Heteroptera Attracted to Butterfly Traps Baited with Fish or Shrimp Carrion

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Heteroptera attracted to butterfly traps baited with fish or shrimp carrion

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Abstract

Records of Heteroptera collected at butterfly traps baited with fish or shrimp carrion during collecting trips to Bolivia, Brazil, Colombia, Ecuador, and Peru are presented. Traps consisted of a cylinder of net fabric (about 35 cm diameter × 75 cm length) attached on the top and bottom to square pieces of wood slightly larger than the diameter of the cylinder. The bait usually consisted of locally available fish or shrimp that were cut into small pieces and placed in a container with water and a little soil and allowed to putrefy for several days to a week or more before use. The Heteroptera collected consisted of 91 species and 1,712 specimens in the following families: Alydidae, Coreidae, Cyrtocoridae, Lygaeidae, Miridae, Pentatomidae, Reduviidae, Rhopalidae, Rhyparochromidae, and Scutelleridae. We collected 1,356 males and 356 females at these traps, but most of the sex bias occurred in the Scutelleridae. Although sex bias was variable by family, a bias towards females generally occurred except for the Scutelleridae. Most of the species collected at these traps were not collected at the location using other collecting methods, so collecting at butterfly traps increased the number of taxa obtained at each location. Butterfly traps baited with fish or shrimp carrion should be considered as an additional collecting tool for biodiversity studies or general collecting.

Key Words: Coreidae; Cyrtocoridae; Miridae; Pentatomidae; Rhyparochromidae; Scutelleridae

Resumen

Se presentan los registros de los Heteroptera recolectados en trampas mariposa cebadas con carroña peces o camarones durante una gira de recolección a Bolivia, Brasil, Colombia, Ecuador y Perú. Las trampas consistían en un cilindro de tejido de red (longitud de aproximadamente 35 cm de diámetro x 75 cm) unida en la parte superior e inferior de piezas cuadradas de madera ligeramente mas grandes que el diámetro del cilindro. El cebo generalmente consistía de pescado o camarones localmente disponibles que se cortaron en trozos pequeños y puestos en un recipiente con agua y un poco de tierra y se deja pudrirse durante varios días a una semana o más antes de su uso. Los Heteroptera recolectado consistieron de 91 especies y 1,712 ejemplares en las siguientes familias: Alydidae, Coreidae, Cyrtocoridae, Lygaeidae, Miridae, Pentatomidae, Reduviidae, Rhopalidae, Rhyparochromidae y Scutelleridae. Se recogieron 1,356 machos y 356 hembras en estas trampas, pero la mayor parte del sesgo sexual sucedio en el Scutelleridae. Aunque el sesgo de sexo fue variable por la familia, un sesgo hacia las hembras en general, se produjo con la excepción de la Scutelleridae. La mayor parte de las especies recolectadas en estas trampas no se recolectaron en el lugar utilizando otros métodos de recolección, por lo tanto, la recoleción en las trampas mariposa aumentó el número de taxones obtenido en cada lugar. Trampas mariposa cebadas con carroña de peces o camarones deben ser considerados como una herramienta de recoleción adicional para estudios de biodiversidad o recoleción general.

Palabras Clave: Coreidae; Cyrtocoridae; Miridae; Pentatomidae; Rhyparochromidae; Scutelleridae

There are a number of reports of Heteroptera collected at carrion or other animal parts (dried skin, bones, etc.). Payne et al. (1968) were among the first to conduct a study of true bugs attracted to carrion. They recorded 12 species of Heteroptera in 6 families on pig carcasses in various stages of decay over a 3 yr period, but observed only 3 species actually feeding on the carcasses and at least 3 other species that were preying on dipterous larvae feeding on the carrion. Adler & Wheeler (1984) summarized reports of 34 species of phytophagous Heteroptera in 8 families feeding on non-phytophagous food sources including bird droppings, dung, and carrion. Constant (2007) added several records including collection data from 10 species of Cydnidae that were taken in pitfall traps baited with human excrement or dead fish, but questioned whether the bait attracted them because cydnids also can be found in unbaited pitfall traps.

