ON THE PHENOLOGY OF SOME CHLOROPIDAE (DIPTERA) IN BELGIUM*

by L. DE BRUYN and M. DE MEYER**

Introduction

In Belgium our knowledge about Chloropidae is limited to some faunistic observations (COLLART, 1938 ; TONNOIR, 1921). The family consists mainly of stem-boring Diptera of which the larvae develop in grasses (VON TSCHIRNHAUS, 1981), while some species also attack cereals. The damage caused may be considerable (JONES & JONES, 1974).

Little is known about the phenology of the various species of the family Chloropidae. In the literature usually only a rough indication of the period of appearance, based on some random observations, is given (WENDT, 1968 ; COLLIN, 1946). An exception is *Oscinella frit* (LINNAEUS, 1758). Several studies were carried out on the population fluctuations of this species (JEPSON & SOUTHWOOD, 1958 ; RYGG, 1967 ; VICKERMAN, 1980). Only recently more detailed studies were carried out on the phenology of some other chloropid flies (VICKERMAN, 1980 ; VON TSCHIRNHAUS, 1981).

During a M.Sc. thesis (DE BRUYN, 1983) the authors made a systematic and ecological studie on Chloropidae. During this study at two different localities in Belgium (Turnhout and Ottignies) 13 species were recorded for the first time in Belgium (DE BRUYN & DE MEYER, in prep.). In the present article the phenology of some of these species is discussed.

---

* Received for publication : 5 October 1983.
** Laboratorium voor Algemene Dierkunde, Dir. Prof. Dr. W.N. Verheyen ; Rijksuniversitair Centrum Antwerpen, Groenenborgerlaan 171, B-2020 Antwerpen.

Material and methods

This study was conducted in Turnhout (UTM : FS 38) and Ottignies (UTM : FS 01) in 1982. In Turnhout two overgrown meadows and one marshy woodland were used as sampling plots.

The vegetation in the two meadows belongs to the order Molinietelia and consists mainly of the following grasses : *Arrhenatherum elatius* M. et K., *Holcus lanatus* L., *Holcus mollis* L., *Agrostis stolonifera* L., *Agrostis tenuis* SIBTH. and *Molinia caerulea* MONCH. In meadow 1 *Holcus lanatus* L. and *Juncus effusus* L. are the dominant species, while in meadow 2 these are *Arrhenatherum elatius* M. et K. and *Carex acutiformis* EHRH.. In the marshy woodland the vegetation consists of a well developed Carici elongatae-Alnetum association, with *Alnus glutinosa* GARTN., *Fraxinum excelcior* L., *Carex elongatae* L. and *Lycopus europaeus* L., as characteristic species. The grass species here are *Poa annua* L., *Phragmites australis* and *Poa trivialis* L., while *Urtica dioica* L. is dominating in the open spaces.

The sampling plot in Ottignies was situated in a garden on the border of the river Dyle. The vegetation consists of a big lawn surrounded by trees, ornamental shrubs and some indigenous lower herbs (FASSOTTE and GROOTAERT, 1981).

To sample the flies, two types of interception traps were used. The first was a Malaise trap which consisted of a vertical white nylon net (width 2 m ; height 2 m at the highest point), bordered on the upper side with a small nylon roof. The collecting jar was filled with 75 % alcohol. The other type was an emergence trap, which consisted of a pyramidal white nylon net with a bottom surface of 1 m^2. On top there was a glass collecting container with a conical bottom (KRIZELJ, 1970), also filled with 75 % alcohol. In all, there were 6 emergence traps (three on each meadow) and 4 Malaise traps (one on each sampling plot) in operation. The catches of both types of traps were removed weekly on sunday (± 15.00 h).

Meteorological data were obtained from the Royal Meteorological Institute of Belgium during the same period of the study. In four localities (Geel, Meerle, Mol and Wuustwezel) in the surroundings of the studied area in Turnhout, measurements were made of the daily maximum and minimum temperatures and the daily rainfall, so that weekly averages could be calculated.

Results and discussion

The phenology of the various species which were trapped in sufficient numbers will be discussed. The results obtained in this study are of course only an indication of the generation periods. JEPSON & SOUTHWOOD (1958) found in their study on the population dynamics of *Oscinella frit* L. a difference of nearly a month in first appearance between two successive years.

