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【Research report】

亞洲地區稻田昆蟲相及其生物學之研究XI 世界性稻田內水棲鞘翅目之記錄【研究報告】

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Abstract

摘要

本報告列表整理曾在世界各地之水田中所採集到的鞘翅昆蟲，共有14科，117種。其中屬於牙蟲科(Hydrophilidae)、龍蟲科(Dytiscidae)、微龍蟲科(Noteridae)者為主要成員。文中就各地域過去之研究亦稍加說明。

Key words:

關鍵詞:

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FAUNAL AND BIOLOGICAL STUDIES ON THE INSECTS OF PADDY FIELDS IN ASIA. XI. RECORDS ON AQUATIC COLEOPTERA FROM PADDY WATER IN THE WORLD¹

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ABSTRACT

Published records on aquatic Coleoptera from paddy water in the world are reviewed and listed for the further studies on the insect group. A total of 117 species and unidentified species belonging to 14 families have been recorded so far. The main studies are reviewed geographically.

INTRODUCTION

The aquatic Coleoptera dwelling in paddy water have been rarely reported or studied in the world. This is because of their economic status in the former rice pest control strategy. As it is requested to study the paddy field ecosystem for the rational rice pest management (Yano, 1978), the aquatic Coleoptera in paddy water are duly intended to study and will be reported elsewhere. The published records on the group in paddy water have been thus reviewed bibliographically and presented here. (Table 1).

So far as we are aware, the records on aquatic Coleoptera from paddy water in the world shown in Table 1 have been presented up to the present time. A total of 117 species and unidentified species belonging to 14 families have been recorded. Dytiscidae, Hydrophilidae and Noteridae are the major families concerned. The number of the species recorded from several countries are listed in order of abundance: Japan including the Nansei Is. (44), U.S.A. (19), Sri Lanka (15), Kenya (12), Thailand (10), Italy (10) and Egypt (10). Most countries except for Japan and the U.S.A. seem not to have been investigated well. The species number for Japan will be increased by the study carrying by the first author now.

The main records are reviewed geographically in the following lines. Original scientific names are cited in parentheses when different from the present usage, but not cited for the change in subgeneric status.

Japan:

Koyama (1898) mentioned that *Cybister* (s. str.) *japonicus* (*Dytiscus*) and *Hydrophilus acuminatus* (*Hydrophilus*) preyed on rice plant weevil in paddy fields. Toba (1900) recorded that *Cybister* (s. str.) *japonicus* attacked grasshoppers in paddy field. The prey is supposed to be *Oxya*

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Table 1. Records on Aquatic Coleoptera From Paddy Water in the World

Family	Species	Locality	Reference	
			(A) With data ¹	(B) Without data
Halipidae	<i>Haliphus (Haliphus) japonicus</i> Sharp	Japan		Nakane, 1950
	<i>Haliphus (Neohaliphus) lineatocollis</i> (Marshall)	Italy		Moretti, 1932 ²
	<i>Haliphus</i> sp.	U.S.A.	Zalom & Grigarick, 1980	
	<i>Pelodytes</i> (s. str.) <i>intermedius</i> Sharp	Japan		Nakane, 1950, 1963; Satô, 1963
	<i>Pelodytes</i> (s. str.) <i>sinensis</i> (Hope)	Nansei Is.	Satô & Miyatake, 1964	
	Halipidae	Japan		Kamiya, 1951; Satô, 1980
	<i>Canthydrus flammulatus</i> Sharp	Thailand	Heckman, 1979	
	<i>Canthydrus flavus</i> (Motschulsky)	Thailand	Heckman, 1979	
	<i>Canthydrus laetabilis</i> (Walker)	Sri Lanka	Fernando, 1963	
	<i>Canthydrus luctuosus</i> (Aubé)	Sri Lanka	Fernando, 1959, 1961	
	<i>Canthydrus morsbacki</i> (Wehncke)	Thailand	Heckman, 1979	
	<i>Canthydrus nitidulus</i> Sharp	Nansei Is.	Satô & Miyatake, 1964	
	<i>Canthydrus notula</i> (Erichson)	Egypt	El-Sherif et al., 1976	
	<i>Canthydrus politus</i> Sharp	Kenya	Service, 1977	
	<i>Hydrocanthus</i> sp.	Japan	Hozumi & Satô, 1957	
	<i>Hydrocoptus</i> (s. str.) <i>subvittulus</i> Motschulsky	U.S.A.	Steelman et al., 1975	
	<i>Hydrocoptus (Neohydrocoptus) bivittis</i> Motschulsky	Sri Lanka	Fernando, 1963	
<i>Hydrocoptus</i> spp.	Thailand	Heckman, 1979 ³		
<i>Noterus clavicornis</i> (DeGeer)	Thailand	Heckman, 1979 ⁴		
<i>Noterus japonicus</i> Sharp	Italy		Moretti, 1932	
	Japan		Takiguchi, 1933	
	Nansei Is.	Satô & Miyatake, 1964		
Noteridae			Satô, 1980	
<i>Aclitus</i> sp.	Japan		Koyama, 1898 ⁵ ; Toba, 1900;	
<i>Cybister</i> (s. str.) <i>japonicus</i> Sharp	U.S.A.	Steelman & Schilling, 1972	Nawa, 1902; Murata, 1927 ⁶ ;	
	Japan		Yago, 1943; Kuwayama, 1954;	
			Kurosa, 1959; Kamiya, 1964	
	Nansei Is.	Satô & Miyatake, 1964		
	Italy		Supino, 1932; Moretti, 1932;	
<i>Cybister</i> (s. str.) <i>lateralimarginalis</i> (DeGeer)			Göidanich, 1943 ⁷	
<i>Cybister (Melanectes) brevis</i> Aubé	Japan		Nakane, 1963 ⁷	
<i>Cybister (Meganeetes) confusus</i> Sharp	Sri Lanka		Fernando, 1969 ⁸	

