

ODONATA (INSECTA) FROM NORTHERN IRAN, WITH COMMENTS ON THEIR PRESENCE IN RICE FIELDS

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ABSTRACT: Odonata are considered effective predators to control pest organisms in rice fields. In the rice fields and other sites located in Northern Iran (Mazandaran Province) during 2003-2006, the 30 species from 19 genera and 8 families of Odonata (both suborders Zygoptera and Anisoptera) were collected and evaluated.

KEY WORDS: Odonata, Rice field, Northern Iran, Mazandaran province

Rice is the primary food for half the people in the world, providing more calories than any other single food. Several pests cause damage and yield loss on this crop (Datta and Khush, 2002). Pesticides can control many of the rice pests, but because of environmental risks, crop infection and killing of beneficial insects (natural enemies and pollinators) are not efficient and safe method (Khan et al., 1991). There are several natural predators in the rice fields that if conserved, can play an effective role in decreasing the pest population density (Mohyuddin, 1990; Bonhof et al., 1997). Larvae and adults of the Odonata are considered efficient predators in the rice fields (Heinrichs, 1994; Alonso Mejia and Marquez, 1994).

Rice fields, together with their contiguous aquatic habitats and dry land comprise a rich mosaic of rapidly changing ecotones, harboring a rich biological diversity, maintained by rapid colonization as well as by rapid reproduction and growth of organisms (Fernando, 1996). The variety of organisms inhabiting the rice field ecosystems includes a rich composition of fauna and flora. These organisms colonize the rice fields by their resting stages in soil, by air and via irrigation water (Fernando, 1993). The fauna are dominated by micro-, meso- and macro- invertebrates (especially arthropods) inhabiting the vegetation, water and soil sub-habitats of the rice fields, while vertebrates are also associated with rice fields. The aquatic phase of rice fields generally harbors a varied group of aquatic animals. Those that inhabit the vegetation are mainly the arthropod insects and spiders. In addition, many species of amphibians, reptiles, birds and mammals visit the rice fields for feeding, from surrounding areas, and are generally considered as temporary or ephemeral inhabitants (Bambaradeniya et al., 1998). In relation to the rice crop, the fauna and flora in rice fields include pests, their natural enemies (predators and parasitoids) and neutral forms.

The arthropod natural enemies of rice insect pests include a wide range of predators and parasitoids that are important biological control agents. Predators include a variety of spiders, and insects such as carabid beetles, aquatic and

terrestrial predatory bugs and dragon flies (Bambaradeniya and Amerasinghe, 2003).

Odonata Fabricius, 1793 are an order of aquatic palaeopterous insects. There are about 6,500 extant species in just over 600 genera. Adult odonates are medium to large in size, often conspicuous and/or brightly colored insects and are aerial predators hunting by sight. They generally are found at or near fresh water although some species roam widely and may be found far from their breeding sites (Norling and Sahlen, 1997). Odonate larvae are non-discriminate hunters which can eat any animal as large as or smaller than themselves, including their own species. Small vertebrates such as tadpoles and juvenile forms of fish are not immune from attack (Novelo et al., 2002). Prey may be stalked or ambushed. Captured prey is pulled back using powerful muscles in the labium and chewed by strong mandibles (Papazian, 1994).

The fauna of Iranian Odonata is quite poorly studied as only 95 species and subspecies have been recorded so far (Heidari and Dumont, 2002). Among the different crop fields, rice fields are the semi-aquatic ecosystems that are suitable for reproduction and survival of Odonata. The fauna of insects as potential prey of Odonata is very diverse in rice fields, which should make them optimal habitats for Odonata. The fauna of dragonflies and damselflies was studied in the rice fields of Northern Iran (Mazandaran Province), and additional specimens were collected from other habitats in this province.

MATERIALS AND METHODS

The materials were collected from the rice seedlings, and around hedges and grasses of Northern Iran through 2003-2006. The sampled regions in this study were Ghaemshahr, Sari, Amol, Savadkooh, Behshahr, Joibar, Mahmood-Abad, Fereydon-Kenar, Babol, Chalus, Noor and Nooshahr. After collecting the materials, they were killed by the cyanide, wings were spread, pinned and labeled (locality, date of collection) and identified preliminarily by different scientific resources and identification keys (Spuris, 1967; Belshev, 1973; Hammond, 1983; Westfall, 1987; Askew, 1988; Kalkman, 2006). Then the materials were sent to the authorized taxonomists including, Dr. Geert De Knijf (Instituut voor Natuur- en Bosonderzoek, Research Institute for Nature and Forest, Belgium) and Dr. Marc Bernard (Société Linnéenne de Bordeaux, France) for identification or confirmation. All the materials were collected by the first, second and third authors, and also many obtained data from different collections were used in this paper. Also, the specimens are deposited in the collections of the mentioned specialists.

