

The Dutch species of *Zeiraphera*, with *Z. rufimitrana* as an addition to the Dutch list (Lepidoptera: Tortricidae)

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Abstract: Four species of *Zeiraphera* are known from Europe, and all four are now found in The Netherlands. Identification keys to the Dutch species are presented, based on external characters and genitalia as well. Moreover, biology and faunistics are discussed. *Zeiraphera rufimitrana* is recorded here for the first time from The Netherlands.

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Introduction

The tortricid genus *Zeiraphera* is a relatively small one of which about twenty species occur in the Palaearctic and eight in the Nearctic. From Europe four species are known which are now all recorded from The Netherlands. These four species were formerly placed in large heterogeneous genera, such as *Grapholitha*, *Steganoptycha*, *Eucosma* and *Semasia*. The splitting up of large tortricid genera, based on the structure of the genitalia, is mainly the result of Obraztsov's work on the generic subdivision of the Palaearctic Tortricidae. His premature death prevented the completion of his revision. However, Obraztsov placed the classification, to be used in the unfinished part (in which the genus *Zeiraphera* would be discussed), at the disposal of other authors, such as Swatschek (1958) and Hannemann (1961). The former confirmed, based on the results of his studies on larval morphology, the correctness of the erection of a separate genus for the species in question.

The adult moths are medium-sized tortricids; the wingspan of the Dutch species ranges from 12.0 mm to 22.0 mm. Colour and markings of the forewing are relatively inconspicuous, and there is a tendency to dark suffusion of the whole wing, notably in *Z. isertana* and *Z. griseana*.

Until 1927 only two species of *Zeiraphera* were known from The Netherlands, viz. *Z. isertana* and *Z. ratzeburgiana*. In that year the first specimen of *Z. griseana* was taken (Kuchlein, 1993). In 1996 the fourth species was discovered: *Z. rufimitrana*, reported here as new to the Dutch fauna.

Zeiraphera isertana is extremely variable in the forewing colouration and markings, and, albeit to a lesser extent, this applies to *Z. griseana* also. Moreover, it appears from the collections that the recognition of *Z. ratzeburgiana* sometimes offers problems, and now a new species of this genus is added to the Dutch list. The mere identification problems already make it desirable to discuss our *Zeiraphera*-species briefly.

List of the Dutch species of *Zeiraphera* Treitschke

The numbering of the species is in accordance with the Dutch checklist (Kuchlein, 1993).

1016 *Zeiraphera ratzeburgiana* (Saxesen, 1840)

1016a *Zeiraphera rufimitrana* (Herrich - Schäffer, 1851)

1017 *Zeiraphera isertana* (Fabricius, 1794)
= *corticana* Hübner, 1813 et auctt. nec
Denis & Schiffermüller, 1775
= *adustana* Hübner, 1813 et auctt.

1018 *Zeiraphera griseana* (Hübner, 1799)
= *diniana* Guenée, 1845

Note: Kusnetzov (1978) introduced for *Z. diniana* the obscure name *griseana* of Hübner. Bradley & Fletcher (1986) regarded Hübner's name as a nomen dubium, thus avoiding the unfortunate change of name of a species, well known under the name *diniana* in ecological and applied-entomological literature. Their opinion was followed by Emmet (1987) and in the Dutch checklist. However, the nomenclatural change appeared to be readily accepted by authors of checklists and monographs, and we shall acquiesce in it.

Identification

Correct identification of the four species of *Zeiraphera* based on external characters offers some problems, mainly because of the variation in forewing colouration and markings in *Z. griseana*, but above all in *Z. isertana*. However, distinction of the *Zeiraphera*-species is not very difficult as appears from the following identification keys.

