

Introduction and Distribution of the American Eastern Cherry Fruit Fly, *Rhagoletis cingulata*, in the Rhine Valley, Germany

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ABSTRACT

In 1983 the American Eastern Cherry Fruit Fly, *Rhagoletis cingulata*, was found in Switzerland. This was the first record outside the western hemisphere. In Germany, the first specimens were discovered near Freiburg/Br. in 1993 and a single female was found near Kaub in the middle Rhine valley in July 1999. Since 2001 *R. cingulata* occurs in the Netherlands. In the cherry growing area of Rhineland-Palatinate a monitoring programme was started in 2002. The dispersal and seasonal abundance of *R. cingulata* was surveyed by using yellow traps (Rebell). The data obtained in three years reveal, that during this time the fly has spread throughout the northern parts of the cherry growing area (Rheinhessen) and to the south, too. The peak of flight activity of the introduced American Eastern Cherry Fruit Fly is about two weeks later than the peak of the European Cherry Fruit Fly, *Rhagoletis cerasi*. Data concerning the efficacy of different trap types are presented. Consequences are discussed.

1. INTRODUCTION

The American Eastern Cherry Fruit Fly, *Rhagoletis cingulata* is known as a pest of cherries in the western hemisphere. Primary hosts are *Prunus cerasus* (Sour Cherry) and *Prunus avium* (Wild Cherry), secondary hosts are *Prunus serotina* (Black Cherry), *Prunus mahaleb* (St. Lucie Cherry) and *Prunus virginiana* (Choke Cherry). Outside the western hemisphere *R. cingulata* was found for the first time in Switzerland in 1983 and in the northern parts of Italy in 1998. In Germany, the first specimens were discovered near Freiburg/Br. in 1993 and a single female was found near Kaub in the middle Rhine Valley in July 1999. Since 2001 *R. cingulata* occurs in the Netherlands. In 2003 the status of *R. cingulata* was monitored. It has been described as: "present, widespread in the coastal area" (EPPO, 2004). In the cherry growing area of Rhineland-Palatinate a first monitoring program was started in 2002 and repeated in 2003. The results gave reason to believe that *R. cingulata* is spread all over Rhineland-Palatinate. The monitoring in 2004 was expected to confirm this assumption. At the same time, the efficiency of the Rebell® amarillo yellow trap, Switzerland, was to be discussed. Perhaps the Rebell traps are more efficient in catching *R. cerasi* than *R. cingulata*. For comparison the Pherocon® AM Trap, USA were ordered. This type of trap has not been used in Rhineland-Palatinate before. The aims of this investigation were (i) to monitor the distribution of *R. cingulata* in Rhineland-Palatinate, (ii) to compare the different types of traps, and (iii) to study the seasonal abundance of *R. cingulata*.

2. METHODS AND MATERIALS

Traps: To monitor the distribution of Cherry Fruit Flies, the following traps were used. The Rebell amarillo Yellow Trap baits the flies by visual attraction. By crossing the boards the trap becomes three-dimensional. The Pherocon AM Trap baits the Cherry Fruit Flies in two ways, on the one hand by visual attraction and on the other hand by means of a pheromone. The glue on the trap contains the attractant. The exact chemical compound has not been published. The producer describes the ingredients as non-toxic synthetic insect pheromones. On inquiry they confirm that the glue contains ammonium acetate. In contrast to other bait traps the Pherocon AM Trap is exposed vertically, not horizontally. The trap becomes two-dimensional by joining the sides of the trap together. This type of traps was not used all over Rhineland-Palatinate but only in the region of Rheinhessen.

Locations: During 2002 and 2003 the locations for the monitoring of Cherry Fruit Fly included mainly the picturesque steep slopes on the Rhine near Kaub and cherry orchards, some of them neglected. The following year it was necessary to find suitable Wild Cherry hedges and neglected orchards in the region, where the American Eastern Cherry Fruit Fly was caught in 2003. Locations with mixed plantings like *Prunus avium*, *Prunus cerasus*, *Prunus mahaleb* and *Prunus serotina* were preferred. The first catches of flies were expected especially in slopes and unmanaged orchards. The distribution and the number of traps in the different cherry growing regions of Rhineland-Palatinate varied from year to year (see below: 3. Results and Discussion).

