Arthropod Biodiversity and Community Structure in Dongxiang Wild Rice (*Oryza rufipogon* Griff.) Fields[1]

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ABSTRACT Dongxiang wild rice, *Oryza rufipogon* Griff. (Poales: Poaceae), has many excellent traits that are of interest to botanists and plant breeders. However, arthropod biodiversity and community structure for this rare species are not well known. Therefore, we investigated the arthropod communities in natural plots of Dongxiang wild rice at three locations in Jiangxi Province, China. The diversity and dominance indices of the arthropod communities within wild rice plots fluctuated only slightly over time. However, the diversity and dominance indices differed significantly among actively growing plots. The vegetation complex surrounding the wild rice plots affected the similarity coefficients of the arthropod communities within them. The surrounding vegetation also significantly affected the diversity and dominance indices of arthropod functional groups, except for the parasitoid group. The dominance of phytophagous groups, such as planthoppers, also was suppressed in more diverse arthropod communities. We are the first to report that the vegetation complex surrounding Dongxiang wild rice affects the pest complex within, and these data provide insight into the protection of Dongxiang wild rice from insect pests.

KEY WORDS cultivated rice, similarity coefficients, community dynamics, function group

Investigations of the diversity of arthropod communities that underlies rice production is important for the development of this crop (Nugaliyadde et al. 2000). In cultivated rice, research has primarily focused on arthropods because they play a key role in rice ecosystems (Schoenly et al. 1996, Settle et al. 1996, Li et al. 2007, Randlkofera et al. 2010), and pest control in cultivated rice is important for high production (Pimentel et al. 1997, Heong et al. 1998, Drechslera & Setteleb 2001, Cardinale et al. 2003, Park & Li 2009, Savary et al. 2012). It has been reported that diversity in the arthropod community promotes rice production (Way & Heong 1994, Matson et al. 1997, Afun et al. 1999, Kandibane et al. 2007). In tropical Asian irrigated rice, abundant natural enemies usually prevent significant insect pest problems (Matteson 2000).

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Populations of a wild rice, *Oryza rufipogon* Griff. (Poales: Poaceae), have been found in eight provinces of China (Xie et al. 2010), with the northernmost distribution in the world being located in Dongxiang (N: 116°36′, E: 28°14′), Jiangxi Province. Dongxiang wild rice has many excellent traits, such as resistance to cold, drought, infertility, diseases, and pests. This rare rice strain has many favorable genes, which include male sterility, wide compatibility, and restorer genes. Therefore, botanists and breeders have paid considerable attention to Dongxiang wild rice since its discovery.

The initial survey of *O. rufipogon* populations in Dongxiang was performed in 1982 (Pan & Rao 1982). At that time, there were nine natural *O. rufipogon* populations that covered an area of approximately 15 km^2. Since then, the habitats of *O. rufipogon* have become considerably deteriorated and only three populations remain today in Anjiashan, Chanshilin, and Zhangtang. In 1995, concrete walls (2-m high) were built around the Anjiashan and Chanshilin locations to prevent extinction of the *O. rufipogon* populations. However, a third population in Zhangtang was left without such protection (Song et al. 2003).

In recent years, research on Dongxiang wild rice has focused particularly on gene structure, genetic diversity, and mapping (Song et al. 2003, Zhang et al. 2006, Chen et al. 2008, Li et al. 2008). Other research on germplasm, growth status, protection, disease resistance, and the characteristics of spider populations have been reported for Dongxiang wild rice fields (Ye & Li 1987, Gao et al. 1996, Yang et al. 2003, Yuan et al. 2007). However, little research has been performed on arthropod biodiversity or community structure in wild rice. The aim of the present study was to investigate the arthropod community structure in Dongxiang wild rice on *in-situ* conservation plots in Jiangxi Province, China. This research provides useful information that could help protect natural populations of this rare type of wild rice.