<i>Cybister (M.) limbatus</i> (Fabricius)	Nansei Is.	Satō & Miyatake, 1964 ⁹	
<i>Cybister (M.) rugosus</i> MacLeay	Thailand	Heckman, 1979 ¹⁰	Murata, 1943 ¹¹
<i>Cybister (Gschwendtnerhydrus) lewisianus</i> Sharp	Japan		Nawa, 1914 ¹² ; Yago, 1943 ¹²
<i>Cybister (G.) tripunctatus orientalis</i> Gschwendtner	Japan		
<i>Cybister (G.) tripunctatus africanus</i> Castelnau	Nansei Is.	Satō & Miyatake, 1964	
<i>Cybister</i> sp.	Egypt	El-Sherif et al., 1976	Kuwayama, 1954 ¹³
<i>Dytiscus (Macrodytes) czeraskii</i> Zaitzev	Kenya	Service, 1977	Moretti, 1932 ¹⁴ ; Goidanich, 1943 ¹⁴
<i>Dytiscus (M.) marginalis</i> Linne	Japan		Murata, 1927; Yago, 1943
<i>Eretes sticticus</i> (Linné)	Italy		
<i>Eretes</i> sp.	Japan		
<i>Graphoderes adamsi</i> Clark	Egypt	El-Sherif et al., 1976	
<i>Herophydrus</i> (s. str.) <i>guineensis</i> (Aubé)	U.S.A.	Zalom et al., 1980	
<i>Hydaticus (Guignotites) bowringi</i> Clark	Japan	Ban & Kiritani, 1980	
<i>Hydaticus (G.) cf. fabricii</i> MacLeay	Japan	Ban & Kiritani, 1980	
<i>Hydaticus (G.) grammicus</i> Germar	Japan	El-Sherif et al., 1976	Hozumi & Satō, 1957
<i>Hydaticus (G.) leander</i> (Rossi)	Thailand	Heckman, 1979 ¹⁶	Takiguchi, 1933 ¹⁵
<i>Hydaticus (G.) vittatus</i> (Fabricius)	Japan	Watanabe et al., 1968 ¹⁷ ;	
<i>Hydaticus</i> sp.	Japan	Watanabe & Wada, 1969 ¹⁸ ;	
<i>Hydaticus</i> sp.	Kenya	Ban & Kiritani, 1980 ¹⁷	
<i>Hydroglyphus inconstans</i> (Régimbart)	Nansei Is.	Service, 1977 ¹⁹	
<i>Hydroglyphus japonicus</i> (Sharp)	Kenya	Satō & Miyatake, 1964 ²⁰	
<i>Hydroglyphus signatellus</i> (Klug)	Nansei Is.	Service, 1977	
<i>Hydrovatus confertus</i> Sharp	Kenya	Ban & Kiritani, 1980	
<i>Hydrovatus longicornis</i> Sharp	Japan	Ban & Kiritani, 1980	
<i>Hygrotes medialis</i> (LeConte)	Sri Lanka	Fernando, 1961 ²¹ , 1963	Fernando, 1959 ²¹
<i>Hygrotes mexicanus atristernalis</i> Crotch	Japan	Ban & Kiritani, 1980 ²²	Takiguchi, 1933 ²² ; Kurosa, 1959 ²²
<i>Hygrotes</i> sp.	Japan		
	Nansei Is.	Satō & Miyatake, 1964	
	Egypt	El-Sherif et al., 1976 ²³	
	Thailand	Heckman, 1979	
	Egypt	El-Sherif et al., 1976	
	U.S.A.	Zalom & Grigarick, 1980	
	U.S.A.	Zalom et al., 1980	
	U.S.A.	Washino & Hokama, 1968;	
		Ahmed et al., 1970; Venski	
		& Washino, 1970	

- Hygrobus*
Hypohoporus rotundatus Gschwendtner
Hyphydrus impressus Klug
Ilybius (s. str.) *fuliginosus* (Fabricius)
Laccophilus adpersus Boheman
Laccophilus atristernalis Crotch
Laccophilus ceylonicus Zimmermann
Laccophilus chinensis Boheman
Laccophilus chinensis inefficiens Walker
Laccophilus decipiens LeConte
Laccophilus difficilis Sharp

Laccophilus maculosus Germar
Laccophilus mexicanus Aubé
Laccophilus minutus (Linné)
Laccophilus sharpi Régimbart

Laccophilus simplicistriatus Gschwendtner
Laccophilus variegatus (Germar)
Laccophilus sp.
Laccophilus sp.

