



【Research report】

亞洲地區稻田昆蟲相及其生物學之研究(VI)台灣產水棲及半水棲半翅目(預報)【研究報告】

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Abstract

摘要

已往於台灣對稻田中水棲與水棲半翅目，除道氏闊肩水黽(*Microvelia douglasi* Scott) 一種外，未有任何之研究。著者等在1981年間，在台灣南部之11個地點之稻田中調查。所集資料除在稻田及灌溉渠中直接採集者外，並利用設置在稻田或蔗田內之誘蟲燈所誘殺之標本，作進一步之討論，而得如下四點結論。(1)在稻田及灌溉渠中採集到9科12種標本：黽椿科(*Mexoveliidae*) 1種，闊翅科(*Veliidae*) 2種，水黽科(*Gerridae*) 2種，絲黽科(*Hydrometridae*) 1種，固頭椿科(*Pleidae*) 1種，仰泳椿科(*Notonectidae*) 1種，蝸椿科(*Nepidae*) 1種，田鱉科(*Belostomatidae*) 1種及水椿科(*Corixidae*) 2種。(2)在所採到的種類中，以*Microvelia horvathi*, *Anisops ruroi*, *Micronecta quadri-striata*及*M.sahlbergi* 四種，為較佔優勢的種類。以外8種在此次調查中，採集之蟲數雖少，但除*Hydrometra annamana*及*Paraplea frontalis* 兩種外，皆為東南亞地區常見之種類。(3)屬於水際椿科(*Saldidae*)之*Saldula ornatula*，在稻田及灌溉渠中未能採到，而從設置在稻田之誘蟲燈中得到唯一的標本，然該蟲在日本、菲律賓之稻田中已有生棲記錄。故在台灣稻田中有該蟲之生棲當無疑問。(4)Yano et al. (1981) 曾發表全球性稻田水棲半翅目之目錄，而本文補充其後所得之資料，並經此次調查後，共得4科9種之新記錄種。

Key words:

關鍵詞:

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FAUNAL AND BIOLOGICAL STUDIES ON THE INSECTS OF
PADDY FIELDS IN ASIA. [VI.] PRELIMINARY REPORT ON
THE AQUATIC AND SEMIAQUATIC HETEROPTERA
FROM TAIWAN¹

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ABSTRACT

The aquatic and semiaquatic Heteroptera dwelling in paddy water from Taiwan are enumerated preliminary based on the material collected in 1981. A total of 643 specimens of 12 species belonging to 9 families were collected from paddy water and irrigation ditch by paddy fields. Besides these, specimens collected by light traps set in paddy fields and sugarcane fields were also examined and listed. Additional records to the list of the group from paddy water in the world given by Yano et al. (1981) are also presented.

INTRODUCTION

This paper deals with the aquatic and semiaquatic Heteroptera dwelling in paddy water from Taiwan along the argument mentioned in Yano (1978). The aquatic insect fauna in paddy fields is supposed to be diverse and they may play an important role in the food chain relating pest species of rice plant. Surveys on the insect group have been duly made in Asian paddy fields by the first author with co-operation of other entomologists and the first report on the Philippine fauna has been published (Yano et al., 1981). The material treated in this paper was collected mainly at southern part of Taiwan in 1981 by the first author in co-operation with the third author, and identified by the second author. The field survey devoted to this research was limited in time, season and localities resulting rather small collection. The collection however is the first data concerning the aquatic in-

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sects of paddy fields in Taiwan, and is due to record here preliminary for further research. Additional records on the aquatic and semiaquatic Heteroptera from paddy water in the world since Yano et al. (1981) are listed here on this occasion.

MATERIALS AND LOCALITIES VISITED

(A) Paddy water and irrigation ditch collections.

The present material was based on the field collectings mentioned above. It was made in late July and covered 11 places of southern part of Taiwan along west coast (Fig. 1, Nos. 4-8, 10, 12-16). Collections were made inside paddy fields, and in irrigation ditches by paddy fields using an insect net described by Yano et al. (1981). General situations of paddy fields around the survey period and respective environment of the places surveyed are described below.

Many paddy fields were flooded due to heavy rains and then drained just before the collectings. As a result, the aquatic insects might be disturbed by these water movements. Insecticide sprays which had been delayed due to heavy and long rains were just operated about the surveys. Notes on the localities and paddies surveyed from July 25 to 30 in Taiwan are mentioned here for the collections concerned (Fig. 1).

Tungjen (同仁) (Fig. 1, site 4), Chiai Hsien, This place is the inner-most one from coast among the localities visited this time, and is near mountain areas. The paddy fields surveyed contained shallow water with rice plants about two months old after transplanting.

Fenchihu (糞箕湖) (Fig. 1, site 5), Tainan Hsien. Situated between Paiho and Kuantling. Paddy fields there were dry. Small irrigation ditch 50 cm wide by the paddy field still contained shallow water for about 5 m in length where the collecting was made.

