criteria (A–E), in accordance with the IUCN Red List Categories and Criteria (IUCN 2001). Coordinates of localities are given in decimal degrees (WGS84 datum). We refer to SOIUSA (Marazzi 2005) for the geographic classification of the Alps.

Illustrations were prepared by Alessandro Infuso directly on specimens observed under the stereomicroscope.

Abbreviations

AER – anterior eye row; **ALE –** anterior lateral eyes; **AME –** anterior median eyes; **AOO –** Area of Occupancy; **a.s.l. –** above sea level; **cd –** copulatory duct; **Cy –** cymbium; **DSA –** distal suprategular apophysis; **e –** embolus; **EOO –** Extent of Occurrence; **fd –** fertilization duct; **Fe –** femur; **kCy –** keel of cymbium; **Me –** metatarsus; **mp –** median plate; **p –** paracymbium; **Pa –** patella; **PER –** posterior eye row; **PLE –** posterior lateral eyes; **PME –** posterior median eyes; **s –** spermatheca; **t –** tegulum; **ta –** tibial apophysis; **Ti –** tibia; **TmI –** trichobothrium of the metatarsus I; **TmIV –** trichobothrium of the metatarsus IV.

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Taxonomy
Family Linyphiidae Blackwall, 1859
Genus *Peponocranium* Simon, 1884

***Peponocranium ambrosii* sp. nov. Milano & Isaia** (Figs. 1a–e, 2a–b, 3a–c, 4a–b, Table 1)
Zoobank. urn:lsid:zoobank.org:pub:325599BD-DEA2-4580-9ED8-1E7C797B4143
Type material. Holotype: 1 ♂, ITALY, Piemonte, Valprato Soana, San Besso, pasture, 45.5533°N, 7.5243°E, 1755 m a.s.l., 27. Jun. 2019, leg. Gran Paradiso National Park staff (MCSNB). Paratypes: 1 ♂, same locality as for the holotype, 26. Jun. 2018, leg. Gran Paradiso National Park staff (CI); 2 ♂♂, Noasca, Casa di Caccia del Gran Piano refuge, broadleaved forest, 45.4597°N, 7.3042°E, 1441 m a.s.l., 12. Jun. 2019, leg. Gran Paradiso National Park staff (CI); 1 ♂, Aurano, Pian d'Arla, 46.0228°N, 8.5977°E, 1313 m a.s.l., 9. Jul. 2019, leg. Val Grande National Park staff (CI); 2 ♂♂, 2 ♀♀, Trentino-Alto Adige, Garniga Terme, Monte Bondone, extensive meadow, 46.0174°N, 11.0521°E, 1530 m a.s.l., 14. May-17. Jun. 1997, leg. P. Bonavita (MCSNB); 1 ♂, Garniga Terme, Monte Bondone, pasture, 46.0068°N, 11.0514°E, 1530 m a.s.l., 21. Oct. 1996-14. May 1997, leg. P. Bonavita (MCSNB); 1 ♀, Valle d'Aosta, Cogne, Lauson, coniferous forest, 45.5842°N, 7.3471°E, 1800 m a.s.l., 15. Jul. 2019, leg. Gran Paradiso National Park staff (CI). – 5 ♂♂, SWITZERLAND, Ticino, Mendrisio, Paruscera, meadow with *Molinia*, 45.9082°N, 8.9535°E, 1020 m a.s.l., 18. May-2. Jun. 1998, leg. L. Pollini (NMB, GBIFCH01401164); 1 ♂, Mendrisio, Forello, meadow with *Carex*, 45.9101°N, 8.9468°E, 960 m a.s.l., 16. Jun-29. Jun. 2004, leg. R. Pierallini (MCSNL, GBIFCH01401165); 1 ♀, Mendrisio, Piancone, pasture, 45.9199°N, 9.0141°E, 1417 m a.s.l. 27. May-31. May 2021, leg. B. Koch and I. Forini (MCSNL, GBIFCH01407788).
Other material. AUSTRIA, Tyrol, Nauders, Bazallerkopf, in soil litter of dry slopes facing south, 46.9233°N, 10.5102°E, 2150 m a.s.l., 12. Jun. 2000, 1 ♂ 1 ♀, leg. K.H. Harms (NMB); same locality, 14. Jun. 2001, 3 ♀♀, leg. K.H. Harms (NMB). – ITALY, Trentino-Alto Adige, Garniga Terme, Monte Bondone, abandoned area, 46.0129°N, 11.0489°E, 1530 m a.s.l., 14. May-17. Jun. 1997, 1 ♀, leg. P. Bonavita (MCSNB). – SWITZERLAND, Graubünden, Zernez, Lingia Lungia, forest, 46.6629°N, 10.2352°E, 7. Jun.-25. Jul. 2004, 3 ♂♂ 1 ♀, leg. WSL Projekt RBA (NMB). Ticino, Locarno, Bolle di Magadino, tall sedge meadow, 46.1613°N, 8.8632°E, 194 m a.s.l., 4. May-7. May 2021, 1 ♂, leg. Fondazione Bolle di Magadino (MCSNL); Locarno, Bolle di Magadino, sedge meadow, 46.1562°N, 8.8621°E, 194 m a.s.l., 4. May-7. May 2021, 1 ♂, leg. Fondazione Bolle di Magadino (MCSNL); Mendrisio, Forello, fallow, 45.9123°N, 8.9478°E, 1045 m a.s.l., 28. Apr.-12. May 1988, 1 ♂, leg. MaWiTI Project (MCSNL); Mendrisio, Forello, sedge meadows, 45.9103°N, 8.9468°E, 974 m a.s.l., 17. May-21. Jun. 2021, 1 ♂ 1 ♀, leg. B. Koch and I. Forini (MCSNL); Mendrisio, Forello, pasture, 45.9104°N, 8.9461°E, 974 m a.s.l., 02. Jun. 1994, 1 ♀, leg. MaWiTI Project (MCSNL); Mendrisio, I Proa dala Poma, old fallow with bushes, 45.8985°N, 9.0132°E, 1000 m a.s.l., 20. Apr.-9. May 1989, 10 ♂♂ 2 ♀♀, leg. MaWiTI Project (MCSNL); Vergelletto, Zardin, birches and brooms, 46.2329°N, 8.5810°E, 940 m a.s.l., 27. Apr.-7. May 1988, 1 ♂, leg. P. Pronini and B. Jann (MCSNL); same locality, 25. Jun.-7. Jul. 1988, 1 ♀, leg. P. Pronini and B. Jann (MCSNL).
Re-examined material. Former literature records (sub *P. orbiculatum*, or otherwise specified) are here revised and assigned to *P. ambrosii* **sp. nov.** on the basis of morphological examinations. Published in Hänggi (1989): SWITZERLAND, Ticino, Mendrisio, Forello, fallow, 1045 m a.s.l., 19. May-29. May 1989, 3 ♂♂ 2 ♀♀, leg. MaWiTI Project; same locality, 28. Jun.-17. Jul. 1989, 3 ♀♀, leg. MaWiTI Project; Mendrisio, I Proa dala Poma, old fallow, 1000 m a.s.l., 9. May-26. May 1989, 6 ♂♂ 2 ♀♀, leg. MaWiTI Project; Mendrisio, Pree, pasture with short vegetation (*Carex*), 980-1020 m a.s.l., 4. Apr.-19. Apr. 1989, 10 ♂♂ 4 ♀♀, leg. MaWiTI Project; Bellinzona, Melirolo, fallow, 1020 m a.s.l., 18. May-25. May 1989, 1 ♂ 1 ♀, leg. MaWiTI Project. – Published in Isaia et al. (2007): ITALY, Lombardia, Pagnona, pathway to Alpe Vesina, burned larch forest, 1580 m a.s.l., 13. May-9. Jun. 1999, 1 ♂, leg. P. Pantini; same locality, 9. Jun.-6. Jul. 1999, 1 ♂, leg. P. Pantini; Pagnona, pathway to Alpe Vesina, larch forest, 1550 m a.s.l., 9. Jun.-6. Jul. 1999, 1 ♂, leg. P. Pantini; Gorno, pasture with shrubs, 1150 m a.s.l., 14. Apr.-19. May 2005, 1 ♂, leg. E. Pelizzoli. – Published in Negro et al. (2009): ITALY, Valle d'Aosta, Torgnon, 1870 m a.s.l., 16. Jun.-30. Jun. 2006, 3 ♂♂, leg. M. Isaia and M. Negro. – Published in Pantini & Mazzoleni (2022): ITALY, Lombardia, Casargo, Sasso Dirotto, pasture, 1542 m a.s.l., 19. Jun.-20. Jul. 2009, 1 ♂, leg. M. Massaro and W. Zucchelli; Casargo, Valle Foppone, pasture, 1631 m a.s.l., 25. May-23. Jun. 2010, 2 ♂♂, leg. M. Massaro and W. Zucchelli. – Published in Pantini et al. (2020): ITALY, Lombardia, Valdidentro, Sasso Prada, dry pasture with bushes of *Pinus mugo*, 1623 m a.s.l., 6. Jun. 2013, 1 ♂, leg. Stelvio National Park staff; same locality, 18. Jul. 2014, 1 ♂, leg. Stelvio National Park staff; Valdidentro, Plator, meadow, 1822 m a.s.l., 6. Jun. 2013, 1 ♂, leg. Stelvio National Park staff; Ponte di Legno, Graole, meadow with shrubs, 2038 m a.s.l., 17. Jun. 2013, 1 ♂, leg. Stelvio National Park staff; same locality, 5. Jul. 2013, 1 ♂, leg. Stelvio National Park staff. – Published in Schenkel (1929), sub *P. ludicrum*: SWITZERLAND, Ticino, Bedretto, Villa Bedretto, valley slope, 1500 m a.s.l., 23. Jul.-7. Aug. 1928, 5 ♀♀, leg. E. Schenkel. – Published in Trivellone et al. (2013): SWITZERLAND, Ticino, Rivera, Bironico, vineyard, 510 m a.s.l., 20. Apr.-27. Apr. 2011, 1 ♂, leg. V. Trivellone and L. Pollini.