Baz et al. (2010) conducted an extensive study of phytophagous insects collected in traps baited with squid carrion in central Spain. Forty-six species of Heteroptera in 8 families were reported from collections in 2003 and 2006–2007. Most specimens captured belonged to the families Alydidae, Coreidae, and Lygaeidae. Species of Miridae, Nabidae, Pentatomidae, Reduviidae, and Rhopalidae were represented by less than 10 specimens, usually with only 1 or 2 specimens of each species collected, of which 87% were males. More recently, Baena (2011) reported the attraction of *Patapius spinosus* (Rossi) (Leptopodidae) to squid-baited traps and the feeding of *Naucoris maculatus* F. (Naucoridae) on a dead newt.

During several collecting trips taken in conjunction with lepidopterists, we observed insects attracted to butterfly traps baited with putrefied fish or shrimp. Use of these traps is a fairly common practice to attract many species of butterflies not otherwise encountered (Austin

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& Riley 1995; Sourakov & Emmel 1995). However, most lepidopterists ignore other insects that can often be numerous. In particular, we were interested in the Heteroptera that were found in or on the traps. Our initial impression was that these were incidental and, on the first encounters, we simply collected the insects present. On subsequent trips, we noted that the attraction of bugs to the traps was more than an incidental occurrence. Initial observations focused on pentatomoids, but all Heteroptera present were collected during later trap captures.

The records of Heteroptera collected at butterfly traps baited with fish or shrimp carrion during several collecting trips to a number of South American countries are presented. In the New World tropics, little work on Heteroptera attracted to carrion has been reported, except for a study by Morón & Terrón (1984), who trapped insects in pitfall traps baited with squid carrion. However, only 3 families were recorded and only 1, the family Miridae, was identified in their report. Dellapé & Melo (2008) described a new species of *Catenes* (Lygaeoidea, Rhyparochromidae); included in the type series was a male collected by us in Ecuador on a carrion-baited butterfly trap. Most of the records of attraction to carrion by species reported in this paper have not been cited previously in the available scientific literature.

Materials and Methods

Detailed location and date information for samples collected in this study are as follows: **Bolivia**—Santa Cruz Dept., 5 km SSE Buena Vista, vic. Hotel Flora & Fauna, 17°29’55”S, 63°39’7”W, elev. 440 m, 10–22-X-2004; **Brazil**—Rondônia State, 62 km SW Ariquemes, vic. Pousada Ecológica Rancho Grande, 10°17’53”S, 62°52’8”W, elev. 171 m; 5–17-X-1993; 8–20-XI-1994; 3–15-XII-1996, and 4–16-XI-1997; **Colombia 1**—Meta, Villavicencio, vic. Gunaviche Estadero, nr. Rio Guatiquia, 4°10’30”N, 73°38’13”W, elev. 447 m, 3–5-VII-2013; **Colombia 2**—Tolima, Ibague, Ver. El Totumo, 4°23’42”N, 75°11’56”W, elev. 1,100 m, 6–9-VII-2013; **Ecuador**—Napo Prov., Misahuallí, vic. Hotel Misahuallí Jungle Lodge, 10°17’53”S, 62°52’8”W, elev. 171 m, 6–18-IX-1998; **Peru 1**—San Martín Dept., Moyabamba, vic. Ecológico “Rumipata”, 6°4’32.0”S, 76°58’7.5”W, elev. 970 m, 13–18-X-2012; **Peru 2**—Amazonas Dept., vic. Huembo Lodge, Km 315 on Hwy N5; 5°51’28.1”S, 77°59’4.8”W, elev. 2,078 m, 18–21-X-2012; **Peru 3**—Amazonas Dept., Chachapoyas, vic. Gocta Lodge, 6°3’22.5”S, 77°53’42.6”W, elev. 1,815 m, 21–24-X-2012.