Materials and Methods

Study site and adjacent vegetation. Arthropod samples were collected during April to November, 2009 from six Dongxiang wild rice plots located in Dongxiang County, Jiangxi Province, China (N: 116°36′, E: 28°14′). Plots 1-4 were located in Anjiashan, plot 5 was located in Chanshilin, and plot 6 was located in Zhangtang. Plot 1 (*A-c*) was adjacent to a chestnut forest that contained 46 plant species. The dominant vegetation included Chinese chestnut, *Castanea mollissima* Blume (Fagaceae); tea, *Camellia sinensis* (L.) Kuntze (Theaceae); Chinese sumac, *Rhus chinensis* Mill. (Anacardiaceae); and the tung oil tree, *Vernicia fordii* (Hemsl.) (Euphorbiaceae). Plot 2 (*A-s*) was adjacent to a shrubby *Imperata* grassland that contained 28 plant species. The dominant vegetation included cogon grass, *Imperata cylindrica* (L.) Beauv. (Poaceae), and a blackberry, *Rubus corchorifolius* L. (Rosaceae). Plot 3 (*A-b*) was adjacent to a brushy area that contained 39 plant species. The dominant vegetation included *I. cylindrica* and *R. corchorifolius*. Plot 4 (*A-g*) was adjacent to a grassy area that contained 17 plant species. The dominant vegetation included Chinese silver-grass, *Miscanthus sinensis* Andersson (Poaceae), and *Cymbopogon goeringii* (Steudel) Camus (Poaceae). Plot 5 (*C-o*) was adjacent to a grassy area that contained 6 plant species. The dominant vegetation included water pepper, *Polygonum hydropiper* (L.) Delabre (Polygonaceae). Plot 6 (*Z-o*) was interspersed among a peach, *Prunus persica* (L.) Batsch (Rosaceae), orchard where all other plants were eliminated through orchard management.

Arthropod sampling. Arthropods were sampled from each plot at about 15-d intervals during the 2009 growing season. Within each of the six plots, three subplots were established for replicated sampling (18 total plots). For each subplot on each date, five random samples of arthropods were taken using a vacuum-suction machine that was modified according to Carino et al. (1979). The vacuum-suction machine was moved over a 1-m^2 area until no arthropods were observed. The arthropods were then transferred into vials filled with 80% ethanol. The samples were identified and counted in the laboratory. When possible, the specimens were identified to species; otherwise, they were identified morphologically to genera or families.

Statistical analysis. To illustrate the effects of different vegetation types on arthropods in Dongxiang wild rice, some common community indices were calculated for the different plots. Alpha species diversity was calculated using the Shannon-Weaver Diversity Index (H'), the Simpson Dominance Index (C), and Jaccard's Similarity Index (q).

The Shannon-Weaver Diversity Index (Shannon & Weaver 1949) was calculated by

$$H' = -\sum_{i=1}^{s} (P_i)(\ln P_i),$$

where S is the total number of species in all samples and P_{i} is the proportion of all individuals in a sample that belong to species i.

The Simpson Dominance Index (Simpson 1949) was calculated by

$$C = \sum P_i^2,$$

where P_{i} is the proportion of all individuals in a sample that belong to species i.

Jaccard's Similarity Index (Pielou 1988) was calculated by

$$q = \frac{C}{N_1 + N_2 - C},$$

where C is the number of taxa shared between a pair of regions, and N_1 and N_2 are the number of species in each plot of Dongxiang wild rice.

SPSS 17.0 software (SPSS Inc., Chicago, IL) was used to analyze the data. Differences in the diversity indices and the composition of the arthropod groups in the six plots were analyzed with Tukey tests. Throughout the text, the results are shown as the means ± SE (standard error of the mean).

Results

The abundance of arthropods in Dongxiang wild rice fields. During this study, a total of 31,223 individual arthropods belonging to 241 species, 85 families, 14 orders, and 3 classes were identified. A total of 6263 individual

Table 1. Diversity indices of arthropod communities in six plots of Dongxiang wild rice.

Diversity index[b]	Location[a]					
	A-c	*A-s*	*A-b*	*A-g*	*C-o*	*Z-o*
H'	2.11 ± 0.07a[c]	2.09 ± 0.06a	2.04 ± 0.08ab	1.87 ± 0.07ab	1.87 ± 0.08ab	1.75 ± 0.07b
C	0.014 ± 0.002a	0.018 ± 0.003a	0.019 ± 0.003a	0.032 ± 0.003b	0.037 ± 0.003b	0.053 ± 0.004c

[a]*A-c*, *A-s*, *A-b*, and *A-g* were located in Anjiashan, *C-o* was located in Chanshilin, and *Z-o* was located in Zhangtang (see text).
[b]H' = Shannon-Weaver Diversity Index, and C = Simpson Dominance Index.
[c]Mean ± SE represents the mean of three replicates and the standard error of the mean. Values in the same row with different lowercase letters are significantly different (Tukey-test, $P < 0.05$).

arthropods belonging to 210 species in 82 families were observed in the experimental plot *A-c*; 5556 individuals of 193 species in 76 families were identified in plot *A-s*; 5482 individuals of 203 species in 78 families were identified in plot *A-b*; 5121 individuals of 134 species in 61 families were identified in plot *A-g*; 4832 individuals of 128 species in 59 families in were identified in plot *C-o*; and 3969 individuals of 110 species in 57 families were identified in plot *Z-o*.