***Peponocranium orbiculatum* (O. Pickard-Cambridge, 1882)** (Figs. 2c–d, 3d–f, 4c–d)
Material: AUSTRIA, Salzburg, Weißbach bei Lofer, Kallbrunnalm, pasture, 47.5161°N, 12.7992°E, 1734 m a.s.l., 21. Jul.-25. Aug. 2009, 1 ♂, leg. C. Komposch et al.; same locality, 26. Jul.-22. Aug. 2012, 4 ♀♀, leg. C. Komposch et al.; Werfenweng, Samer Alm, pasture, 47.4822°N, 13.2970°E, 1520 m a.s.l., 1998-1999; 4 ♂♂ 4 ♀♀, leg. C. Muster. – GERMANY, Bayern, Dillingen an der Donau, Gremheim, drained bottomland forest, 48.6341°N, 10.6600°E, 417 m a.s.l., 15. Apr.-15. Nov. 1985, 1 ♂ 2 ♀♀, leg. W. Dehler (NMB); Saxony, 09. May-03. Jun. 1999, 1 ♂ 1 ♀, only photographs (P. Oger, https://arachno.piwigo.com).
Verified citations. List of the former records (sub *P. orbiculatum*) now assigned to *P. ambrosii* **sp. nov.** on the basis of the examination of material collected at the same locality or in the frame of the same project (see Re-examined material). Published in Hänggi (1992): SWITZERLAND, Ticino, Acquarossa, Brinzosca di Sopra, old fallow dominated by *Brachy-*

