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RESEARCH ARTICLE

NATURAL ENEMIES AND PREY OF *RHYNOCORISALBOPILOSUS* (HETEROPTERA, REDUVIIDAE) IN GRAND-LAHOU, SOUTHERN CÔTE D'IVOIRE

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ABSTRACT

Rhynocoris albopilosus (Heteroptera: Reduviidae) is a commun predator in West Africa agroecosystems. In preparation of its settlement as biological agent in that environment, it is important to know its natural enemies and it sprey. The observations carried on field showed that *R. albopilosus* has a wide range of prey, belonging to eightinsectorders. Moreover, the main naturels enemie sare spiders *Peucetia* (Arachnida: Oxyopidae: Araneae) and the eggs parasitoids belonging to the genus *Gryon* (Hymenoptera: Scelionidae). Parasitism rate is very variable and not correlated with the number of eggs per batch.

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INTRODUCTION

Rhynocoris albopilosus is a commun predator, generally found on vegetable crops in West Africa (James *et al*., 2003; Kwadjo *et al*., 2008). It is known as the commun predator of *Dysdercus* spp in cotton fields in Central Africa (Pierrard, 1972). According to Villiers (1948), it is one of the communreduviids present in Africa. Through its predation activities in fields, Kwadjo *et al*. (2008) noted that *R. albopilosus* may be considered an important natural enemy against the pests in keeping their population low. The same observation has already been done by Odhiambo (1959). To assess the potential of this predator as biological control agent, some works have been undertaken about the voracity and somebiological parameters (Kwadjo *et al*., 2010, 2012, 2013; Sahayaraj, 2015). The aim of these studies was to establish mass rearing of the predator to supply and increase its population in agroecosystems (Grundy and Maelzer, 2000; Sahayaraj, 2014). It was therefore important to know the biological factors that could influence the successful settlement of *R. albopilosus* population in agroecosystems. Then, this study has been carried out to know, in its natural environment (in Grand-Lahou), the prey and the enemies of *R. albopilosus*.

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MATERIALS AND METHODS

Study site

This work was carried out at a dozen kilometers of Grand-Lahou, along Bandama River (5° 17' North latitude and 4° 57' West longitude). Vegetation of Grand-Lahou is that of coastal wetlands in Côte d'Ivoire. It is characterized by swampy forests and vegetation associated with lagoons and estuaries such as mangroves and marshy meadows. The site of our study was bordered to the south by an oil palm plantation and cocoa flap; to the west by Bandama River having on board a banana belt; north and east by marshy areas with mainly raffia. The vegetation of the site is essentially composed of *Imperatacylindrica* (L.), *Chromoleanaodorata* (L.) and *Puerariaphaseoloides* (Roxb.).

Prey of *R. albopilosus*

The proposed method was sight catching of the predator using a sweep net, both on crops and on wild flora. When an individual of *R. albopilosus* was found in possession of a prey, it was captured with its prey using a sweep net. Then, the prey was placed in a tube with 70% alcohol and the predator was released immediately. The following data were recorded: date, place and plant on which the predator was observed; the development stage of the predator and sex for adults.

Natural enemies of *R. albopilosus*

During the various missions in Grand-Lahou, any animal seen hunting or consuming an individual of *R. albopilosus* was captured with a sweep net. Egg batches of the reduviid detected were carefully observed to record any attack of oophagous animals. Once an insect was seen consuming eggs or laying therein, it was captured using a sweep net or a mouth aspirator. In addition, some egg batches were collected during surveys in field and incubated in an oven (temperature 28 °C; humidity 65 ± 8%, photoperiod 12: 12). Each egg batch was placed on filter paper in a Petri dish (35 mm diameter and 10 mm in height) containing a small wet tampon. Adult of parasitoids that emerged from eggs of *R. albopilosus* were then identified. Parasitism rate for a given egg cluster was determined as followings:

$$P = Np \times \frac{100}{Ne}$$

Where P is Parasitism rate; Np is the number of parasitoids emerged and Ne the number of eggs for a given batch.

