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# STHENARUS DISSIMILIS AND ORTHOPS RUBRICATUS: CONIFER-FEEDING MIRIDS NEW TO NORTH AMERICA (HEMIPTERA: MIRIDAE)

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ABSTRACT—The Palearctic mirids Orthops rubricatus (Fallén) and Sthenarus dissimilis Reuter are reported in North America for the first time. The record of O. rubricatus is based on a single specimen taken June 26, 1973 in a northeastern Pennsylvania nursery on white spruce, Picea glauca (Moench) Voss. Sthenarus dissimilis was abundant on ornamental firs in 5 counties in southeastern Pennsylvania during 1973. Characters are given and figures of the adult, male genitalia, and last-instar nymph are provided to facilitate recognition in the Nearctic fauna. Eggs hatched about May 1; adults matured during late May and became scarce by mid-June. Eggs were laid in older wood of fir stems. Both species probably were introduced with nursery stock imported from Europe.

Sthenarus dissimilis Reuter and Orthops rubricatus (Fallén) represent the third and fourth Palearctic mirids discovered in North America during our survey of the Miridae associated with conifers in Pennsylvania (Henry and Wheeler, 1974b). This paper summarizes our observations on these two species.

#### Sthenarus dissimilis Reuter

Reuter (1878) described this species from eastern France. Hüeber (1913) redescribed *dissimilis* and included a key to the species of *Sthenarus*. Stichel (1934) published another key to species but did not present new information on S. *dissimilis*.

The generic placement of *dissimilis* is unclear. Reuter (1878) apparently considered placing it in the genus *Atractotomus* Fieber because he listed "*Atractotomus dissimilis* Reut. olim in litt." as a synonym. Wagner (1958) placed it in the subgenus *Phoenicocoris* of *Sthenarus*, an arrangement followed by Carvalho (1958) in his "Catalogue of the Miridae of the World." Kerzhner (1962), in noting the uncertain taxonomic position of *dissimilis*, discussed the similarity in general appearance, genitalia, pubescence, and coloration to the genus *Atractotomus*. He noted, however, that the aedeagus was suggestive of the genera *Phoenicocoris* and *Salicarus* but tentatively retained *dissimilis* in *Sthenarus*. He considered *S. carbonarius* Horvath as merely a dark-colored variety of *dissimilis*. Wagner (1967) retained *dissimilis* in *Sthenarus* but placed it in the subgenus *Asthenarius*.

The range of S. dissimilis, which includes Czechoslovakia, France, Germany, Hungary, Poland, and Rumania (Stichel, 1956; Carvalho,



Fig. 1-6. Sthenarus dissimilis. 1, adult. 2, fifth-instar nymph. 3, left clasper. 4, right clasper. 5, theca. 6, vesica.

1958; Wagner, 1958), nearly coincides with that of its only known host, silver fir, *Abies alba* Mill. (= pectinata DC.). Stichel (1956) gave European larch, *Larix decidua* Mill., as a host plant, but this may have represented a sitting record since no other authors have reported larch as a host and we have not taken it on larch during our survey. The biology of S. dissimilis has not been investigated. Because this species is not known to occur in England or Sweden, it was not treated by Butler (1923), Southwood and Leston (1959), or Kullenberg (1944).

We first collected specimens of dissimilis in York County in May

1973. These specimens, like those of the other European mirid species discovered during our conifer survey, proved impossible to identify using available North American keys. With Carvalho's (1955) "Keys to the Genera of the Miridae of the World," our specimens were tentatively placed in the genus *Sthenarus*. In the U.S. National Museum collection we found specimens of *S. dissimilis* from Rumania that appeared identical to our specimens. This tentative identification was verified (by TJH) by comparing our specimens with those of *S. dissimilis* borrowed from the U.S. National Museum.

Neither the adult nor the immature stages have been figured, although Wagner (1958, 1967) did figure setal patern, head, antennae, and tarsi, and Kerzhner (1962) illustrated  $\delta$  genitalia. To facilitate identification, we are including figures of the adult,  $\delta$  genitalia, lastinstar nymph, and egg.

Adults (fig. 1) of dissimilis may be separated from all other phyline mirids in our region by the following characters: body black, subparallel in  $\delta \delta$ , more ovate in  $\Im \Im$ ; head shiny black, covered with erect, black bristlelike setae; rostrum reaching middle coxae; antennal segments 3 and 4 pale with their combined length equalling 2nd segment; pronotum and hemelytra with white scalelike pubescence intermixed with pale to black erect and suberect bristlelike setae; pleuron without scalelike pubescence; membrane black; legs black; front femora paler at apices; tibia and tibial spines black; 3rd tarsal segment longer than 2nd. Lengths of Pennsylvania specimens are as follows: 10  $\Im$  2.80-3.64 mm ( $\overline{X} = 3.23$  mm); 5  $\delta \delta$  3.48-3.76 mm ( $\overline{X} = 3.58$  mm).

Male genitalia (fig. 3-6) proved to be quite variable, especially in the left clasper. Three different variations (fig. 3) are provided. All of six  $\delta \delta$  examined had some variation in the shape of the right and left claspers. The theca and vesica (fig. 5, 6) showed very little variation throughout the series.

The last-instar nymph (fig. 2) is characterized by the following: body oval, fusco-testaceous, clothed with suberect black setae; head with pale v-shaped line on vertex; eyes red; 2nd and 3rd antennal segments pale; pronotum and wing pads with pale median line; abdomen red, with 1st segment, anterior half of 2nd, and last segment fusco-testaceous; legs fuscous. Length (15 specimens): 2.25-2.83 mm  $(\overline{X} = 2.54 \text{ mm})$ .

