



Species Conservation Profile

Species conservation profile of the alpine stenoendemic spider *Vesubia jugorum* (Araneae, Lycosidae) from the Maritime Alps

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Abstract

Vesubia jugorum (Simon, 1881) (Araneae: Lycosidae) is a large-sized wolf spider that occurs in alpine rocky areas above 2,000 m altitude. The species is stenoendemic, with a limited number of populations documented in the literature from the Maritime Alps (Italy, France). Due to the climate change, the current observed extent of occurrence (EEO 4,412 km²) and the area of occupancy (AOO 835 km²) are declining.

Keywords

Climate Change, wolf spider, high altitudes, IUCN, red list

Contributors

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Species information

Taxon Name: *Vesubia jugorum* (Simon, 1881)

Common names

Giant alpine spider (English)

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Arachnida	Araneae	Lycosidae

Taxonomic notes

Vesubia jugorum is a large-sized spider (body length: 15–20 mm, prosoma: 7-9 mm). The prosoma is generally blackish or dark brown, marked with black streaks irradiating from the fovea. The opisthosoma is dark grey dorsally and brown reddish ventrally. Legs are dark brown dorsally and reddish-yellowish ventrally, especially on coxae (Figs 1, 2). See Tongiorgi (1968), Tongiorgi (1969), Maurer and Thaler (1988) and Nentwig et al. (2016) for genitalic drawings and other relevant diagnostic features.

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic



Figure 1.

Habitus of *Vesubia jugorum* — female. [Photo credit: Emanuele Biggi, 2003]



Figure 2.

Vesubia jugorum — female with spiderlings. [Photo credit: Emanuele Biggi, 2016]

Countries:

- France
- Italy

Map of records (image):

Fig. 3

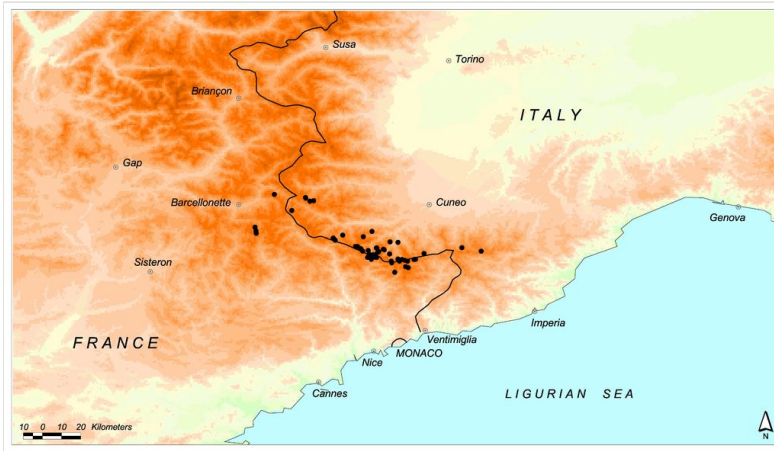


Figure 3.

Distribution map of *Vesubia jugorum* (black dots).

Map of records (Google Earth):

Suppl. material 1

Basis of EOO and AOO: Species Distribution Model

Basis (narrative)

We based the Species Distribution Model (SDM) on literature data (Isaia et al. (2015), Isaia et al. (2007), Maurer and Thaler (1988), Simon (1881), Tongiorgi (1968), Tongiorgi (1969)) and original unpublished data gathered during recent surveys (see New occurrences).

Occurrences were used to model the current distribution of the species through a MaxEnt model in *dismo* R package (Hijmans et al. 2014). See Mammola et al. (2015) and Isaia et al. (2016) for details on modeling procedure. We estimated the extent of occurrence (EOO) and the area of occupancy (AOO) from the model, as implemented in the *red* R package (Cardoso 2016).

To estimate the potential variation of the EOO and AOO due to future climate change, the model was projected in the future (year 2028; i.e. 3 spider generations) according to two different representative concentration pathways, namely rcp 2.6 (low emission rate) and rcp 8.5 (high emission rate).

Min Elevation/Depth (m): 2037

Max Elevation/Depth (m): 2939

Range description

Vesubia jugorum was originally described from an unspecified locality at high altitude in the vicinity of St. Martin-Vésubie (Haute Vésubie Valley, France). The range of this stenoendemic species is centered on the Maritime Alps (43 records). Two additional subpopulations occur at the eastern and north-western corners of the range, in Ligurian (2 records) and Cottian Alps (2 records). Most localities are situated in the Site of Community Importance and Special Area of Conservation IT1160056 “Alpi Marittime” (NW Italy).