RESULTS

A total of 30 species of 19 genera and 8 families were recorded from Northern Iran (Mazandaran province; fig. 1). Of these, 22 species were collected in the rice fields surveyed. The list of Odonata species from rice fields of Northern Iran is given below.

LIST OF ODONATA FROM NORTHERN IRAN**SUBORDER ZYGOPTERA****CALOPTERYGIDAE*****Calopteryx splendens orientalis*** Selys, 1887

Material examined: Ghaemshahr (2♂, 1♀), August 2004 and September 2005; Sari (2♀), July 2005.

COENAGRIONIDAE***Coenagrion vanbrinkae*** Lohmann, 1993

Material examined: Ghaemshahr (Rice field) (2♀), June 2004.

Ischnura elegans ebneri Schmidt, 1838

Material examined: Ghaemshahr (Rice field) (1♀), April 2003; Sari (Rice field) (1♂), August 2005.

Ischnura forcipata Morton, 1907

Material examined: Sari (Rice field) (1♂), July 2005; Amol (Rice field) (1♀, 1♂), June 2005.

Ischnura pumilio (Charpentier, 1825)

Material examined: Savadkooh (Rice field) (1♀), May 2003.

Pseudagrion decorum (Rambur, 1842)

Material examined: Ghaemshahr (Rice field) (1♂), July 2005; Behshahr (Rice field) (1♀), September 2004.

Pyrrhosoma nymphula (Sulzer, 1776)

Material examined: Ghaemshahr (1♀), August 2004; Amol (1♂), September 2005.

EUPHAEIDAE***Epallage fatime*** (Charpentier, 1840)

Material examined: Savadkooh (1♂), June 2005; Joibar (1♂), August 2005.

PLATYCNE MIDIDAE***Platycnemis dealbata*** Selys & Hagen, 1850

Material examined: Sari (Rice field) (1♀, 1♂), June 2004.

SUBORDER ANISOPTERA**AESHNIDAE*****Aeshna affinis*** Vander Linden, 1820

Material examined: Savadkooh (Rice field) (1♀), Sept. 2005.

Aeshna mixta Latreille, 1805

Material examined: Amol (Rice field) (1♂, 1♀), September 2004, 2005; Ghaemshahr (Rice field) (1♀), October 2005.

Anax parthenope (Selys, 1839)

Material examined: Behshahr (Rice field) (1♀, 1♂), July and August 2005; Amol (Rice field) (2♀), September 2005.

Anax imperator Leach, 1815

Material examined: Savadkooh (Rice field) (1♂), August 2004.

Brachytron pratense (Müller, 1764)

Material examined: Joibar (1♀), May 2005; Ghaemshahr (1♂), August 2005.

CORDULIIDAE

Somatochlora flavomaculata (Vander Linden, 1825)

Material examined: Mahmood-Abad (Rice field) (1♂), August 2003; Fereydon-Kenar (Rice field) (1♂), September 2003.

GOMPHIDAE

Anormogomphus kiritshenkoi Bartenef, 1913

Material examined: Sari (1♀, 1♂), April 2003; Amol (2♂), July 2004.

Onychogomphus forcipatus albotibialis (Schmidt, 1954)

Material examined: Ghaemshahr (1♂), September 2005.

LIBELLULIDAE

Orthetrum albistylum (Selys, 1848)

Material examined: Savadkooh (Rice field) (1♀), July 2005.

Orthetrum luzonicum (Brauer, 1868)

Material examined: Ghaemshahr (Rice field) (1♀), August 2005.

Orthetrum sabina (Drury, 1773)

Material examined: Babol (1♂, 2♀), August, July and September 2005; Behshahr (2♀), June, 2004; November 2005; Ghaemshahr (2♂, 2♀) September 2002, July 2005, February 2005; Amol (Rice field) (3♂, 1♀), September 2004, September 2005, February 2005; Sari (2♂), July 2004.

Libellula depressa Linnaeus, 1758

Material examined: Amol (Rice field) (1♂), July 2005; Sari (1♂), August 2005; Savadkooh (Rice field) (1♂), August 2005.

Sympetrum sanguineum (Müller, 1764)

Material examined: Savadkooh (Rice field) (1♂), June 2004.

Sympetrum striolatum striolatum (Charpentier, 1840)

Material examined: Babol (2♂), Sept. 2005; Amol (2♂), August - July 2004; Amol (Rice field) (2♀) May and September 2005; Behshahr (2♀, 2♂), September 2005; Sari (3♀, 1♂), September 2005; Ghaemshahr (3♀, 5♂), April 2006. .

