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First record of *Stegania trimaculata* (de Villers, 1789) (Lepidoptera, Geometridae) in Poland, with comments on its distribution in Europe

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Abstract: The article reports on the first record of *Stegania trimaculata* (de Villers, 1789) (Lepidoptera, Geometridae) from western Poland. Its distribution in Europe and beyond is discussed, with particular focus on its eastward expansion and possible colonization of western Poland. The presence of this species in Asian countries is questioned in the light of possible confusion with *Stegania dilectaria* (Hübner, 1790) (Lepidoptera, Geometridae).

Keywords: faunistics, biodiversity, geographical distribution, new record, *Stegania trimaculata*, Poland

Introduction

The genus *Stegania* Guenée, 1845, a member of the subfamily Ennominae Duponchel, 1845 contains ten species. Five of them occur in North Africa and one in Bali. According to Skou & Sihvonen (2015), the other four have been reported from Europe: *S. dilectaria* (Hübner, 1790), *S. cararia* (Hübner, 1790), *S. dalmataria* (Guenée, 1858) and *S. trimaculata* (de Villers, 1789). Two of these – *S. dilectaria* and *S. cararia* – have been reported from Poland to date (Malkiewicz 2017).

Stegania trimaculata (de Villers, 1789) is a Sub-Mediterranean species. In Europe, it is common in the Iberian Peninsula, southern France including Corsica, and Italy including Sardinia and Sicily (Skou & Sihvonen 2015). It has also been reported from the British Isles, the Benelux countries and Denmark (Hendriksen & Karsholt 2004), Germany (Gelbrecht 2000, 2006) and the alpine countries. To date, however, it has not been recorded anywhere in eastern Europe or in the Balkans (Malkiewicz 2012), although it was recently found in Croatia (Koren *et al.* 2015). There is an old single record from the Volga-Don region in Russia (Mironov *et al.* 2008) but it is very likely the consequence of erroneous labelling (Skou & Sihvonen 2015). Outside Europe, it has been reported from North Africa – Algeria, Morocco and Tunisia (*S. trimaculata* ssp. *ochrearia* (Bang-Haas, 1910)), and also from Turkmenistan, Uzbekistan and Turkey.

In central Europe, *S. trimaculata* occurs mainly along rivers, but also in towns and woodlands, wherever its food plants occur (Skou & Sihvonen 2015). It inhabits riparian forest and scrub, also with single poplar and willow trees, as well as a variety of anthropogenic habitats (Malkiewicz 2012). The caterpillars feed on poplar trees, especially *Populus alba*, *P. nigra* and *P. x canadensis* (Ebert *et al.* 2003). In Sardinia and Morocco, larvae were found on *Salix* spp. (Skou & Sihvonen 2015). The species is normally bivoltine, but during warm summers it may produce three generations between May and September (Gelbrecht 2006).

Based on the range of *S. trimaculata* known so far in Europe, it was hypothesized that the species should also occur in Poland in the selected location, especially in areas bordering

on north-eastern Germany, where it has been confirmed in recent years.

Material and Methods

The moths were attracted at night to a white screen illuminated by a 250 W mercury vapour bulb, powered by a portable generator, and also to a number of accumulator-powered UV light traps, which were deployed for one night in interesting ecosystems.

The voucher specimens are deposited in the collection of Łukasz Matuszewski.

Results

Stegania trimaculata (de Villers, 1789) was recorded for the first time in Poland during a field study of moths in the province of Western Pomerania (NW Poland). The moths (Fig. 1) were trapped at Cedynia (UTM: VU45) in the West Pomeranian Lake District [Pojezierze Zachodniopomorskie] on 27.05.2020. Males and females (2♂♂, 2♀♀ leg. Ł. Matuszewski & R. Wąsala) were caught at light in dry psammophilous sward on the edge of a moor (Fig. 2).

A wide spectrum of colour saturation and contrast is possible in this species. The diagnostic characters of the specimens concerned were as follows:

a) wingspan: 21-22 mm;

b) male (Fig. 1A): more worn than the other three specimens, almost white, forewings pale yellow only along the leading edge, lines narrow, brown; hindwings: only postmedial line visible;

c) male (Fig. 1D) and females (Fig. 1B, C): forewings ochre-yellow, suffused with brown, veins also brown, thus forming a weakly reticulate pattern, lines distinct, brown; hindwings similarly stippled brown, veins brown;

d) male antennae (Fig. 1A, D) bipectinate; female antennae (Fig. 1B, C) filiform;

f) thorax white (Fig. 1A), brown (Fig. 1B, C) dark brown (Fig. 1D);

g) male and female hind tibia with 2+2 spurs;

h) abdomen concolorous with thorax and wings.