New occurrences

Materials

- a. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: France; stateProvince: Alpes-Maritimes; municipality: Uvernet Fours; locality: Col des Esbéliousses; verbatimElevation: 2500; minimumElevationInMeters: 2500; maximumElevationInMeters: 2500; decimalLatitude: 44.28240; decimalLongitude: 6.71840; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 23 Jul 2006; habitat: Rocky areas; individualCount: 1; sex: female; lifeStage: adult; recordedBy: Breton, Braud; identifiedBy: Herve; dateIdentified: 2006; basisOfRecord: PreservedSpecimen
- b. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: France; stateProvince: Alpes-Maritimes; municipality: Uvernet Fours; locality: Le Trou de l'Aigle; verbatimElevation: 2748; minimumElevationInMeters: 2748; maximumElevationInMeters: 2748; decimalLatitude: 44.26490; decimalLongitude: 6.72290; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 20 Aug 2006; habitat: Rocky areas; individualCount: 1; sex: female; lifeStage: adult; recordedBy: Breton; identifiedBy: Isaia (Validated); dateIdentified: 2016; basisOfRecord: Based on photographs
- c. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: France; stateProvince: Alpes-Maritimes; municipality: Meyrannes; locality: Les Courroies de David; verbatimElevation: 2405; minimumElevationInMeters: 2405; maximumElevationInMeters: 2405; decimalLatitude: 44.43750; decimalLongitude: 6.80880; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 25 Jun 2007; habitat: Rocky areas; individualCount: 6; sex: female; lifeStage: adult; recordedBy: Breton; identifiedBy: Isaia (Validated); dateIdentified: 2016; basisOfRecord: Based on photographs
- d. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: France; stateProvince: Alpes-Maritimes; municipality: Allos; locality: Lac de la Petite Cayolle; verbatimElevation: 2600; minimumElevationInMeters: 2600; maximumElevationInMeters: 2600; decimalLatitude: 44.25400; decimalLongitude: 6.72370; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 03 Aug 2007; habitat: Rocky areas; individualCount: 1; sex: male; lifeStage: adult; recordedBy: Breton; identifiedBy: Isaia (Validated); dateIdentified: 2016; basisOfRecord: Based on photographs
- e. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince:

- Cuneo; municipality: Valdieri; locality: Passo di Préfouns; verbatimElevation: 2395; minimumElevationInMeters: 2395; maximumElevationInMeters: 2395; decimalLatitude: 44.16970; decimalLongitude: 7.22490; georeferenceProtocol: GPS; samplingProtocol: vidity; eventDate: 09 Aug 2011; habitat: Rocky areas; individualCount: 5; sex: female; lifeStage: adult; recordedBy: Morando, Pala; identifiedBy: Isaia (Validated); dateIdentified: 2016; basisOfRecord: Based on photographs
- f. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Entracque; locality: Sentiero Pagari; verbatimElevation: 2500; minimumElevationInMeters: 2500; maximumElevationInMeters: 2500; decimalLatitude: 44.13050; decimalLongitude: 7.41020; georeferenceProtocol: GPS; samplingProtocol: vidity; eventDate: 17 Aug 2011; habitat: Rocky areas; individualCount: 1; sex: female; lifeStage: adult; recordedBy: Giordano, Dalmaso; identifiedBy: Isaia (Validated); dateIdentified: 2016; basisOfRecord: Based on photographs
- g. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: France; stateProvince: Alpes-Maritimes; municipality: Saint-Martin-Vesubie; locality: Lake Mercantour; verbatimElevation: 2600; minimumElevationInMeters: 2600; maximumElevationInMeters: 2600; decimalLatitude: 44.14031; decimalLongitude: 7.29012; georeferenceProtocol: GPS; samplingProtocol: vidity; eventDate: 02 Aug 2011; habitat: Rocky areas; individualCount: 1; sex: female; lifeStage: adult; recordedBy: Piacenza; identifiedBy: Isaia (Validated); dateIdentified: 2016; basisOfRecord: Based on photographs
- h. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Valdieri; locality: Bivio Lago Nasta; verbatimElevation: 2792; minimumElevationInMeters: 2792; maximumElevationInMeters: 2792; decimalLatitude: 44.16750; decimalLongitude: 7.30020; georeferenceProtocol: GPS; samplingProtocol: vidity; eventDate: 30 Aug 2011; habitat: Rocky areas; individualCount: 1; sex: female; lifeStage: adult; recordedBy: Morando, Pala; identifiedBy: Isaia (Validated); dateIdentified: 2016; basisOfRecord: Based on photographs
- i. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Valdieri; locality: Colle di Ciriegia; verbatimElevation: 2543; minimumElevationInMeters: 2543; maximumElevationInMeters: 2543; decimalLatitude: 44.14183; decimalLongitude: 7.28315; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 24 Jun 2016; habitat: Rocky areas; individualCount: 6; sex: female; lifeStage: adult; recordedBy: Isaia, Mammola; identifiedBy: Isaia; dateIdentified: 2016; basisOfRecord: PreservedSpecimen
- j. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Valdieri; locality: Vallone di Ciriegia; verbatimElevation: 2265; minimumElevationInMeters: 2265; maximumElevationInMeters: 2265; decimalLatitude: 44.14887; decimalLongitude: 7.27741; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 24 Jun 2016; habitat: Rocky areas; individualCount: 3; sex: female; lifeStage: juvenile, adult; recordedBy: Isaia, Mammola; identifiedBy: Isaia; dateIdentified: 2016; basisOfRecord: PreservedSpecimen
- k. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Valdieri; locality: Pian della Casa; verbatimElevation: 2037;