Elachiptera cornuta (FALLÉN, 1820).

Elachiptera cornuta was trapped only in Ottignies in sufficient numbers (fig. 1). This species was captured from early spring (11/IV) until the end of autumn (21/IX). A first short peak was reached in April while a second, lower but broader peak was reached end October. These results agree well with those of von Tschirnhaus (1981), with the exception of the second peak. In his study he found this peak in July. *Elachiptera cornuta* overwinters in two ways (Nye, 1958), either as larvae under decaying litter (although this is rarely the case), or as adults between the leaves of *Typha* spp.. Because only a few warm days are sufficient to end the diapause, these adults will give rise to the first peak in spring. Clearly this peak is caused by the same flies as the one in the preceeding autumn.

Elachiptera diastema COLLIN, 1946.

Elachiptera diastema was captured in low numbers with the emergence traps in Turnhout from early July (4/VII) until half November (14/XI) with a maximum in the second half of November.

Elachiptera pubescens (THALHAMMER, 1898).

Just as the preceeding species, *Elachiptera pubescens* was only trapped with the emergence traps (fig. 2). There is a distinct short period of emergence which coincides with the month of October. An emergence peak is reached at the end of October. No data concerning this species were found in literature.

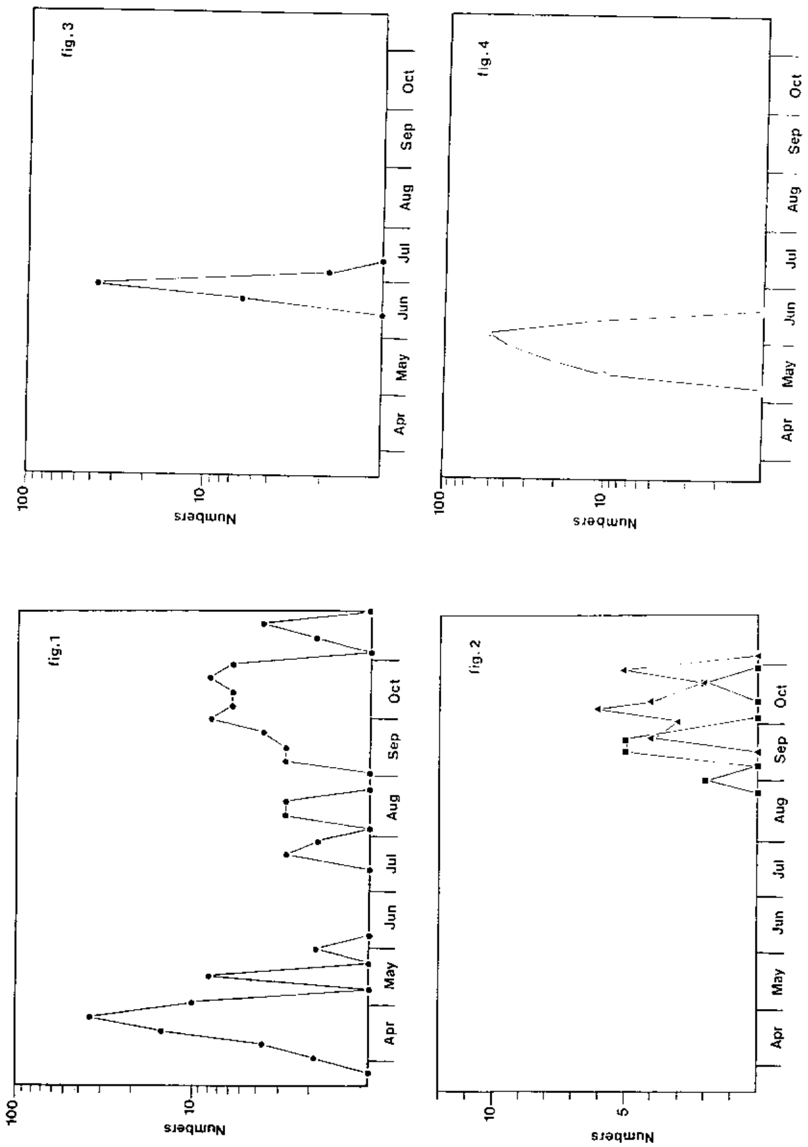


FIG. 1-4. — The numbers [log(n+1)] of : 1. *E. cornuta* ; 2. *E. pubescens* ; 3. *I. kertezi* ; 4. *L. rufitarsis* (▲——▲, emergence traps, meadow 1 ; ■——■, emergence traps, meadow 2 ; O——O, Malaise trap, marshy woodland ; ●——●, Malaise trap, Ottignies. Emergence traps = sum of three traps ; Malaise trap = actual numbers).