Key based on external characters

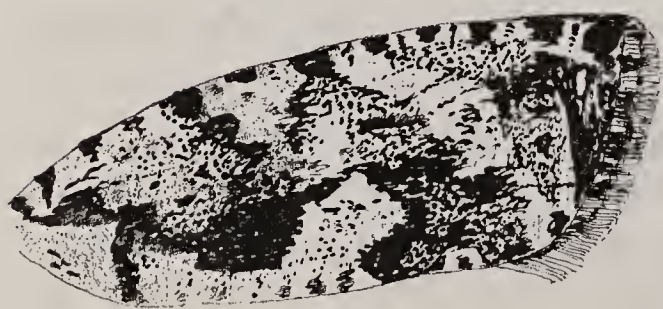
- 1 Forewing unicolourous or nearly unicolourous dark coloured (fig. 4, 6) 2



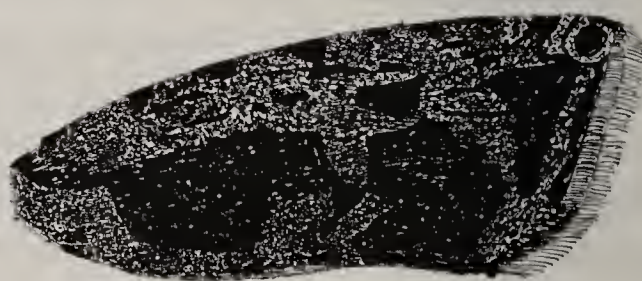
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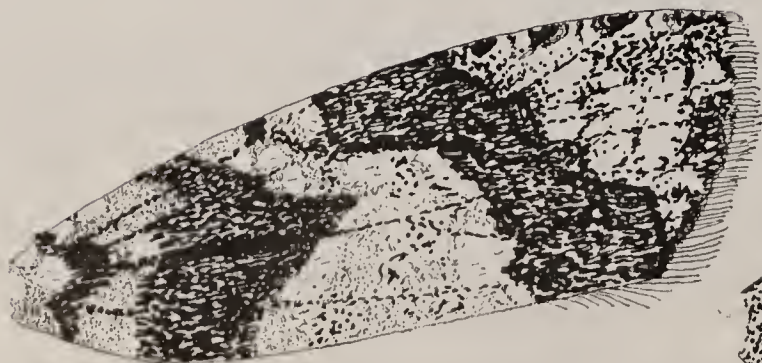
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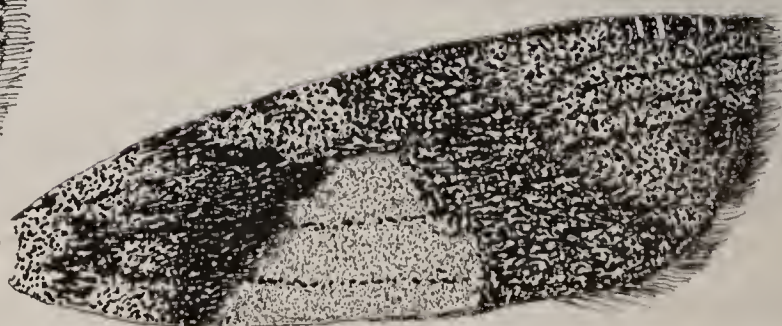
3



4



5



6

Fig. 1-6. Forewing of *Zeiraphera*-species. 1, *Z. ratzeburgiana*; 2, *Z. rufinitrana*; 3-4, *Z. isertana*; 5-6, *Z. griseana*.

- Forewing with distinct markings (fig. 1-3, 5) 3
- 2 Forewing velvety deep blackish brown. Wingspan 12.3 - 18.5 mm (fig. 4) *Z. isertana* (part)
See 5.
- Forewing dull greyish. Wingspan 17.5 - 22.0 mm. (fig. 6) *Z. griseana* (part)
See 5.
- 3 Vertex ferruginous - ochreous or yellowish grey. Forewings always with tawny brown parts 4
- Vertex grey or greyish white, often dark mixed, without any brownish or yellowish tinge. Forewing usually without brown parts, but if present the colour is more olive-brown 5
- 4 In forewing edge of dark basal area with a right angle on dorsum (fig. 2). Vertex and thorax ferruginous - ochreous *Z. rufimitrana*
Wingspan 12.0 - 16.0 mm. In forewing only minor variation in intensity of markings.
- In forewing edge of dark basal area with an oblique angle on dorsum (approximately 60°) (fig. 1) Vertex and thorax yellowish grey *Z. ratzeburgiana*
Wingspan 12.0 - 16.0 mm. In forewing considerable variation in intensity and development of markings.
- 5 In forewing pale coloured dorsal blotch comparatively small, hardly reaching half of wing (fig. 3) *Z. isertana* (part)
Wingspan 12.3 - 18.5 mm. In forewing markings and colouration extremely variable.