- minimumElevationInMeters: 2037; maximumElevationInMeters: 2037; decimalLatitude: 44.15387; decimalLongitude: 7.27433; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 24 Jun 2016; habitat: Rocky areas; individualCount: 1; sex: female; lifeStage: adult; recordedBy: Isaia, Mammola; identifiedBy: Isaia; datelIdentified: 2016; basisOfRecord: PreservedSpecimen
- l. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Entracque; locality: Bivacco Moncalieri; verbatimElevation: 2710; minimumElevationInMeters: 2710; maximumElevationInMeters: 2710; decimalLatitude: 44.13331; decimalLongitude: 7.39079; georeferenceProtocol: GPS; samplingProtocol: vidity; eventDate: 23 Aug 2011; habitat: Rocky areas; individualCount: 1; sex: female; lifeStage: adult; recordedBy: Morando; identifiedBy: Isaia (Validated); datelIdentified: 2016; basisOfRecord: Based on photographs
- m. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Vinadio; locality: Alpine scree near Colle della Lombarda; verbatimElevation: 2342; minimumElevationInMeters: 2342; maximumElevationInMeters: 2342; decimalLatitude: 44.21163; decimalLongitude: 7.39079; georeferenceProtocol: GPS; samplingProtocol: vidity; eventDate: 20 Jul 2016; habitat: Rocky areas; individualCount: 1; sex: female; lifeStage: adult; recordedBy: Mammola; identifiedBy: Mammola (Validated); datelIdentified: 2016; basisOfRecord: Based on photographs
- n. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Acceglio; locality: Passo dell'Escalon; verbatimElevation: 2939; minimumElevationInMeters: 2939; maximumElevationInMeters: 2939; decimalLatitude: 44.42262; decimalLongitude: 6.95581; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 25 Aug 2016; habitat: Rocky areas; individualCount: 2; sex: female; lifeStage: adult; recordedBy: Isaia, Mammola; identifiedBy: Isaia; datelIdentified: 2016; basisOfRecord: PreservedSpecimen
- o. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Canosio; locality: Passo della Gardetta; verbatimElevation: 2568; minimumElevationInMeters: 2568; maximumElevationInMeters: 2568; decimalLatitude: 44.40713; decimalLongitude: 6.99455; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 25 Aug 2016; habitat: Rocky areas; individualCount: 1; sex: female; lifeStage: adult; recordedBy: Isaia, Mammola; identifiedBy: Isaia; datelIdentified: 2016; basisOfRecord: PreservedSpecimen
- p. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Acceglio; locality: Oserot; verbatimElevation: 2508; minimumElevationInMeters: 2508; maximumElevationInMeters: 2508; decimalLatitude: 44.40522; decimalLongitude: 6.97708; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 25 Aug 2016; habitat: Rocky areas; individualCount: 1; sex: female; lifeStage: adult; recordedBy: Isaia, Mammola; identifiedBy: Isaia; datelIdentified: 2016; basisOfRecord: PreservedSpecimen
- q. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Argentera; locality: Rocca dei Tre Vescovi; verbatimElevation: 2628; minimumElevationInMeters: 2628; maximumElevationInMeters: 2628; decimalLatitude: 44.36185; decimalLongitude: 6.89117; georeferenceProtocol: GPS; samplingProtocol:

- hand collecting; eventDate: 19 Aug 2016; habitat: Rocky areas; individualCount: 2; sex: female; lifeStage: adult; recordedBy: Isaia, Mammola, Biggi, Galindo; identifiedBy: Isaia; dateIdentified: 2016; basisOfRecord: PreservedSpecimen
- r. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Entracque; locality: Vallone del Chiapous; verbatimElevation: 2324; minimumElevationInMeters: 2324; maximumElevationInMeters: 2324; decimalLatitude: 44.17833; decimalLongitude: 7.32277; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 06 Aug 2016; habitat: Rocky areas; individualCount: 5; sex: male, female; lifeStage: adult; recordedBy: Milano; identifiedBy: Isaia; dateIdentified: 2016; basisOfRecord: PreservedSpecimen
- s. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Vinadio; locality: Passo Tesina; verbatimElevation: 2450; minimumElevationInMeters: 2450; maximumElevationInMeters: 2450; decimalLatitude: 44.23121; decimalLongitude: 7.08665; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 20 Jul 2016; habitat: Rocky areas; individualCount: 5; sex: male, female; lifeStage: adult; recordedBy: Isaia, Mammola, Milano; identifiedBy: Isaia; dateIdentified: 2016; basisOfRecord: PreservedSpecimen
- t. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Vinadio; locality: Passo di Sant'Anna; verbatimElevation: 2397; minimumElevationInMeters: 2397; maximumElevationInMeters: 2397; decimalLatitude: 44.22240; decimalLongitude: 7.09513; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 20 Jul 2016; habitat: Rocky areas; individualCount: 5; sex: female; lifeStage: adult; recordedBy: Isaia, Mammola, Milano; identifiedBy: Isaia; dateIdentified: 2016; basisOfRecord: PreservedSpecimen
- u. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Valdieri; locality: Rifugio Bozano; verbatimElevation: 2390; minimumElevationInMeters: 2390; maximumElevationInMeters: 2390; decimalLatitude: 44.18480; decimalLongitude: 7.29145; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 01 Aug 2016; habitat: Rocky areas; individualCount: 4; sex: male, female; lifeStage: adult; recordedBy: Milano; identifiedBy: Isaia; dateIdentified: 2016; basisOfRecord: PreservedSpecimen
- v. scientificName: *Vesubia jugorum*; family: Lycosidae; taxonRank: species; scientificNameAuthorship: (Simon, 1881); continent: Europe; country: Italy; stateProvince: Cuneo; municipality: Chiusa Pesio; locality: Canale dei Torinesi (Monte Marguareis); verbatimElevation: 2160; minimumElevationInMeters: 2160; maximumElevationInMeters: 2160; decimalLatitude: 44.17671; decimalLongitude: 7.69461; georeferenceProtocol: GPS; samplingProtocol: hand collecting; eventDate: 21 Aug 2016; individualCount: 4; sex: male, female; lifeStage: adult; recordedBy: Isaia, Galindo; identifiedBy: Isaia; dateIdentified: 2016; basisOfRecord: PreservedSpecimen

Extent of occurrence

EOO (km²): 4412

Trend: Decline (projected)

Justification for trend

The species inhabits rocky areas of the subnival and nival zones of the Maritime Alps. The high altitude regions are particularly vulnerable to climatic variations due to climate change, with warming rates approximately doubling the global average (Böhm et al. 2001). In consequence of temperature increase, range shifts towards higher latitudes or altitudes are expected (Bellard et al. 2012), causing a decrease in the EOO. In particular, we predict a future reduction of the EOO ranging from 24% (low emission scenario) to 41% (high emission scenario).