Species richness and diversity. To illustrate the effects of different vegetation types on arthropods in Dongxiang wild rice, the common community indices, Shannon-Weaver Diversity Index (H') and the Simpson Dominance Index (C), were calculated for the different plots. Significant differences were found in these indices for the six plots (H', $F_{5,17} = 4.39$, $P = 0.017$; C, $F_{5,17} = 23.22$, $P < 0.001$) (Table 1).

The diversity and dominance indices of the arthropod communities within the Dongxiang wild rice plots fluctuated only slightly over time (Figure 1). Dongxiang wild rice has a long growing period (April–November); therefore, for each of the six plots, we calculated the indices of diversity and dominance at four different growth stages of the rice. They were the seedling stage (SS, April–July), the earring and flowering stage (ES, July–September), the mature stage (MS, September–October), and the dormant stage (DS, November). Over this long growing period, there were significantly different diversity and dominance indices among plots, except during the dormant stage (H', $F_{5,35} = 0.25$, $P = 0.94$; C, $F_{5,35} = 0.68$, $P = 0.64$). For plots *A-c*, *A-s*, and *A-b*, there were significant differences in the diversity and dominance indices at different growing stages. However, in plots *A-g* (H', $F_{3,59} = 2.00$, $P = 0.13$; C, $F_{3,59} = 0.64$, $P = 0.60$), *C-o* (H', $F_{3,59} = 1.42$, $P = 0.25$; C, $F_{3,59} = 0.18$, $P = 0.91$), and *Z-o* (H', $F_{3,59} = 1.57$, $P = 0.21$; C, $F_{3,59} = 1.44$, $P = 0.24$) there were no significant differences in the diversity and dominance indices at the different growing stages (Table 2).

Significant differences in similarity coefficients were found among plots (Table 3). The similarity coefficient between plots *A-c* & *A-b* (0.86) was the highest and between plots *A-b* & *Z-o* (0.48) was the lowest among the plots, respectively.