Hsikang (西港) (Fig. 1, site 6), Tainan Hsien. The area visited is dominated by paddy fields and some sugarcane fields. Various stages of rice plants were seen in paddy fields there, namely just after transplanting to just before heading stage. Paddy water was generally shallow there when the collecting was made, and aquatic insects were poor in diversity.

Anting (安定) (Fig. 1, site 7), Tainan Hsien. Paddy fields surveyed were applied insecticide in early June and in just after collecting. It was not easy to use collecting net since water was shallow. Small irrigation ditch cemented and 50 cm wide with shallow, slow running water, and larger ditch 2 m wide with rich, slow running water were selected for collecting also.

Yungkang (永康) (Fig. 1, site 8), Tainan Hsien. The rice plants of the paddy fields where the collecting was made were at heading stage. The water was slowly moving to the irrigation ditch.

Kueijen (歸仁) (Fig. 1, site 10), Tainan Hsien. The paddy field selected had rice plants about one month after transplanting. The depth of water was 10 cm, and aquatic insects were rather rich in diversity.

Pingtung (屏東) (Fig. 1, site 12), Pingtung Hsien. The collectings were done at the paddy fields of Kaohsiung District Agricultural Improvement Station at Pingtung. The paddy water of the station was derived from well.

Wantan (萬丹) (Fig. 1, site 13), Pingtung Hsien. The paddy fields in this place kept no water when we visited. Small irrigation ditch by the paddy field was also almost dry besides tiny spot of water which was not enough for net collecting. Larger irrigation ditch nearby was full of rapidly

running water owing to the current heavy rains, and no insects were collected by net.

Hsinpei (新埤) (Fig. 1, site 14), Pingtung Hsien. Owing to the insecticide applications operated recently, and poor water there, the collectings in this place were unsuccessful. Only dead specimens of Dytiscidae, Hydrophilidae and some *Microvelia* alive on tiny spot of water were collected.

Fangliao (枋寮) (Fig. 1, site 15), Pingtung Hsien. The paddy fields within one month after transplanting were surveyed. Though they kept rather shallow water, good collectings were made there.

Checheng (車城) (Fig. 1, site 16), Pingtung Hsien. Very shallow water was seen in paddy fields where the collecting was made. It was not easy to use net owing to shallow water, and aquatic insects were poor in diversity also. Small irrigation ditch about 50 cm wide by the fields kept rapidly running water and few aquatic insects were collected.

(B) Light trap collections (paddy fields).

Besides the materials collected from paddy water and adjacent irrigation ditch mentioned above, a series of specimens collected by light traps set in paddy fields was also examined and listed. These specimens became available for the present research through the courtesy of Mr. Fu-cheng Yen. Light traps set in paddy fields are operated at many places in Taiwan to forecast the occurrence of insect pests. Collections of the following five places in Chiai (Fig. 1, sites 1-3) and Tainan area (Fig. 1, sites 9-10) were selected because the area relating to these five places covered the present survey area in some extent. At Kueijen (Fig. 1, site 10), collection was made by the first author as described above.

Places with dates of the collections are shown below: Touliu (斗六) (site 1), Yunlin Hsien (August 22-24, 1981); Talin (大林) (site 2), Chiai Hsien (August 18-22, 1981); Potyu (朴子) (site 3), Chiai Hsien (August 19-20, 1981); Hsinhua (新化) (site 9), Tainan Hsien (August 20-21, 1981) and Kueijen (歸仁) (site 10), Tainan Hsien (August 19-21, 1981).

The traps in these places are operated by fluorescent lamp (30 W), and situated among almost pure paddy field areas with irrigation ditches and streams. There is a fish pond about 1.5 km apart from the Talin trap site, and another one about 500 m apart from the Touliu trap site. The paddy fields around these five trap sites contained water when the collections were made. Since the collections from each site were rich, specimens have not been sorted completely yet. A total of 134 specimens were sorted for the present paper.

The specimens attracted to these light traps were mostly derived from paddy water and irrigation ditches around the traps, but some may have been originated from other water bodies. Apart from the abundance of species concerned, consequently, the fauna seen in this light trap collection may well reflect the one of paddy water.

(C) Light trap collections (sugarcane fields).

Taiwan Sugar Research Institute has been working on the insects attracted to light traps in their sugarcane fields. Collections of these traps have been examined through the courtesy of Dr. Yung-song Pan. The traps set up at Chiatou (橋頭), Kaohsiung Hsien are operated by fluorescent lamp and black light. Part of the collections of the following dates were available for this study: July 28, 1981 and August 20, 1981. On July 28, 1981, the first author visited the trap site together

