Notes on the distribution of some insect species living in the stems of Aster tripolium L. (Compositae)

by

J. van SOELEN & M. M. MARKUSSE
Delta Institute for Hydrobiological Research
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ABSTRACT. — An inventarisation was made on the insect fauna living inside the flowering stems of *Aster tripolium*. Three species of stem-mining insects were found: *Agapanthia villosoviridescens* (Degeer) (Coleoptera: Cerambycidae), *Melanagromyza tripolii* Spencer (Diptera: Agromyzidae) and *Phalonidia affinitana* (Douglas) (Lepidoptera: Cochilidae). Of these three species only *P. affinitana* caused obvious damage to the plants. Salinity appears to have a strong influence on their distribution.

Introduction

The halophyte *Aster tripolium* L. occurs in saline and brackish tidal salt marshes, but also in non-tidal marshy areas with a high salinity, for instance on the banks of ditches and creeks and in areas subjected to seepage of salt water from beneath the sea dike. In the course of a research project on the population dynamics of *A. tripolium* (Compositae) the attack by several insect species living inside the flowering stems was detected. In this paper an assessment will be made of the distribution of the three most common stem-mining species in *A. tripolium* in the south western part of the Netherlands and of the damage caused to the plant populations.

Materials and methods

From November 1980 to April 1981 samples of flowering stems of *A. tripolium* were collected monthly at a number of stations; each sample consisted of 30 stems. On each of the five salt marshes (fig. 1) two stations were sampled, one above the Mean High Water Line (MHWL) and one around this level.

From the data collected in the winter of 1980/1981, it appeared that salinity might have a strong influence on the distribution and abundance of the insects. Therefore, an adjusted sampling programme was set up for the next year, which included both sampling on salt marshes as well as on a number of non-tidal saline areas. In non-tidal saline areas only one station was sampled.

The larvae were collected in the laboratory by cutting the stems longitudinally. A sample of the larvae was sent to the Plant Protection Service at Wageningen for identification. Another part of the stems was kept under field conditions for observations on the development of the larvae.

Results and discussion

Three species of stem-mining insects were frequently found in the flowering stems of *A. tripolium*. Occasionally individuals of *Orchestia* spp. (Crustacea), *Hydrobia* spp. (Mollusca), larvae of Hymenoptera and unidentified Vermes were found, but only in very small numbers. Severe frost does not seem to increase mortality of the larvae in the stems. The findings for each of the three species of stem-mining insects will now be discussed separately.

Agapanthia villosoviridescens (Degeer) (Coleoptera: Cerambycidae). According to Brakman (1966) this species occurs throughout the Netherlands except in the provinces of Groningen and Friesland. During our sampling programme, the species has been found only in *A. tri-*