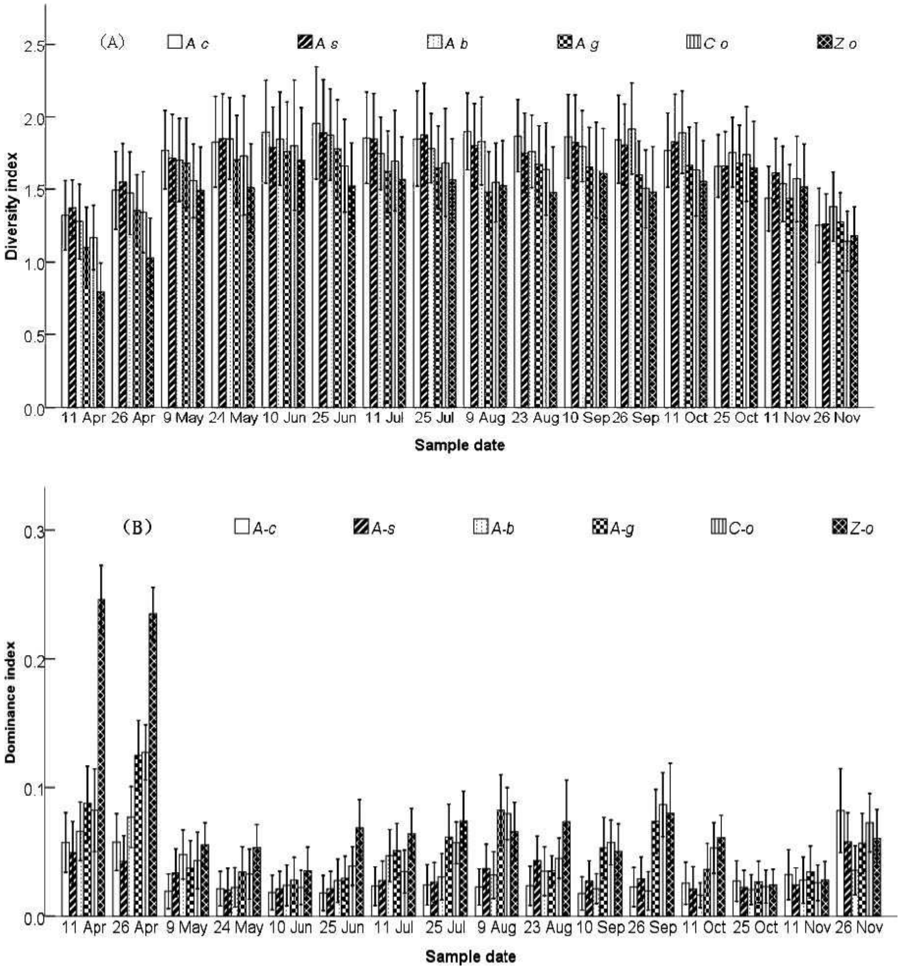

Fig. 1. Temporal dynamics of the diversity index (A) and dominance index (B) for arthropod communities in six plots (bars are 95% CIs). The meanings of *A-c*, *A-s*, *A-b*, *A-g*, *C-o*, and *Z-o* are the same as those in Table 1.

Dominance distribution. To analyze the arthropod biodiversity and community structure in Dongxiang wild rice, the collected arthropods were separated into four functional groups (Settle et al. 1996). The functional groups were predators, parasitoids, phytophagous arthropods (plant feeders), and neutral species (this group of arthropod posed no direct or indirect threat to Dongxiang wild rice). The predator group contained 11,267 individuals from 92 species, the parasitoid group contained 5733 individuals from 50 species, the phytophagous group contained 11,281 individuals from 52 species, and the neutral group contained 2942 individuals from 47 species. For each plot, the predator group had the highest diversity index, while the phytophagous group had the lowest diversity index (Table 4). Functional groups had significantly

Table 2. Diversity indices of arthropod communities in the different growing stages of Dongxiang wild rice.

Diversity index[b]	Growing stage[c]	Location[a]					
		A-c	*A-s*	*A-b*	*A-g*	*C-o*	*Z-o*
H'	SS	1.75 ± 0.06Aa[d]	1.74 ± 0.06Aa	1.70 ± 0.06Aa	1.58 ± 0.06Aa	1.59 ± 0.07Aa	1.40 ± 0.08Ab
	ES	1.86 ± 0.05Aa	1.82 ± 0.05Aa	1.81 ± 0.05Aa	1.61 ± 0.05Ab	1.62 ± 0.06Ab	1.54 ± 0.05Ab
	MS	1.79 ± 0.06Aab	1.78 ± 0.07Aab	1.84 ± 0.06Aa	1.65 ± 0.06Abc	1.63 ± 0.07Abc	1.57 ± 0.07Ac
	DS	1.35 ± 0.09Ba	1.44 ± 0.11Ba	1.46 ± 0.09Ba	1.36 ± 0.08Aa	1.36 ± 0.13Aa	1.35 ± 0.11Aa
C	SS	0.030 ± 0.004Bd	0.030 ± 0.003Bd	0.043 ± 0.005Acd	0.057 ± 0.007Ab	0.054 ± 0.007Abc	0.084 ± 0.017Aa
	ES	0.022 ± 0.003Bb	0.031 ± 0.003Bb	0.031 ± 0.004Bb	0.059 ± 0.005Aa	0.059 ± 0.006Aa	0.068 ± 0.005Aa
	MS	0.023 ± 0.003Bb	0.025 ± 0.004Bb	0.020 ± 0.003Bb	0.047 ± 0.007Aa	0.055 ± 0.008Aa	0.054 ± 0.008Aa
	DS	0.057 ± 0.014Aa	0.042 ± 0.007Aa	0.032 ± 0.006ABa	0.046 ± 0.009Aa	0.049 ± 0.012Aa	0.044 ± 0.009Aa

[a] *A-c*, *A-s*, *A-b*, and *A-g* were located in Anjiashan, *C-o* was located in Chanshilin, and *Z-o* was located in Zhangtang (see text).