Statistical analysis

Statistical analysis of data, particularly about parasitism rate, were performed using MINITAB 15.1.20.0. The relationship between the size of the egg batches and the parasitism rate was assessed using the regression analysis.

predator individuals found eating an insect were adult females and larvae at stages IV and V. A larva of the third stage has been seen consuming thrips. Emptied carcasses of lepidopteran larvae collected did not allowed to identify the family of these insects.

Natural enemies of *R. albopilosus*

In this study, only spiders have been observed consuming *R. albopilosus*. However, many times, parasitoids have been seen laying in the predator'seggs.

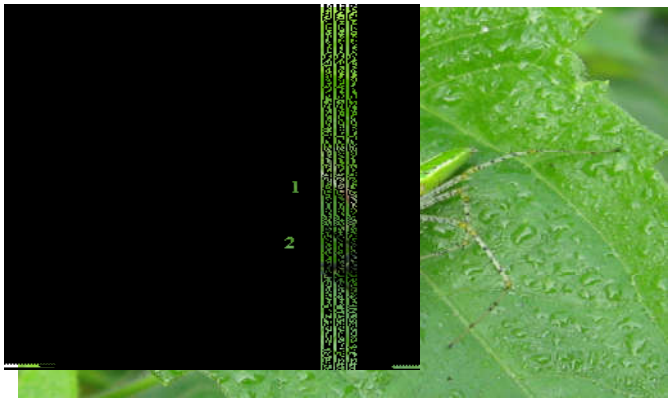

Figure 1. Specimen of *Peucetia* sp consuming an adult of *Rhynocorisalbopilosus* on *Chromolaenaodorata* leave. 1. *Peucetia* sp ; 2. *R. albopilosus*. Scale= 15 mm

Table 1. List of natural prey of *Rhynocoris albopilosus* collected at Grand-Lahou

Ordres	Families	Species	Stage of predator
Coleoptera	Chrysomelidae	*Hispellaatra* L.	Larva V
	Platypsyllidae	*Platypsylluscastoris* Ritsema	Adultfemale
	Carabidae	*Badisterbipustulatus* (Fabricius)	Adultfemale
	Curculionidae	*Polydrususs*p	Adultfemale
Dermaptera	Forficulidae	*Doru lineare* Eschscholtz	Adultfemale
Diptera	Muscidae	*Muscadomestica* L.	Larva IV
	Calliphoridae	*Phormiaregina* (Meigen)	Larva V
	Syrphidae	*Volucella*sp	Adultfemale
Heteroptera	Pyrrhocoridae	*Dysdercusvolkeri*Schmidt	Adultfemale
	Pentatomidae	*Aspaviaarmigera* (F.)	Adultfemale
	Lygaeidae	*Geocoris*sp	Adultfemale
	Lygaeidae	*Lygaeus*sp	Larva IV ; Adultfemale
Homoptera	Cicadellidae	Undetermined	Adultfemale
Hymenoptera	Apidae	*Apis mellifera* L.	Adultfemale Larva V
	Ichneumonidae	Undetermined	Larva V
		Undetermined	Adult male
		Undetermined	Adult male
	Crabronidae	*Trypoxylonfigulus* (L.)	Adultfemale
Lepidoptera	Undetermined	Undetermined	Larva IV
	Geometridae	Undetermined	Larva V
	Undetermined	Undetermined	Adultfemale
Thysanoptera	Thripidae	*Acanthothripsnodicornis* Reuter	Larva III

RESULTS

Prey of *R. albopilosus*

In its natural environment at Grand-Lahou, prey of *R. albopilosus* identified belong to eight insect orders: Coleoptera, Diptera, Hymenoptera, Heteroptera, Dermaptera, Homoptera, Dictyoptera and Thysanoptera. Each order includes one or more families (Table 1). In most cases, the

Predators

Predatory spiders of *R. albopilosus* identified were green lynx of the genus *Peucetia* (Arachnida: Oxyopidae: Araneae) (Figure 1). They were observed consuming adults *R. albopilosus* early in the morning.

Parasitoids

The identification of captured oophagous parasitoids as well as those that emerged in the laboratory revealed that they all

belong to the family of Scelionidae, mainly to the genus *Gryon* (Fig. 2). So far, the species of this genus obtained in this study have not yet been identified.