podium pinnatum, 980 m a.s.l., 15. Apr.-1. May 1989, 1 ♂, leg. MaWiTI Project; same locality, 1. May-15. May 1989, 8 ♂♂, leg. MaWiTI Project; same locality, 15. May-27. May 1989, 5 ♂♂ 3 ♀♀, leg. MaWiTI Project; same locality, 27. May-14. Jun. 1989, 4 ♂♂ 2 ♀♀, leg. MaWiTI Project; Bellinzona, Melirolo, old fallow with bushes of *Brachypodium pinnatum* and *Molinia arundinacea*, and with young trees (*Betula pendula*, *Fraxinus excelsior* and *Acer* ssp.), 1040 m a.s.l., 15. Apr.-1. May 1989, 3 ♂♂, leg. MaWiTI Project; same locality, 1. May-18. May 1989, 2 ♂♂, leg. MaWiTI Project; same locality, 18. May-25. May 1989, 1 ♂ 1 ♀, leg. MaWiTI Project; same locality, 25. Jul.-12. Aug. 1989, 1 ♂ 1 ♀, leg. MaWiTI Project; Melirolo, fallow with bushes of *Brachypodium pinnatum* and *Bromus erectus*, 1020 m a.s.l., 1. Jul.-19. Jul. 1988, 1 ♀, leg. MaWiTI Project; same locality, 2. Apr.-15. Apr. 1989, 1 ♂, leg. MaWiTI Project; same locality, 15. Apr.-1. May 1989, 3 ♂♂ 1 ♀, leg. MaWiTI Project; same locality, 1. May-18. May 1989, 1 ♂ 1 ♀, leg. MaWiTI Project; same locality, 25. May-8. Jun. 1989, 1 ♂ 1 ♀, leg. MaWiTI Project; same locality, 8. Jun.-24. Jun. 1989, 1 ♀, leg. MaWiTI Project; same locality, 24. Jun.-7. Jul. 1989, 1 ♀, leg. MaWiTI Project; same locality, 7. Jul.-25. Jul. 1989, 1 ♀, leg. MaWiTI Project; Intragna, Pian Segna, young fallow with *Carex fritschii*, *Festuca rubra*, *Dactylis glomerata*, *Poa chaixii* and *Deschampsia flexuosa*, 15. May-21. May 1992, 1 ♂, leg. F. Rampazzi; Lionza, All'Oro, old fallow surrounded by forest and scrub with *Anthoxanthum odoratum* and *Festuca rubra*, 860 m a.s.l., 10. May-22. May 1989, 2 ♂♂, leg. MaWiTI Project; same locality, 1. May-14. May 1990, 2 ♂♂ 2 ♀♀, leg. MaWiTI Project; same locality, 14. May-30. May 1990, 1 ♂, leg. MaWiTI Project; Mendrisio, Forello, old fallow with *Molinia arundinacea*, 1045 m a.s.l., 12. May-1. Jun. 1988, 2 ♂♂, leg. MaWiTI Project; same locality, 20. Apr.-10. May 1989, 2 ♂♂, leg. MaWiTI Project; same locality, 10. May-19. May 1989, 2 ♂♂, leg. MaWiTI Project; same locality, 29. May-14. May 1989, 1 ♀, leg. MaWiTI Project; same locality, 14. Jun.-28. Jun. 1989, 1 ♂ 1 ♀, leg. MaWiTI Project; Mendrisio, Pree, pasture near forest edge, 980-1020 m a.s.l., 20. Apr.-9. May 1989, 7 ♂♂ 1 ♀, leg. MaWiTI Project; Mendrisio, Pree, pasture with *Brachypodium*, 980-1020 m a.s.l., 4. Apr.-19. Apr. 1989, 11 ♂♂ 2 ♀, leg. MaWiTI Project; same locality, 20. Apr.-9. May 1989, 5 ♂♂ 2 ♀♀, leg. MaWiTI Project; same locality, 9. May-26. May 1989, 9 ♂♂ 1 ♀, leg. MaWiTI Project; same locality, 26. May-14. Jun. 1989, 2 ♀♀, leg. MaWiTI Project; same locality, 14. Jun.-6. Jul. 1989, 3 ♀♀, leg. MaWiTI Project; same locality, 6. Jul.-22. Jul. 1989, 2 ♀♀, leg. MaWiTI Project; Mendrisio, Pree, pasture with short vegetation (*Carex*), 980-1020 m a.s.l., 1. Jun.-13. Jun. 1988, 1 ♂, leg. MaWiTI Project; same locality, 4. Apr.-20. Apr. 1989, 1 ♂, leg. MaWiTI Project; same locality, 20. Apr.-9. May 1989, 5 ♂♂ 2 ♀♀, leg. MaWiTI Project; same locality, 9. May-26. May 1989, 2 ♂♂, leg. MaWiTI Project; Mendrisio, Pree, meadow, 980-1020 m a.s.l., 4. Apr.-19. Apr. 1989, 3 ♂♂, leg. MaWiTI Project; same locality, 20. Apr.-9. May 1989, 2 ♂♂ 1 ♀, leg. MaWiTI Project; same locality, 9. May-26. May 1989, 4 ♂♂ 1 ♀, leg. MaWiTI Project; Mendrisio, I Proa dala Poma, old fallow with bushes of *Brachypodium pinnatum* and *Asphodelus albus*, 1000 m a.s.l., 13. Jun.-1. Jul. 1988, 3 ♂♂, leg. MaWiTI Project; same locality, 1. Jul.-18. Jul. 1988, 1 ♂, leg. MaWiTI Project; same locality, 18. Jul. 1988-28. Jan. 1989, 1 ♀, leg. MaWiTI Project; same locality, 4. Apr.-20. Apr. 1989, 3 ♂♂, leg. MaWiTI Project; same locality, 26. May-14. Jun. 1989, 2 ♀♀, leg. MaWiTI Project; same locality, 14. Jun.-6. Jul. 1989, 3 ♀♀, leg. MaWiTI Project.