Evaluation: One Rebell® amarillo Yellow Trap was suspended at every site. Pherocon AM Traps were not available in great numbers so we used these in unmanaged orchards and slopes. The traps were placed at distances of ten meters. The monitoring started with the beginning of flight of *R. cerasi* in the middle of May, because the beginning of flight of *R. cingulata* was not known exactly. In the region of Rheinhessen the traps were controlled twice a week, in the region of Pfalz and Ahrweiler once a week. The date of control and the number of flies caught on the trap were put down. The two species of cherry fruit flies can be distinguished by the wing pattern. The number of caught flies was tabulated for every location. Thus we obtained a data collection about the distribution of *R. cingulata*, the course of flight and the efficiency of the traps.

3. RESULTS AND DISCUSSION

In the cherry growing area of Rhineland-Palatinate the first monitoring programme was started in 2002. In that year no American Eastern Cherry Fruit Fly was found on the 74 Rebell yellow traps. In 2003 the monitoring was repeated with 45 traps. In this year eleven *R. cingulata* were found. Except one specimen, all of them were detected on two “Rebell” yellow traps in two nearby Wild Cherry hedges. These places are situated about 60 km from Kaub in the area of Mainz / Rheinhessen. This was the reason to assume that *R. cingulata* is spread over Rheinhessen. In 2004 the monitoring in Rhineland-Palatinate was repeated. 49 cherry orchards were selected, and 27 of these were attacked by the American Eastern Cherry Fruit Fly (see fig. 1).

In 2004 in Rhineland-Palatinate 16.529 *R. cerasi* and 1.113 *R. cingulata* were caught in 64 traps. In this year 263 specimens were found in the same places where *R. cingulata* occurred

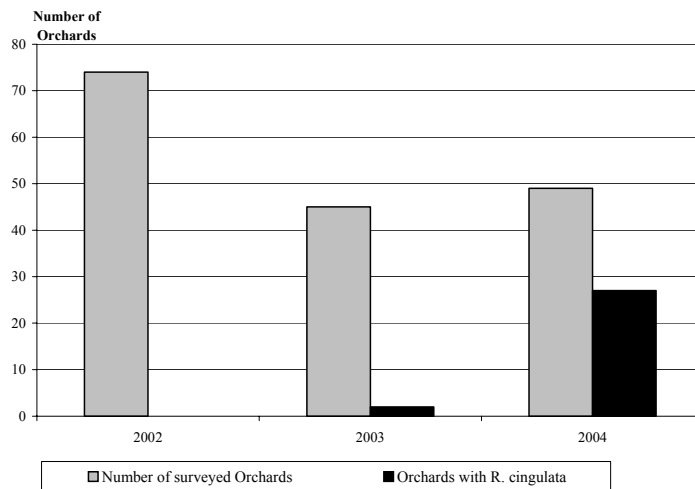


Fig. 1 Surveyed orchards and number of places where *R. cingulata* were caught with Rebell or Pherocon Traps.

in 2003. Only in the nearby orchard called “Orbel” we found more *R. cingulata* than *R. cerasi*. There were about 510 American Cherry Fruit Flies on the traps (see. Fig. 4a+b). Nearby there is the large housing area Uhlerborn, until recently used by the American Forces. In the whole region of Rheinhessen 1.075 Eastern Cherry Fruit Flies were found, in the region of Pfalz 37 *R. cingulata* and in Ahrweiler only one individual.