Figure 2. Specimen of Scelionidae *Gryon* laying in eggs of *Rhynocoris albopilosus*. 1. Egg of *R. albopilosus*; 2. *Gryon*sp. Scale = 2 mm

Among the 596 eggs of *R. albopilosus* collected in field and incubated, 153 (25.7%) were parasitized. Parasitism rate is very variable from an egg cluster to another (Table 2). There is no significant relationship between the size of the egg clusters and the parasitism rate (P = 0.384).

Table 2. Number of parasitoids emerged from eggs of *Rhynocoris albopilosus* and parasitism rate

Number of eggs per cluster	Number of parasitoids emerged	Parasitism rate (%)
33	32	96.97
81	11	13.58
134	13	9.70
32	5	15.63
97	26	26.80
37	16	43.24
50	22	44.00
43	10	23.26
35	10	28.57
23	2	8.70
31	6	19.35

DISCUSSION

The relationship between *R. albopilosus* and its natural environment was analyzed through its prey and natural enemies. The great variability of prey in *R. albopilosus* confirms that this predator is general, like other assassin bug (Balduf, 1943; Balduf, 1950; Grundy and Maelzer, 2000; Grundy *et al*., 2000; Cogni *et al*., 2002; Claver *et al*., 2003; Grundy, 2004). Odhiambo (1959) is the only one who addressed, in the laboratory, the range of natural prey of *R. albopilosus*. Thus, he postulated that the younger stages of *R. albopilosus* feed on thrips and other tiny insects like. From the fourth larval stage to adult, these insects probably feed on larger insects. Our observations support that postulate of Odhiambo. Indeed, stages IV and V, as well as adults capture forms of insects highly active such as *Volucella* sp (Syrphidae), *A. mellifera* L. (Apidae) and *M. domestica* L. (Muscidae). Odhiambo (1959) found that individuals of *R. albopilosus* accept various insects (including beetles, bees and grasshoppers) he offered them in laboratory. Spiders of the genus *Peucetia* were the only predators observed, consuming *R. albopilosus*. Spiders of that genus are generalist predators. They could be used as biological control agents against pests according to several authors (Turner, 1979; Louda, 1982; Randall, 1982; Nyffeler *et al*., 1987; Corey and Taylor, 1989; Nyffeler *et al*., 1992). The closest species to the specimen observed in this study is *P. viridans* (Hentz). *R. albopilosus* predation by these spiders confirms the work of Turner (1979) and Randall (1982) on prey of *P. viridans*. Indeed, they identified someReduviidae including *Zelusbilbobus* Say and *Pselliopuscinctus* (Mfg.) among the prey of *P. viridans*. Oophagous animals identified as enemies of *R. albopilosus* were microhymenopteran parasitoids of the genus *Gryon* (Scelionidae). This genus was not observed by Odhiambo (1959), who cites as *R. albopilosus* egg parasitoids: *Hadronotusantestiae* Dodd and *Hadronotus sp. nr.* Hiberus Nixon (Proctotrupoidea, Scelionidae). Besides Scelionidae, Bequaert (1912) also reported Pteromalidae as egg parasitoids in this predator. Eggs of other species of *Rhynocoris* are also parasitized by Scelionidae. Thus, during his work on Scelionidae, Mineo (1978) described a new species parasitoid of *R. costae* Piccoeggs: *Telenomusviggianii* Mineo (Hymenoptera: Scelionidae). In addition, these parasitoids have been reared on *R. erythropus* L. eggs. In general, Scelionidae specimens are recognized as important natural enemies of several major crop pests by various authors (Naumann and Steinbauer, 2001; Zimmermann *et al*., 2002; Wiedemann *et al*., 2003; Canto-Silva *et al*., 2005; Kivan and Kilic, 2006; Masner *et al*., 2007).

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Conclusion

The reduviid *R. albopilosus* is a general predator of several insects in Grand-Lahou agroecosystems. However, its population is naturally controlled by spiders of the genus *Peucetia* and oophagous parasitoids of the genus *Gryon*. These information should be taking account when using *R. albopilosus* as a biological control agent.

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