Unverified citations. Former records (sub *P. orbiculatum*) that we were not able to verify, likely to be assigned to *P. ambrosii* **sp. nov.** on a geographical basis. Published in Hansen (2011): ITALY, Friuli-Venezia Giulia, Udine, Pontebba, Torbiera di Pramollo 1510-1518 m a.s.l., 1 ♂. – Published in Noflatscher (1990): ITALY, Trentino-Alto Adige, Bolzano/Bozen, Ora/Auer, Castelvetere/Castelfeder, 400 m a.s.l., ecotone area of an east-facing oak forest with *Quercus pubescens*, *Fraxinus ornus*, *Pistacia terebinthus* and *Celtis australis*, 6 ♂♂ 9 ♀♀. – Published in Pesarini (1997): ITALY, Lombardia, Lecco, Monte Barro, 1 ♀. – Published in Rief & Ballini (2017): ITALY, Trentino-Alto Adige, Matscher Tal, Swiss pine forest, 2063 m a.s.l., 26. Jun.-30. Jun. 2016, 1 indet., leg. LTSER. – Published in Thaler (1980): ITALY, Trentino-Alto Adige, Trento, Val d'Ampola, west to Riva sul Garda, 750 m a.s.l., 1. Jun. 1964, 1 ♀.

Diagnosis. The new species is most similar to *Peponocranium orbiculatum* in general appearance and genitalia (Figs 1–4). Males of the new species are best diagnosed by the proximal pointed keel of the cymbium (*kCy* in Fig. 1a–b), which is shorter and curved in *P. orbiculatum* (Fig. 3d–e), and by the long tibial apophysis (*TA* in Fig. 1a–b) bearing a curved and tapering tip pointing upward and forward (see Figs. 1a–b, 3a–c vs. Figs 3d–f). Unlike *P. orbiculatum*, in *P. ambrosii* **sp. nov.** the tip of the embolus (*e* in Fig. 1a–b) is not widened (Figs. 1a–b, 3a–f). The male prosoma is very similar to those of *P. orbiculatum*, but it differs by having a cephalic lobe more leaning in its posterior part (see Figs. 1c, 2a vs. Fig. 2c). Females differ from *P. orbiculatum* by the copulatory ducts of the vulva (*cd* in Fig. 1e) extending further forward, up to the level of the anterior edge of the spermathecae (Figs. 1e, 4b).

Description. Male (holotype) (Fig. 1a–c). Prosoma 0.622 long, 0.660 wide, pale yellow, with large globular cephalic lobe descending backwards and marked off from cephalothorax by a deep horizontal indentation (Fig. 1c). Sternum smooth, yellowish, margined with a dark border, extended between coxae IV. Clypeus 0.227 long. Chelicerae 0.286 long. Eyes normally developed. AME smallest. PME and PLE slightly larger than ALE. PME on the top of the cephalic lobe. PME–PLE distance = 0.123, AME–ALE distance = 0.019, AME and AME almost contiguous (0.009), PME–PME distance = 0.072. Eye diameters AME 0.041, ALE 0.057, PME 0.060, PLE 0.059. Legs yellowish, tibia and metatarsi of the first pair of legs with a light brown hue. Leg measurements as in Table 1. Femur I shorter than prosoma. Tibial spinal formula 1111. TmI 0.85–0.91. TmIV present. Abdomen pale yellow-whitish. Pedipalp as in Fig 1a-b. Palpal patella (*Pa* in Fig. 1a) longer than tibia. Palpal tibia (*Ti* in Fig. 1a–b) bearing a prominent and tapering apophysis (*TA* in Fig. 1a–b), the tip pointing upward and forward. Palpal cymbium (*Cy* in Fig. 1a–b) with a distinct long and pointed dorsal keel extending posteriorly (*kCy* in Fig. 1a–b). Embolus (*e* in Fig. 1a–b) long and very thin, coil-shaped.

Female (paratype from Lauson, Cogne, Italy, 15. Jul. 2019) (Fig. 1d–e). Prosoma 0.710 long, 0.542 wide, pale yellow. Sternum smooth, yellowish margined with a dark border, extended between coxae IV. Clypeus 0.137 long. Chelicerae 0.290 long. Eyes normally developed. AME smallest. PME–PLE distance = 0.048, AME–ALE distance = 0.050, AME–

Tab. 1: Leg measurements (mm) of *Peponocranium ambrosii* **sp. nov.** (male holotype and female paratype).

	I	II	III	IV	Pedipalp
Male holotype					
Femur	0.490	0.502	0.455	0.538	0.297
Patella	0.159	0.149	0.163	0.172	0.144
Tibia	0.535	0.459	0.366	0.544	0.114
Metatarsus	0.367	0.352	0.376	0.501	–
Tarsus	0.240	0.225	0.227	0.260	0.304 (Cy)
Female paratype from Lauson, Cogne (Italy)					
Femur	0.495	0.461	0.449	0.581	0.235
Patella	0.192	0.188	0.182	0.168	0.088
Tibia	0.463	0.338	0.358	0.551	0.139
Metatarsus	0.384	0.336	0.341	0.473	–
Tarsus	0.225	0.220	0.212	0.255	0.230

