

Aquatic animal assemblages inhabiting the rice fields in Shiga Prefecture, central Japan

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In the past few decades, importance of secondary nature, such as *Satoyama* and agricultural landscapes, for conservation of biodiversity has been recognized in Japan. In monsoon Asia, large part of natural wetlands, such as alluvial fan and flood plain, have been converted to rice fields, which is temporary wetlands with strict seasonality by farmers' management, and then the rice fields have provided various aquatic animals with habitats. In Shiga Prefecture, various types of practices have been made for conservation of many kinds of organisms in rice paddies in recent years. However, comprehensive studies for species diversity of aquatic animals inhabiting rice paddies were not enough to discuss the efficacy of the practices. In this study, we investigated the aquatic animal assemblages including both vertebrates and invertebrates in rice fields with various farming practices, locations and water conditions in Shiga Prefecture during transplantation of rice plants and mid season drainage.

As a result, at least 125 aquatic taxa belonging to 6 phyla, 11 classes were observed from 26 rice fields (see Table 1). Class Insecta was most dominant taxon in the study, at least 81 taxa was observed and larvae or nymphs were found in 71 taxa. The result show paddies are used as reproductive habitats by most insects found in the paddies. Assemblage structures of aquatic insects were similar among paddies located nearby. Though some taxa were considered to be affected by the farming practices, the effect of farming practices were not clear in the assemblage structure. The results suggest that locality may be important to determine the assemblage structure of aquatic insects in rice paddies. However, since some taxa were considered to be affected by farming practices and other factors, further research should be needed.

Table1 List of aquatic taxa observed in 26 rice fields in Shiga Prefecture in 2010.

| Phylum | Class | Order | Family | Genus | Scientific name | | | |
|-----------------|----------------|----------------|-----------------|-------------------------|----------------------------|--------------------------------|-------------------------|-----------------------|
| Platyhelminthes | Turbellaria | Tricladida | (Unidentified) | (Unidentified) | Tricladida sp. | | | |
| Nematoda | (Unidentified) | (Unidentified) | (Unidentified) | (Unidentified) | Nematoda sp. | | | |
| Mollusca | Gastropoda | Prosobranchia | Viviparidae | Cipangopaludina | Cipangopaludina chinensis | | | |
| | | | | Sinotaia | Sinotaia quadrata histrica | | | |
| | | | | Parafossarulus | Gabbia kiusiuensis(?) | | | |
| | | | | Semisulcospira | Semisulcospira sp. | | | |
| | | | | Laevapex | Laevapex nipponica | | | |
| | | | | Fossaria | Fossaria ollula | | | |
| | | | | Physa | Physa acuta | | | |
| | | | | Gyraulus | Gyraulus chinensis | | | |
| | | | | Polypylis | Polypylis hemisphaerula | | | |
| | | | | Bivalvia | Veneroida | Pisidiidae | Pisidium | Pisidium uejii |
| | | | | | | Sphaeriidae | Sphaerium | Sphaerium japonicum |
| | | | Annelida | Hirudinea | Rhynchobdellida | Glossiphoniidae | Alboglossiphonia | Alboglossiphonia lata |
| | | | | | | | (Unidentified) | Glossiphoniidae sp. |
| | | | | | | Arhynchobdellida | Hirudinidae | Hirudo |
| | (Unidentified) | (Unidentified) | | | | Whitmania | Whitmania edentula | |
| | (Unidentified) | (Unidentified) | | | | (Unidentified) | Erpobdelliformes sp. | |
| | Oligochaeta | (Unidentified) | (Unidentified) | (Unidentified) | Oligochaeta sp. | | | |
| Arthropoda | Malacostraca | Amphipoda | Gammaridae | Gammarus | Gammarus nipponensis | | | |
| | | Anostraca | Chirocephalidae | Branchinella | Branchinella kugenumaensis | | | |
| | | Conchostraca | Cyzicidae | Caenestheriella | Caenestheriella gifuensis | | | |
| | | | Leptestheriidae | Leptestheria | Leptestheria kawachiensis | | | |
| | | Decapoda | Cambaridae | Procambarus | Procambarus clarkii | | | |
| | | Diplostraca | Lynceidae | Lynceus | Lynceus biformis | | | |
| | | Isopoda | Asellidae | Asellus | Asellus hilgendorfi | | | |
| | | Notostraca | Triopsidae | Triops | Triops sp. | | | |
| | | Arachnida | Acariformes | (Unidentified) | (Unidentified) | (Unidentified) | Acariformes sp. | |
| | | | | Arrenuridae | Arrenurus | Arrenurus sp. | | |
| | | Insecta | Ephemeroptera | Odonata | Baetidae | Baetis | Baetis sp. | |
| | | | | | | Cloeon | Cloeon sp. | |
| | | | | | | Ephemerellidae | Cincticostella | Cincticostella nigra |
| | | | | | | Lestidae | Indolestes | Indolestes peregrinus |
| | | | | | Lestes | Lestes temporalis | | |
| | Coenagrionidae | | | | Ischnura | Ischnura sp. | | |
| | | | | | Paracercion | Paracercion sieboldii | | |
| | Aeshnidae | | | | Gynacantha | Gynacantha japonica | | |
| | Libellulidae | | | | Lyriothemis | Lyriothemis pachygastra | | |
| | | | | | Orthetrum | Orthetrum albistylum speciosum | | |
| | | | | | Sympetrum | Sympetrum frequens | | |
| | | | | | | Sympetrum darwinianum | | |
| | | | | | | Sympetrum infuscatum | | |
| | | | | | | Sympetrum eroticum eroticum | | |
| | | | | | | Sympetrum sp. | | |
| | Plecoptera | | | | Nemouridae | Nemoura | Nemoura sp. | |
| | | | | | | (Unidentified) | Nemouridae sp. | |
| | Hemiptera | | | | Belostomatidae | Appasus | Appasus japonicus | |
| | | | | | Nepidae | Laccotrephes | Laccotrephes japonensis | |
| | | | Ranatra | Ranatra chinensis | | | | |
| | | Notonectidae | Notonecta | Notonecta triguttata | | | | |
| | | Pleidae | Paraplea | Paraplea indistinguenda | | | | |
| | | | | Paraplea japonica | | | | |
| | | Corixidae | Micronecta | Micronecta sp. | | | | |
| | | | Sigara | Sigara septemlineata | | | | |
| | | | | Sigara substriata | | | | |
| | | | | Sigara sp. | | | | |
| | | | | Sigara nigroventralis | | | | |
| | | | (Unidentified) | Corixidae sp. | | | | |
| | | Veliidae | Microvelia | Microvelia sp. | | | | |
| | | Gerridae | Gerris | Gerris latiabdominis | | | | |