Dicraeus vagans (MEIGEN, 1838).

Only one male of *Dicraeus vagans* was captured with the Malaise trap in meadow 1 in Turnhout. Sweepnet samples taken during the same period demonstrated that this species was present in great numbers during a very short period in July. This short period agrees well with the results of NARTSHUK (1960) in Leningrad and WENDT (1968) in Berlin, and is probably the result of the fact that the larvae of this species live strictly monofagous in the grains of the grass *Arrhenatherum elatius* (NARTSHUK, 1960).

Incertella kertezi (BECKER, 1910).

According to Collin (1946), *Incertella kertezi* can be found from June until August. In Turnhout this species was captured with the emergence traps in meadow 1 from the end of June (21/VI) until half July (11/VII). A maximum was reached between 28/VI and 4/VII (fig. 3).

Lipara rufitarsis (LOEW, 1858).

Lipara rufitarsis is a strictly monofagous species on *Phragmites australis*. Because the survical rate of the larvae is higher when the reedshoots are younger (CHVÂLA et al., 1974), the emergence of the adults has to be coupled to the germination of the reed. In Turnhout, there was one flight period during the second half of May and the first half of June (fig. 4).

Aphanotrigonum trilineatum (MEIGEN, 1830).

Just as in the study of von Tschirnhaus (1981), *Aphanotrigonum trilineatum* was irregularly trapped during a very long period from early June (6/VI) until the end of October (31/X). No distinct peaks were found. Because of this very long emergence period between the first and last record, there is probably more than one generation.

Oscinella frit (LINNAEUS, 1758).

The number of generations of *Oscinella frit* during a year appears to vary with temperature. In Northern Europe (VON TSCHIRNHAUS,