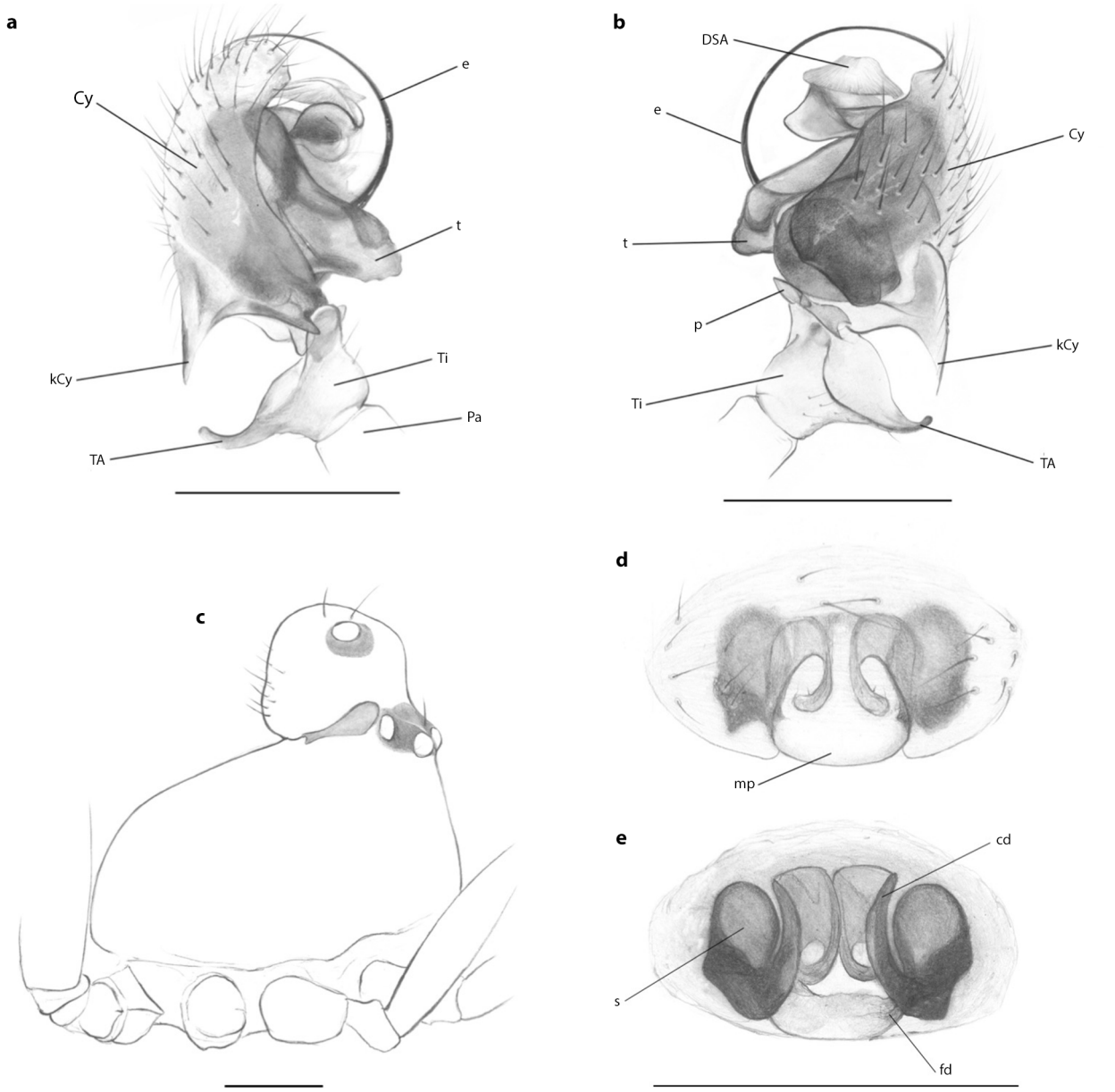

Fig. 1: *Peponocranium ambrosii* **sp. nov.** male pedipalp (**a–b**), male prosoma (**c**) and female epigyne/vulva (**d–e**). **a.** male left pedipalp, prolateral view; **b.** male left pedipalp, retrolateral view; **c.** male prosoma, lateral view; **d.** female epigyne, ventral view; **e.** female vulva, dorsal view (drawings: A. Infuso). Scale bars = 0.2 mm. Abbreviations: **cd**, copulatory duct; **Cy**, cymbium; **DSA**, distal suprategular apophysis; **e**, embolus; **fd**, fertilization duct; **kCy**, keel of cymbium; **mp**, median plate; **p**, paracymbium; **Pa**, patella; **s**, spermatheca; **t**, tegulum; **TA**, tibial apophysis; **Ti**, tibia.

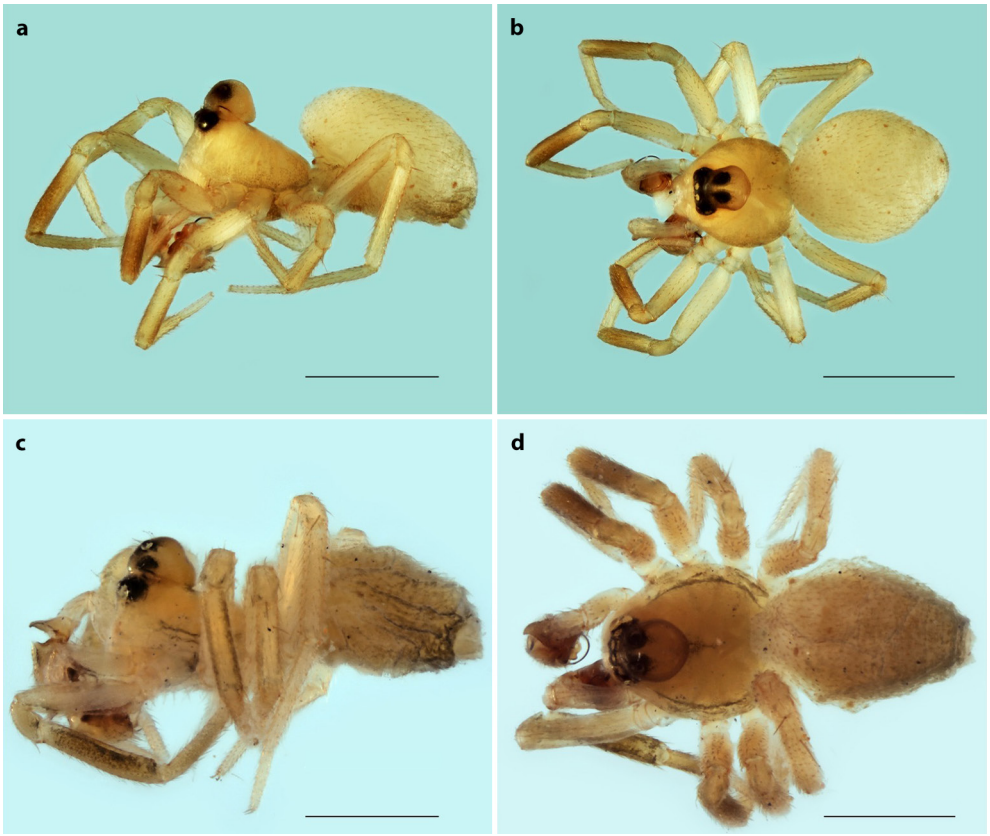

Fig. 2: *Peponocranium ambrosii* **sp. nov.** (male from Pree, Mendrisio, Switzerland) habitus (**a–b**) and comparative figures of *P. orbiculatum* (male from Saxony, Germany) habitus (**c–d**). **a.** *Peponocranium ambrosii* **sp. nov.** lateral view; **b.** dorsal view. **c.** *Peponocranium orbiculatum* lateral view; **d.** dorsal view (photos: P. Oger, https://arachno.piwigo.com). Scale bars = 0.5 mm