Laccophilus spp.
Laccophilus
Liodesus affinis (Say)

Methes cribratellus (Fairmaire)
Rhantus sp.
Thermonectes basilaris (Harris)

Thermonectes sp.

Thermonectes spp.
- | | | |
|------------|--|-----------------------------|
| U.S.A. | Steelman et al., 1975 | Washino, 1970 |
| Nansei Is. | Satô & Miyatake, 1964 | |
| Kenya | Service, 1977 | Moretti, 1932 ²⁴ |
| Italy | Service, 1977 | |
| Kenya | Washino & Hokama, 1968 | |
| U.S.A. | Fernando, 1963 ²⁵ | |
| Sri Lanka | Satô & Miyatake, 1964 | |
| Nansei Is. | Fernando, 1961 | |
| Sri Lanka | Washino & Hokama, 1968 | |
| U.S.A. | | Hozumi & Satô, 1957 |
| Japan | | |
| Nansei Is. | Satô & Miyatake, 1964 | |
| U.S.A. | Washino, 1969 | |
| U.S.A. | Zalom & Grigarick, 1980 | |
| Italy | | Moretti, 1932 |
| Japan | | Hozumi & Satô, 1957 |
| Nansei Is. | Satô & Miyatake, 1964 | |
| Kenya | Service, 1977 | |
| Italy | Service, 1977 | |
| Kenya | Washino & Hokama, 1967; | |
| U.S.A. | Venski & Washino, 1970; | |
| | Miura & Takahashi, 1973 | |
| U.S.A. | Washino et al., 1972 | |
| U.S.A. | Steelman et al., 1975 | Washino, 1970 |
| U.S.A. | Zalom & Grigarick, 1980; | |
| | Zalom et al., 1980 | |
| Kenya | Service, 1977 | |
| U.S.A. | Washino & Hokama, 1968 | |
| U.S.A. | Washino & Hokama, 1968 ²⁶ ; | |
| U.S.A. | Washino et al., 1972 ²⁶ ; | |
| | Steelman & Schilling, 1972 ²⁶ ; | |
| | Zalom & Grigarick, 1980 ²⁶ ; | |
| | Zalom et al., 1980 ²⁶ | |
| U.S.A. | Ahmed et al., 1970 ²⁷ ; | |
| | Venski & Washino, 1970 ²⁷ ; | |
| | Steelman & Schilling, 1972 ²⁷ | |
| U.S.A. | Steelman et al., 1975 ²⁸ | |