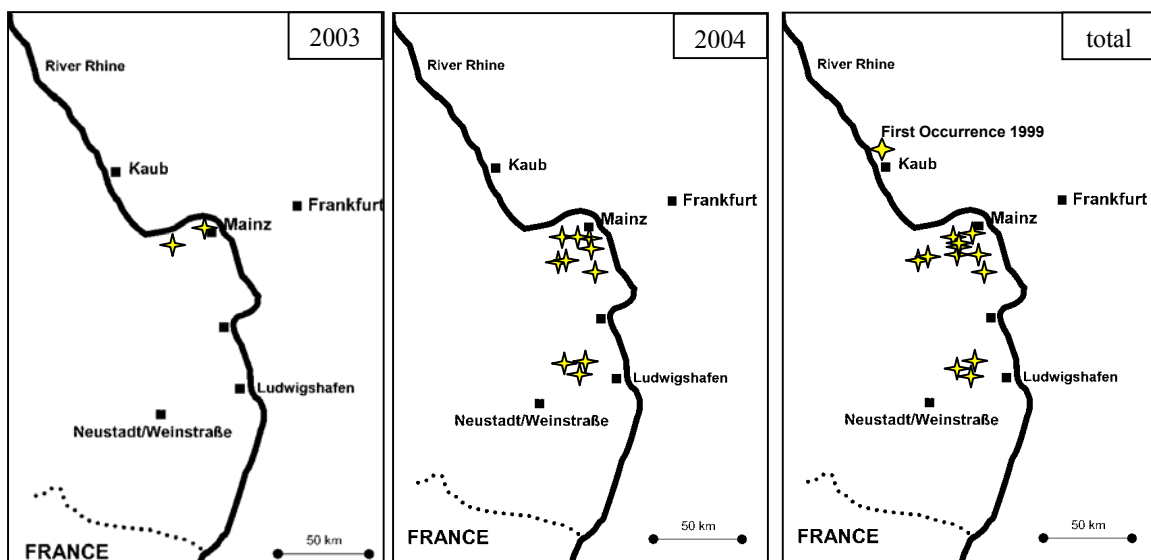


Fig. 2: The regional distribution of *R. cingulata* in the Rhine Valley in the years 2003 and 2004 and in total (one star presents the occurrence of *R. cingulata*).

The assumption of the expansion of the American Eastern Cherry Fruit Fly in the Rhine Valley has been confirmed. Now this species can be described as “widespread” throughout the northern parts of the cherry growing area in Rheinhessen and “present” towards the south in the area of Pfalz (see fig. 2).

In order to compare the suitability of different traps, the Pherocon AM Trap and the Rebell amarillo Yellow Trap were placed in the same orchards. Figure 3 shows the results of these experiments. The number of Eastern Cherry Fruit Flies caught in Pherocon AM Traps in 2004 was significantly higher than in Rebell amarillo Yellow Trap, whereas the Rebell Traps were more attractive to *R. cerasi*.

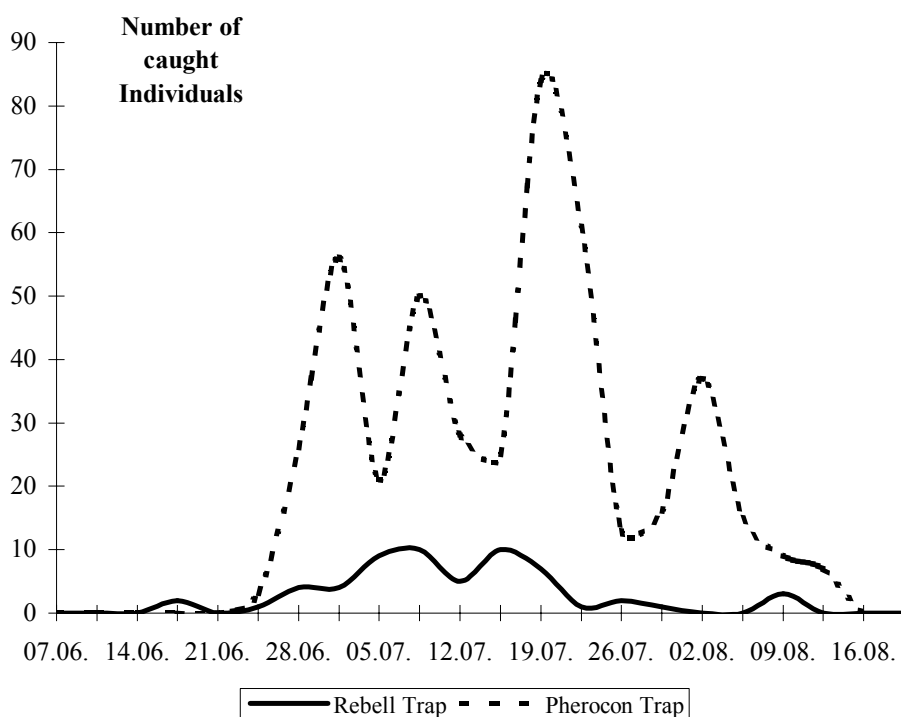


Fig.3: Comparison of efficacy of Rebell amarillo Trap and Pherocon AM Trap for the American Eastern Cherry Fruit Fly, *R. cingulata* in the orchard “Orbel” in 2004