[b] *H'* = Shannon-Weaver Diversity Index, and *C* = Simpson Dominance Index.

[c] SS = seedling stage, ES = earing and flowering stage, MS = mature stage, and DS = dormant stage.

[d] Mean ± SE represents the mean of three replicates and the standard error of the mean. The values in the same row with different lowercase letters are significantly different; while for each index, values in the same column with different capital letters are significantly different (Tukey-test, $P < 0.05$).

Table 3. The similarity coefficients of the arthropod community in six plots of Dongxiang wild rice.

	Location[a]					
Location[a]	*A-c*	*A-s*	*A-b*	*A-g*	*C-o*	*Z-o*
A-c	-	0.84 ± 0.04a[b]	0.86 ± 0.03a	0.60 ± 0.03cd	0.59 ± 0.02cd	0.51 ± 0.02d
A-s	-	-	0.78 ± 0.03ab	0.58 ± 0.03cd	0.57 ± 0.02cd	0.51 ± 0.02d
A-b	-	-	-	0.58 ± 0.03cd	0.56 ± 0.02d	0.48 ± 0.02d
A-g	-	-	-		0.77 ± 0.02ab	0.69 ± 0.02bc
C-o						0.76 ± 0.0ab
Z-o						

[a]*A-c*, *A-s*, *A-b*, and *A-g* were located in Anjiashan, *C-o* was located in Chanshilin, and *Z-o* was located in Zhangtang (see text).
[b]Mean ± SE represents the mean of three replicates and the standard error. The values in the table with different lowercase letters are significantly different (Tukey-test, $P < 0.05$).

different diversity indices among plots, except for the parasitoid group ($F_{5,17} = 1.241$, $P = 0.350$). For each plot, the phytophagous group had the highest dominance index, while predators had the lowest dominance index. Except for parasitoids, functional groups had significantly different dominance indices among plots ($F_{5,17} = 0.637$, $P = 0.676$) (Table 4).

Discussion

In 2009, the total number of individuals and species of arthropod was different for each plot of Dongxiang wild rice. The number of arthropods collected from plot *A-c* (6263 individuals, 210 species) was far higher than that from plot *Z-o* (3969 individuals, 110 species). This is consistent with the report that an increased diversity of surrounding vegetation was correlated significantly with an increased arthropod abundance in Dongxiang wild rice (Siemann et al. 1998, Symstad et al. 2000).

The diversity and dominance indices indicated that there were significant differences in the number of arthropods found in the six plots. The highest diversity index was in plot *A-c* (2.11) and the lowest index was in plot *Z-o* (1.75). In contrast, the highest dominance index was in plot *Z-o* (0.053) and the lowest index was in plot *A-c* (0.014). Forty-six plant species were adjacent to plot *A–c* and only one plant species was adjacent to plot *Z-o*. Arthropod orientation, diversity, and dominance in Dongxiang wild rice are determined by the relationship between plant volatile diversity and plant species diversity (Symstad et al. 2000, Randlkofera et al. 2010). This result is in accordance with a previous report that showed that the surrounding vegetation complexity influences arthropod diversity in cultivated rice (Afun et al. 1999, Wilby et al. 2006, Deb 2009, Randlkofera et al. 2010).

In each plot, the diversity indices increased from April to May, fluctuated slightly from May to October, and finally decreased from October to November. In general, the dominance index in plot *Z-o* was higher than in other plots, and the

Table 4. The diversity indices for groups of arthropods in six plots of Dongxiang wild rice.