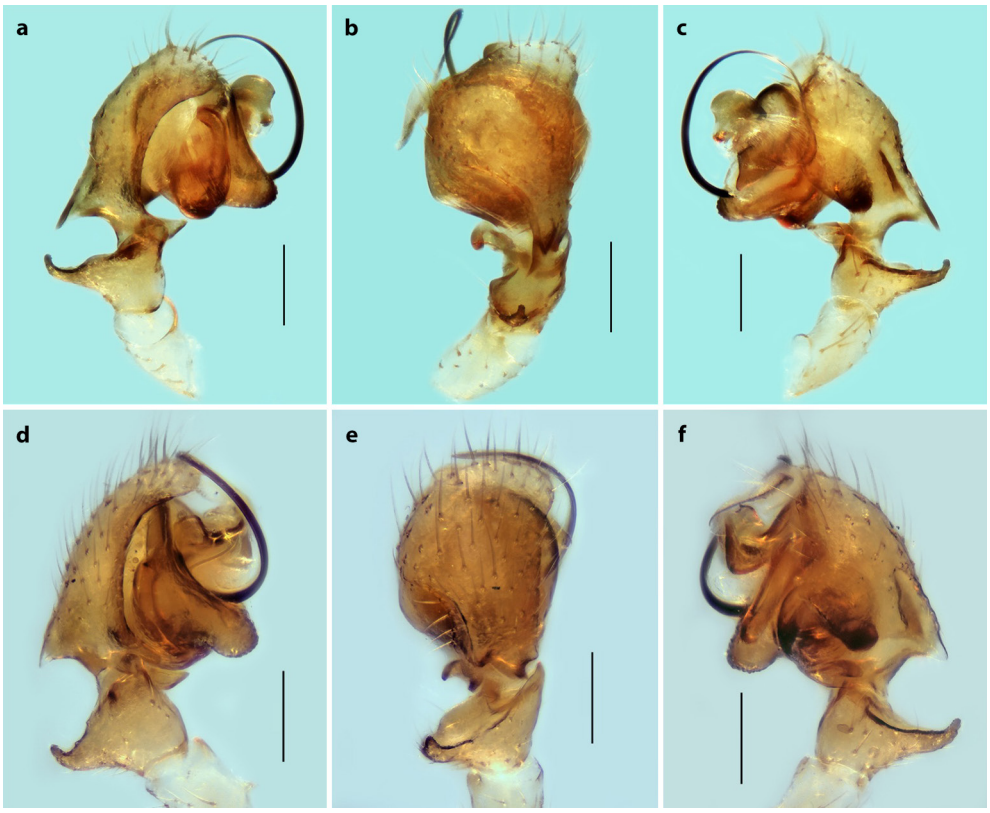

Fig. 3: *Peponocranium ambrosii* **sp. nov.** (specimen from Pree, Mendrisio, Switzerland) male pedipalp (**a–c**) and comparative figures of *P. orbiculatum* (specimen from Saxony, Germany) male pedipalp (**d–f**). **a.** *Peponocranium ambrosii* **sp. nov.** left pedipalp, prolateral view; **b.** id., dorsal view; **c.** id., retrolateral view. **d.** *Peponocranium orbiculatum* male left pedipalp, prolateral view; **e.** id., dorsal view; **f.** id., retrolateral view (photos: P. Oger, https://arachno.piwigo.com). Scale bars = 0.1 mm

AME distance = 0.033, PME–PME distance = 0.040. Eye diameters AME 0.029, ALE 0.036, PME 0.050, PLE 0.031. Legs yellowish, tibia and metatarsi of the first pair of legs with a light brown hue. Leg measurements as in Table 1. Femur I shorter than prosoma. Tibial spinal formula 1111. TmI 0.85–0.91. TmIV present. Abdomen pale yellow-whitish. Epigynum as in Fig 1d. Median plate of epigyne (*mp* in Fig. 1d) wider than long, margins slightly convergent anteriorly. Vulva as in Fig. 1e. Spermathecae (*s* in Fig. 1e) directed anteriorly. Copulatory ducts (*cd* in Fig. 1e) running parallel to spermathecae and extending anteriorly up to the level of their anterior margin.

Etymology. The species epithet derives from the name of the Swiss arachnologist Ambros Hänggi (latinised "Ambrosius"),