- In forewing pale coloured dorsal blotch larger, extending more than half of wing, and often reaching costa, forming a transverse fascia (fig. 5) *Z. griseana* (part)
Wingspan 17.5 - 22.0 mm. In forewing termen more rounded than in *Z. isertana*, and the whole wing as well as head and thorax farinose (scales variably tipped with whitish), which is not present in *Z. isertana*. In forewing markings variable. The vast majority of the Dutch specimens do not belong to these forms but to the fuscous form (see 2b).

Key based on male genitalia

- 1 Valva long and slender: length about six times largest width (fig. 9) *Z. isertana*
Sacculus indent before and beyond middle.
- Valva broader: length about four times largest width (fig. 7-8, 10) 2
- 2 Valva geniculate towards middle, not or hardly indent in proximal part (fig. 8) *Z. ratzeburgiana*
Apex of valva notably blunt.
- Valva slightly curved, clearly indent in proximal part (fig. 7, 10) 3
- 3 Valva gradually narrowing from less than one half (fig. 10) *Z. griseana*
- Valva distinctly narrowing only beyond two third (fig. 7) *Z. rufimitrana*

Key based on female genitalia

- 1 Corpus bursae with one signum (fig. 14) *Z. griseana*



Fig. 7. Male genitalia of *Zeiraphera rufimitrana*.