Discussion

Stegania trimaculata is not regarded as a migratory moth. However, in recent years, its distribution has altered considerably as a result of dispersal, even though new localities are only gradually being colonized. Given the nature of such movements, the appearance of a new species of geometrid moth is a noteworthy occurrence. Interestingly, of all the *Stegania* species, only *S. trimaculata* is currently known to be undergoing such range modifications (Skou & Sihvonen 2015). Ongoing climatic changes in Europe are certainly creating favourable conditions for this west-to-east expansion, and further potential factors mediating this process include the direction of prevailing winds, the lack of geographical barriers in the form of high mountain ranges, and the abundance of larval host plants.

Researchers are of the opinion that the historical records of *S. trimaculata* from Turkmenistan, Uzbekistan and Turkey, and also the single one from Russia, could have been due to mis-labelling as a result of confusion with *S. dilectaria* (Skou & Sihvonen 2015), which is widely distributed in those parts of Asia and in eastern Europe (Fig. 4). While there have been no more new records of *S. trimaculata* in those countries, *S. dilectaria* is still being recorded there (GBIF).

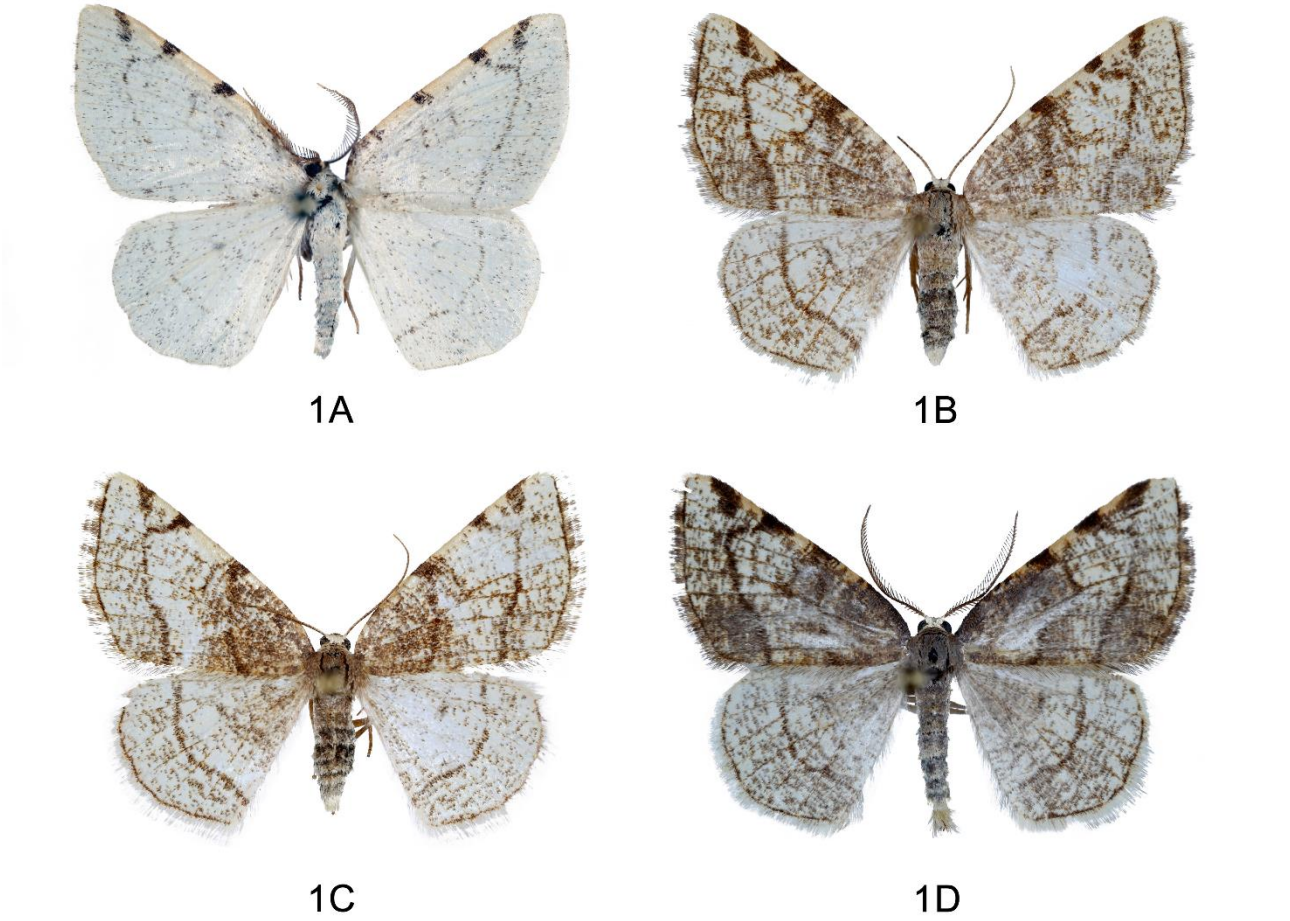

Fig. 1. Different colour forms of *Stegania trimaculata* (de Villers, 1789), from Cedynia, Poland, 27.05.2020: A) and D) male; B) and C) female. Leg. Ł. Matuszewski & R. Wąsala. Photo Ł. Matuszewski.