Figure 3 shows that on the Pherocon AM Trap considerably more *R. cingulata* were caught than on the Rebell amarillo Trap. In the beginning and in the middle of July peaks of flight are identifiable. But the Rebell amarillo Trap does not show the peaks of flight of *R. cingulata* as detected by the Pherocon trap. In orchards where the population of *R. cingulata* was smaller than in the orchard “Orbel”, the efficacy of the traps sometimes shows higher catches. In comparison with the Pherocon AM Trap the Rebell amarillo Trap showed better results under these conditions.

Before the start of the monitoring it was discussed whether the flight period of *R. cingulata* starts a few weeks later than that of *R. cerasi* and if the period of flight might last longer. Also, the start of the flight of the American Eastern Fruit Fly could not be predicted. The data for the European Cherry Fruit Flies could be derived from routine monitoring in this region. According to the literature *R. cerasi* hatches from the pupae after 430 DD. The soil temperature is measured at a depth of 5 cm, based on a threshold of 5°C. Measuring starts on January 1st (Boller, 1966). According to Jupp and Cox (1974) in *R. cingulata* the development after the diapause to the hatching of the adults takes 918 to 1234 DD, with an average of 930 DD. The base temperature is 4.4 °C, start of measuring March 1st. This indicates that the

pupae of *R. cingulata* require a higher temperature sum to reach maturity than *R. cerasi*. Our results confirm these observations: the first specimens of *R. cingulata* were caught in mid-June, two or three weeks after the first records of *R. cerasi*. In the year 2004, the flight period of the American Eastern Cherry Fruit Fly did not last longer than that of the European species. Both species were observed until mid-August

At the peak of emergence the flies were noticed in many orchards about harvest time (mid to late July) (Howitt, 1993) . But in 2004, in Rheinhessen the peaks of flight varied in the different orchards and were not synchronous. The course of flight and the peaks extended over a long period from the 24th to the 32nd calendar week. We hope to obtain detailed data in the coming years.