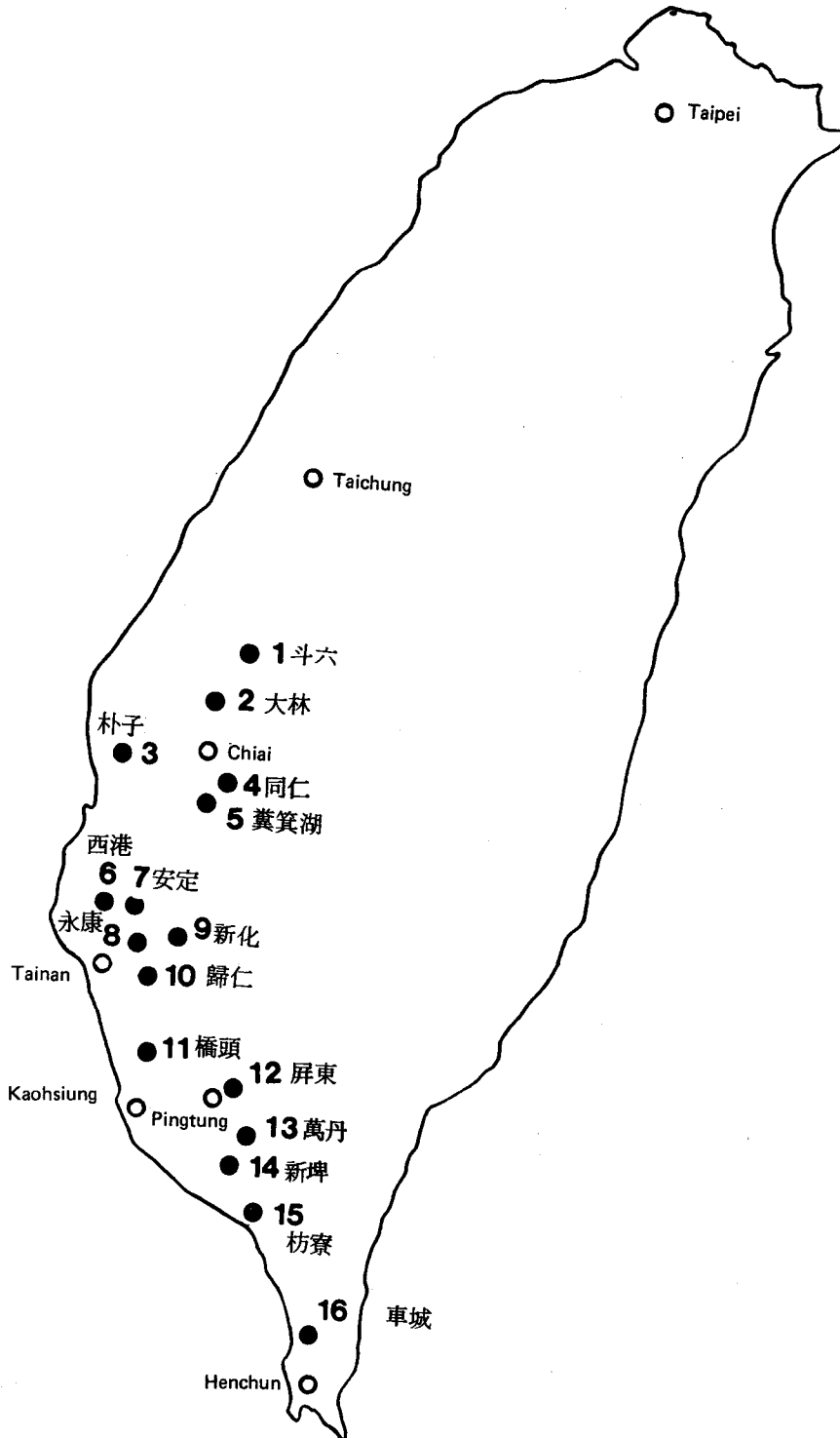


Fig. 1. Map of Taiwan showing the location of the places surveyed (solid circle). 1. Tou-liu; 2. Talin; 3. Potyu; 4. Tungjen; 5. Fenchihu; 6. Hsikang; 7. Anting; 8. Yungkang; 9. Hsinhua; 10. Kueijen; 11. Chiatou; 12. Pintung; 13. Wantan; 14. Hsinpei; 15. Fangliao; 16. Checheng.

with Dr. Pan, and obtained the attracted specimens of one of the traps.

There is an irrigation ditch below the traps, and the nearest paddy fields are situated about 500 m from the trap site. Attracted insects are supposedly derived from the ditch, and few from paddy fields. However, the data are presented here for information since the fauna of paddy water might not be isolated from those of other adjacent water bodies. The attracted specimens were rich in quantity, but aquatic Heteroptera are not abundant among them. A total of 27 specimens belonging to four species have been found among the collection as listed in the following pages.

RESULTS

A total of 643 specimens of 12 species belonging to 9 families were collected from paddy water and irrigation ditch, and enumerated in the following lines. All specimens collected from paddy water were listed without any indivation. One adult of *Microvelia horvathi* and one nymph of *Diplonychus rusticus* were collected by sweeping made above water level in Pingtung, and were listed here. The specimens collected by light traps in paddy fields and sugarcane fields were also listed here. Light trap collections from paddy fields contain 4 species belonging to 3 families, and one species among them has not been collected from paddy water and irrigation ditch. Distribution locality based on the paddy water material, present or former records, is shown with an asterisk.