The morphological features distinguishing *S. trimaculata* from *S. dilectaria* are shown on Fig. 3. The most important difference between them lies in the shape of the postmedial line of the forewing. In *S. trimaculata* it runs roughly parallel to the outer edge of the wing, before turning through almost 90 degrees to meet the costa. In *S. dilectaria* the postmedial line is distinctly wavy or concave, and sharply angled before the costa. The hindwing postmedial line in *S. trimaculata* is gently curved, though may sometimes be slightly concave; in *S. dilectaria* it is clearly undulating.

It is difficult to verify the correctness of these historical data, as this would require re-examination of the voucher specimens. Apart from the problematic single, historical records from Asia, obtained far from the contiguous range of *S. trimaculata*, this species and *S. dilectaria* have never yet been found to occur sympatrically on that continent. However, one consequence of the recent ongoing eastward expansion of *S. trimaculata* is that the ranges of both species have begun to overlap in central Europe (Fig. 4)

Fig. 2. The biotope at Cedynia, where *Stegania trimaculata* (de Villers, 1789) was found for the first time in Poland. Photo R. Wąsala.

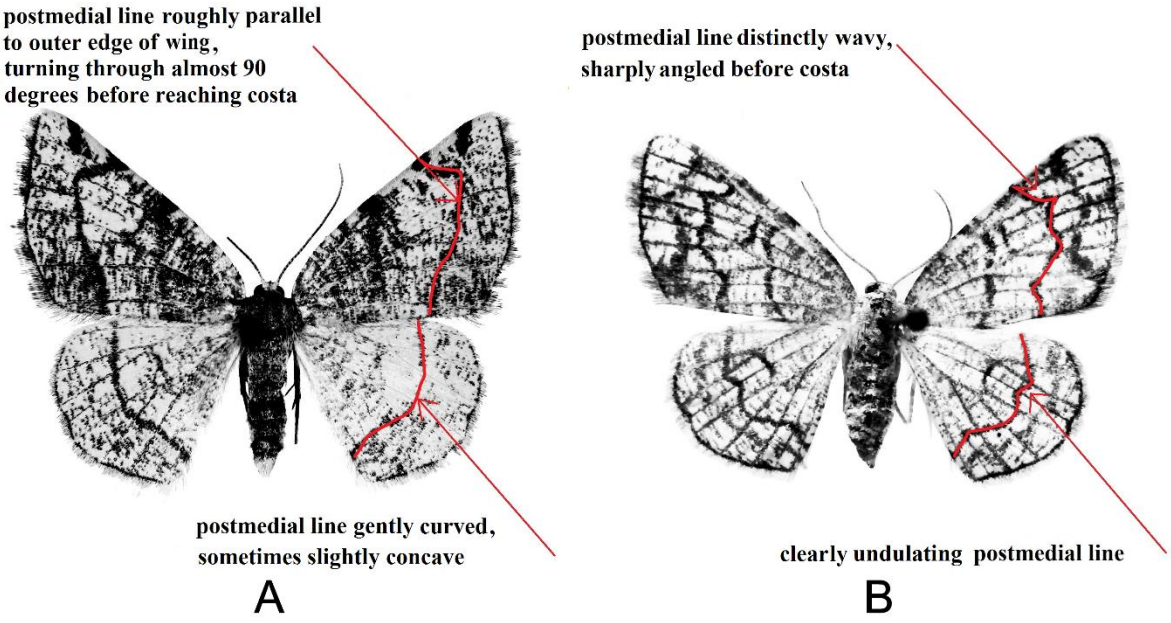

Fig. 3. Morphological differences between: A) *Stegania trimaculata* (de Villers, 1789), 27.05.2020 – 1♂ from Cedynia, leg. Ł. Matuszewski & R. Wąsala (photo Ł. Matuszewski) and B) *Stegania dilectaria* (Hübner, 1790), 30.07.1991 – 1♀ from Oreske, Slovakia, leg. Z. Tokar (photo A. Malkiewicz, provided by the author). The voucher specimen *of S. dilectaria* is deposited in the collection of A. Malkiewicz.