Genus sp.	Japan	Watanabe et al., 1968	
Genus sp.	Japan	Ban & Kiritani, 1980	Kuwayama, 1952 ²⁹
Dytiscidae spp.	Japan	Heckman, 1974 ³⁰	
Dytiscidae spp.	Laos	Gerhardt, 1955; Ahmed et al., 1970	
Dytiscidae	U.S.A.	1970	
Dytiscidae	Japan	Satô, 1980	
Dytiscidae	Japan	Satô, 1977a	
Dytiscidae	Nansei Is.	Satô & Miyatake, 1964	
Dytiscidae	Japan		Satô, 1977b
Dytiscidae	Italy		Moretti, 1932
Dytiscidae	U.S.A.	Miura & Takahashi, 1973	
Dytiscidae	Thailand	Heckman, 1979	
Dytiscidae	Laos	Heckman, 1974	
Dytiscidae	Thailand	Heckman, 1979	
Dytiscidae	Sri Lanka	Heckman, 1979	Fernando, 1959
Dytiscidae	Thailand	Heckman, 1979	Fernando, 1959
Dytiscidae	Sri Lanka	Heckman, 1979	Moretti, 1932
Dytiscidae	Italy	Heckman, 1974	
Dytiscidae	Laos	El-Sherif et al., 1976	
Dytiscidae	Egypt	Service, 1977	
Dytiscidae	Kenya		Fernando, 1959
Dytiscidae	Sri Lanka		Satô, 1981 ³¹
Dytiscidae	Japan		
Dytiscidae	Nansei Is.	Satô & Miyatake, 1964	
Dytiscidae	Thailand	Heckman, 1979	
Dytiscidae	Japan	Ban & Kiritani, 1980	Hozumi & Satô, 1957 ³²
Dytiscidae	Sri Lanka	Fernando, 1963	
Dytiscidae	Japan	Ban & Kiritani, 1980	
Dytiscidae	U.S.A.	Steelman & Schilling, 1972	
Dytiscidae	U.S.A.	Washino & Hokama, 1968;	
Dytiscidae		Zalom et al., 1979; Zalom	
Dytiscidae		& Grigarick, 1980	
Dytiscidae	Japan	Ban & Kiritani, 1980	
Dytiscidae	Kenya	Service, 1977 ³³	
Dytiscidae	Kenya	Service, 1977 ³⁴	
Dytiscidae	Sri Lanka	Fernando, 1959, 1961 ³⁵	
Gyrinidae			
Gyrinidae		<i>Dineutus (Cyclous) australis</i> (Fabricius)	
Gyrinidae		<i>Dineutus (Spinodineutes) orientalis</i> (Modeer)	
Gyrinidae		<i>Gyrinus</i> (s. str.) <i>curtus</i> Motschulsky	
Gyrinidae		<i>Gyrinus</i> (s. str.) <i>nataior</i> Linné	
Gyrinidae		<i>Gyrinus</i> (s. str.) <i>punctellus</i> Ochs	
Gyrinidae		<i>Orectochilus productus</i> Régimbart	
Gyrinidae		Genus sp.	
Hydroscaphidae		<i>Hydroscapha</i> sp.	
Hydraenidae		<i>Hydraena</i> (s. str.) <i>fontana</i> d'Orchymont	
Hydraenidae		<i>Hydraena</i> sp.	
Hydraenidae		<i>Limnebius</i> (s. str.) <i>rufipennis</i> (Régimbart)	
Hydraenidae		<i>Ochthebius</i> sp.	
Hydrochidae		<i>Hydrochus elongatus</i> (Schaller)	
Hydrochidae		<i>Hydrochus</i> sp.	
Spercheidae		<i>Spercheus cerisyi</i> Guerin	
Spercheidae		<i>Spercheus</i> sp.	
Hydrophilidae		<i>Amphiptops gibbus</i> (Illiger)	
Hydrophilidae		<i>Amphiptops mater</i> Sharp	
Hydrophilidae		<i>Amphiptops</i> sp.	
Hydrophilidae		<i>Berosus</i> (s. str.) <i>japonicus</i> Sharp	
Hydrophilidae		<i>Berosus</i> (s. str.) <i>pulchellus</i> MacLeay	
Hydrophilidae		<i>Berosus</i> (s. str.) <i>striatus</i> (Say)	
Hydrophilidae		<i>Berosus</i> (s. str.) <i>styliferus</i> Horn	
Hydrophilidae		<i>Berosus</i> (s. str.) <i>vestitus</i> Sharp	
Hydrophilidae		<i>Berosus</i> (s. str.) <i>?vitticollis</i> Boheman	
Hydrophilidae		<i>Berosus (Eroplurus) cuspidatus</i> Erichson	
Hydrophilidae		<i>Berosus (E.) indicus</i> Motschulsky	

- Berosus (E.) lewisius* Sharp
Japan Kobayashi et al., 1973³⁶;
Ban & Kiritani, 1980³⁷ Nakane, 1950³⁷; Sato, 1981³⁷
- Berosus (E.) fairmairei* Zaitzev
Nansei Is. Satô & Miyatake, 1964
- Berosus* sp.
U.S.A. Steelman et al., 1975
- Berosus* sp.
Laos Heckman, 1974
- Coelostoma* sp.
Thailand Heckman, 1979
- Enochrus (Lumetus) cuspidatus* (LeConte)
U.S.A. Zalom et al., 1979³⁸
- Enochrus (L.) esuriens* (Walker)
Sri Lanka Fernando, 1959³⁹
- Enochrus (L.) hamiltoni* (Horn)
Japan Ban & Kiritani, 1980⁴⁰
- Enochrus (L.) pectoralis* (LeConte)
U.S.A. Zalom et al., 1979⁴¹
- Enochrus (L.) tetraspilus* (Régimbart)
U.S.A. Zalom et al., 1979⁴²
- Enochrus (Holcophilydrus) simulans* (Sharp)
Egypt El-Sherif et al., 1976⁴³
- Enochrus* spp.
Japan Ban & Kiritani, 1980⁴⁴
- Helochares* (s. str.) *ivividus* Forster
Thailand Heckman, 1979⁴⁵
- Helochares* (s. str.) *pallens* (MacLeay)
Kenya Service, 1977⁴⁶
- Helochares (Hydrobaticus) anchoralis* Sharp
Japan Ban & Kiritani, 1980⁴⁷
- Helochares* sp.
Kenya Service, 1977
- Helochares* sp.
Nansei Is. Satô & Miyatake, 1964
- Helochares* spp.
Kenya Service, 1977
- Helophorus* sp.
Egypt El-Sherif et al., 1976
- Hydrophilus acuminatus* Motschulsky
Thailand Heckman, 1979⁴⁸
U.S.A. Miura & Takahashi, 1973;
Steelman et al., 1975
- Hydrophilus affinis* Sharp
Japan Koyama, 1898⁴⁹; Nawa, 1914;
Matsumura, 1915; Murata,
1927⁵⁰; Hosoi, 1939⁵¹; Yago,
1943⁵¹; Kuwayama, 1954;
Ishihara, 1957; Hozumi & Satô,
1957⁵¹; Kamiya, 1964
- Hydrophilus bilineatus cashmirensis* (Redtenbacher)
Kurosa, 1959
- Hydrophilus cavisternus* (Bedel)
Thailand Heckman, 1979
- Hydrophilus piceus* (Linne)
Italy Moretti, 1932⁵³; Goidanich,
1943⁵³
- Egypt El-Sherif et al., 1976⁵³