So far as we are aware, two species, *Microvelia douglasi* Scott and *Limnogonus parvulus* (Stål), had been known from the paddy water in Taiwan, though these species have not been collected. Several species which are not illustrated in the previous paper (Yano et al., 1981) are shown in Fig. 2.

(A) Saldidae

Saldula ornatula (Reuter) (Fig. 2-A)

Specimen examined: (Light trap in paddy field) 1 adult, Hsinhua, Tainan Hsien, 20-21, viii. 1981.

Distribution: Japan*, Taiwan*, Philippines*.

This species has not been collected from paddy water or irrigation ditch, and has been found among the light trap collection made in Hsinhua.

(B) Mesoveliidae

Mesovelia vittigera Horváth

Specimens examined: 5 adults, Pingtung, Pingtung Hsien, 28. vii. 1981.

Distribution: Japan*, Nansei Is., Taiwan*, Philippines*, Sumatra*, Thailand*, Korea, India, S.E. Asia, New Guinea, Guam, Middle East, S. Europe, Africa.

This widely distributed species has been found from paddy water in Taiwan in due course, though it has collected from Pingtung only.

(C) Veliidae

Microvelia diluta Distant (Fig. 2-B)

Specimen examined: 1 adult, Anting, Tainan Hsien, 25. vii. 1981, irrigation ditch.

Distribution: Nansei Is. (Okinawa I.), Taiwan*, Philippines*, India, Oriental region, Micronesia.

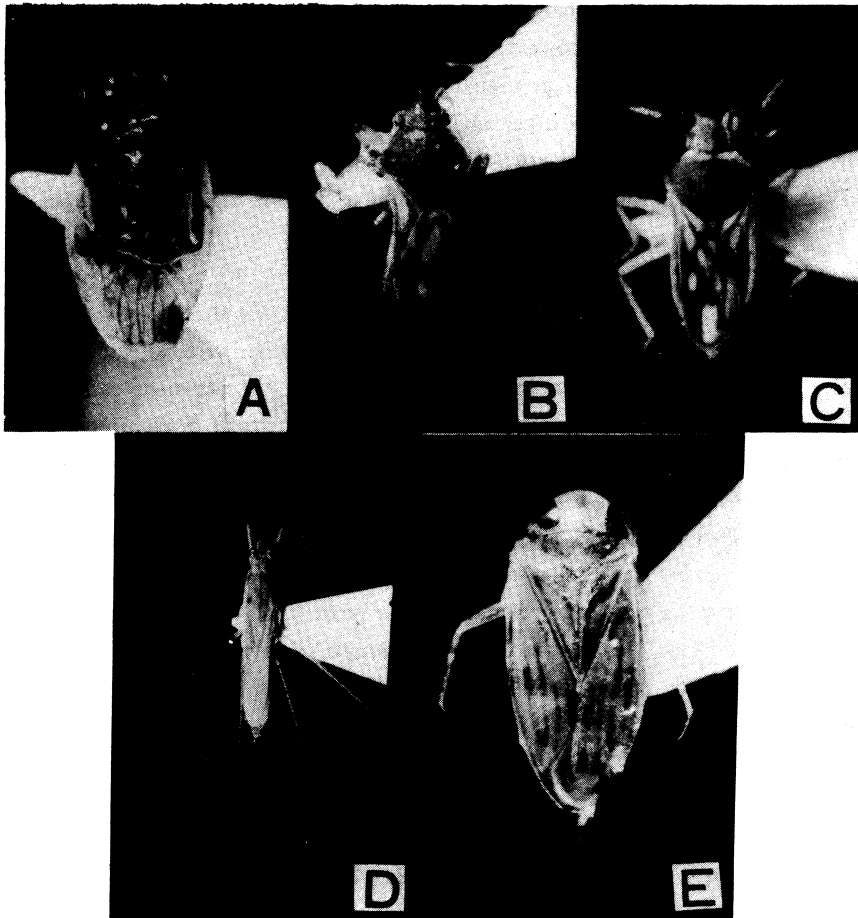


Fig. 2. A. *Saldula ornata* (Reuter), Hsinhua, Tainan Hsien; B. *Microvelia diluta* Distant, Anting, Tainan Hsien; C. *Microvelia horvathi* Lundblad, Pingtung, Pingtung Hsien; D. *Gerris paludum insularis* Motsch., Anting, Tainan Hsien; E. *Micronecta sahlbergi* Jakovlev, Kueijen, Tainan Hsien.

Only one adult of this species was collected from irrigation ditch by paddy field of Anting. Polhemus and Reisen (1976) examined rather many specimens collected from paddy fields of Lubang Island, the Philippines. Miyamoto (1953) made a biological observation on this species from Taiwan, but the material was not from paddy field. He also mentioned that this species was seen in Taiwan on stagnant waters or small drains, and was as dominant as *M. douglasi*. It is noted here that 3 adults were collected from irrigation ditch in citrus orchard at Tungjen, Chiai Hsien (30. vii. 1981, K. Yano).

