Present status of knowledge on *Lissorhoptrus oryzophilus* Kuschel (Rice Water Weevil) in Italy

D. Lupi [(1)], M. Colombo [(1)], M. L. Giudici [(2)], B. Villa [(2)], A. C. Sparacino [(3)], and F. Ranghino [(1)]

ABSTRACT - *Lissorhoptrus oryzophilus* ***(Rice Water Weevil, RWW) is native to the United States, and remained confined in North America until 1976 when it spread to Asia. In Europe, it was detected for the first time in Italy in 2004 on spontaneous plants. In consideration of the potential damage caused by this pest, great efforts have been made to acquire data on the biology, settlement, and diffusion of the insect in Italy. The results of the monitoring process performed in 2005-2006 showed that the insect settled in a wide area (in the South West of Milan toward Pavia) and its diffusion is still expanding in the remaining part of Lombardy and in Piedmont. A long-term monitoring process on seven different fields allowed to acquire data not only on the ethology and biology of the insect, but also on its relationship with spontaneous plants. Important data were obtained on the behaviour of the pest in relation to seeding techniques and cultivars in Italy, and on the feasible agronomic control practices.***

KEY WORDS - *Rice Water Weevil; Erirhinidae; alien species; diffusion; biology****.***

I. INTRODUCTION

THE rice water weevil (RWW), *Lissorhoptrus oryzophilus* Kuschel (Coleoptera: Erirhinidae) is native to the western part of the United States, where the beetle reproduces sexually and feeds on rice and poaceous and cyperaceous weeds [1]-[3]. When rice was introduced in the United States, there was an host shift to it. Since then, RWW has become one of the most destructive pest of rice. In 1959 the insect was detected in California where it developed as a population of parthenogenetic females [2]. However it had been confined in North America until 1976 when it was accidentally introduced into Japan [4]. Since then the insect has spread all over Japan, in 1988 was detected in China and Korea [5]; in India [6] and in 2004 in Italy [7]. In our country it was first detected on spontaneous plants in Ticino park.

The insect is now inserted in EPPO (European and Mediterranean Plant Protection Organization) Alert List [6]. RWW is considered one of the most important phytophagous of rice all over the world. Damages are caused by larvae: the newly hatched larva feeds within the sheath for a short time, then moves to the mud and feeds within and upon rice roots [8]. Root pruning results in a reduced plant height, a slight delay in maturation and a reduced yield. In extreme cases wind may cause the plant to dislodge and to float [9].

Adults too can feed on rice, eating the leaves and causing longitudinal scars on flooded rice. Leaf-feeding damage by adult has no economic importance [10].

In consideration of the potential damage caused by this pest, great efforts have been made to acquire data on the biology, settlement, and diffusion of the insect in Italy. For this purpose two projects have been financed by Lombardy region and have involved various specialists of different disciplines.

II. MATERIAL AND METHODS

A. Insect diffusion

To establish the geographical distribution of RWW, the rice growing areas in Lombardy and Piedmont (regions with respectively the 43% and the 51% of the Italian rice production) were surveyed in 2005 and 2006. The sites were randomly chosen from the zone where the RWW had been detected for the first time in 2004. The position of each site was georegistered with a GPSMAP® 76S GARMIN and the points were put on a CTR map with Manifold®System.

The methods used to detect the insect in the monitoring process were dependent from the period of observation and, consequently, from the biology of the insect. Overwintering sites were studied by collecting soil and litter. In early spring, when the temperature caused the exit of the insect from the litter, but rice has not been present yet, adults were searched on weeds with a net. From May to September the insect was searched directly in rice fields.

B. Insect biology

To acquire information on the biology of the insect in relation to different practices and cultivars, different fields were made the object of a long-term monitoring process.

In 2005 two water seeded fields were analysed.

In 2006 seven different fields were surveyed. Among them four were flooded seeded, and three dry seeded. Four fields were reserved to analyse differences regarding the seeding period: two late maturing varieties were sown at the end of April and two early maturing were sown at the end of May.