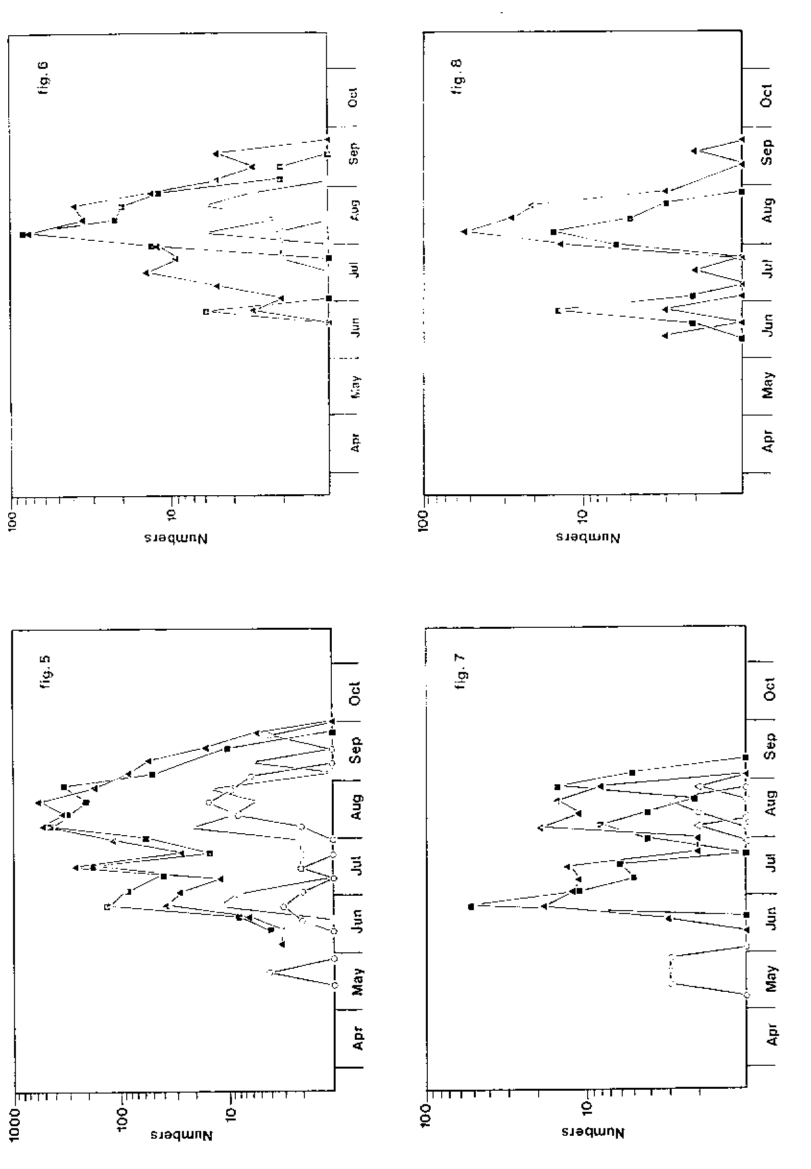


FIG. 5-8. — The numbers [log(n+1)] of : 5. *O. frit* ; 6. *hortensis* ; 7. *O. nigerrima* ; 8. *O. pusilla* (▲——▲, emergence traps, meadow 1 ; ■——■, emergence traps, meadow 2 ; Δ——Δ, Malaise trap, meadow 1 ; □——□, Malaise trap, meadow 2 ; O——O, Malaise trap, marshy woodland. Emergence traps – sum of three traps ; Malaise traps = actual numbers).

1981) generally, only two generations are completed, while in Southern England, normally three generations are completed (Jepson & Southwood, 1958 ; Vickerman, 1980). When the weather is exceptionally warm, a partial fourth generation can occur (van Emden *et al.*, 1961). In Turnhout, *Oscinella frit* was trapped during a long period from end May (24/V) until early November (3/XI) (fig. 5). During this period, three overlapping generations were found, with the first peak between 28/VI and 4/VII, the second between 19/VII and 25/VII and the third between 9/VIII and 15/VIII.

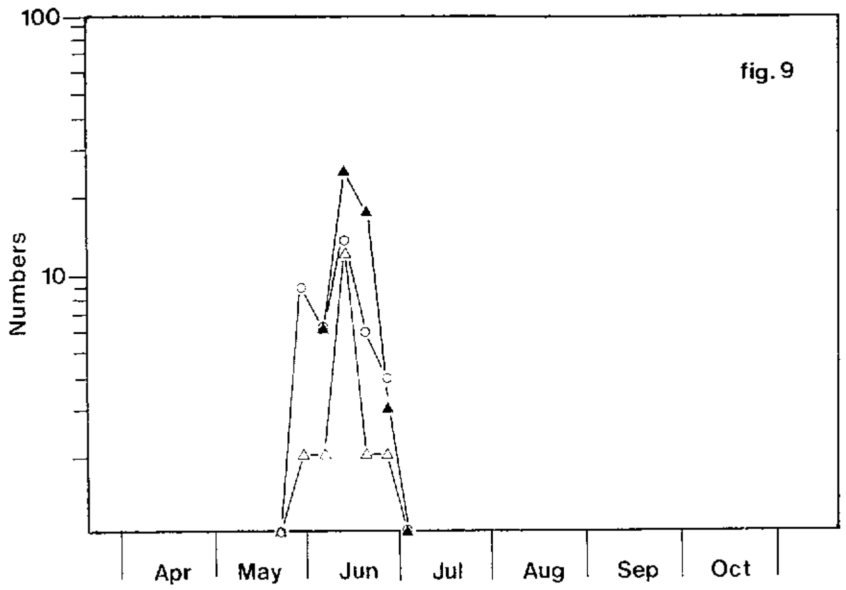
Oscinella hortensis Collin, 1946.

According to Vickerman (1980) *Oscinella hortensis* is bivoltine with a first peak in June and a second in August. In our study, only one distinct peak was found in August, although a very small peak could be observed at the end of June in meadow 2 (fig. 6). This peak was not recorded with the Malaise trap. Probably the first (small) generation in meadow 1 had shifted due to bad weather conditions in the winter and autumn, resulting in a large overlap with the second generation.

Oscinella nigerrima (Macquart, 1935).

In literature some differences were found about the phenology of *Oscinella nigerrima*. Wendt (1968) in Berlin, trapped this species from half May until half October. Vickerman (1980) in England said there were probably two generations in April and in July, while von Tschirnhaus (1981) in Denmark found only one generation from half May until end of July.