<i>Hydrophilus triangularis</i> Say	U.S.A.	Portman & Williams, 1952 ⁵⁴ ; Washino & Hokama, 1967, 1968; Washino et al., 1970; Venski & Washino, 1970; Washino et al., 1972; Steelman & Schilling, 1972 ⁵⁴ Miura & Takahashi, 1973; Zalom et al., 1979; Zalom & Grigarick, 1980	Lange et al., 1970; Washino, 1970
<i>Hydrophilus</i> sp.	Laos	Heckman, 1974	Fernando, 1959
<i>Paracymus evanescens</i> (Sharp)	Sri Lanka	Fernando, 1963	Fernando, 1959
<i>Paracymus</i> sp.	Thailand	Heckman, 1979	Fernando, 1959
<i>Regimbartia attenuata</i> (Fabricius)	Sri Lanka	Service, 1977	Hozumi & Satô, 1957; Kurosa, 1959
<i>Regimbartia nilotica</i> (Sharp)	Kenya	Watanabe et al., 1968; Watanabe & Wada, 1969 ⁵⁵	
<i>Sternolophus</i> (s. str.) <i>rufipes</i> (Fabricius)	Japan	Satô & Miyatake, 1964 El-Sherif et al., 1976	
<i>Sternolophus</i> sp.	Nansei Is.	Service, 1977	
<i>Sternolophus</i> (s. str.) <i>solieri</i> (Castelnau)	Egypt	Watanabe et al., 1968; Watanabe & Wada, 1969 ⁵⁵	
<i>Sternolophus</i> (Neosternolophus) <i>angolensis</i> (Erichson)	Kenya	Satô & Miyatake, 1964 El-Sherif et al., 1976	
<i>Sternolophus</i> sp.	Kenya	Service, 1977	
<i>Sternolophus</i> sp.	Kenya	Service, 1977	
<i>Tropisternus columbianus</i> Brown	Laos	Heckman, 1974	
<i>Tropisternus lateralis</i> (Fabricius)	U.S.A.	Zalom et al., 1979	Washino, 1970
	U.S.A.	Washino & Hokama, 1967; Venski & Washino, 1970; Washino et al., 1970; Washino et al., 1972; Steelman & Schilling, 1972; Miura & Takahashi, 1973; Zalom & Grigarick, 1980 Washino & Hokama, 1968; Zalom et al., 1970	
<i>Tropisternus lateralis humeralis</i> Motschulsky	U.S.A.	Zalom et al., 1970	
<i>Tropisternus</i> sp.	U.S.A.	Ahmed et al., 1970	
<i>Tropisternus</i> spp.	U.S.A.	Steelman et al., 1975	
<i>Berosinae</i> sp.	U.S.A.	Steelman & Schilling, 1972	
Genus sp.	Japan		Kuwayama, 1952
Genus sp.	Japan	Miura, 1969	
Genus sp.	Japan	Ban & Kiritani, 1980	
Hydrophiliidae	Australia		Hely, 1958; Grist & Lever, 1969

- Helodiidae
Cyphon sp. Japan
Scirtes japonicus Kiesenwetter Sri Lanka Fernando, 1963
Scirtes sp. Japan Kobayashi et al., 1973⁵⁶
 Heteroceridae Sri Lanka Fernando, 1963
 Lampyridae Japan
 Japan
 Japan
 Chrysomelidae *Donacia* (*Cyphogaster*) *provosti* Fairmaire Japan
- Curculionidae
Bagous trapae Prasad India Prasad, 1960⁵⁸
Echinochenus oryzae Marshall Pakistan
 India
 India
Echinochenus squameus Billberg Japan Okamoto & Abe, 1957
- Helodytes* (s. str.) *foveolatus* (Duval) British Guiana
 Guyana
 Surinam
 Brazil Amaral, 1950
 Brazil Amaral, 1950
 Cuba Carboneli & Sousa, 1979
 Argentina
 Japan
 U.S.A.
 Paraguay
 Guatemala
 Panama
- Hydrotimites* sp.
Lissorhoptus brevirestris (Suffr.)
Lissorhoptus bosqui Kuschel
Lissorhoptus oryzophilus Kuschel
- Nawa, 1915; Kamiya, 1951
 Nomura, 1963
 Yuasa & Nakane, 1950;
 Hayashi, 1959; Nakane, 1963;
 Yuasa, 1950⁵⁷; Kamiya, 1951⁵⁷;
 Urida, 1951⁵⁷; Nishide, 1955⁵⁷;
 Ishihara, 1957⁵⁷; Hayaashi,
 1959⁵⁷; Chaijo & Kimoto, 1961;
 Jap. Soc. Appl. Ent. Zool.,
 1980⁵⁷
 FAO, 1972
 FAO, 1972
 Rao, 1952; Grist & Lever, 1969;
 FAO, 1972
 Yuasa & Kono, 1950; Urida,
 1951; Ishihara, 1957; Jap. Soc.
 Appl. Ent. Zool., 1980
 Kennard, 1965
 Grist & Lever, 1969
 Grist & Lever, 1969
 Grist & Lever, 1969
 Grist & Lever, 1969
 Watanabe, 1976; Anon., 1979;
 Jap. Soc. Appl. Ent. Zool., 1980
 Metcalf & Flint, 1962;
 Grist & Lever, 1969; Lange
 et al., 1970⁵⁹
 Grist & Lever, 1969⁶⁰
 Grist & Lever, 1969⁶⁰
 Grist & Lever, 1969⁶⁰