Microvelia horvathi Lundblad (Fig. 2-C)

Specimens examined: 71 adults, 4 nymphs, Anting, Tainan Hsien, 25. vii. 1981; 14 adults, ditto, 25. vii. 1981, irrigation ditch; 9 adults, 1 nymph, Hsikang, Tainan Hsien, 25. vii. 1981; 25 adults, Yungkuang, Tainan Hsien, 26. vii. 1981; 11 adults, 1 nymph, Fangliao, Pingtung Hsien, 27. vii. 1981; 9 adults, 6 nymphs, Hsinpei, Pingtung Hsien, 27. vii. 1981; 2 adults, Checheng, Pingtung Hsien, 27. vii. 1981; 44 adults, 4 nymphs, Pingtung, Pingtung Hsien, 28. vii. 1981; 1 adult, ditto,

28. vii. 1981, sweeping; 5 adults, 4 nymphs, Wantan, Pingtung Hsien, 27. vii. 1981, irrigation ditch; 13 adults, 2 nymphs, Fenchifu, Tainan Hsien, 29. vii. 1981, irrigation ditch.

(Light trap in paddy field) 50 adults, Hsinhua, Tainan Hsien, 20-21. viii. 1981; 16 adults, Kueijen, Tainan Hsien, 19-21. viii. 1981; 11 adults, Talin, Chiai Hsien, 18-22. viii. 1981; 22 adults, Touliu, Yunlin Hsien, 22-24. viii. 1981.

(Light trap in sugarcane field) 1 adult, Chiatou, Kaohsiung Hsien, 28. vii. 1981; 4 adults, ditto, 20. viii. 1981.

Distribution: Japan*, Nansei Is., Taiwan*, Korea, China.

This is one of the two common *Microvelia* species in Japanese paddy fields. Another one is *M. douglasi* Scott. From eight places besides light trap material, this species was found abundantly during the present short survey in Taiwan. It is no doubt that this species is common throughout Taiwanese paddy fields. *M. douglasi* has been known from Taiwanese paddy field, but it has not been found among the present collection.

(D) Gerridae

Gerris paludum insularis Motschulsky (Fig. 2-D)

Specimens examined: 1 adult, Pingtung, Pingtung Hsien, 28. vii. 1981; 2 adults, ditto, 28. vii. 1981, irrigation ditch; 4 adults, Anting, Tainan Hsien, 25. vii. 1981, irrigation ditch.

Distribution: Japan*, Korea, Taiwan*, China, E. Siberia.

This gerrid species is common in ponds and streams in Japan, though it has been recorded from paddy water also. During the present survey, 2 adults were collected from irrigation ditch in citrus orchard (Tungien, Chiai Hsien, 30. vii. 1981, K. Yano) besides the paddy field material listed above.

Limnogonus fossarum (Fabricius)

Specimens examined: 1 adult, Pingtung, Pingtung Hsien, 28. vii. 1981; 1 adult, Yung kang, Tainan Hsien, 26. vii. 1981, irrigation ditch.

Distribution: Japan, Nansei Is*, Taiwan*, China, Philippines*, Malaya*, Singapore, Celebes, Java, Sumatra*, Sri Lanka, India, Micronesia, Fiji.

This widely distributed Oriental species was known from Taiwan previously in general aquatic environment, and was collected this time from paddy water, though the collected number was few. Second author (S. M.) found this species commonly as *L. parvulus* (Stål) on paddy at Peitou (北投) near Taipei in late 1940's (unpublished data).

(E) Hydrometridae

Hydrometra annamana Hungerford et Evans

Specimen examined: 1 adult, Yung kang, Tainan Hsien, 26. vii. 1981.

Distribution: Nansei Is*, Taiwan*, China, Vietnam.

(F) Pleidae

Paraplea frontalis (Fieber)

Specimen examined: 1 adult, Fenchihu, Tainan Hsien, 29. vii. 1981, irrigation ditch.

Distribution: Taiwan*, Thailand, India, Nicobar Is.

This species has not been known from paddy water or nearby irrigation ditch in the world. One

specimen was collected from irrigation ditch by paddy field, and none from paddy water.

(G) Notonectidae

Anisops kuroiwae Matsumura

Specimens examined: 12 nymphs, Anting Tainan Hsien, 25. vii 1981; 26 adults, 30 nymphs, Yungkuang, Tainan Hsien, 26. vii. 1981; 3 adults, Kueijen, Tainan Hsien, 26. vii. 1981; 13 adults, 49 nymphs, Fangliao, Pingtung Hsien, 27. vii. 1981; 31 nymphs, Checheng, Pingtung Hsien, 27. vii. 1981; 6 adults, 3 nymphs, Pingtung, Pingtung Hsien, 28. vii. 1981; 13 adults, 30 nymphs, Tungjen, Chiai Hsien, 30. vii. 1981; 43 adults, 68 nymphs, Fenchihu, Tainan Hsien, 29. vii. 1981, irrigation ditch; 1 nymph, Wantan, Pingtung Hsien, 27. vii. 1981, irrigation ditch.