In our study *Oscinella nigerrima* showed two peaks in all three sampling plots (fig. 7). In the marshy woodland however, the first one was found nearly a month earlier than in the two meadows. The first peak was found in May in the marshy woodland, and in June-July in the two meadows, while the second was found in August in all the sampling plots. The difference was probably due to different microclimatical conditions. Unfortunately no data concerning the microclimate could be obtained on the sampling plots.



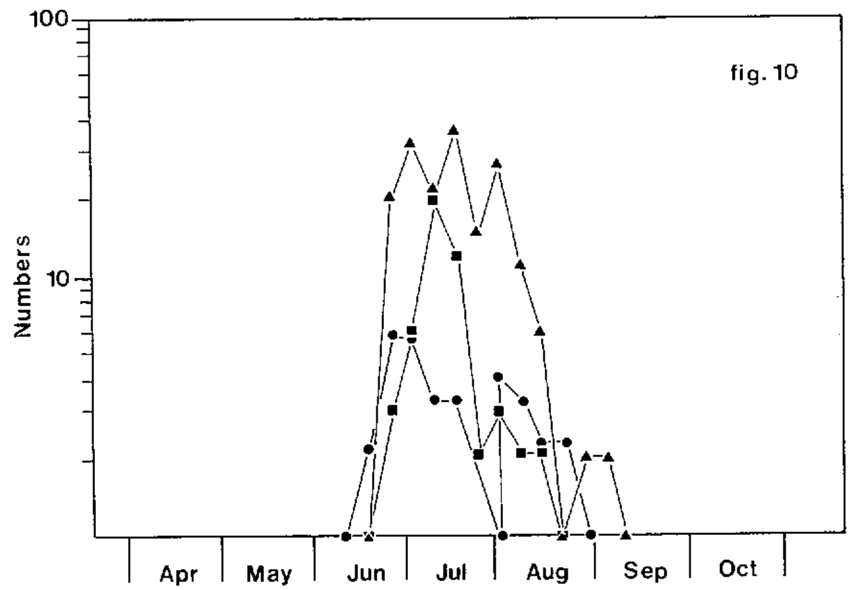


FIG. 9-0. — The numbers [log(n+1)] of : 9. *C. meigeni* ; 10. *C. elongata* (▲——▲, emergence traps, meadow 1 ; ■——■, emergence traps, meadow 2 ; △——△, Malaise trap, meadow 1 ; O——O, Malaise trap, maishy woodland ; ●——●, Malaise trap, Ottignies. Emergence traps = sum of three traps ; Malaise traps = actual numbers).

Oscinella pusilla (MEIGEN, 1830).

Oscinella pusilla showed two distinct peaks in meadow 2 : the first the end of June, the second in August (fig. 8). In meadow 1 only high numbers were recorded in August. On the other hand in the marshy woodland, only the first peak was distinct. The second was only represented by one specimen. In literature no data concerning this species were found.

Chlorops hypostigma (MEIGEN, 1830).

Chlorops hypostigma was trapped from end May (24/V) until half September (12/IX) while peak numbers were reached begin June (between 7/VI and 13/VI). Both WENDT (1968) in Berlin and VON TSCHIRNHAUS (1981) in Denmark found two generations for *Chlorops hypostigma*, the first in June, the second in September. In the present study we were not able to find an explanation why this second generation was not found.

Chlorops meigeni (LOEW, 1866).

Chlorops meigeni produced one distinct generation from the end of May (31/V) until early July (4/VII) (fig. 9). This result agrees well with those of WENDT (1968) in Berlin.

Cetema elongata (MEIGEN, 1830).

Cetema elongata was trapped both in meadow 1 and meadow 2 (fig. 10). In both plots, numbers increased very quickly until a maximum was reached in early July. In meadow 1 however *Cetema elongata* was found in high numbers during a long period, while in meadow 2 numbers diminished until the end of the period in early September. Both WENDT (1968) and VON TSCHIRNHAUS (1981) found the same results in their studies.

Thaumatomyia notata (MEIGEN, 1830).

Both YARKULOV (1971) in the USSR and VON TSCHIRNHAUS (1981) in Denmark recorded two generations for *Thaumatomyia notata*. The first in July, the second in August. In our study *Thaumatomyia notata* was only found in Ottignies in sufficient numbers.

