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*Aradus lugubris* FALLÉN, 1807 (Hemiptera, Heteroptera, Aradidae)  
in a chestnut forest of Southern Switzerland after a fire experiment

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The impact of forest fires on the arthropod fauna was studied in a fire experiment conducted in a chestnut forest in Southern Switzerland (Canton Ticino) in March 1998. Three standardised sampling methods were used: pitfall traps for epigeic arthropods, yellow window traps for flying insects, ground eclectors and litter-soil samples for soil dwelling groups. One group which was studied in detail, the true bugs (Hemiptera, Heteroptera), was sampled before and after the fire. *Aradus lugubris* FALLÉN, 1807, a pyrophilous species of Aradidae, was attracted by the burnt area. It was only collected after the fire, and only on the burnt forest sites but never on the control sites. Over a period of two weeks, 27 specimens of *A. lugubris* were collected by ground eclectors, pitfall and yellow window traps.

Keywords: Heteroptera, Aradidae, *Aradus lugubris*, pyrophilous, forest fire, chestnut.

INTRODUCTION

Most forest fires in Switzerland occur on the southern slope of the alps, in the canton Ticino, during the winter. Since the 1960ies, the number of forest fires has drastically increased and, from the 1970ies onwards, fires occur more and more also during summer (CONEDERA et al. 1996). This is not only a consequence of climatic change but also of the stop of extraction of fire wood by the local people (CONEDERA et al. 1997). The latter leads to an accumulation of combustible material increasing the fire risk (CONEDERA et al. 1996). A few insect species, called pyrophilous, are attracted by fire, heat or smoke (EVANS 1971, WIKARS 1992). For some of them a population increase can be noticed for a short period of time after the outbreak of fire (CHANDLER et al. 1983). In Heteroptera there are pyrophilous species known from the family Aradidae (flat bugs). Aradidae are forest insects predominantly living under and on the bark of dying, dead and burnt trees, always associated with fungi. Some species feed on polyporous fungi, e.g. *Aradus corticalis* (LINNAEUS, 1758), *A. betulinus* FALLÉN, 1829, *A. pictus* BÄRENSPRUNG, 1859 (TAMANINI 1956, HELIÖVAARA & VÄISÄNEN 1983) or on the phloem of living trees, such as *A. cinnamomeus* PANZER, 1806 on *Pinus* sp. As part of the EU-project “PROMETHEUS s.v.”, the WSL Sottostazione SdA in Bellinzona conducted a fire experiment in a chestnut forest in Southern Switzerland. One kg/m<sup>2</sup> of chestnut litter was put on the lower part of the test area and the upper part was left untreated (MARXER & CONEDERA 1999). One aim of the experiment was to simulate two different fire intensities for studying ecological effects of a forest fire in relation to fire intensity. The influence of fire intensity on insects was studied by HERZOG (1998) and WYNIGER (1999).

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## MATERIAL AND METHODS

The test area is situated in the Canton Ticino, community St. Antonino, at 500 m above sea level (720 000 / 112 000). The surface, including the control area, was 1 ha, the totally burnt site was 0.23 ha.

To study the influence of the forest fire on insects, four standardised sampling methods were installed six weeks before the fire experiment took place on March 28: 22 pitfall traps (DUELLI et al. 1999), 16 ground electors (MÜHLEBERG 1993), 9 yellow window traps (DUELLI et al. 1999) and litter-soil samples (MORETTI et al. 1998). On the experimental site the pitfall traps were re-installed the same day, just after the fire, all the other traps one day after the fire (HERZOG 1998, WYNIGER 1999). From February 10 until June 30, 1998, the traps were checked weekly (WYNIGER 1999), except for the first sixteen days after the fire when they were checked daily (HERZOG 1998).

## RESULTS

27 specimens of *Aradus lugubris* were collected after the fire experiment (WYNIGER 1999): 14 by pitfall traps, 11 by yellow window traps and two by ground electors. No specimen was found in litter-soil samples. Before the fire experiment, *A. lugubris* was not collected at all and after the fire, it could only be found on the burnt area, but never on the control plot (WYNIGER & DUELLI 2000). The first specimen was collected the day after the fire experiment and another seven in the following five days (Fig. 1). During the following three weeks no *A. lugubris* speci-