Diversity index[b]	Arthropod group[c]	Location[a]					
		A-c	*A-s*	*A-b*	*A-g*	*C-o*	*Z-o*
H'	Pr	1.73 ± 0.06ab[d]	1.75 ± 0.08a	1.65 ± 0.06abc	1.53 ± 0.06bc	1.52 ± 0.06c	1.46 ± 0.06c
	Pa	1.51 ± 0.06a	1.51 ± 0.06a	1.58 ± 0.06a	1.46 ± 0.06a	1.47 ± 0.07a	1.38 ± 0.05a
	Ph	1.42 ± 0.06a	1.31 ± 0.06ab	1.28 ± 0.06ab	1.15 ± 0.06b	1.09 ± 0.06c	0.95 ± 0.06c
	Na	1.42 ± 0.06ab	1.45 ± 0.07a	1.29 ± 0.06abc	1.10 ± 0.07c	1.22 ± 0.06c	1.25 ± 0.08bc
C	Pr	0.026 ± 0.006bc	0.024 ± 0.006c	0.031 ± 0.005bc	0.041 ± 0.006ab	0.042 ± 0.005ab	0.048 ± 0.006a
	Pa	0.032 ± 0.006a	0.033 ± 0.007a	0.029 ± 0.007a	0.039 ± 0.007a	0.033 ± 0.007a	0.044 ± 0.007Aa
	Ph	0.074 ± 0.019a	0.123 ± 0.013ab	0.125 ± 0.019ab	0.155 ± 0.020b	0.183 ± 0.024b	0.251 ± 0.027c
	Na	0.054 ± 0.011a	0.043 ± 0.010a	0.093 ± 0.015bc	0.116 ± 0.012b	0.064 ± 0.013ac	0.060 ± 0.012ac

[a] *A-c*, *A-s*, *A-b*, and *A-g* were located in Anjiashan, *C-o* was located in Chanshilin, and *Z-o* was located in Zhangtang (see text).
[b] H' = Shannon-Weaver Diversity Index, and C = Simpson Dominance Index.
[c] Pr = predator, Pa = parasitoid, Ph = phytophagous, and Na = neutral group.
[d] Mean ± SE represents the mean of three replicates and the standard error. The values in the same row with different lowercase letters are significantly different (Tukey-test, $P < 0.05$).

highest dominance index was 0.25 on 11 April. In each plot, the dominance indices in April were higher than in the other months. This may be due to the off-season continuity of natural enemies in Dongxiang wild rice. Particularly during April, the lack of adjacent vegetation in the *Z-o* plot led to fewer early arriving predators and phytophagous groups that were dominant, which contributed to the highest dominance index (Way & Heong 1994, Matteson 2000, Cardinale et al. 2003). The temporal dynamics of the diversity and dominance indices in arthropod communities have been shown to fluctuate widely in cultivated rice (Li et al. 2007) because of human intervention. In contrast, the plant community in Dongxiang wild rice is rather stable and the temporal dynamics only fluctuate slightly.

During the entire growing period for plots A-c, A-s, and A-b , the arthropod diversity (H') and dominance indices (C) of the seedling stage (SS), the earring and flowering stage (ES), and the mature stage (MS) were significantly different from those of dormant stage (DS). However, for plots *A-g*, *C-o*, and *Z-o* there were no differences in these indices at the four growth stages. The diversity of the plants surrounding these plots may have contributed to this difference (Wilby et al. 2006, Randlkofera et al. 2010). Only during the dormant stage (November) were the arthropod diversity and dominance indices not significant among the six plots. The lower temperature in November may be the main reason for this phenomenon, which affected the distribution of the arthropods (Matsumura & Takeda 2010).

The similarity coefficients of the arthropod communities in the six plots were associated with the vegetation surrounding Dongxiang wild rice. As the plant species diversity of plots *A-c* (46) and *A-b* (39) had similar vegetation adjacent which were higher than other plots, they had the highest similarity coefficient (0.86) among the plots. The lowest similarity coefficient (0.48) was found between plots *A-b* and *Z-o*, but the difference in the number of surrounding plant species between the two plots (*A-b*: 39 and *Z-o*: 1) was lower than the difference between plots *A-c* (46) and *Z-o* (1). Based on analysis of the similarity coefficients of the arthropod communities, we speculated that the similarity coefficients of the arthropod community in Dongxiang wild rice may have a relationship to plant volatile diversity and plant species diversity, which is consistent with research by Randlkofera et al. (2010).

We found that there were significant differences in the diversity and dominance indices for predators in each plot. For plot *A-c*, 2273 individual predators from 86 species were identified, 2248 predators from 78 species were identified from plot *A-s*, 1920 predators from 80 species were identified from plot *A-b*, 1845 predators from 52 species were identified from plot *A-g*, 1624 predators from 49 species were identified from plot *C-o*, and 1357 predators from 42 species were identified from plot *Z-o*. In Dongxiang wild rice, spiders (Araneae) in the families Linyphiidae, Lycosidae, and Tetragnathidae were the dominant predators. The dominant species were *Ummeliata insecticeps* Boes. et Str., *Pirata subpiraticus* Boes. et Str., *Hylyphantes graminicola*, and *Coleosoma octomaculatum* Boes. et Str. This is in agreement with a previous report that investigated the presence of spiders in the community structure of Dongxiang wild rice (Yuan et al. 2007). Dominant insect predators included *Cyrtorhinus livdipennis* Reuter (Hemiptera: Miridae), *Paederus fuscipes* Curtis (Coleoptera: Staphylinidae), and other members of these families (Kromp 1989). These results imply that predator groups play an important role in controlling the pests in Dongxiang wild rice, similar to their role in cultivated rice (Krishnasamy et al. 1983, Fagan et al. 1998, Li et al. 2007).