There were three distinct periods of appearance : the first early in the spring (April-May), the second in July and the third in October. Because *Thaumatomyia notata* overwinters as adult (YARKULOV, 1971), we can assume that the early peak and the one in the preceeding autumn are caused by the same generation.

Furthermore, we have to mention that, unlike the other Chloropidae, *Thaumatomyia notata* is not a phytophagous species, but a parasite of *Pemphigius* spp. (Homoptera, Pemphigidae).

General discussion

The first species to appear in spring is *Elachiptera cornuta*, followed in April-May by *Elachiptera tuberculifera* and *Thaumatomyia notata*. In early July there is a first maximum in both total numbers and species number. This maximum is dominated by the species of the genus *Oscinella*. After a decrease in numbers, a second peak is reached in August. Here again the *Oscinella* species are dominant. Later the numbers decrease again, while the different *Elachiptera* species, accompanied by *Aphanotrigonum trilineatum* are now dominating the numbers.

Il we consider the biology of the different chloropid species, we see that the first species to appear are those which can overwinter as adults. These chloropid species only need a few days of warm weather to end their diapause. During the summer the dominant species are those with a large host spectrum (*Oscinella frit* ; *Oscinella hortensis* ; *Oscinella nigerrima*). They usually also complete more than one generation cycle during one season. In autumn the saprofagous species dominate the quantities.

In contrast to the polyphagous species which are usually multivoltine and which are found during a long period, the strictly monophagous species (*Dicraeus vagans* ; *Lipara* spp. ; *Calamoncosis minima*) produce normally only one very short period of appearance, propably due to the host dependence.

Earlier studies on the phenology of different chloropid flies suggest that the number and the timing of the generations are mainly influenced by the environmental temperature (VICKERMAN, 1980 ; RYGG, 1967). In our study however, only some tendencies could be observed due to the limited climatological data. If we consider those species which were caught in high numbers (*Oscinella frit* ; *Oscinella nigerrima* ; *Oscinella hortensis* ; *Oscinella vastator*) we see a simultaneous decrease in numbers between 16/VIII and 29/VIII, a period during which the temperatures also showed a considerable decrease (slightly more than 4°C). The following increase of the temperature is accompanied by an increase in numbers of the species in question.

A second and clearer influence of the temperature was found in the early generations of the first appearing flies. During the preceeding winter and spring, the temperatures were lower than normal. This was reflected in a delayed appearance of the first generations of almost all chloropid flies. An increase of the temperatures above normal in the following summer made it possible for almost all species to complete their next generations.

In contrast to the temperature, no influences on the phenology, due to rainfall fluctuations, were found during our study.

Acknowledgements

We would like to thank Prof. Dr. W.N. Verheyen and Dr. P. Grootaert for providing working facilities and for critically reviewing the manuscript. Further, we want to thank the Royal Meteorological Institute of Belgium for providing the meteorological data.

Abstract

In 1982, Chloropidae were caught in emergence traps and Malaise traps in two overgrown meadows, one marshy woodland and one garden, situated at two different localities in Belgium. The numbers of the different species were counted and the phenology determined.

References

COLLART A., 1938. — Contribution a l'étude des Diptères de Belgique (4e note). *Bull. Ann. Soc. Ent. Belg.*, LXXVIII : 363-373.

COLLIN J.E., 1946. — The British genera and species of Oscinellinae (Diptera, Chloropidae). *Trans. R. Ent. Soc.*, 97 (5) : 117-148.

CHVALA M., DOSKOCIL J., MOOK J.H. & POKORNY V., 1974. — The genus *Lipara* MEIGEN (Diptera, Chloropidae), systematics, morphology, behaviour and ecology. *Tijdschr. Ent.*, 117 : 1-25.

DE BRUYN L., 1983. — *Een systematische en ecologische studie van de Chloropidae (Diptera)*. M. Sc. thesis. Univ. Antwerpen. 198 pp. (unpublished).

DE BRUYN L. & DE MEYER M. (in prep.). — New and notheworthy Chloropidae (Diptera) for the Belgian fauna.