The egg is 1.08 mm long and 0.26 mm wide. The operculum is yellow; the chorion is smooth and translucent white. Eggs are deposited deeply into the stems leaving only the operculum exposed (fig. 7).

We have taken S. dissimilis on balsam fir, Abies balsamea (L.) Mill.; concolor fir, A. concolor (Gord.) Ldl.; and Nordmann fir, A. nordmanniana (Stev.) Spach in 5 counties in southeastern Pennsylvania (fig. 8). Our earliest record was May 7 when I and II instar nymphs were present in large numbers on balsam and concolor fir. This would



Fig. 7. Partially exposed egg of Sthenarus dissimilis in stem of fir. Operculum indicated by arrow.

indicate an approximate hatching date of May 1. By May 12, mostly III through V instar nymphs were present, and on May 25 we took our first adults, many of them teneral. At this time, nymphs still greatly outnumbered adults, but by May 31 their numbers had declined and mainly adults were collected. The last record for this univoltine species was June 21. This mirid overwinters in Pennsylvania as eggs deposited in older stems of fir. No eggs were found in the current season's growth.

Sthenarus dissimilis nearly always was collected on the new growth of fir along with the balsam twig aphid, *Mindarus abietinus* Koch, a major pest of fir in Pennsylvania. It is possible that *dissimilis* preys on this aphid, although no observations of predation were made. The European S. roseri (Herrich-Schaeffer) is known to be an aphid predator (Southwood and Leston, 1959).

Atractotomus magnicornis Fallén is the only other mirid found to breed on fir in Pennsylvania. This European species, introduced into North America (Knight, 1923) and collected commonly during our conifer survey, also occurs with S. dissimilis on A. alba in the Car-



Fig. 8. Distribution of Orthops rubricatus and Sthenarus dissimilis in North America.

pathian Mountains of central Europe (Reuter, 1908). On balsam and concolor fir we found eggs of *magnicornis* to hatch about one week before those of *dissimilis*. The early-instar nymphs are easily confused with *dissimilis* in the field, but with closer examinaton are found to have thickened second antennal segments, strong black setae on the dorsum, and lighter coloration. Adults may be separated from *dissimilis* by the thickened 2nd antennal segment (especially in  $9 \ 9$ ), rostrum reaching beyond posterior coxae, scalelike pubescence on pleuron, and spots at the bases of tibial spines.

### Orthops rubricatus (Fallén)

A single specimen of Orthops rubricatus was taken in our survey: a  $\Im$ , June 26, 1973 (AGW) on white spruce, Picea glauca (Moench) Voss, in a Wayne County nursery (fig. 8). Identification of rubricatus was verified by comparing our specimen with those in the American Museum of Natural History and the U.S. National Museum.

Orthops rubricatus was described in the genus Lygus by Fallén in 1807. This species occurs throughout Europe, and in northern Africa and Russia (Carvalho, 1959). Hüeber (1901) expanded Fallén's original description; Wagner (1943) figured the adult, and Wagner (1952) illustrated  $\diamond$  genitalia. The egg and last-instar nymph also have been described (Butler, 1923; Kullenberg, 1942). In England, adults are present from June to September; the species overwinters as eggs deposited in young needles of spruce, and less commonly in fir and pine (Butler, 1923; Southwood and Leston, 1959).

Our single specimen fits the description of the variety *flava* Stichel (Stichel, 1958). In 1974 we plan to collect extensively on spruce and pine in the northeastern counties of Pennsylvania to determine whether this species is established in North America.

## DISCUSSION

O. rubricatus has in common with the majority of our other introduced mirids a range that includes most of Europe and Great Britain. Its rather wide host range includes mainly spruce, but also pine and fir. Sthenarus dissimilis, however, is known only from the mountains of central Europe where it is apparently restricted to breeding on silver fir.

The most obvious means of introduction of S. dissimilis was on silver fir nursery stock from Europe. Hoopes (1868) noted that silver fir was imported for gardens and arboretums in the Philadelphia area during the early 1800's. Surface (1915) reported a number of insects imported into Pennsylvania on coniferous nursery stock, including Abies spp. Silver fir did not adapt well to conditions in eastern North America (Rehder, 1937), and this plant does not appear in any of the various unpublished lists of rare and unusual plants of southeastern Pennsylvania. We have located only one tree in Pennsylvania. Since between 1912 and 1919 it became illegal to import any fir into this country, an early importation on silver fir nursery stock seems likely. The fact that this species is an early season mirid restricted to breeding on fir could account for its having been overlooked by earlier collectors. If S. dissimilis were introduced subsequent to the establishment of quarantine provisions, it could have come into the United States via Canada or as a clandestine importation from Europe.

Sthenarus dissimilis now appears to be well adapted to firs growing in nurseries and landscape plantings. Further collecting is necessary to determine whether O. rubricatus is well established in Pennsylvania.

The 2 species of Palearctic mirids we have reported previously from Pennsylvania, *Camptozygum aequale* (Villers) (Wheeler and Henry, 1973) and *Plagiognathus vitellinus* (Scholtz) (Henry and Wheeler, 1974a), as well as *O. rubricatus* and *S. dissimilis*, deposit their eggs in the stems of conifers and have been taken in nursery situations. Knight (1917) reported 3 Palearctic mirid species from a large importing nursery in New York State. We agree with Knight (1917) that many mirids have been introduced on nursery stock and that in this way "...we...will probably continue to import insects that deposit their eggs in the stems of various plants."

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## NOTE ADDED IN PROOF

On June 18, 1974 we found IV and V instar nymphs in abundance on white spruce in 2 nurseries and several roadside plantings in Wayne County.