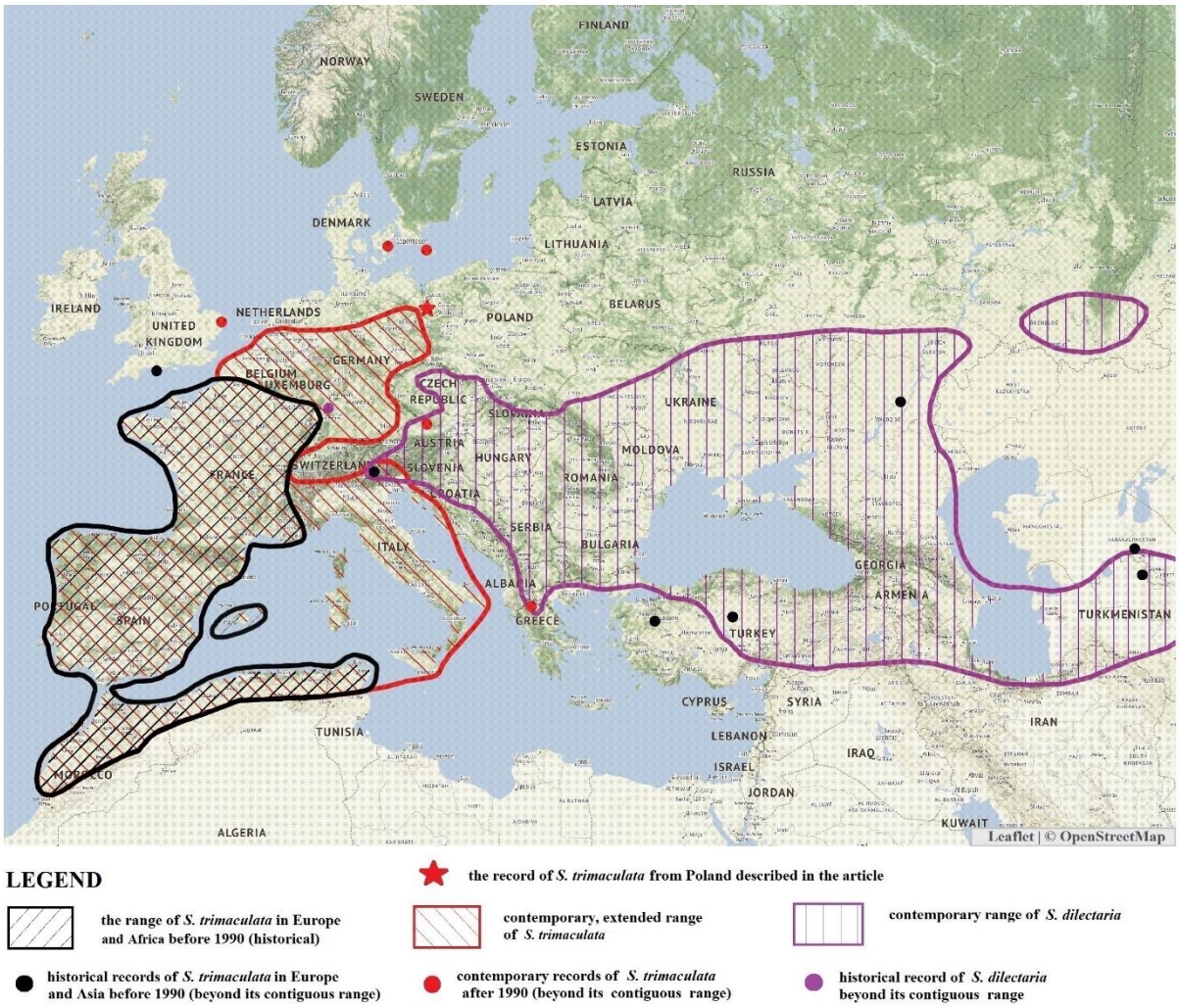

Fig. 4. Range of *Stegania trimaculata* (de Villers, 1789) in Europe, Asia and Africa, compared to that of *S. dilectaria* (Hübner, 1790). Map based on the Leaflet OpenStreetMap license, modified by the authors: Ł. Matuszewski & R. Wąsala.

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