Parasitoids are known to be relatively sensitive to their habitat (Way & Heong 1994, Settle et al. 1996, Kruess & Tscharntke 2000). In this study, we did not find a difference in the abundance of parasitoids among the six plots, and this result is worth further investigation.

The dominant phytophagous insect families in Dongxiang wild rice were Delphacidae, Cicadellidae, and Pentatomidae. There was a significant dominance of phytophagous groups in each plot in the present study, but this dominance was lower than that found in cultivated rice (Lawton 1983, Heong et al. 1991, Way & Heong 1994, Schoenly et al. 1998, Li et al. 2007, Chen et al. 2011). Because Dongxiang wild rice is a natural system without human intervention, its species complex is more stable and balanced than cultivated rice due to natural control functions (Hooper et al. 2005). The brown planthopper, *Nilaparvata lugens* (Stål) (Delphacidae), and the rice leafroller, *Cnaphalocrocis medinalis* (Guen.) (Crambidae), are two major pests of cultivated rice (Kenmore et al. 1984). Although *N. lugens* is a dominant species in Dongxiang wild rice, its population density was markedly lower than that found in cultivated rice (Heong et al. 1992). The numbers of *N. lugens* individuals were found to be significantly different in the six plots analyzed ($F_{5,17} = 109.138$, $P < 0.001$). We found 493 *N. lugens* planthoppers in plot *A-c*, 572 in plot *A-s*, 552 in plot *A-b*, 739 in plot *A-g*, 784 in plot *C-o*, and 815 in plot *Z-o*. The reason for the variation in these numbers may be due to the difference in spider dominance in the six plots. Spiders are important biological control agents for rice, and they play a key role in controlling both planthopper and leafhopper populations (Barrion & Litsinger 1984, Arida et al. 1994, Sigsgaard 2000, Sebastian et al. 2005). This is probably also true for Dongxiang wild rice. The second important pest, *C. medinalis*, was seldom found in Dongxiang wild rice, primarily because morphological characteristics of the stems and leaves make it resistant to this pest (Zhu & Liu 1985). Another interesting observation was that *Spodoptera litura* (F.) (Noctuidae) larvae were found only in plot *A-c*, which deserves further attention.

In this study, we categorized arthropods that posed no direct or indirect threat to Dongxiang wild rice into a "neutral group," which contained detritivores and arthropods that were not predators, parasitoids, or plant feeders (Schoenly et al. 1996, Li et al. 2007). The diversity and dominance indices of the neutral group were significantly different within each plot. Although this group had no direct controlling effects on pests, they may still play an important role in the Dongxiang wild rice natural ecosystem as they do in cultivated rice (Schoenly et al. 1996).

In conclusion, we found that the diversity and dominance indices of arthropods were significantly different among Dongxiang wild rice plots that were adjacent to different vegetation types, and that the diversity and dominance indices of the arthropod communities fluctuated only slightly over time in Dongxiang wild rice, a natural ecosystem. Furthermore, except during the dormant stage, the diversity and dominance indices and similarity coefficients of arthropod communities in Dongxiang wild rice were affected significantly by vegetation in adjacent fields. In addition, the vegetation surrounding Dongxiang wild rice plots significantly affected the diversity and dominance indices of arthropod groups (except for parasitoids), with Dongxiang wild rice plots having a significantly lower dominance index than cultivated rice plot. The vegetation surrounding Dongxiang wild rice plots suppressed the dominance of phytophagous groups, especially planthoppers, and *Cnaphalocrocis medinalis* was seldom found in these plots. Our data provide potential insights into the control of pest populations in Dongxiang wild rice as well as in rice cultivated for agricultural production. Further studies should be focus on the relationships between arthropods in Dongxiang wild rice and surrounding vegetation.

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