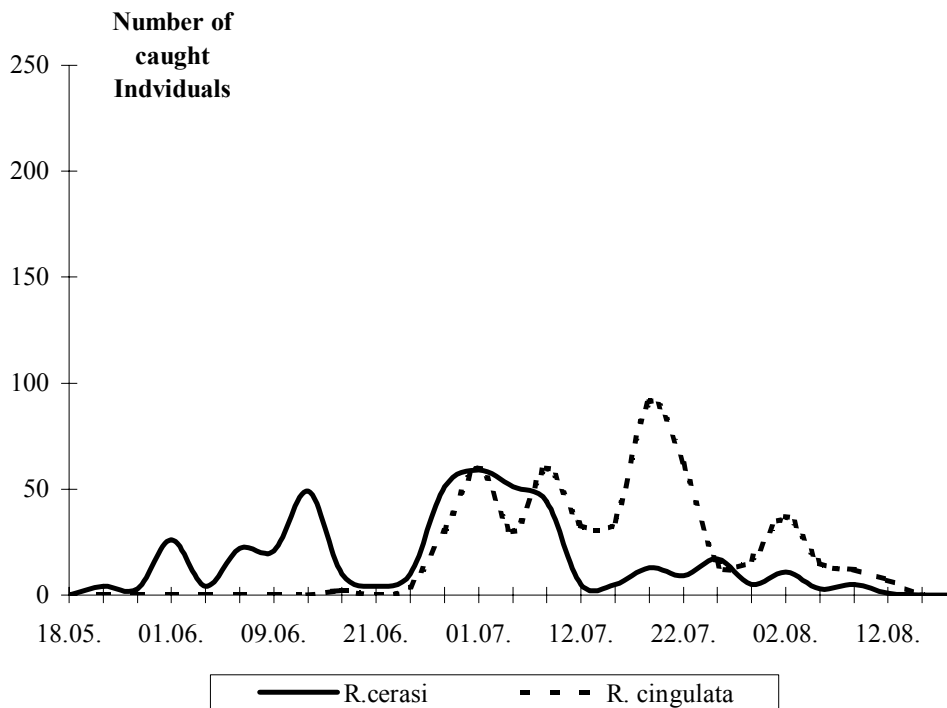


Fig.4a: The comparison of course of flight of *R. cingulata* and *R. cerasi* in the orchard “Orbel” with the data of Pherocon AM Trap and Rebell amarillo Trap

Figures 4a und 4b show that the American Eastern Cherry Fruit Flies were caught later than the European Cherry Fruit Flies. The orchards “Orbel” and “Heuweg” are Wild Cherry orchards. In managed cherry orchards, the flight began later and the number of caught American Cherry Eastern Fruit Flies was lower than in Wild Cherry trees.

By mid and end of May, we found the first flies. The very long flight period of *R. cerasi* was surprising. Thus *Prunus cerasus* (Sour Cherry) was heavily attacked by the Cherry Fruit Flies. In the orchards with *P. cerasus* we mainly caught *R. cingulata*, but a considerable number of *R. cerasi* as well. According to the literature *R. cerasi* does not infest late varieties of sour cherries. This does not correspond with the number of the caught flies and the observations during the monitoring 2004. The flight and the appearance of *R. cingulata* by the end of June may become a problem for the Sour Cherry orchards in the next years. Particularly the Wild Cherry trees and alternative hosts are permanent sources for reinfestation of cultivated cherry orchards.

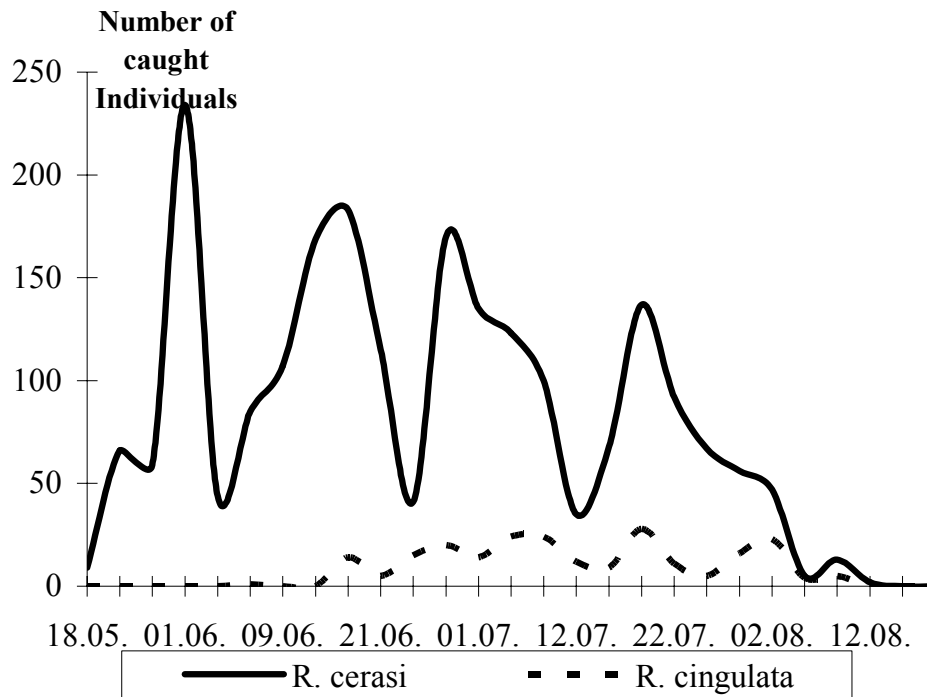


Fig. 4b: The comparison of course of flight of *R. cingulata* and *R. cerasi* in the orchard “Heuweg” with the data of Pherocon AM Trap and Rebell amarillo Trap

4. REFERENCES

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