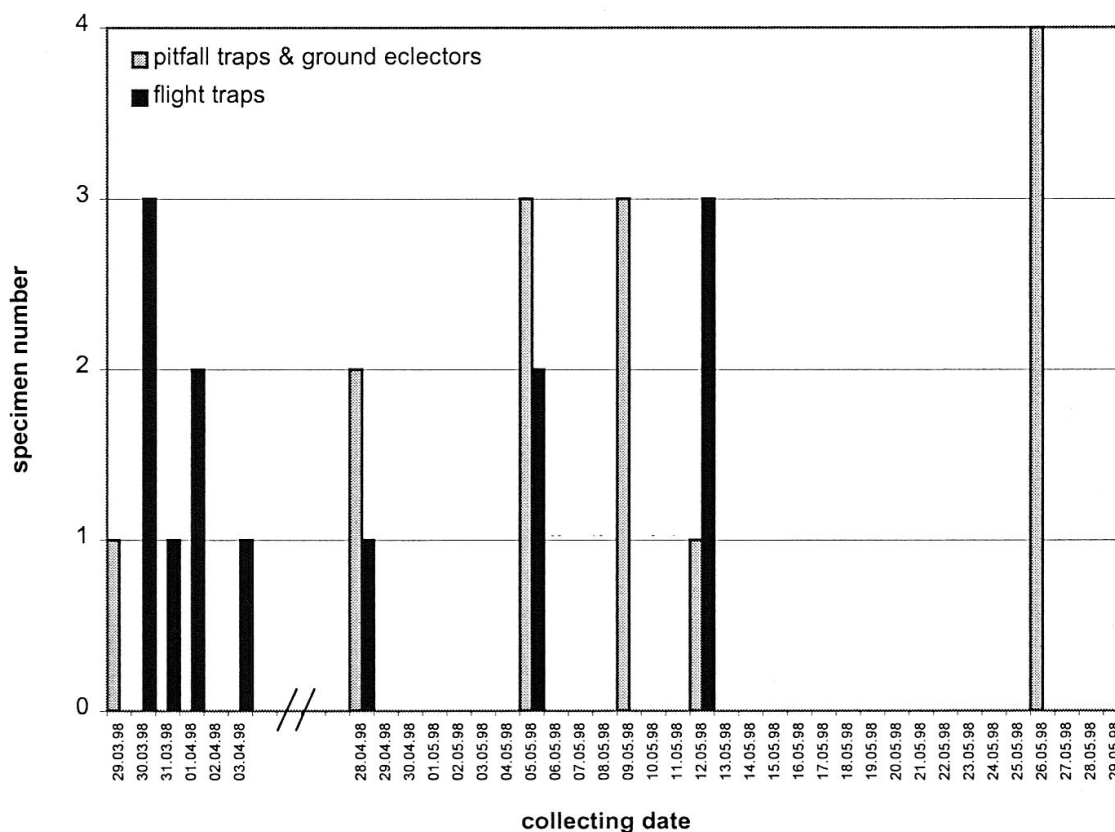


Fig. 1. Specimens of *Aradus lugubris* FALLÉN, 1807 collected by different traps.

mens were found (Fig. 1). Afterwards another 19 specimens were found until May 26, 1998. After that period no additional specimen was found. *A. lugubris* is known also from other freshly (naturally) burnt forests of the Canton Ticino (WYNIGER 1999).

#### DISCUSSION

Forest fires remove the existing fauna and hence create new substrates open for colonisation. The quick arrival of a species in a newly burnt area may be, therefore, vital for a successful colonisation. The higher temperature in burnt areas after the fire and the growing fungi are additional positive factors (WIKARS 1992). Most of the pyrophilous species live and breed during the time without forest fire on unburnt (dead or living) trees (EVANS 1971, HELIÖVAARA & VÄISÄNEN 1983, WIKARS 1992). *Aradus lugubris* does not require forest fires (HELIÖVAARA & VÄISÄNEN 1983) but, when available, seems to prefer burnt areas; copulation in newly burnt areas has been observed (WIKARS 1992). *A. lugubris* seems to be able to exploit temporary resources reacting quickly to new environmental circumstances.

In the days just after the fire, most catches took place in the yellow window traps, indicating an approach of the bugs by flight (Fig. 1). After that initial period of flight activity, more specimens were collected in the pitfall traps and the eclectors on the ground. Both flight and ground traps reflect the kind and degree of activity of epigeic arthropods (HALSALL & WRATTEN 1988, OBRIST & DUELLI 1996). This first active phase enabled the insects to find the most suitable feeding and/or breeding habitats. *A. lugubris* is attracted by the fast growing fungi after a forest fire (e.g. Ascomycetes). These fungi constitute the food for the offspring (WIKARS 1997). Later on, other fungi (e.g. *Fomes*, *Trametes*) provide additional food resources (HEISS, pers. com.). A similar behaviour can be observed for *Aradus annulicornis* FABRICIUS, 1803 (= *anisotomus* PUTON, 1879), *A. crenaticollis* R. F. SAHLBERG, 1848 and *A. signaticornis* R. F. SAHLBERG, 1848 (WIKARS 1997). The reason for the intermittent phase lacking records may be the wet and colder weather during that time (HERZOG 1998).

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