Records were kept only for Pentatomoidea on the Brazil trips. In Bolivia, traps were placed near a dry stream and, after a short time, were washed away in heavy rains so collecting there was limited.

Traps used for these studies were variable in design but basically similar to those used by Austin & Riley (1995) and Sourakov & Emmel (1995) and consisted of a cylinder of net fabric (about 35 cm diameter × 75 cm length) attached on the top and bottom to square or round thin pieces of wood, plastic, or other rigid materials that were slightly larger than the diameter of the cylinder (Fig. 1). The top was attached directly to the rigid material that protected the bait from rainfall, whereas the bottom was attached in such a way as to allow a gap for entrance of butterflies or other insects. A hole in the bottom piece allowed for placement of a cup to hold the bait (Fig. 2). One variation in design was to tie up excess net fabric at the top of the cylinder so that only the bottom was rigid. The bait usually consisted of locally available fish cut into small pieces and placed in a container with water and a little soil to add microorganisms. Shrimp carrion was used in Bolivia instead of fish carrion, and some traps in Ecuador also had shrimp carrion. After 3 to 4 d, the putrid bait was used in traps. Lepidopterists frequently bring bait that has already begun to putrefy, but we chose initially to rely on locally available fish and shrimp and avoid packing this material in luggage. On the most recent trip to Colombia, the bait (ladyfish, *Elops* sp.; Elopiformes: Elopidae) was cut into small pieces and placed in a leak-proof container 1 wk before departure, giving the bait extra time to decay.

Fig. 1. Example of a butterfly trap used in these studies.

Traps were suspended from tree branches at a height of about 1.5 to 3.0 m along trails, near streams or bodies of water when available.

Fig. 2. Detail of the bottom of the trap showing the bait cup inserted in a hole in the middle.

They were checked during the day and early evening as frequently as possible, but length of time between collections at any one trap varied by weather, distance between traps, etc. Because data on taxa other than Pentatomoidea were not kept on all trips, results are not comparable across higher taxa.

Results and Discussion

Ninety-one species and 1,712 specimens were collected at butterfly traps baited with rotting fish or shrimp carrion (Table 1). Because butterfly traps are designed to trap butterflies and not Heteroptera, they were routinely visited in order to capture the bugs. Most of the Heteroptera collected were on the outside of the cylinder or on the wooden base or top (Fig. 3), and more active bugs such as *Leptoglossus* spp. and some other coreids, *Edessa* spp., Rhyparochromidae, and Alydidae, frequently escaped capture. Thus, more individuals were attracted to our traps than were captured, and there was some bias in favor of less active taxa, such as Scutelleridae.

Baz et al. (2010) noted that most bugs attracted to pitfall traps baited with squid carrion were males and postulated that males may need proteins to refresh those expended during mating. Huh et al. (2005) found that males of *Riptortus clavatus* (Thunberg) (Alydidae) were attracted to traps baited with fish carrion whereas females were not attracted. It is interesting to note that butterflies showed a similar bias for males attracted to carrion or urine (Hall & Willmott 2000). We collected 1,356 males and 356 females at our traps or 79% males. However, most of the sex bias occurred in the Scutelleridae, of which 93% were males. In families other than Scutelleridae, a bias for females occurred (201 males, 265 females). Further, bias for a particular sex appeared to vary consistently by family. Pentatomoids, other than Scutelleridae, had more females (32) than males (5). We collected mostly female mirids whereas alydids were mostly males. Males and females of coreids and rhyparochromids were attracted in roughly equal numbers. Within families, additional differences in sex bias by species sometimes occurred. For example, most species of the scutellerid genus *Symphylus* were dominated by males, but more females than males of *S. cyphonoides* were attracted.