	<i>Lissorhoptus tibialis</i> Hustache	Argentina	Grist & Lever, 1969
	<i>Neobagous</i> sp.	Uruguay	Grist & Lever, 1969
Family ?	Coleoptera spp.	Brazil	Amaral, 1950 ⁶¹
		Japan	Kuroda, 1930 ⁶²

1. References with collecting or observing data including primarily locality name, date and collector or observer name.
2. *Protolalplus lineatocollis* Marsh.
3. *Hydrocoptus bivittis* Motsch.
4. Two species without specific names.
5. *Dytiscus*
6. *Cybister chinensis* Motsch.
7. *Cybister brevis* Aube
8. *Cybister confusus* Sharp
9. *Cybister limbatus* (Fabricius)
10. *Cybister rugosus* MacLeay
11. *Cybister lewisianus* Sh.
12. *Cybister tripunctatus* Olivier
13. *Dytiscus dannicus* Cebler
14. *Dytiscus marginalis* L.
15. *Hydaticus bowringi* Clark
16. *Hydaticus* cf. *fabricii* MacLeay
17. *Hydaticus grammicus* Germar
18. Japanese name only.
19. *Hydaticus leander* (Possi)
20. *Hydaticus (Guignotetes) lenzi* (Schonfeldt)
21. *Bidessus inconstans*
22. *Bidessus japonicus* Sharp
23. *Bidessus signatellus* Klug
24. *Agabus fuliginosus* L.
25. *Laccophilus ceylonicus* Wlk.
26. *Thermonectus basilaris* (Harris)
32. *Berosus signaticolis punctipennis* Harold
33. *Berosus ?vittatus* Boheman
34. *Berosus cuspidatus* Erichson
35. *Berosus indicus* Motsch.
36. Japanese name only
37. *Berosus lewisius* Sharp
38. *Enochrus cuspidatus* (LeConte)
39. *Enochrus esuriens* (Wlk.)
40. *Enochrus ornateiceps*
41. *Enochrus hamiltoni* (Horn)
42. *Enochrus pygmaeus pectoralis* (LeConte)
43. *Enochrus tetraspilus* Reg.
44. *Enochrus simulans*
45. Two species without specific names.
46. *Helochaeres dilutus* (Erichson)
47. *Helochaeres lewisius*
48. Two species without specific names.
49. *Hydrophilus*
50. *Hydrophilus cognatus* Sharp
51. *Hydrous acuminatus* Motsch.
52. *Hydrophilus cashmirensis* Redtenbacher
53. *Hydrous piceus* L.
54. *Hydrous triangularis* (Say)
55. Japanese name only.
56. Japanese name only.
57. *Donacia provosti* Fairmaire
58. *Bagus trapae* Prasad

27. *Thermonectus* sp.
28. *Thermonectus* spp.
29. Three species without specific names.
30. Thirteen species without specific names.
31. Japanese name only.

59. *Lissorhoptrus oryzophilus* Kuschel
60. *Lissorhoptrus simplex* Say
61. *Neobagus* sp.
62. Eight species without specific names.

japonica Willemse. Nawa (1902) reported that *Cybister* (s. str.) *japonicus* feeds on various aquatic insects and small fishes in paddy fields. These are probably the oldest records on aquatic Coleoptera from paddy fields. Nawa (1914) mentioned the injury of *Cybister* (*G.*) *tripunctatus* and *Hydrophilus acuminatus* by ovipositing to rice plants, and he reported the predation of the hydrophilid beetles to rice stem borer without definite data (Nawa, 1915). Matsumura (1915) also described that *H. acuminatus* occurred abundantly in nurseries and infested roots of rice seedlings. Nishide (1915) recorded the attack by *Donacia provosti* of rice root in Akita Pref. Kuroda (1930) reported the presence of 8 species of Coleoptera in paddy water in Tokyo, but no specific names were given. Yago (1943) reported that rice seeds and rice seedlings in nurseries were disturbed by *Hydrophilus acuminatus* (*Hydrous acuminalis*), *Cybister* (s. str.) *japonicus*, *C. (G.) tripunctatus* and *Dytiscus (M.) marginatus*. Kuwayama (1954) mentioned a similar phenomenon in the first two species above and *Dytiscus czerskii* (*D. dauricus*) in Hokkaido.

