

Ovary structure in a presocial insect, *Elasmucha grisea* (Heteroptera, Acanthosomatidae)

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ABSTRACT

First generation egg clusters of *Elasmucha grisea* are more closely guarded than second generation clusters. The ovaries of this species are structured to enhance this behavior. The population of *E. grisea* from S-W Poland breeds in the spring (May–June) and late summer (July–August). The second generation clutches contain fewer eggs and are destroyed 3–4 days after oviposition by predators and parasitoids.

The ovary structure in the studied species differs from that found in other Heteroptera. The average number of ovarioles per ovary is 24 while in the other investigated species the number of ovarioles per ovary is 6–7. Lateral oviducts are elongated and the ovarioles are arranged in a pennate pattern. Each ovariole contains only one growing ovarian follicle. Differentiation of the ovarioles and ovarian follicles is synchronised thus enabling simultaneous oviposition. A comparative analysis of the ovary structure during the life cycle, particularly the presence of atresive ovarian follicles in the ovarioles of egg- and nymph guarding females, as well as the shape and structure of the apical part of the tropharium all support the hypothesis of cooperation between females in *E. grisea*. A similar ovary structure has been observed in the Coccoidea (Hemiptera, Homoptera) which indicates presocial behavior.

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1. Introduction

Parental care is a common type of social behavior in insects (for review see Wilson, 1971; Tallamy, 1984, 1999; Preston-Matham and Preston-Matham, 1993; Tallamy and Schaefer, 1997). In this respect the genus *Elasmucha* is among the best investigated insects.

The first information about parental care in genus *Elasmucha* was published by Adolf Modeer (*Elasmucha grisea*) in 1764 (after Tallamy, 1999). Subsequent data were provided by Hellins (1870, 1872, 1874) (*E. grisea*) Jensen-Haarup (1917) (*Elasmotethus griseus*) Strawński (1951) (*Elasmucha ferrugata*), Jordan (1958) (*E. grisea*), Melber and Schmidt (1975a,b) (*E. grisea* and *Elasmucha fieberi*), Melber et al. (1980) (*E. grisea*), Mappes et al. (1997) (*E. ferrugata*). In other heteropteran groups parental care has been observed in *Rhynocoris albopilosus* (Reduviidae) by Bequaert (1912), *Clinocoris griseus* (Cimicidae) by Schumacher (1917), *Sehirus sexmaculatus* (Cydnidae) by Boselli (1932), *Gargafia iridescens* (Tingidae) by Bueno (1942), *Sehirus cinctus* (Cydnidae) by Kight (1997). Besides, paternal care has been observed in Belostomatidae, Nepomorpha by Smith (1976a,b) and Smith and Larsen (1993). General information on parental care in Heteroptera has been presented by Kirkaldy (1902), Piéron (1907),

Frost and Haber (1944), Tallamy (1984, 1999), Preston-Matham and Preston-Matham (1993), Smith (1997). Observations and experiments on the strategy of oviposition (egg size differences depending on the position inside the clutch) suggest that cooperation in progeny guarding may take place in *Elasmucha* (Mappes and Kaitala, 1994; Mappes et al., 1995, 1997). The behavioral biology of *E. grisea* discussed in this paper is associated with the functional structure of the female sexual organs (ovary, ovariole, oviducts) during the whole life cycle. Structural similarities in the female reproductive organs in *E. grisea* and scale insects (Homoptera, Coccinea) as related to their behavioral similarities are discussed.

2. Material and methods

2.1. Behavioral biology

The study was carried out on a population of *E. grisea* in Międzybórz and Kolonia Sokołowice (Lower Silesia, S-W Poland) in years 1999–2003, from the first days of April through the end of August. This species lives mainly on old, branched birches (*Betula pendula* Roth, *Betula verrucosa* Ehrh.). About 40 females were observed continuously. A few females were collected each week for histochemical analysis. The total number of females investigated histologically was 65.