(Light trap in sugarcane field) 2 adults, Chiatou, Kaohsiung Hsien, 20. viii. 1981.

Distribution: Japan*, Nansei Is., Taiwan*, Philippines*, Thailand*, Hainan Is., China, Burma, Assam, India.

This common, widely distributed species has been collected from almost all the places visited. It is apparent that this is one of the dominant members among the aquatic Heteroptera in the Taiwanese paddy water. One adult was collected from irrigation ditch in citrus orchard at Tungjen, Chiai Hsien during the present collection (30. vii. 1981, K. Yano).

(H) Nepidae

Laccotrephes grossus (Fabricius)

Specimen examined: 1 adult, Fenchihu, Tainan Hsien, 29. vii. 1981, irrigation ditch.

Distribution: Nansei Is., Taiwan*, China, Laos*, Sumatra, India, Sri Lanka*.

This species was formerly recorded as *L. kohlii* Ferrari from Taiwan (Esaki, 1926).

(I) Belostomatidae

Diplonychus rusticus (Fabricius)

Specimens examined: 5 nymphs, Yungkuang, Tainan Hsien, 26. vii. 1981; 1 nymph, Checheng, Pingtung Hsien, 27. vii. 1981; 2 nymphs, Wantan, Pingtung Hsien, 27. vii. 1981, irrigation ditch; 1 nymph, Pingtung, Pingtung Hsien, 28. vii. 1981, sweeping.

(Light trap in sugarcane field) 10 adults, Chiatou, Kaohsiung Hsien, 28. vii. 1981; 8 adults, ditto, 20. viii. 1981.

Distribution: Nansei Is., Taiwan*, Philippines*, China, Thailand*, Sri Lanka*, Sumatra*, Java, New Guinea.

This species has been known from S. E. Asian paddy water, and has been found in Taiwan this time.

(J) Corixidae

Micronecta quadristrigata Breddin

Specimens examined: 1 adult, Tungjen, Chiai Hsien, 30. vii. 1981; 5 adults, Anting, Tainan Hsien, 25. vii. 1981, irrigation ditch.

(Light trap in paddy field) 10 adults, Talin, Chiai Hsien, 18-22. viii. 1981; 14 adults, Touliu, Yunlin Hsien, 22-24. viii. 1981.

(Light trap in sugarcane field) 1 adult, Chiatou, Kaohsiung Hsien, 20. viii. 1981.

Distribution: Taiwan*, Philippines*, Sri Lanka*, India*, Malaya, Borneo, Sumatra*, Java, Celebes, Vietnam, Thailand, Hong Kong, Iran.

This is the most common species among the S. E. Asian paddy water fauna of Heteroptera, though the present specimens collected were not many.

Micronecta sahlbergi Jakovlev (Fig. 2-E)

Specimens examined: 3 adults, Yung kang, Tainan Hsien, 26. vii. 1981; 1 adult, Kueijen, Tainan Hsien, 26. vii. 1981; 1 adult, Fangliao, Pingtung Hsien, 27. vii. 1981; 1 adult, Checheng, Pingtung Hsien, 27. vii. 1981; 24 adults, Anting, Tainan Hsien, 25. vii. 1981, irrigation ditch; 1 adult, Wantan, Pingtung Hsien, 27. vii. 1981, irrigation ditch.

(Light trap in paddy field) 10 adults, Talin, Chiai Hsien, 18-22. viii. 1981.

(Light trap in sugarcane field) 1 adult, Chiatou, Kaohsiung Hsien, 20. viii. 1981.

Distribution: Japan*, Taiwan*, China, E. Siberia.

This species has been known only from the Japanese paddy water without definite data.

As the collection described above is limited, only brief comment will be available for the Taiwanese fauna of aquatic and semiaquatic Heteroptera from paddy water at present. It is certainly expected that the supposed fauna will be more rich judging from the fauna of general aquatic environment in Taiwan, and diversified environment of paddy fields which are almost remained untouched by the present survey. Hebridae and Ochteridae which have not been collected this time will be found by further collecting. More species of Gerridae, Hydrometridae, Notonectidae, Nepidae and Corixidae will probably be added to the fauna in future.

ADDITIONAL RECORDS OF THE WORLD AQUATIC AND SEMIAQUATIC HETEROPTERA FROM PADDY WATER

After the publication of the list of the aquatic and semiaquatic Heteroptera from paddy water in the world (Yano et al., 1981), several records have been published, and some overlooked ones have been found. These additional records are listed in Table 1.