In the 1950's, several aquatic Coleoptera were enumerated in textbooks and illustrated books as they were distributed in paddy water (Nakane, 1950; Yuasa, 1950; Yuasa & Nakane, 1950; Yuasa & Kono, 1950; Ishihara, 1957; Kurosa, 1959; Hayashi, 1959). Satô and Miyatake (1964) recorded 18 aquatic species belonging to 5 families, Haliplidae, Noteridae, Dytiscidae, Gyrinidae and Hydrophilidae, from paddy water in Iriomote I., the Nansei Is. This is the richest collecting in a single area in Japan. Watanabe et al. (1968) conducted feeding experiments on *Sternolophus* (s. str.) *rufipes* (larva), *Sternolophus* sp. (adult), *Hydaticus (G.) grammicus* (larva) and a dytiscid species (adult) with larvae of *Culex tritaeniorhynchus summorosus*. These species were collected from paddy water in Okayama. Watanabe and Wada (1969) reported the abundance of *Sternolophus* (s. str.) *rufipes* and *Hydaticus (G.) grammicus* in paddy water in Okayama and mentioned that the former species was abundant in early summer and the latter was seen from June to September without any peak in population. Kobayashi et al. (1973) made surveys on the insects in paddy fields in Tokushima Pref. and listed two species of Hydrophilidae and one each of Helodidae and Curculionidae.

In 1976, the famous rice water weevil (*Lissorhoptrus oryzophilus*) was found in Aichi Pref. and its distribution expanded in the following years (Tsuzuki & Isogawa, 1976; Watanabe, 1976; Isogawa, 1977; Amano, 1978; Morita, 1978; Anon., 1979). The weevil has now become a serious rice pest in Japan.

Ban and Kiritani (1980) studied the seasonal prevalence of aquatic insects in paddy fields of Kochi Pref. They observed two families, Dytiscidae and Hydrophilidae regarding aquatic Coleoptera, and 11 species including unidentified ones. Among these, *Hydroglyphus japonicus* (*Bidessus japonicus*) was most abundant. they stated. Satô (1977a. b. 1980. 1981) mentioned the occurrence of Halipidae, Noteridae, Dytiscidae, Gyrinidae and Hydrophilidae in Japanese paddy water, and listed several species belonging to these groups.

The following paper on light trap collections made near paddy fields is worth noting. Yamamoto (1951) set up a fluorescent light in a paddy field area in Hyogo Pref. and collected aquatic beetles for two years, covering part of the rice cultivation period. The area covered included some crop fields and a stream about 50 meters from the trap site. Many of the insects trapped were probably derived from paddy water, but some may have also been from other water bodies. The record was excluded from the present review. He examined the following number of species: Dytiscidae (14 spp.), Haliplidae (3 spp.), Gyrinidae (3 spp.), Hydrophilidae (14 spp. and 7 unidentified spp.), Dryopidae (9 spp.) and Heteroceridae (1 sp.). As stated earlier, no intensive surveys have been made before in Japan or other parts of the world, so that the record may offer the following two possibilities. One is that the collection contains certain or even a considerable number of species derived from non-paddy water environments, and the other possibility is that the collection have been derived mostly from paddy water. If so, the fauna was apparently more

diverse than the present fauna. We suppose the first possibility is more likely, though it is true that the fauna has changed in the past 3 decades.

Laos and Thailand:

Heckman (1974, 1979) collected aquatic Coleoptera from paddy fields in these areas. From Laos, 4 species of Hydrophilidae, 1 species of Gyrinidae and 13 species of Dytiscidae were collected, but none of these were identified to the species level. From Thailand, 2 other families (Hydraenidae and Hydrosaphidae) were recorded in addition to those from Laos. A total of 23 species belonging to 5 families were listed, but many of them were not identified to the species level.

Indian Subcontinent:

Two water weevil species on rice were reported from India, Pakistan and Bangladesh (Rao, 1952; Prasad, 1960; FAO, 1972). These are *Echinocnemus oryzae* and *Bagous trapae* (*Bagus trapae*). Fernando (1959, 1961, 1963) reported many aquatic Coleoptera from aquatic environments including paddy fields in Ceylon (Sri Lanka). Many of these were collected in light traps. Records regarding the specimens collected only from paddy fields with or without data are cited in Table 2. Specimens at light are excluded since they were not definitely derived from paddy water. Common species in paddy water in Sri Lanka are *Berosus* (*E.*) *inicus*, *Enochrus* (*L.*) *esuriens* and *Laccophilus inefficens* according to these records. Fernando (1977) made surveys on the aquatic fauna from paddy fields mainly in Sri Lanka and West Malaysia. Rotifera, Cladocera, Copepoda, non-Arthropoda groups and Arthropoda groups were compared by their habitats: marshes, ponds, lakes, rivers and streams, paddy fields, and miscellaneous water environments. Insect groups were not treated separately, but as shown within Arthropoda groups. Consequently no comments are provided from the surveys for the present paper.

Italy and Africa:

Moretti (1932), Supino (1932) and Goidanich (1943) mentioned the occurrence of some aquatic Coleoptera in Italian paddy fields. A total of 11 species belonging to Haliplidae, Dytiscidae, Gyrinidae and Hydrophilidae were recorded without collecting data.