Some species, represented by only 1 or 2 specimens, may have been incidental visitors to the traps but, as mentioned earlier, many were not collected using other methods, so finding them on the traps suggests an attraction. Heteroptera were rarely seen feeding on the bait and were mostly found on the outside of the traps, but this does not mean they were not attracted to carrion for the nutrients it provides. Hall & Willmott (2000) suggested that certain Lepidoptera feed on urine and carrion to obtain protein necessary to sustain flight muscle mass. Krupke et al. (2008) found that males of *Euschistus conspersus* Uhler (Pentatomidae) transferred about 14% of their body weight during the first mating. The need to replenish any proteins lost by males during mating or females during oviposition may explain attraction to protein sources such as carrion.

Although Heteroptera may be attracted to carrion as a food source, there is also a possibility that it is used for aggregation. Constant (2007) postulated that feces and carcasses may contain chemicals similar to those used for aggregation or mating pheromones. Large numbers and mating pairs on carrion were observed by Englehardt (1912), Bromley (1937), Payne et al. (1968), and Baz et al. (2010), suggesting that carrion may be attractive for aggregation and mating purposes in some species. There is also the possibility that one sex attracted to carrion for feeding may release aggregation or sex pheromones that attract the opposite sex for mating. Clearly, more work is needed to elucidate the reasons for the attraction of various insect groups to carrion.

The butterfly traps utilized added greatly to the number and diversity of Heteroptera collected at various sites. Most of the species collected at traps were not collected using other methods (beating, sweeping, light sheets or traps, etc.), so collecting at butterfly traps increased the number of taxa obtained at various locations. Eger (1990) observed that the species of *Polytes* (Scutelleridae) in collections were represented by only or predominately male specimens. Specimens of *Crathis* (Scutelleridae) found in collections are also predominately males. Label data rarely specify collection method, but if specimens were collected at carrion, this may help explain the sex bias in collections.

Another interesting aspect of trap catches was the specificity of attraction to these traps. Many common species of Heteroptera in the vicinity of the traps were never collected at traps, and sometimes only certain species within genera were found at the traps whereas other species were clearly not attracted. Specimens of *Edessa* (Pentatomidae) collected at traps consisted of several species, all of which were closely related to *E. nicopinata* Breddin, although many other species of *Edessa* were found in the area. *Sibaria armata* (Dallas) (Pentatomidae) was common at most locations where we trapped but was never collected on a trap, whereas 9 females of *S. englemani* Rolston, present only at the Colombia 2 location, were collected at the traps.

Many of the traps set out by lepidopterists appeared to have more bugs than our traps did. They generally allowed their baits to putrefy a week or so prior to the beginning of the collection trip, and these appeared more attractive. Also, we noticed more specimens than usual attracted at the onset of our trip to Colombia with bait that was created beforehand. However, we did not do comparative studies with replicated trials needed to confirm that bait allowed to putrefy over a longer time is more attractive than less-putrefied bait.

There also appeared to be an increase in the catches when the traps were placed near a body of water. In Brazil there were small streams near the traps, in Peru there was generally some type of small stream, and in Colombia there were medium to large streams. The largest number of species and specimens in the Pentatomoidea collected on these traps was in Ecuador, where the trapping oc-

Fig. 3. *Melucha phyllocnemis* (Burmeister) on the side of a trap and *Leptoglossus* sp. on the base.

Table 1. Heteroptera collected at butterfly traps baited with putrefied fish or shrimp carrion.