FASSOTTE C. & GROOTAERT P., 1981. — Contribution a l'étude de la faune des Diptères capturés en automne au piège Malaise a Ottignies (Belgique, Brabant). *Bull. K. Belg. Inst. Nat. Wet.*, 53 (14) : 1-15.

JEPSON W.F. & SOUTHWOOD T.R.E., 1958. — Population studies on *Oscinella frit* L. *Ann. appl. Biol.*, 46 (3) : 465-474.

JONES F.G.W. & JONES M.G., 1974. — *Pests of field crops*. London 448 pp.

KRIZELJ S., 1970. — Un nouveau type de piège d'émergence. *Bull. Rech. agron. Gembloux.*, 4 (3-4) : 555-556.

NARTSHUK E.P., 1960. — On the biology of the genus *Dicraeus*. *Ent. obosr.*, 39 : 585-593 (Russian).

NYE J.W.B., 1958. — The external morphology of some of the dipterous larvae living in Graminae of Britain. *Trans. Roy. Ent. Soc. Lond.*, 110 : 411-487.

RYGG T., 1967. — Emergence periods and population fluctuations of the frit fly *Oscinella frit* L. (Diptera, Chloropidae) in Norway. *Norsk. ent. Tidsskr.*, 14 : 12-23.

TONNOIR A., 1921. — Notes sur les Chloropidae (Dipt.) de Belgique. *Bull. Soc. Ent. Belrg.*, 61 (3) : 131-136.

VAN EMDEN H.F., JEPSON W.F. & SOUTHWOOD T.R.E., 1961. — The occurence of a partial fourth generation of *Oscinella frit* L. (Diptera : Chloropidae) in Southern England. *Entomologia exp. appl.*, 4 : 220-225.

VICKERMAN G.P., 1980. — The phenology of *Oscinella* spp. (Diptera, Chloropidae). *Bull. ent. Res.*, 70 : 601-620.

VON TSCHIRNHAUS M., 1981. — Die Halm- und Minierfliegen im Grenzbereich Land-Meer der Nordsee. Eine ökologische studie mit beschreibung von zwei neuen Arten und neuer Fang- und Konservierungsmethoden (Diptera : Chloropidae et Agromyzidae). *Spixiana suppl.*, 6 : 405 pp.

WENDT H., 1968. — Faunistisch- ökologische Untersuchungen an Halmfliegen der Berliner Umgebung. (Dipt. Chloropidae). *Dt. ent. Z. (N.F.)*, 15 : 49-105.

YARKULOV F., 1971. — About the biology of predaceous flies *Thaumatomyia sulcifrons* BECKER and *Th. notata* MEIG. (Chloropidae, Diptera). *Zool. Zh.*, 50 : 1252-1254 (Russian).

TROPIDUCHIDAE (Homoptera, Fulgoroidea) FROM MOUNT KUPE (CAMEROON)*

by Jan VAN STALLE**

Introduction

This paper deals with the Tropiduchidae collected during the second Belgian expedition to Cameroon. The first expedition was mainly concentrated on Mount Cameroon, and lasted from February to April 1981. Details were published by BOSMANS (1982), and a list of the Homoptera Fulgoroidea was given by VAN STALLE (1982 & in press).

The second expedition took place from January to April 1983 and investigated a mountain chain starting with Mount Cameroon and extending in northeastern direction along Mount Kupe, the Manengouba Hills, the Bambouto Mountains, the Mbam Massif, Mount Oku, the Tchabal Mbabo Massif and the Poli Mountains (Hosseré Vokré). The material studied below is deposited in the collections of the Koninklijk Belgisch Instituut voor Natuurwetenschappen.

The vegetation of these mountains was described by LETOUZEY (1968), but almost everywhere the primary forest has been replaced by a secondary vegetation or man-made habitats such as pastures, cultivated area's and small villages. The submontane and montane forest belt was mostly restricted to small relicts (galery forests) along rivers and valleys with steep sloops difficult to access. This was the case for the Bambouto Mountains, the Mbam Massif, Mount Oku, the Poli Mountains and the lower parts of the Manengouba Hills and the Tchabal Mbabo Massif. Well-developed

* Scientific Results of the Belgian Cameroon Expeditions 1981 and 1983, Nr. 12 ; received for publication : 7 December 1983.

** Koninklijk Belgisch Instituut voor Natuurwetenschappen, Vautierstraat 29, B-1040 Brussel.