(1) Istituto di Entomologia agraria - Università degli Studi di Milano, Milano, Italy
(2) Ente Nazionale Risi - Centro Ricerche sul Riso, Castello d'Agogna, Italy
(3) A. C. Sparacino is with Dipartimento di Produzione Vegetale - Università degli Studi di Milano, Milano, Italy

This work was supported in part by Regione Lombardia research projects: "The rice water weevil: biology and biological control"
"Individuation of exotic arthropods in Lombardy"

Larval and pupal density were determined by taking root/soil core samples with a metal sampler (10.0cm in diameter by 10.0cm deep) [11] fortnightly from the beginning of May until September.

III. RESULTS AND DISCUSSION

A. Insect diffusion

The monitoring process allowed us to establish that the insect is settled in Italy. It has colonised a wide area in Lombardy (in the South West of Milan toward Pavia). In the south of Milan the major presence of dry seeded field may have affected the diffusion of the insect. In fact, according to many Authors [12], [13] the ovipositional and feeding behaviour of the insect is negatively influenced by delayed flooding. On the other hand its presence is still low in Piedmont, where, notwithstanding the presence of flooded seeded fields, there are few separated focus of infection. This means that its diffusion is still expanding.

B. Insect biology

Over the two years of analysis, we observed the exit of adults from overwintering sites in the last decade of April. Later, they remained on weeds until the first decade of May when they immigrated in the nearby flooded paddies, where they fed and oviposited. Dry seeded fields were colonized only after flooding. Laboratory and field observations allowed us to establish that adults activity lasted until the end of June, when they stopped oviposition and began to die. Larvae were detected in core samples from the end of May until the end of July. It was difficult to detect the newly hatched larvae as they fed within the sheath for a short time and only at the end of the first instar they moved to the mud and fed within the rice roots. No statistical difference in the distribution of larvae in fields was evaluated.

Maximum larval density was detected in June in flooded fields. In one field the density was the highest both in 2005 (13.6±1.97 larvae/core) and 2006 (12.4±1.55 larvae/core) (Fig. 1). Later on the number of larvae detected decreased and became null at the end of July. Pupae, enclosed in a mud cocoon attached to the roots of rice plants were detected mainly in July.

Newly emerged adults were observed from the beginning of July in water seeded fields. Both larval detection and adult emergence were delayed in dry seeded fields.

Some adults were caught and dissected in July and August. No ovary development was observed, demonstrating they were new emerged adults but not mature yet and, consequently, not ready to oviposit. At the end of August adults migrate from rice to spontaneous plants near the fields where they fed until they entered diapause. This behaviour gave evidence to the great importance of the spontaneous plants presence in fields at the end of the season when rice is unsuitable for the insect.

All the information acquired in this research allowed us to establish that only one generation occurred in 2005 and 2006. Damages on rice plants were not significative and the yield was satisfactory.

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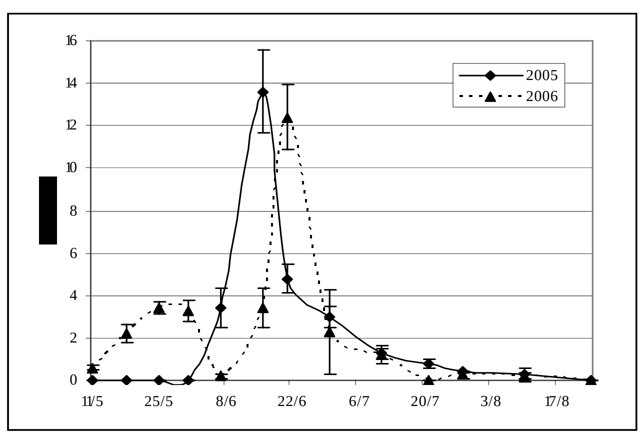

Fig. 1. Trend of larval presence in the flooded field in which the larval density was the highest in both the years of observation.