Taxon	Location	No. of males	No. of females
SUBORDER CIMICIMORPHA			
Miridae: Mirinae: Mirini			
Calocorisca cuscona Carvalho	Peru 3	0	1
Calondas superbus Distant	Colombia 2	0	11
Chrysodasia sp.	Peru 3	0	1
Derophthalma reuteriana Carvalho and Gomes	Colombia 2	2	6
Derophthalma sp.	Peru 3	0	1
Iridopeplus pellucidipennis Bergroth	Colombia 1	0	1
Piasus cribricollis (Stål)	Colombia 2	0	3
Proba vittiscutis (Stål)	Colombia 2	0	3
Tropidosteptes sp.	Colombia 2	0	6
Reduviidae: Harpactorinae: Apiomerini			
Apiomerus sp.	Colombia 2	1	0
SUBORDER PENTATOMOMORPHA			
Alydidae: Alydinae			
Hyalymenus limbativentris Stål	Colombia 1	2	1
Hyalymenus sinuatus (F.)	Colombia 2	4	0
Coreidae: Coreinae: Acanthocerini			
Zoreva lobulata Stål	Colombia 2	0	2
Coreidae: Coreinae: Anisoscelini			
Anisoscelis scutellaris Stål	Colombia 2	0	3
Diactor bilineatus (F.)	Colombia 2	1	0
Leptoglossus concolor (Walker)	Colombia 2	6	6
Leptoglossus conspersus Stål	Colombia 2	3	5
Leptoglossus macrophyllus Stål	Colombia 2	2	0
Leptoscelis conspicuus Brailovsky and Barrera	Colombia 2	0	3
Leptoscelis excellens Stål	Colombia 1	0	1
Malvanaioides intricata Brailovsky	Ecuador	11	0
Phthia cantharidina Bergroth	Ecuador	11	0
Phthia lunata (F.)	Colombia 2, Ecuador	5	0
Phthiadema cyanea (Signoret)	Ecuador	3	0
Phthiadema ornata (Stål)	Ecuador	3	0
Phthiadema smaragdina (Walker)	Ecuador	2	0
Phthiarella decorata (Stål)	Ecuador	12	1
Phthiarella sp.	Colombia 1	1	0
Coreidae: Coreinae: Discogastrini			
Savius diversicornis (Westwood)	Colombia 1	0	2
Savius sp.	Ecuador	0	7
Coreidae: Coreinae: Hypselonotini			
Cebrenis cauta Brailovsky	Bolivia	24	1
Cebrenis colorata Mayr	Ecuador	3	1
Cebrenis criminosa Brailovsky	Ecuador	1	0
Cebrenis furtiva Brailovsky	Bolivia, Ecuador	34	85
Cebrenis gibbosa Brailovsky	Ecuador	13	4
Cebrenis ningula Brailovsky	Colombia 2	1	3
Cebrenis rolstoni Brailovsky	Ecuador	24	0
Cebrenis tenebrosa Brailovsky	Colombia 2	1	0
Cebrenis truncatulata Brailovsky	Bolivia	6	0
Daphnasa simillima Brailovsky	Colombia 2	4	26
Petersitocoroides sp.	Colombia 2	4	0
Coreidae: Coreinae: Nematopodini			
Melucha phyllocnemis (Burmeister)	Colombia 2	1	4
Nematopus ruficrus (Perty)	Colombia 1&2, Ecuador	0	8
Coreidae: Coreinae: Stenoscelideini			
Stenoscelidea hilaris Breddin	Ecuador	1	29
Coreidae: Meropachyinae: Spathophorini			
Lycambes martinezi Kormilev	Ecuador	1	0
Cyrtocoridae			
Cyrtocoris andicola Horvath	Brazil	0	1

Table 1. (Continued) Heteroptera collected at butterfly traps baited with putrefied fish or shrimp carrion.