As stated before, *Microvelia douglasi*, has been known from the Taiwanese paddy water. Following references are involved in the species from Taiwan. Yen (1973) listed *M. douglasi* as the predator of *Nephotettix apicalis* Motsch., *N. cincticeps* Uhler, *N. impicticeps* Ishihara and *Sogatella furcifera* Horváth without giving data. Chiu (1978) also listed *M. douglasi* as the predator of *N. cincticeps* without data. Chu and Hirashima (1981) revised these former publications. Chu and Reid (1982) made biological observations on the species especially its feeding behavior. This is probably the first authentic record of *M. douglasi* from the Taiwanese paddy water. Miyamoto (1961) mentioned that the crowding of *Limnogonus parvulus* (Stål) on paddy water in Taiwan.

Ban and Kiritani (1980) recorded 6 aquatic species of Heteroptera from the paddy fields in Kochi, Japan. They mentioned that the diversity of the insect group was simple. This figure and argument may not be appropriate judging from the data accumulating by the first author in Japan (unpublished data). Barrion et al. (1981) listed 9 species of 8 aquatic Heteropterous families attacking *Nilaparvata lugens* in the Philippine paddy fields. Data mentioned above along with other fragmental records provide additional 9 species in 4 families to the former list.

Table 1. Additional records to the list of the aquatic and semiaquatic Heteroptera from paddy water in the world (Yano et al., 1981).¹

Family	Species	Locality-recorded from paddy water	Reference		
			(A) With data ²	(B) Without data	
Saldidae	<i>Saldula ornatula</i> (Reuter)	Philippines	Barrion et al., 1981		
	<i>Saldula saltatoria</i> (Linnaeus)	Japan	Gyotoku, 1974		
Mesoveliidae	<i>Mesovelia vittigera</i> Horváth	Philippines	Barrion et al., 1981		
Veliidae	Mesoveliidae	U. S. A.	Steelman et al., 1975		
	<i>Microvelia douglasi</i> Scott	Japan Taiwan	Ban & Kiritani, 1980	Gyotoku, 1974 Yen, 1973; Chiu, 1978; Chu & Hirashima, 1981; Chu & Reid, 1982	
Gerridae	<i>Microvelia d. atrolineata</i> Bergroth	Philippines	Barrion et al., 1981 ³		
	<i>Microvelia horvathi</i> Lundblad	Japan		Gyotoku, 1974	
	<i>Microvelia</i> sp.	India		Misra, 1980	
	<i>Gerris elongatus</i> (Uhler)	Japan	Ban & Kiritani, 1980		
	<i>Gerris lacustris</i> (Linnaeus)	Japan	Ban & Kiritani, 1980		
	<i>Limnogonus fossarum</i> (Fabricius)	Japan		Miyamoto, 1961	
	<i>Limnogonus nitidus</i> (Mayr)	India		Misra, 1980	
	<i>Limnogonus parvulus</i> (Stål)	Taiwan India		Miyamoto, 1961 Misra, 1980	
	? <i>Limnogonus</i> sp.	Philippines	Barrion et al., 1981		
	Gerridae		U. S. A.	Washino & Hokama, 1967	
Hydrometridae	<i>Hydrometra lineata</i> Eschscholtz	Philippines	Barrion et al., 1981		
	<i>Hydrometra procera</i> Horváth	Japan		Gyotoku, 1974	
	<i>Hydrometra</i> sp.	India		Misra, 1980	
Ochteridae	<i>Ochterus marginatus</i> (Latreille)	Philippines	Barrion et al., 1981		
	<i>Ochterus m. flavomarginatus</i> Scott	Japan	Gyotoku, 1974		
Notonectidae	<i>Anisops kuroiwaie</i> Matsumura	Philippines	Barrion et al., 1981		
	<i>Anisops</i> sp.	Philippines	Barrion et al., 1981		
	<i>Buenoa scimitra</i> Bare	U. S. A.	Washino & Hokama, 1968		
	<i>Notonecta undulata</i> Say	U. S. A.	Washino & Hokama, 1968		
	<i>Notonecta unifasciata</i> Guérin-Ménéville	U. S. A.	Washino & Hokama, 1968; Miura & Takahashi, 1973		
	<i>Notonecta</i> sp.	U. S. A.	Steelman & Schilling, 1972		
	<i>Notonecta</i> spp.	U. S. A.	Steelman et al., 1975		
Notonectidae		U. S. A.	Gerhardt, 1955; Washino & Hokama, 1967		
Nepidae	<i>Laccotrephes japonensis</i> Scott	Japan	Gyotoku, 1974; Ban & Kiritani, 1980		
	<i>Ranatra chinensis</i> Mayr	Japan	Gyotoku, 1974; Ban & Kiritani, 1980		
Belostomatidae	<i>Abedus indentatus</i> (Haldeman)	U. S. A.	Washino, 1970		
	<i>Belostoma bakeri</i> Montandon	U. S. A.	Washino & Hokama, 1968		
	<i>Belostoma flumineum</i> Say	U. S. A.	Washino & Hokama, 1968		
	<i>Belostoma</i> sp.	U. S. A.	Ahmed et al., 1970; Venski & Washino, 1970; Steelman et al., 1975; Zalom & Grigarick, 1980		
	<i>Belostoma</i> spp.	U. S. A.	Steelman & Schilling, 1972 ⁴		
	<i>Diplonychus japonicus</i> (Vuillefroy)	Japan	Gyotoku, 1974		
	Belostomatidae		U. S. A.	Washino & Hokama, 1967	
	Corixidae	<i>Corisella decolor</i> (Uhler)	U. S. A.	Miura & Takahashi, 1973; Zalom & Grigarick, 1980 ⁵	
		<i>Corisella</i> sp.	U. S. A.	Washino & Hokama, 1967, 1968; Washino et al., 1972	
		<i>Micronecta quadririgata</i> Breddin	Philippines	Barrion et al., 1981	
<i>Sigara substriata</i> (Uhler)		Japan	Gyotoku, 1974		
<i>Trichocorixa</i> sp.		U. S. A.	Steelman & Schilling, 1972		
Genus sp.		Japan	Ban & Kiritani, 1980		
Corixidae			U. S. A.	Washino & Hokama, 1967; Venski & Washino, 1970; Ahmed et al., 1970; Steelman et al., 1975	
? Family	Hemiptera	Japan		Kuroda, 1930 ⁶	