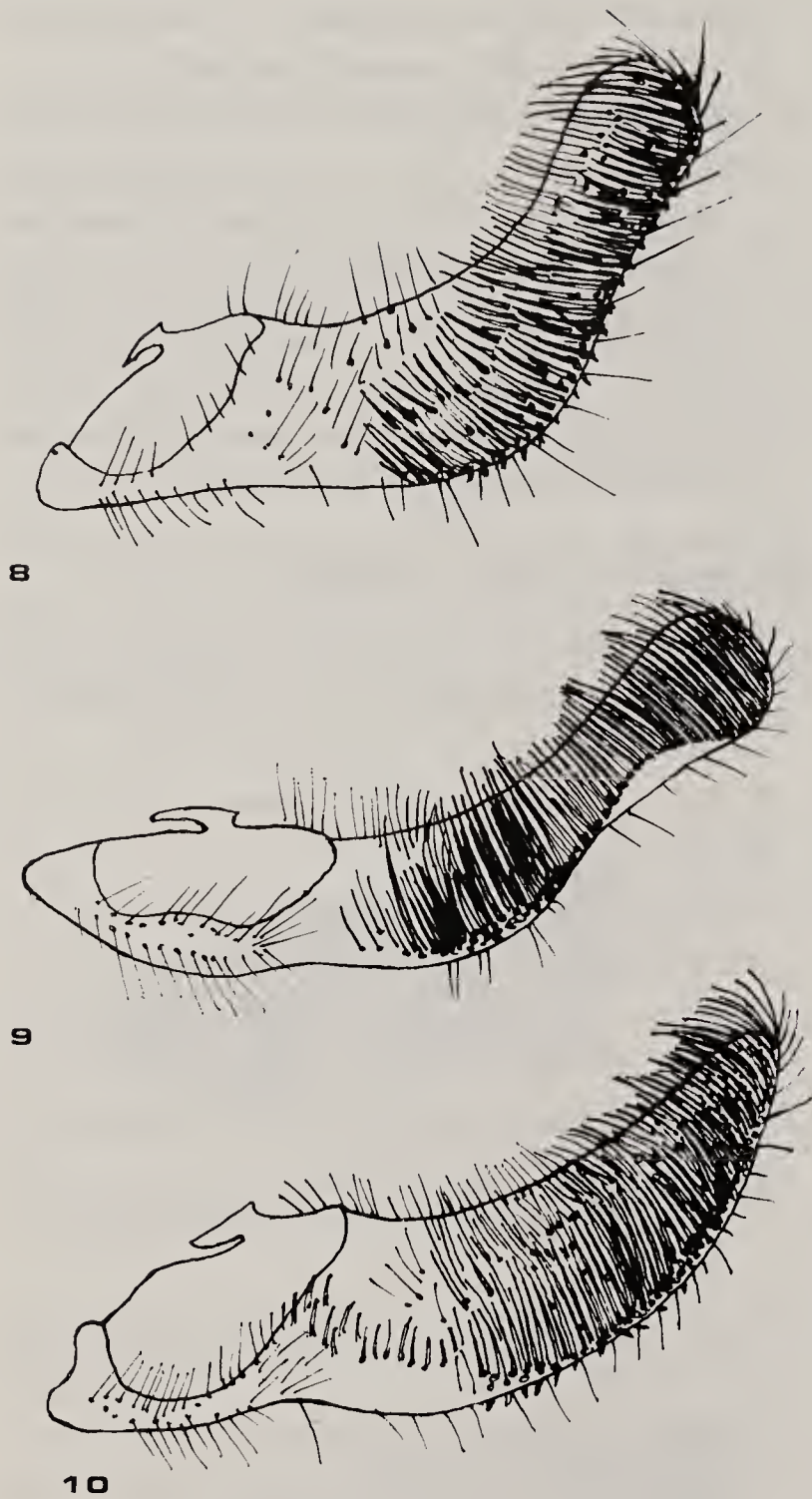
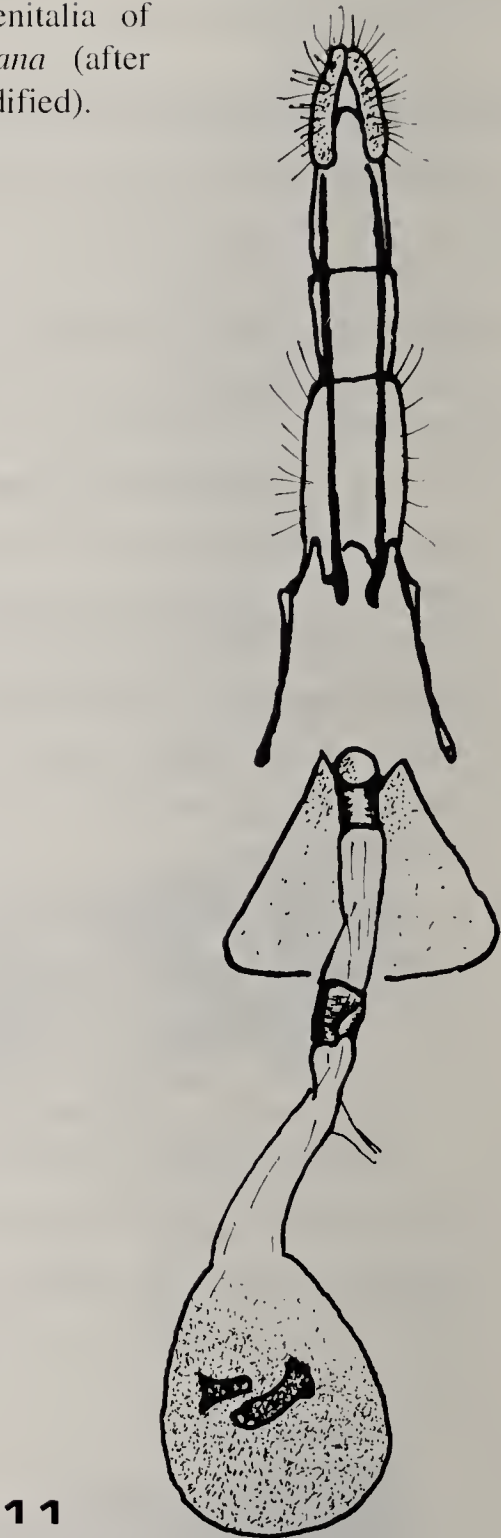


Fig. 8-10. Valva of *Zeiraphera*-species. 8, *Z. ratzeburgiana*; 9, *Z. isertana*; 10, *Z. griseana*.

- Corpus bursae with two signa (fig. 11-13) 2
- 2 Corpus bursae and ductus bursal not distinct. Signa pointed (fig. 12) *Z. ratzeburgiana*
- Corpus bursae and ductus bursal more or less distinct. Signa rounded or blunt (fig. 11, 13) 3
- 3 Signa of about equal size (fig. 13) *Z. isertana*
Corpus bursae more or less spherical.
- One large and one small signum (fig. 11) .. *Z. rufimitrana*
Corpus bursae long drawn.