Taxon	Location	No. of males	No. of females
Lygaeidae: Lygaeinae			
Ochrimnus sp., nr. *disseptus* (Stål)	Peru 3	0	1
Pentatomidae: Discocephalinae			
Platycarenus umbraculatus (F.)	Ecuador	0	1
Pentatomidae: Edessinae			
Edessa nicopinata Breddin	Ecuador	0	2
Edessa sp. #1	Bolivia	0	1
Edessa sp. #2	Colombia 1	0	1
Edessa sp. #3	Colombia 2	0	2
Peromatus sp.	Ecuador	0	1
Pentatomidae: Pentatominae: Carpocorini			
Mormidea bovilla (Distant)	Colombia 2, Ecuador	0	7
Sibaria englemani Rolston	Colombia 2	0	9
Pentatomidae: Pentatominae: Catacanthini			
Runibea euopta (Walker)	Brazil	1	0
Pentatomidae: Pentatominae: Pentatomini			
Banasa roosevelti Thomas	Ecuador	0	4
Serdia (*Serdia*) *ruckesi* Thomas and Rolston	Peru 2	0	1
Taurocerus achilles Stål	Brazil	4	0
Taurocerus edessoides (Spinola)	Brazil	0	2
Rhopalidae: Rhopalinae			
Niesthrea vicentii (Westwood)	Colombia 2	1	0
Rhyparochromidae: Rhyparochrominae: Myodochini			
Catenes australis Dellapé and Melo	Colombia 1, Ecuador	3	0
Neopamera neotropicalis (Kirkaldy)	Ecuador	NA[1]	NA[1]
Neopamera sp., *neotropicalis* complex	Ecuador	NA[1]	NA[1]
Neopamera sp. #1	Ecuador	NA[1]	NA[1]
Neopamera sp. #2	Colombia 1	3	0
Neopamera sp. #3	Colombia 2	2	0
Rhyparochromidae: Rhyparochrominae: Ozophorini			
Ozophora concava Distant	Ecuador	NA[1]	NA[1]
Ozophora scutellata Slater	Ecuador	NA[1]	NA[1]
Ozophora singularis Slater	Ecuador	NA[1]	NA[1]
Ozophora sp. #1	Peru 1	0	1
Ozophora sp. #2	Colombia 2	0	6
Scutelleridae: Pachycorinae			
Crathis longifrons Stål	Bolivia, Brazil, Colombia 2, Ecuador	29	0
Pachycoris torridus (Scopoli)	Colombia 2, Ecuador	5	0
Polytes bimaculatus Eger	Peru 3	3	0
Symphylus cyphonoides (Walker)	Colombia 2, Ecuador	6	8
Symphylus sp., nr. *cyphonoides* (Walker)	Ecuador	4	1
Symphylus leucospilus (Walker)	Ecuador	3	0
Symphylus ramivitta Walker	Bolivia, Brazil, Ecuador, Peru 1	29	2
Symphylus sp. #1	Colombia 1, Ecuador, Peru 1	123	0
Symphylus sp. #2	Brazil, Colombia 1, Ecuador, Peru 1-3	38	0
Symphylus sp. #3	Ecuador, Peru 1	847	69
Symphylus sp. #4	Ecuador, Peru 1	3	1
Symphylus sp. #5	Ecuador	2	0
Symphylus sp. #6	Brazil	0	1
Symphylus sp. #7	Brazil	2	1
Symphylus sp. #8	Ecuador	10	6
Symphylus sp. #9	Colombia 1, Ecuador, Peru 1	9	0
Symphylus sp. #10	Ecuador	7	0
Symphylus sp. #11	Colombia 2	33	1
Tetyra sp.	Brazil	2	1

[1] Lygaeoid specimens from Ecuador were identified by the late Jim Slater, and we do not have information on total numbers or numbers of each sex. NA, not available.

curred on trails that ran along a large river. At the Peru 3 location, one trap located on a tree and not near any type of stream did not yield any Heteroptera. The trap was then moved to a spot directly over a stream on the morning of the last day and by afternoon had attracted 3 male specimens of *Polytes bimaculatus* Eger. Further, 5 collecting trips to the Kaw Mountains in French Guiana did not yield

any Heteroptera attracted to these traps. This was probably due in part to bait not having time to putrefy, but this location was not in close proximity to streams or rivers. Proximity to a source of fish or other carrion may play a role in conditioning these bugs to visit carrion for whatever purpose it serves.

In summary, butterfly traps baited with fish or shrimp carrion attracted a variety of Heteroptera and should be considered as an additional collecting tool for biodiversity studies or general collecting.

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