- References marked by a superior number used scientific names different from the present usage, and the original ones are cited in the footnote.
- References with collecting or observing data including primarily locality name, data and collector or observer name.
- Microvelia atrolineata* Bergroth
- Two species without scientific names.
- Corisella decolor*
- Six species without any names.

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SUMMARY

The aquatic and semiaquatic Heteroptera dwelling in paddy water from Taiwan were studied. Preliminary surveys were made in 1981 at eleven places in southern part of Taiwan. Light trap collections were made in paddy fields and sugarcane fields of almost same areas were also examined for subsidiary information. Following results were obtained through the surveys.

- 1) Twelve species belonging to the following 9 families were collected from paddy water and irrigation ditch by paddy field: Mesoveliidae, Veliidae, Gerridae, Hydrometridae, Pleidae, Notonectidae, Nepidae, Belostomatidae and Corixidae.
- 2) Four species among the paddy water and irrigation ditch were collected rather abundantly compared with other species. They are *Microvelia horvathi*, *Anisops kuroiwae*, *Micronecta quadristrigata* and *M. sahlbergi*. Remaining species are also common in S. E. Asian paddy water except for *Hydrometra annamana* and *Paraplea frontalis*.
- 3) One specimen of *Saldula ornatula* of the family Saldidae was found among the light trap collections made in paddy fields. This has not been collected from paddy water or irrigation ditch by the present collection, though it is known from Japanese and Philippine paddy water.
- 4) Additional records to the list of the world aquatic and semiaquatic Heteroptera from paddy water given by Yano et al. (1981) are presented. Nine species in 4 families have been added to the former list.

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亞洲地區稻田昆蟲相及其生物學之研究(VI) 台灣產水棲及半水棲半翅目(預報)

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中文摘要

已往於台灣對稻田中水棲與半水棲半翅目，除道氏潤肩水黽 (*Microvelia douglasi* Scott) 一種外，未有任何之研究。著者等在 1981 年間，在台灣南部之 11 個地點之稻田中調查。所集資料除在稻田及灌溉渠中直接採集者外，並利用設置在稻田或蔗田內之誘蟲燈所誘殺之標本，作進一步之討論，而得如下四點結論。

(1) 在稻田及灌溉渠中採集到 9 科 12 種標本：黽蟻科 (Mesoveliidae) 1 種，潤眼科 (Veliidae) 2 種，水眼科 (Gerridae) 2 種，絲眼科 (Hydrometridae) 1 種，固頭蟻科 (Pleidae) 1 種，仰泳蟻科 (Notonectidae) 1 種，蜷蟻科 (Nepidae) 1 種，田鼈科 (Belostomatidae) 1 種及水蟻科 (Corixidae) 2 種。

(2) 在所採到的種類中，以 *Microvelia horvathi*, *Anisops kuroi wae*, *Micronecta quadristrigata* 及 *M. sahlbergi* 四種，為較佔優勢的種類。以外 8 種在此次調查中，採集之蟲數雖少，但除 *Hydrometra annamana* 及 *Paraplea frontalis* 兩種外，皆為東南亞地區常見之種類。

(3) 屬於水際蟻科 (Saldidae) 之 *Saldula ornatula*，在稻田及灌溉渠中未能採到，而從設置在稻田之誘蟲燈中得到唯一的標本，然該蟲在日本、菲律賓之稻田中已有生棲記錄。故在台灣稻田中有該蟲之生棲當無疑問。

(4) Yano et al. (1981) 曾發表全球性稻田水棲半翅目之目錄，而本文補充其後所得之資料，並經此次調查後，共得 4 科 9 種之新記錄種。

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