

THE AUCHENORRHYNCHA OF CAMBODIAN LOWLAND RICE

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This paper describes the species of Auchenorrhyncha and their natural enemies in Cambodian lowland rice, as well as the association between Auchenorrhyncha population levels and rice variety, water levels, and yields.

Arthropods were collected from Cambodian lowland rice from 1994 to 1996 using sweep nets, tap traps, and vacuum machines. There are 20 known species of Auchenorrhyncha inhabiting Cambodian lowland rice (Table 1). Not all of the Auchenorrhyncha collected in this study feed on rice plants. For example, the Meenoplid *Nisia* sp. feeds on the weed *Cyperus* sp.. At least 12 species of predators prey on the Auchenorrhyncha (Table 2). The Strepsipteran *Elenchus yasumatsui* (Kifune et Hirashima), a parasite of the brown planthopper (*Nilaparvata lugens* (Stål)), is the only non-Hymenopterous parasite of Auchenorrhyncha found in Cambodian rice (Table 3).

TABLE 1. AUCHENORRHYNCHA OF CAMBODIAN LOWLAND RICE.

Superfamily	Family	Species
Cicadoidea	Cercopidae	<i>Clovia</i> sp.
	Cicadellidae	<i>Baclutha</i> nr. <i>incisa</i> (Matsumura)
		<i>Baclutha</i> spp.
		<i>Cofana unimaculata</i> Young
		<i>Cofana spectra</i> (Distant)
		<i>Deltocephalus</i> sp.
		<i>Empoasca</i> sp.
		<i>Exitianus</i> sp.
		<i>Macrosteles</i> sp.
		<i>Nephotettix malayanus</i> Oshihara & Kawase
		<i>Nephotettix nigropictus</i> (Stål)
		<i>Nephotettix parvus</i> Ishihara & Kawase
		<i>Nephotettix virescens</i> (Distant)
<i>Recilia dorsalis</i> (Motschulsky)		
<i>Thaia oryzivora</i> Ghauri		
Fulgoroidea	Delphacidae	<i>Nilaparvata lugens</i> (Stål)
		<i>Opiconsiva</i> sp.
		<i>Peregrinus malidis</i> Ashmead
		<i>Sogatella furcifera</i> (Horvath)
	Meenoplidae	<i>Nisia</i> sp.

TABLE 2. ARTHROPOD PREDATORS OF THE AUCHENORRHYNCHA OF CAMBODIAN LOWLAND RICE

Order	Family	Species
Araneae (Spiders)	Araneidae	<i>Araneus inustus</i> (L. Koch)
		<i>Argiope catenulata</i> (Doleschall)
	Clubionidae	<i>Clubiona japonicola</i> (Bosenberg & Strand)
	Lycosidae	<i>Pardosa</i> sp.
Coleoptera	Tetragnathidae	<i>Tetragnatha maxillosa</i> (Boesenberg & Strand)
	Carabidae	<i>Ophionea ishii</i> (Habu)
Diptera	Staphylinidae	<i>Paederus fuscipes</i> (Curtis)
	Empidae	<i>Drapetis</i> spp.
Hemiptera	Mesoveliidae	<i>Mesovelia vittigera</i> (Horvath)
	Miridae	<i>Cyrtorhinus lividipennis</i> Reuter
Odonata	Veliidae	<i>Microvelia douglasi</i> (Bergroth)
	Coenagrionidae	<i>Agriocnemis fermina fermina</i> (Brauer)

TABLE 3. ARTHROPOD PARASITES OF SELECTED AUCHENORRHYNCHA OF CAMBODIAN LOWLAND RICE

Auchenorrhyncha	Associated Parasites
Brown planthopper (<i>Nilaparvata lugens</i> (Stål))	Hymenoptera: Dryinidae: <i>Haplogonatopus</i> sp., <i>Pseudogonatopus</i> spp., Mymaridae: <i>Anagrus optabilis</i> (Perkins), Trichogrammatidae: <i>Paracentrobia andoi</i> (Ishii) Strepsiptera: Elenchidae: <i>Elenchus yasumatsui</i> (Kifune et Hirashima)
Green leafhopper (<i>Nephotettix malayanus</i> Oshihara & Kawase, <i>Nephotettix nigropictus</i> (Stål), <i>Nephotettix parvus</i> Ishihara & Kawase, <i>Nephotettix virescens</i> (Distant))	Hymenoptera: Dryinidae: <i>Haplogonatopus</i> sp., Halictophagidae: <i>Halictophagus</i> sp., Mymaridae: <i>Anagrus optabilis</i> (Perkins), <i>Gonatocerus</i> sp., Trichogrammatidae: <i>Oligosita</i> spp., <i>Paracentrobia andoi</i> (Ishii),
Whitebacked planthopper (<i>Sogatella furcifera</i> (Horvath))	Hymenoptera: Dryinidae: <i>Haplogonatopus</i> sp., <i>Pseudogonatopus</i> spp., Mymaridae: <i>Anagrus flaveolus</i> (Waterhouse), Trichogrammatidae: <i>Oligosita</i> spp.
White leafhopper (<i>Cofana spectra</i> (Distant))	Hymenoptera: Mymaridae: <i>Gonatocerus</i> sp.
Zigzag leafhopper (<i>Recilia dorsalis</i> (Motschulsky))	Hymenoptera: Mymaridae: <i>Anagrus optabilis</i> (Perkins)

The viral diseases vectored by leafhoppers and planthoppers do not have a major impact on Cambodian rice production. Based on a national survey of over 1000 rice farmers, "yellow leaf" is the most commonly reported disease in 3 Cambodian provinces. Any number of pathogens and nutrient deficiencies can cause rice leaves to yellow. Possibly, some cases of yellow leaf are tungro, a viral disease vectored by green leafhoppers, but no one has ever conducted the immunological tests to confirm the presence of tungro virus in Cambodia.

In the 1995 wet season pest and natural enemy populations were studied in 25 lowland rice fields. Planthopper levels were based on direct counts on plants, while the levels of leafhoppers and beneficial arthropods were based on 5 sweep net collections per field per visit. Each sweep net sample consisted of 10 strokes while crossing the field diagonally. Fields were visited at 4 stages of crop development: tillering, booting, milk, and ripening. The yield of each field was estimated by taking the average of 3 randomly selected 2m X 5m areas. Averages were converted to tons per hectare. The arthropod population data was averaged over the fields at successive crop development stages. The crop stage with the population peak of each type of pest indicated which crop stage to use for analyzing the link between yield, rice variety, or water levels and the incidence of particular pests.

Contingency tables and chi-square analysis were used to look for links between rice variety, water levels, yields, and pest infestations. This statistical method allows simultaneous analysis of qualitative data (e.g., rice variety) and quantitative data (e.g., pest levels). Different factors were compared to low or high levels of pests in contingency tables. Pest levels were categorized as low or high depending on whether they were lower or higher than the average at the crop stage with the peak population. The cells of the contingency tables were filled in with the number of fields that fit each pair of criteria. Likewise, the effect of pests on yield was measured with contingency tables comparing low and high pest levels to low and high yields. Yields were categorized, as low or high, relative to the average yield for the entire group of fields being analyzed.

Planthoppers and leafhoppers had no significant effect on rice yields. Planthoppers, leafhoppers, and natural enemies were at their peak in the tillering stage and steadily declined through the remainder of the season. Medium duration rice had lower levels of leafhoppers than early or late duration rice. Planthopper levels were independent of variety. Fields with inadequate water had higher than average levels of planthoppers.

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