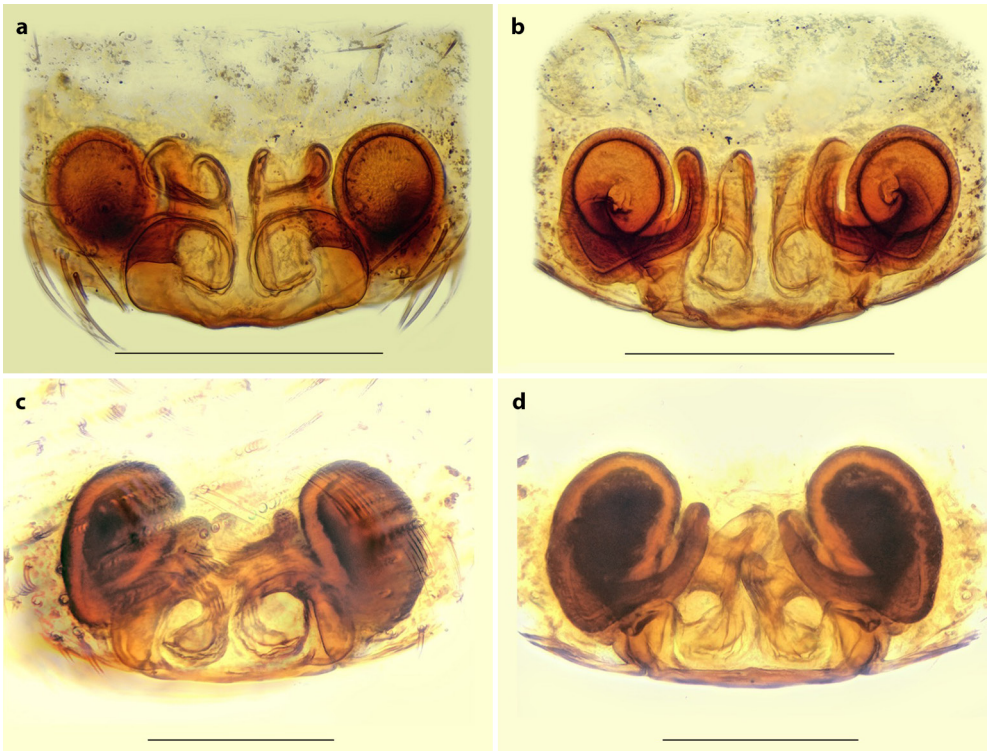

Fig. 4: *Peponocranium ambrosii* **sp. nov.** (specimen from Pree, Mendrisio, Switzerland) female epigyne/vulva (**a–b**) and comparative figures of *P. orbiculatum* (specimen from Saxony, Germany) female epigyne/vulva (**c–d**). **a.** *Peponocranium ambrosii* **sp. nov.** epigyne, ventral view; **b.** vulva, dorsal view. **c.** *Peponocranium orbiculatum* epigyne, ventral view; **d.** vulva, dorsal view (photos: P. Oger, https://arachno.piwigo.com). Scale bars = 0.1 mm

who made a considerable contribution to the knowledge of the spider fauna of the Alps, and initially hypothesized the existence of this new species.

Distribution. The known distribution of *P. ambrosii* **sp. nov.** is shown in Fig. 5. The species mostly occurs on the southern slope of the Alps, from Graian Alps (Northwestern Alps) to Rhaetian Alps (Central Eastern Alps) and Carnic Alps (Eastern Alps), across Valle d'Aosta (Northwestern Italy), Ticino (Southern Switzerland), Garda Lake and Trentino-Alto Adige (Northeastern Italy), and Tyrol (Western Austria).

Ecology. The new species preferably occurs in montane habitats between 800 and 2000 m a.s.l., mainly in alpine pastures and dry meadows with prevalent southern aspect. Most of the specimens were collected in grasslands dominated by *Brachypodium*, *Festuca*, *Carex* and *Molinia*, sometimes with sparse shrubs and young trees (*Pinus mugo, Betula pendula*, *Fraxinus excelsior*, *Acer* ssp.) or near the forest edge. A few specimens were also recorded in broadleaved (Piemonte and Ticino) and coniferous forests (Valle d'Aosta, Lombardia, Trentino-Alto Adige and Graubünden). Three records referred to lower elevations, in a vineyard at the edge of a forest at 510 m a.s.l. (Trivellone et al. 2013) and in sedge meadows on the northern bank of the Verbano Lake at 194 m a.s.l. Adult males and females are mostly found in spring and summer (approximately from April to August).

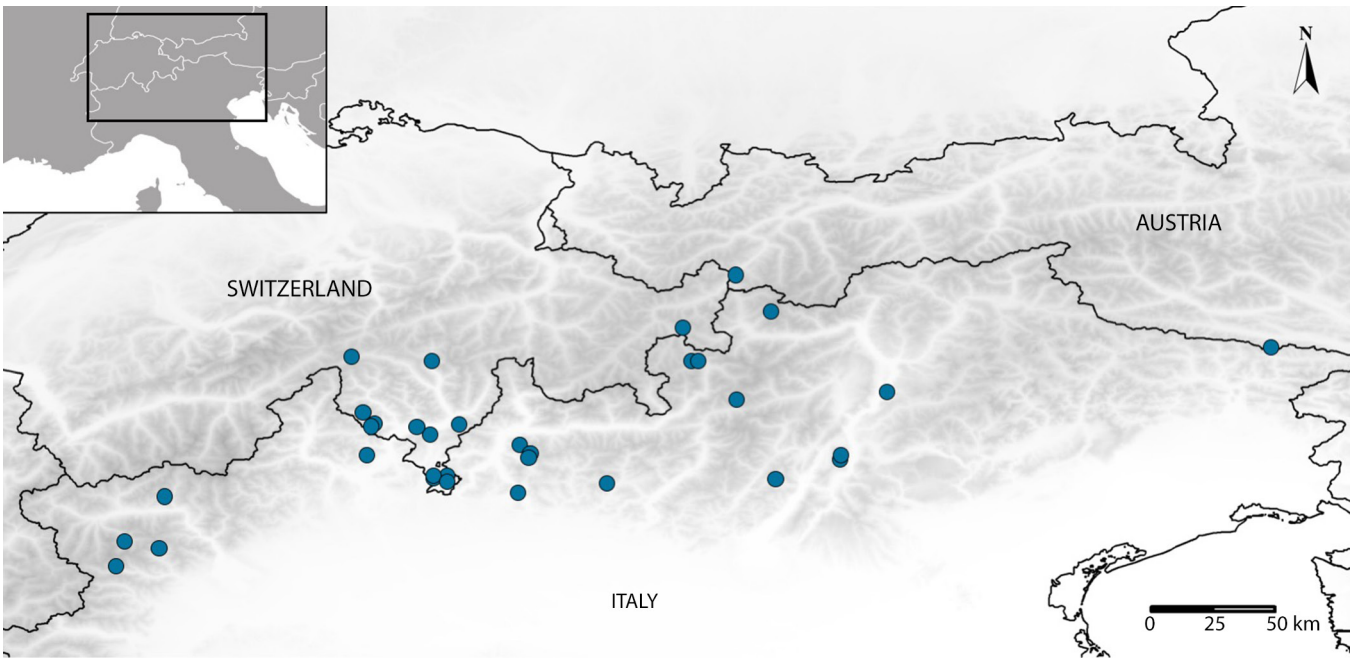

Fig. 5. Map showing the distribution range of *Peponocranium ambrosii* **sp. nov.**