Sympetrum vulgatum decoloratum (Selys, 1884)

Material examined: Ghaemshahr (Rice field) (2♂), September 2005; Chalus (Rice field) (1♀), August 2005.

Crocothemis erythraea (Brullé, 1832)

Material examined: Ghaemshahr (1♂), June 2005; Amol (3♂), September 2005.

Crocothemis servilia (Drury, 1773)

Material examined: Ghaemshahr (2♂), July and Sept. 2005; Savadkooh (2♀), June 2004 and Dec. 2005; Ghaemshahr (1♀), May 2004; Babol (1♂), September 2005; Amol (Rice field) (2♀, 1♂), September 2005; Behshahr (2♂), September 2005.

Diplacodes lefebvrii (Rambur, 1842)

Material examined: Amol (Rice field) (1♀), November 2004; Savadkooh (Rice field) (1♀), August 2005.

Trithemis annulata (Palisot de Beauvois, 1807)

Material examined: Mahmood-Abad (Rice field) (2♀), September 2004; Amol (Rice field) (1♀), June 2005.

Trithemis arteriosa (Burmeister, 1839)

Material examined: Fereydon-Kenar (Rice field) (1♀), November 2005; Noor (Rice field) (1♂), July 2004.

Trithemis festiva (Rambur, 1842)

Material examined: Nooshahr (Rice field) (1♂), September 2004; Chalus (2♂), November 2003; Savadkooh (Rice field) (1♂), August 2005.

DISCUSSION

Among the 8 families reported in this paper, the two families including, Libellulidae and Coenagrionidae with 13 and 6 species, respectively are more diverse taxa in terms of the number of species in Northern Iran. Also, of the 30 collected species from rice fields and around grasslands of Northern Iran, three species included, *Sympetrum striolatum*, *Orthetrum sabina* and *Crocothemis servilia* are dominant species and probably have a more efficient role in the control of rice pests. *S. striolatum* is the most cosmopolitan and dominant species in Mazandaran province. About the importance of *Sympetrum* species in biological control, the predatory capacities and efficiencies of *S. frequens* dragonfly nymphs on *Anopheles sinensis* mosquito larvae were evaluated in the laboratory as part of a series of studies on their prey-predator relationship in rice fields (Urabe *et al.*, 1986). Urabe *et al.* (1986) showed that the 8th, 9th and 19th instar nymphs of *S. frequens* consumed 12, 19 and 28 individuals of the 4th instar larvae or more than 100 individuals of the 2nd instar larvae of *A. sinensis* per day, respectively, when the prey larvae were plentiful. During the 30-day period between the 8th and 10th nymphal instars (except for 3 or 4 days just before emergence), the nymph of *S. frequens* consumed an average of 524 individuals of 4th instar larvae of *A. sinensis*.

This research deals with the fauna of Odonata in a part of Iran; Iran is a large country incorporating various geographical regions and climates; consequently it would be expected that a large number of additional species and new records are to be expected to occur in country. For example in Turkey, a species frequently present in rice fields is *Sympetrum depressiusculum*. Since it was recorded from South Eastern Armenia, it is very probably also present in Iran. However, although the Odonata fauna of Turkey was studied rather well (Demirsoy, 1995; Kalkman, 2006; Salur and Kiyak, 2000, 2006; Salur and Özsarac, 2004; Miroğlu and Kartal, 2008), but there are a few faunistic papers on Iranian fauna (Blom, 1982; Heidari and Dumont, 2002). Therefore it is very necessary to work on this interesting and beneficial taxon in Iran.

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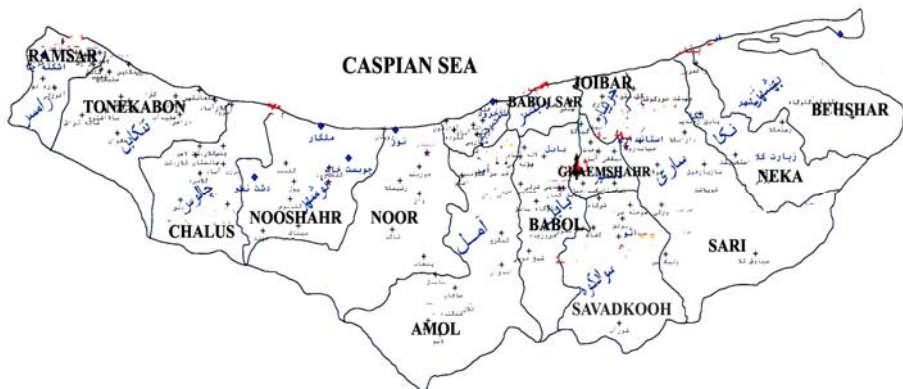


Fig. 1. The map of Mazandaran province (Northern Iran) included all the regions and cities.