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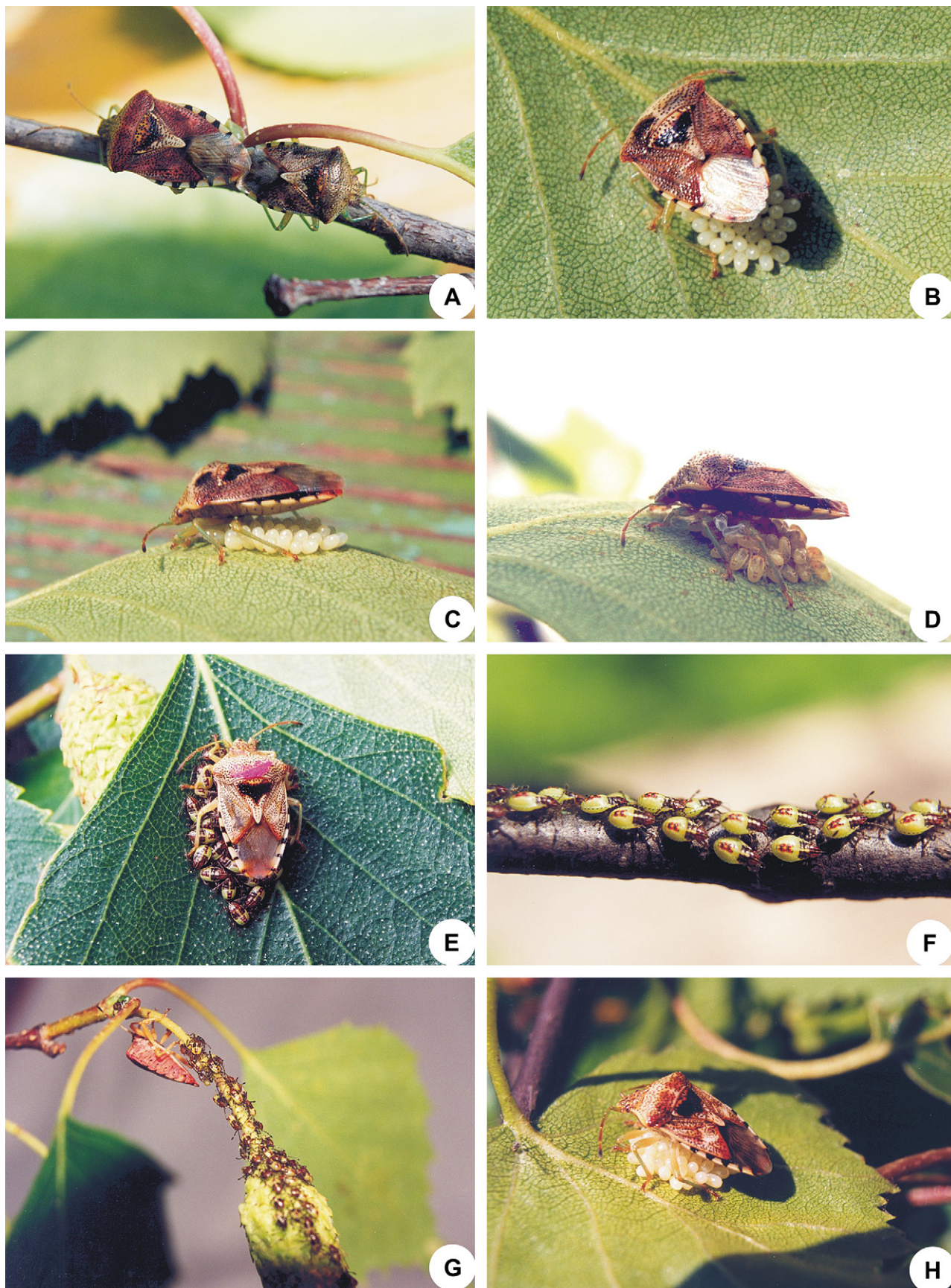


Fig. 1. Behavioral biology of *E. grisea*. A. Copulation. B and C. Egg clutch guarding. D and E. Nymph guarding. F and G. Nymphs and female on an inflorescence. H. Guarding of a 2nd generation egg clutch.

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