El-Sherif et al. (1976) and Service (1977) recorded aquatic Coleoptera in paddy fields from Egypt and Kenya, respectively. From Egypt, 11 species including unidentified species belonging to Dytiscidae and Hydrophilidae were reported. Among them, *Hydrovatus longicornis*, *Hydroglyphus signatellus* (*Bidessus signatellus*), *Sternolophus* (s. str.) *solieri*, *Spercheus cerisyi*, *Enochrus* (*L.*) *tetraspilus* and *Helochares* sp. were common or frequent. From Kenya, Noteridae, Dytiscidae and Hydrophilidae containing around 15 known and unidentified species were reported in the course of the research on the mortalities of *Anopheles gambiae* complex.

U.S.A.:

Many papers on the mosquito control practices in paddy fields of mainly California have been published. Some of them covered or included aquatic Coleoptera as non-target organisms in the habitat or bio-control agents for mosquitoes. The main reports on this problem are as follows: Washino and Hokama (1967, 1968), Ahmed et al. (1970), Venski and Washino (1970), Washino (1970), Washino et al. (1970), Steelman and Schilling (1972), Washino et al. (1972), Miura and Takahashi (1973), Steelman et al. (1975), Zalom et al. (1979), Zalom and Grigarick (1980), Zalom et al. (1980). Twenty-five or more species belonging to Haliplidae, Noteridae, Dytiscidae, Gyrinidae, Hydrophilidae and Curculionidae, have been observed in these surveys. Dominant species seem to be *Hydrophilus triangularis*, *Tropisternus lateralis*, *Berosus* (s. str.) *styliferus* and *Thermonectus basilaris* (*Thermonectus basilaris*). Flight behavior and seasonal cycles of some species have also

been reported.

The economic status of these aquatic Coleoptera in the habitat is not simple. The famous rice water weevil, *Lissorhoptrus oryzophilus*, attacks the rice plant severely. Species such as *Hydrophilus triangularis* affects the young rice plant by its movement. Foods of aquatic Coleoptera vary such as mosquitoes, chironomid midges and other insects including aquatic beetles and shrimps. Fishes as mosquito control agent in paddy water prey aquatic beetles also.

C. and S. America:

Several species of rice water weevils were reported from Central and South America (Amaral, 1950; Kennard, 1965; Grist and Lever, 1969; Carboneli and Sousa, 1979). There may also be other references about weevils in these areas.

Others:

Hely (1958) mentioned the infestation by Hydrophilidae on rice plants in New South Wales, Australia. No specific name was given in the case.

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SUMMARY

Records on aquatic Coleoptera from paddy water in the world are reviewed and listed. A total of 117 species and unidentified species belonging to 14 families have been recorded. Dytiscidae, Hydrophilidae and Noteridae are the major ones among the families concerned.

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ADDENDUM

We noticed the following paper after we sent the manuscript for publication: Nishio, Y. 1952. Coleoptera found in the paddy fields of the north temperate region of Japan. *Coleopt. Bull.* 6:58-60.

In the paper, sixty species were listed based on the collection made in Hokkaido, Japan. No data on their habitats nor collecting dates were given. Following aquatic species are included in the list.

Haliplidae: *Peltodytes intermedius* Sharp

Noteridae: *Noterus japonicus* Sharp

Dytiscidae: *Agabus japonicus* Sharp*, *Cybister japonicus* Sharp*, *Eretes sticticus* (L.), *Hydaticus bowringi* Clark, *H. grammicus* Germar, *Hyphydrus eximius* Clark* (*H. japonicus* Sharp), *Neonectes natrix* (Sharp)* (*Graptodytes natrix*), *Rhantus pulverosus* (Stephens)*

Gyrinidae: *Dineutus (Spinodineutus) orientalis* (Modeer) (*D. orientalis*)

Hydrophilidae: *Berosus* (s. str.) *signaticollis punctipennis* Harold*, *Helochaeres (Hydrobaticus)*

striatus Sharp*, *Hydrochara affinis* (Sharp)* (*Hydrophilus affinis*), *H. liber* (Sharp)* (*Hydrophilus libera*), *Hydrophilus acuminatus* Motschulsky (*Hydrous acuminatus*)

Curculionidae: *Echinocnemus squameus* Billberg

Nine species with asterisk among these are not listed in Table 1 of the present paper. *Dineutus* (*S.*) *orientalis* was listed in the table based on the Nansei Is. collection, while the above record from Hokkaido, Japan.

亞洲地區稻田昆蟲相及其生物學之研究

XI 世界性稻田內水棲鞘翅目之記錄

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本報告列表整理曾在世界各地之水田中所採集到的鞘翅昆蟲，共有 14 科，117 種。其中屬於牙蟲科 (*Hydrophilidae*)、龍蝨科 (*Dytiscidae*)、微龍蝨科 (*Noteridae*) 者為主要成員。文中就各地域過去之研究亦稍加說明。