Table 1 (Continue)

| | | | | | |
|------------|----------------|----------------|------------------|----------------|---|
| Arthropoda | Insecta | Coleoptera | Haliplidae | Halipilus | Halipilus sharpi Halipilus sp. |
| | | | | Peltodytes | Peltodytes intermedius |
| | | | Noteridae | Noterus | Noterus japonicus Noterus sp. |
| | | | Dytiscidae | Copelatus | Copelatus weymarni |
| | | | | Cybister | Cybister brevis |
| | | | | Eretes | Eretes sticticus |
| | | | | Hydaticus | Hydaticus grammicus Hydaticus bowringii Hydaticus sp. |
| | | | | Hydroglyphus | Hydroglyphus japonicus |
| | | | | Hydrovatus | Hydrovatus acuminatus |
| | | | | Laccophilus | Laccophilus kobensis Laccophilus difficilis Laccophilus sp. |
| | | | Hydrophilidae | Rhantus | Rhantus suturalis |
| | | | | Coelostoma | Coelostoma stultum |
| | | | | Laccobius | Laccobius bedeli |
| | | | | Enochrus | Enochrus simulans Enochrus sp. |
| | | | | Herochares | Herochares striatus Herochares pallens Herochares sp. |
| | | | | Hydrochara | Hydrochara affinis |
| | | | | Hydrophilus | Hydrophilus acuminatus |
| | | | | Regimbartia | Regimbartia attenuata |
| | | | | Sternolophus | Sternolophus rufipes |
| | | | | Berosus | Berosus punctipennis Berosus sp. Hydrobiinae sp. |
| | | | Curculionidae | (Unidentified) | Hydrophilidae sp. |
| | | | | Echinocnemus | Echinocnemus squameus |
| | | | | Gymnaetron | Gymnaetron miyoshii |
| | | | | Lissorhopterus | Lissorhopterus oryzophilus |
| | | | | Miarus | Miarus sp. |
| | | | | Tanysphyrus | Tanysphyrus brevipennis Tanysphyrus major |
| | | | Lampyridae | Luciola | Luciola lateralis |
| | | | Scirtidae | Scirtes | Scirtes sp. |
| | Diptera | | Ceratopogonidae | (Unidentified) | Ceratopogonidae sp. |
| | | | Chironomidae | (Unidentified) | Chironomidae sp. |
| | | | Culicidae | Anopheles | Anopheles sp. |
| | | | | Culex | Culex sp. |
| | | | | (Unidentified) | Culicidae sp. |
| | | | Dixidae | (Unidentified) | Dixidae sp. |
| | | | Ephydriidae | (Unidentified) | Ephydriidae sp. |
| | | | Sciomyzidae | (Unidentified) | Sciomyzidae sp. |
| | | | Tabanidae | (Unidentified) | Tabanidae sp. |
| | | | Tipulidae | (Unidentified) | Tipulinae sp. Limoniinae sp. Tipulidae sp. |
| | | | (Unidentified) | (Unidentified) | Brachycera sp. |
| | | Lepidoptera | Crambidae | Elophila | Elophila fengwhanalis |
| | | Trichoptera | (Unidentified) | (Unidentified) | Trichoptera sp. |
| | | | Lepidostomatidae | Lepidostoma | Lepidostoma sp. |
| | | | Leptoceridae | Oecetis | Oecetis sp. |
| | | | Molannidae | Molanna | Molanna sp. |
| Chordata | Actinopterygii | Cypriniformes | Cobitidae | Misgernus | Misgurnus anguillicaudatus |
| | | | Cyprinidae | Carassius | Carassius sp. |
| | | (Unidentified) | (Unidentified) | (Unidentified) | Actinopterygii sp. |
| | Amphibia | Anura | Hylidae | Hyla | Hyla japonica |
| | | | Ranidae | Fejervarya | Fejervarya limnocharis |
| | | | | Rana | Rana rugosa Rana nigromacurata Rana porosa brevipoda |
| | | | Rhacophoridae | Rhacophorus | Rhacophorus schlegelii Rhacophorus arboreus |
| | | | (Unidentified) | (Unidentified) | Anura sp. |
| | | Urodela | Salamandridae | Cynops | Cynops pyrrhogaster |