Fig. 11. Female genitalia of *Zeiraphera rufimitrana* (after Razowski, 1987, modified).



Bionomics

In The Netherlands the species of *Zeiraphera* are univoltine. The larvae of *Z. isertana* feed on *Quercus*, living in a folded leaf or between spun leaves in May and June. The larvae of the other species feed on conifers, notably on *Abies*, *Picea* and *Pinus*, but the larch budmoth (*Z. griseana*) especially on *Larix decidua* Miller. The conifer-feeding larvae live in tubes made from spun needles, preferring the new growth of shoots from April to June.

The adults fly from late June to August at sunset and dusk about trees (sometimes rather high up) and may later come to light. The adults of *Z. isertana* rest on the trunks and branches of oaks during the day, and readily fly off when disturbed. The adults of the conifer-feeding species usually rest in the

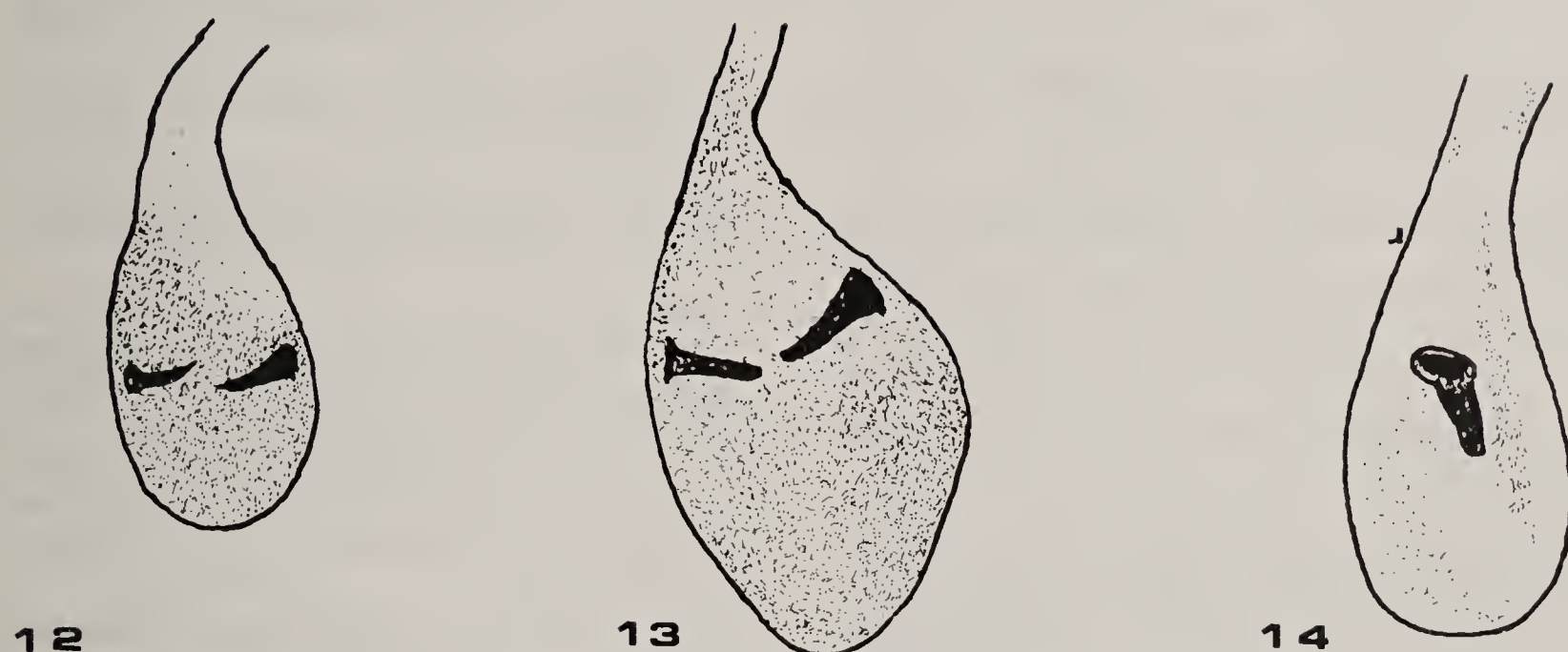


Fig. 12-14. Corpus bursa of *Zeiraphera*-species. 12, *Z. ratzeburgiana*; 13, *Z. isertana*; 14, *Z. griseana*.

shelter of the trees. All species overwinter as an egg.