Conservation status. Available information on the occurrence of *P. ambrosii* **sp. nov.** was used to evaluate the species against the IUCN criteria (IUCN 2001). Due to a lack of data, it is not possible to observe, estimate, infer or suspect trends in population size. On the same line of reasoning, a decline of > 30% over the past 10 years is unlikely, so the species does not meet the thresholds for criterion A. The Extent of Occurrence (EOO) is approximately 34600 km^2, which is far from qualifying for the Vulnerable category under the criterion B1 (EOO < 20000 km^2). On the other hand, the Area of Occupancy (AOO), *i.e.* the area of suitable habitat currently occupied by the species (IUCN 2001), is 128 km^2, meeting the thresholds for both the Vulnerable (AOO < 2000 km^2) and Endangered (AOO < 500 km^2) categories under criterion B2. While these values may be underestimates, it is likely that the AOO is less than 2000 km^2, which would qualify the species for the threatened categories under criterion B. However, there is no evidence of continuing decline or fluctuations in range or population size, and no direct threats to the species' survival have been identified. *Peponocranium ambrosii* **sp. nov.** seems to have a close association with south-exposed alpine pastures and dry meadows, which are typically watched over by monitoring and maintenance programmes (Lörtscher et al. 1994, Pantini et al. 2020). Moreover, a significant proportion of the records were found in protected areas and sites of the Natura 2000 network. Therefore, the extent and the quality of the species' habitat are not expected to decline significantly, and no major threats are likely to impact the entire population. Given the absence of major threats and population declines, the species does not meet criterion B for threatened categories. Whilst there is considerable lack of knowledge regarding population size, the lower plausible limit is well above the thresholds for criteria C and D, and the AOO is not highly restricted as required in criterion D2 (AOO < 20 km^2). In light of this, we classify the new *Peponocranium* as Least Concern (LC), as the species does not meet the thresholds required for the inclusion in a threatened category.

Discussion

This work supports the hypothesis of Hänggi (1989), who first pointed out the existence of a new putative species of *Peponocranium* in the Alps. Based on an analysis of specimens collected in different localities of the canton of Ticino (Southern Switzerland), he suggested slight deviations from *P. orbiculatum*, providing the first illustration of the copulatory organs of both the male and the female (Hänggi 1989). We corroborate this view thanks to the examination of material stored in museum and private collections, collected in different localities on the southern slope of the Alps. The new species is diagnosed by small details in the shape of the male pedipalp and the female copulatory organs. Males are readily distinguished by the form of the cymbial and tibial apophyses. Females require more care, but can be distinguished from females of *P. orbiculatum* by the form of the copulatory ducts. General size, leg length and overall pattern do not provide useful comparative details for separating the two species.

It seems likely that, due to its close resemblance to *P. orbiculatum*, this species was previously misidentified, and previous identifications of *P. orbiculatum* within the current range of the new species should be reassigned to this latter. Although locally rare, *P. orbiculatum* has a wide Palearctic distribution, extending from Central Europe to the Caucasus and the Southern Urals (Nentwig et al. 2025). However, based on the findings presented here, it appears not to occur on the southern slope of the Alps. According to our interpretation, all previous records of *P. orbiculatum* in Italy and Switzerland should be attributed to *P. ambrosii* **sp. nov.**, and *P. orbiculatum* should be removed from the national checklists. Nevertheless, its presence in northern Switzerland cannot be entirely ruled out, as it is known to occur in Baden-Württemberg, southern Germany, near the Swiss border (Arachnologische Gesellschaft 2025). Despite this possibility, there is currently no confirmed evidence of its occurrence within Swiss territory.

Conversely, the examination of specimens from different localities in Austria confirms the co-occurrence of both the species in this country, with *P. ambrosii* **sp. nov.** restricted to the south-west. However, due to the limited number of localities, the precise distributions and the geographic limits of the two species in Austria remain uncertain. In general terms, it seems reasonable to assume that *P. ambrosii* **sp. nov.** is restricted to the southern slope of the Alps, from Graian Alps in the West and in the South, to Ötztal Alps in the North, and Carnic Alps in the East (Fig. 5).

The two species show similarities in terms of habitat preference, despite them never being found in syntopy. *Peponocranium orbiculatum* occurs in a variety of open habitats at ground level, such as in grass, moss and leaf-litter (Nentwig et al. 2025), at different elevations. *Peponocranium ambrosii* **sp. nov.** seems to be more related to montane areas, at medium to high elevations, showing a close association with south-exposed alpine pastures and dry meadows, with low shrubs and young trees.

The geographical spread of *P. ambrosii* **sp. nov.** along the southern slope of the Alpine arc is likely enabled by the species' dispersal ability. Aerial dispersal is a well-documented behaviour in small linyphiids, conferring on the species high colonisation abilities (Duffey 1998, Blandenier 2009). This trait is expected to be relevant for the distribution pattern of *P. ambrosii* **sp. nov.**, as it enables connectivity between isolated patches of suitable habitat and supports the colonisation of new environments. The discovery of a male specimen in a burned forest at Pagnona, in Lombardia (Italy) further supports the species' potential for aerial dispersal.

Considering its distribution range, habitat quality, dispersal ability and the absence of known major threats, *P. ambrosii* **sp. nov.** is assessed as Least Concern (LC), as it does not meet any of the thresholds for inclusion in an IUCN threatened category. Although estimating changes in range and population size is not possible due to lack of data, there is no evidence of any direct major threats to the species.

While the application of the IUCN Red List criteria may be a challenging process due to the limited data availability (Cardoso et al. 2011b) and may not be appropriate for most invertebrate species (Cardoso et al. 2011a), it is still the most widely used and objective tool for evaluating species' extinction risks. However, further research is needed to clarify ecology and habitat requirements of *P. ambrosii* **sp. nov**, and to identify any potential threats.

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