Future decline (%): 41

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km²): 835

Trend: Decline (projected)

Justification for trend

Future forecasts based on different emission scenarios show a significant reduction in the bioclimatic range of *Vesubia jugorum* (details in Isaia et al. (2016)). We predict a future reduction of the AOO ranging from 12% (low emission scenario) to 32% (high emission scenario). In this perspective, it is important to take into account the connectivity of the suitable habitat, in order to provide coherent interpretations of the future trends. Suitable ecological corridors for this species would be represented by high-altitude rocky areas, which rarely occur between the Maritime Alps and the northern Alpine districts. The species is probably also limited by its low dispersal ability.

Future decline (%): 32

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Locations

Number of locations: 1

Justification for number of locations

The whole population is affected by the ongoing climate change.

Trend: Stable

Population

Number of individuals: Unknown —a census/estimation of the population has never been attempted.

Trend: Decline (inferred)

Justification for trend

Inferred from the decline in AOO.

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: 3

Trend: Decline (projected)

Justification for trend

The main subpopulation of the species is centred in Maritime Alps. This core area includes over 90% of the known localities. Two additional subpopulations are identified at the north-western and eastern corners of the distribution range, corresponding to the Southern Cottian and Ligurian Alps, respectively. All future warming scenarios predict the extinction of the latter subpopulation.

Extreme fluctuations?: Unknown

Justification for fragmentation

Within the core area the suitable habitat is roughly continuous, with peaks and rocky areas ensuring connectivity between local populations. However, unsuitable habitat —namely grasslands at lower altitudes— reduces connectivity between subpopulations.

Habitat

System: Terrestrial

Habitat specialist: Yes

Habitat (narrative)

The species is restricted to alpine rocky areas above 2,000 m. These include rocky debris, boulder fields, and alpine screes (Figs 4, 5).



Figure 4.

Typical rocky areas inhabited by *Vesubia jugorum* — Maritime Alps, Province of Cuneo. [Photo credit: Emanuele Biggi, 2016]

Trend in extent, area or quality?: Stable

Justification for trend

The optimal habitat for the species is not expected to undergo significant variations in the future, as touristic pressure is negligible in the high mountain peaks of the Maritime Alps. Altitudinal shifts of vegetation due to climate change may hypothetically affect the extension of the subnival zone determining small variations in the extent of high altitude rocky areas.

Habitat importance: Major Importance

Habitats:

- 6. Rocky areas (e.g. inland cliffs, mountain peaks)



Figure 5.

An example of rocky areas colonized by *Vesubia jugorum* — Maritime Alps, Province of Cuneo. [Photo credit: Filippo Milano, 2016]

Ecology

Size: Body length: 15–20 mm, prosoma: 7–9 mm

Generation length (yr): 4

Dependency of single sp?: No

Ecology and traits (narrative)

The species is active during the warm season, from the snow melting in late June to mid September. Males are mainly found from July to August, whereas females and immatures can be found throughout the whole season. During the day, individuals can be observed wandering on the rocks. Females with cocoons build retreats under stones (see illustration in Tongiorgi (1969)), usually of 10–15 x 3cm. Preliminary data on reared individuals and estimations based on body size suggest generation length > 3–4 years.

Threats**Threats**

Threat type: Future

Threats:

- 11. Climate change & severe weather
- 11.1. Climate change & severe weather - Habitat shifting & alteration
- 11.3. Climate change & severe weather - Temperature extremes

Conservation**Conservation actions**

Conservation action type: In Place

Conservation actions:

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

Conservation action type: Needed

Conservation actions:

- 3. Species management
- 3.3. Species management - Species re-introduction
- 3.4. Species management - Ex-situ conservation
- 4. Education & awareness

Justification for conservation actions

Most of the species range falls within the borders of national parks, sites of community importance and special protection areas, namely Parco Naturale Alpi Marittime (Italy), Parco Naturale del Marguareis (Italy) and Parc National du Mercantour (France).

In the light of the existing threats, it is expected that the survival of the species will depend on monitoring, conservation management and translocation programmes. Ex-situ conservation should also be considered, to ensure the preservation of healthy individuals for re-introduction in suitable habitats situated to the north from the current distribution area.

Other**Research needed:**

- 1. Research
- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 2. Conservation Planning

- 2.1. Conservation Planning - Species Action/Recovery Plan
- 3. Monitoring
- 3.1. Monitoring - Population trends

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Supplementary material

Suppl. material 1: Extent of Occurrence of *Vesubia jugorum* (Simon, 1881)

Authors: Stefano Mammola, Filippo Milano, Pedro Cardoso, Marco Isaia

Data type: Geographic range

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