Zeiraphera griseana is a defoliator of conifers, especially in the Central European mountains. Its bionomics have been studied exhaustively (Bovey, 1978).

Faunistics

Distribution maps for *Zeiraphera ratzeburgiana*, *Z. isertana* and *Z. griseana* are given by Kuchlein (1993). Additional records did not result in important changes in their distribution patterns, so there is no need to produce new distribution maps. Some faunistical data of interest are given under the individual species treated below.

Zeiraphera ratzeburgiana. This species, already recorded from The Netherlands by De Graaf (1862), has never become common and widespread. Recently, *Z. ratzeburgiana* was found in regions of northwest Europe where the species did not occur before, e.g. Ireland (Agassiz, 1982), Belgium (Janmoulle, 1962), and the Hamburg area (Albers, 1959). It is not known as a pest in our country, but abroad outbreaks on fir (*Picea* sp.) have been reported occasionally during the last decades. In the European checklist of Karsholt & Razowski (1996) *Z. ratzeburgiana* is erroneously omitted for The Netherlands.

Zeiraphera rufimitrana. The second author collected a male of *Z. rufimitrana* on 15

August 1996 by means of a light trap placed in his garden at Drempt (province of Gelderland). This species was previously not recorded from The Netherlands. *Z. rufimitrana* occurs in the temperate zones of the Palaearctic, its range extending from Ireland to Japan. In northwest Europe this species has returned in regions where it had disappeared for more than fifty years, e.g. Belgium (Janmoulle, 1958) and the Hamburg area (De Lattin, 1958). Now *Z. rufimitrana* has penetrated into The Netherlands. Occasional outbreaks on *Abies alba* Miller have been reported from its range already since the last century.

Zeiraphera isertana. In The Netherlands widespread and common, often in large numbers. Nevertheless no records of *Z. isertana* as a pest on oak are known to us, neither from The Netherlands, nor from elsewhere.

Zeiraphera griseana. The larch budmoth, *Zeiraphera griseana*, is a defoliator of pine and larch in the Palaearctic. Cyclic numerical fluctuations occur in larch forests in Switzerland, each cycle lasting 8 or 9 years. Fluctuations of similar magnitude have been recorded elsewhere in its range, mostly aperiodic. The population dynamics of this species has been studied extensively by a team of Swiss research-workers. They showed that its numbers are regulated by several biotic factors, which vary spatially and temporally (Baltensweiler et al., 1977). In The Netherlands *Z. griseana* was found for the first time

in 1927 (Kuchlein, 1993). Until 1963 not more than five specimens were recorded, but in that year more than hundred moths were observed throughout the whole country. The year 1971 became second best, and ever since the species has been found occasionally, also being absent for periods of many years. In Switzerland the migration behaviour of *Z. griseana* and its effects on population density has been investigated by Baltensweiler & Von Salis (1975) and by Baltensweiler et al. (1977). They concluded that migration plays an important part in the realization of its abundance and even demonstrated density-dependence of migration in this species. They also studied the "take-off" behaviour of the moths and found that they could be displaced over hundreds of kilometres. Kuchlein & Munsters (1988) argue that *Z. griseana* in The Netherlands (and adjacent areas of continental Europe) is an immigrant, not being able to establish itself in this region. They based this idea on the irregularity of its appearance and the many records from localities with no or few conifers. Moreover, the larvae are still not found in our country. Most striking, however, is the synchronizing of the top-years in The Netherlands, mentioned above, with the years of outbreaks in the Swiss Alps (Baltensweiler, 1964; Auer, 1974), which strongly suggests that the immigrants originate from Central-Europe. Accordingly *Z. griseana* is included in the Dutch list of immigrants on which is reported yearly (De Vos, 1992).

Acknowledgements

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