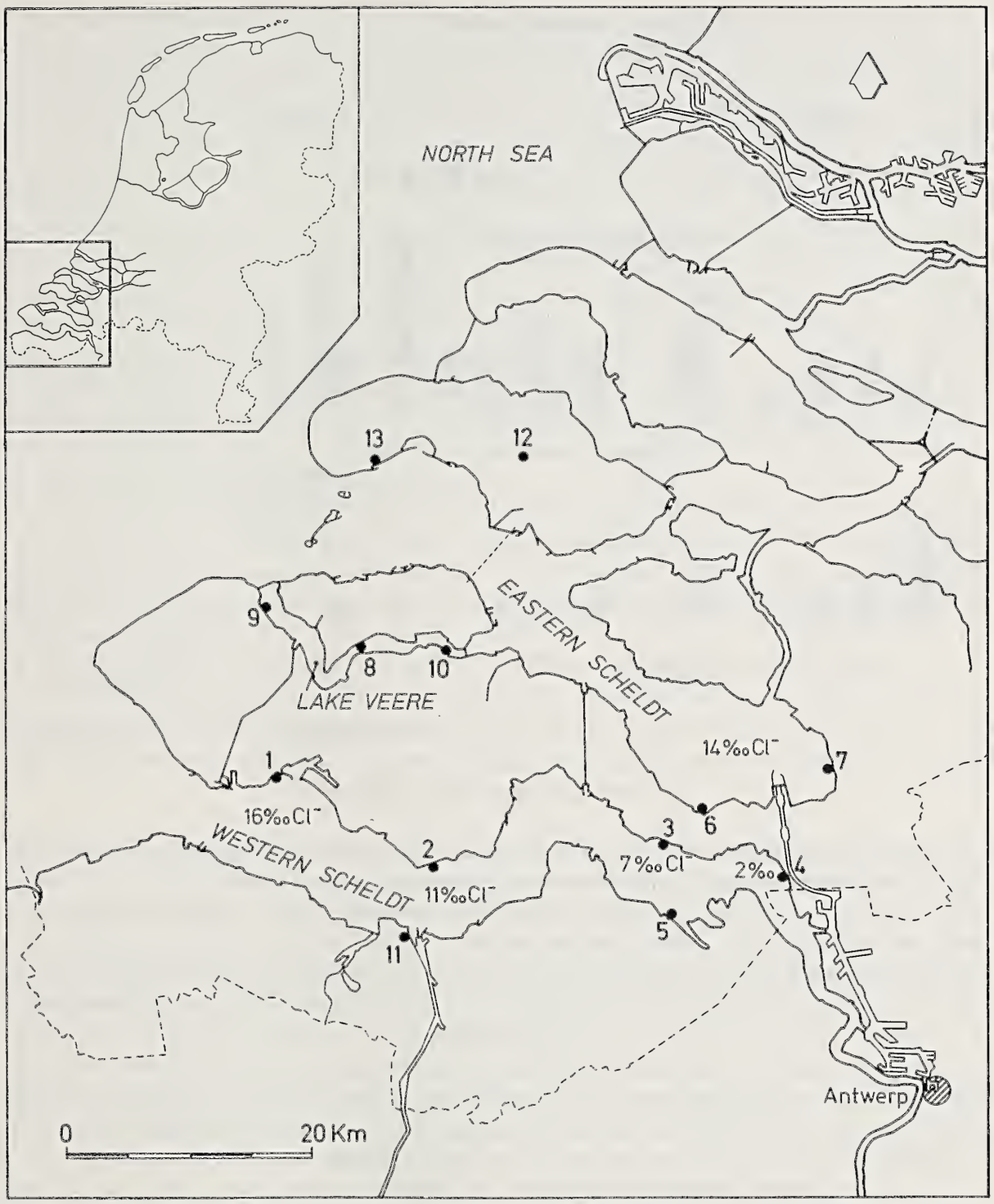

Fig. 1. Sample sites of insect larvae. 1. Ritthem; 2. Ellewoutsdijk; 3. Waarde; 4. Hinkelenoord; 5. Saeftinge; 6. Stroodorpepolder; 7. Bergen op Zoom; 8. Middelplaten; 9. Veere; 10. Kwistenburg; 11. Wulpenbek; 12. Kakkersweel; 13. Westerschouwense inlaag.

polium stems in the eastern part of the Delta area, the highest numbers were found in the most eastern part of the Western Scheldt (figs. 1, 2).

The white larvae could be found in the marrow of the stems of *A. tripolium* from mid-July until mid-May the next year. On the salt marsh of Hinkelenoord larvae of *A. villosoviridescens* were also found in stems of *Sonchus arvensis* L. and *Matricaria inodora* L. (Compositae). We found only one living larva per stem. It was observed in laboratory cultures that a greater number of larvae in one culture kill each other until only one survives. This phenomenon was also observed by Sorauer (1954). The larvae eat their way through the marrow of the stem, from its base upwards and pupate there until about mid-May. Laboratory cultures showed a short pupation stage ranging from a few days to a week. An obvious adverse effect of the larvae on the

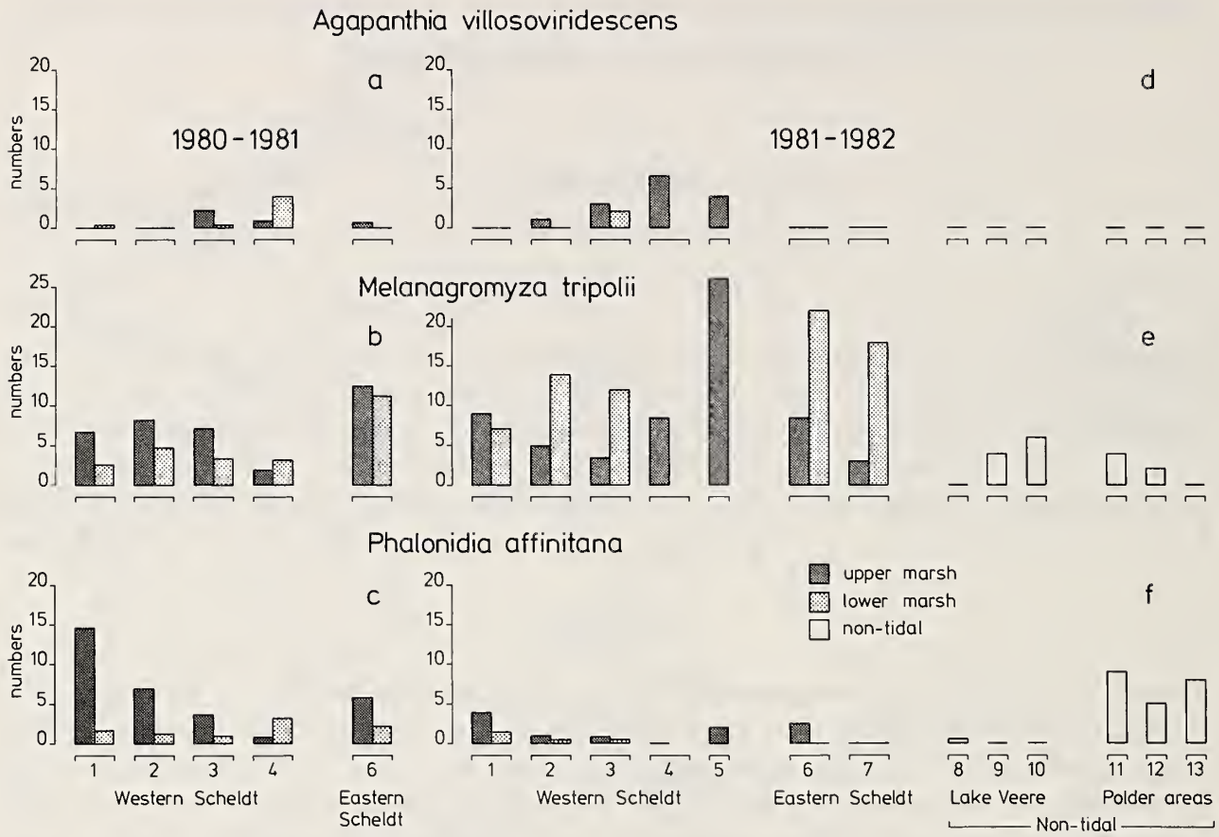

Fig. 2. Insect larvae found in the stems of *Aster tripolium* sampled in the 13 sites specified in figure 1. Averages of 30 flowering stems sampled monthly. Periods: November 1980-April 1981 and November 1981-April 1982.

plants could not be observed. As the larvae ate only the marrow, the strength of the stem was not affected. No larvae were found in the samples from inland saline areas.

The stems of *A. tripolium* that are mined by *A. villosoviridescens* spread a strange smell (Duffy, 1952, speaks of the smell of snuffed candles).

The consistent difference in size of the larvae of *A. villosoviridescens* is noteworthy: 2.5-3 cm in the salt marshes of Hinkelenoord, Saeftinge and the marsh south of Bergen op Zoom, and 1-1.5 cm only in the more westerly marshes near Waarde and the Stroodorpepolder. This difference in length, which is maintained in all stages of the larvae and in the adult beetles (respectively ± 1.7 cm and 1.0-1.2 cm long), may indicate the existence of two (eco)types of *A. villosoviridescens* but it might also be that the increasing salinity — going westwards — has an adverse effect on the development of the *A. villosoviridescens* larvae.

Melanagromyza tripolii Spencer (Diptera: Agromyzidae). This fly, described in 1957, was found in most of the study sites, both in tidal salt marshes and in non-tidal saline areas (figs. 2b, e), but it occurred in higher numbers in the tidal marshes, especially in the upper parts. In contrast with *A. villosoviridescens* higher numbers of *M. tripolii* were found in the, more saline, western part of the Western Scheldt and in the Eastern Scheldt (figs. 2a, d). More than 50% of the pupae were found in the same section of the stem, between 20 to 40 cm above the ground. The pupae were reared in the laboratory to adult flies for identification.

In May the 4 mm long black flies appear in the field. *M. tripolii* was sometimes found with larvae of *P. affinitana* and *A. villosoviridescens*. The latter belonged almost always to the smaller type. The larvae eat the marrow of the stem, their damage to the plant was difficult to identify. A number of *M. tripolii* flies in the culture flasks appeared to be parasitized by Hymenoptera which could not yet be identified.

Kabos (1971) lists also *Phytomyza tripolii* De Meyere as a stem-mining species on *A. tripolium*. Adult flies of this species (about 1 mm long) were not found in the culture flasks.

Phalonidia affinitana (Douglas) (Lepidoptera: Cochilidae). Caterpillars of this species were at first found in July in the base of the developing flowering stems, and the upper root of *A. tripolium*. Huggins (1958) mentions the existence of caterpillars in the upper root in late summer, originally coming from the stem. Thus combining his results with ours it is possible that a part of the population has its wintering place in the base of the plant and the other part of the population stays in the stem. The caterpillars in the stems could be found mainly from July to May the next year.

In the tidal marshes caterpillars could only be found in the inflorescences till October, for the inflorescences have decayed by then. However, also in the non-tidal areas where inflorescences may last all winter no caterpillars were found. Our results suggest that the stem seems to be the most common place to hibernate. In late summer and in autumn the caterpillars eat the marrow. In winter they stay cocooned in the hollow stems.

These findings are in accordance with those of Swatschek (1958) who reported that larvae of this species occur from August to June or July the next year in the inflorescences or in the stem of *A. tripolium*. The young caterpillar mines the stem, pupates and the adult insect appears from May to July (Kasy, cited in Razowski, 1970).

The distribution of the species showed a strong positive correlation with salinity (figs. 2c, f). In the tidal salt marshes the species is mainly found on the upper marsh. At this site the species was less abundant in the winter of 1981/1982. In non-tidal areas the species is hardly found along Lake Veere (locations 8, 9 and 10), and found commonly in the polder areas. The species was parasitized by wasps.

In July the affected stems were clearly recognizable in the field because of the brown coloured dead top and branches, the stems break easily at the base and their marrow is coloured pink to violet with mines and excrements.

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Vierstraat 28, 4401 EA Yerseke, the Netherlands.