ANNALES
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA
LUBLIN — POLONIA

VOL. XLVIII, 19 SECTIO C 1993

Instytut Biologii UMCS
Zakład Zoologii

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The Biology of Developmental Stages of *Megaloceroea recticornis* (Geoffroy, 1785) — *Heteroptera, Miridae*

Biologia stadiów rozwojowych *Megaloceroea recticornis* (Geoffroy, 1785) — *Heteroptera, Miridae*

Megaloceroea recticornis (Geoffr.), as the representative of the tribe *Stenodemini* China, is a phytophage biologically connected with grasses. It is a species of palaearctic origin but its distribution is cosmopolitan. It occurs in Europe (except for north-east areas), in Asia Minor and North Africa, and also in North America and New Zealand (3, 11, 18). Scant references to biology of *M. recticornis* were published by Butler (2) and Slater (13). Some aspects of the species ecology are discussed in papers by Gibson (4, 5), Kamm (10) and Morris (12).

Smreczyński (16), Strawiński (17) and Herczek (6, 7, 8) have reported the occurrence of the species in Poland. In 1979 the presence of *M. recticornis* was indicated in synantropic graminaceous communities of Lublin (Smardzewska, 14). Since the morphology and biology of the species were hardly known, research in this field was undertaken. Up to the present the morphology of developmental stages has been described (14, 15).

The aim of the present paper was to scientifically describe the biology of the stages in *M. recticornis* life cycle. The synchronization of life cycle of the bug with the development of host plants has been analysed.

I wish to express my thanks to Prof. Zdzisław Cmoluch for his advice in the course of elaboration of the subject as well as to Małgorzata Balana, M. A, Elżbieta Budzyńska, M. A. and Zofia Stączek, M. A. for their technical assistance.

AREA, MATERIAL AND METHODS OF EXAMINATIONS

The distribution of localities was displayed in Fig. 1. These are synantropic biotopes of considerable humidity and insolation, with abundant and dense overgrowth, non-utilized agriculturally.

At the localities 1, 2 and 4 (Fig. 1) the following grasses occurred plentifully: *Festuca pratensis, Poa pratensis, Lolium perenne, F. rubra, Agropyron repens, Dactylis glomerata, Agrostis vulgaris, Phleum pratense.* The locality 3 (Fig. 1) is a roadside (not mown) and bordering on it urban lawn, sown up with mixture of grasses and twice mown (June, August). The species prevailing in the grass were: *L. perenne, F. rubra, P. pratensis, B. mollis, A. vulgaris.* The locality 5 (Fig. 1) was reported at Rudnik near Lublin in 1989. It is a non-utilized narrow strip of meadow at the foot of xerothermic slope, covered with grasses: *B. inermis, Brachypodium pinnatum, F. pratensis, P. pratensis, D. glomerata.*

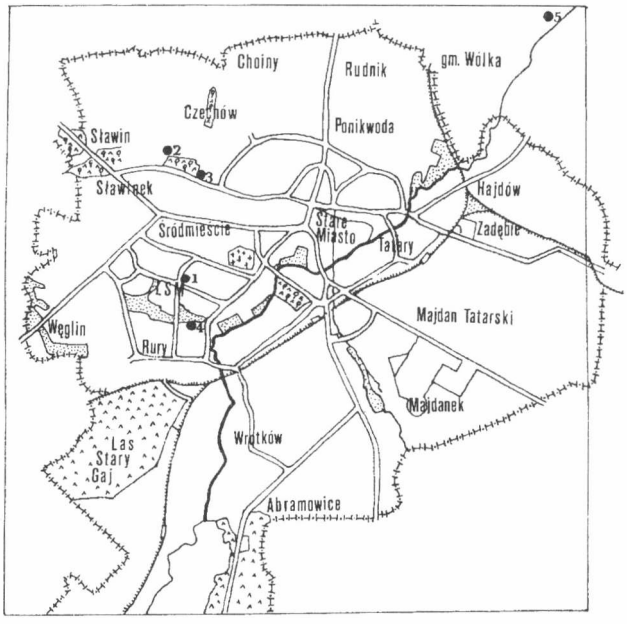

Fig. 1. Distribution of test sites (1–5) in the area of Lublin

The observations of *M. recticornis* life cycle and of inhabiting host plants were carried out once to three times a week at the localities 1–5 in spring and summer of 1980–1982 and 1989. The insects were collected by sweeping with a standard insect net and shaking down food plants. Quantitative samples were collected at the locality 2 by means of sweep net method (4×50 catches with a sweep net constituted one sample), twice a week, from the middle of May till the end of July in 1981–1982. In order to find out the way and place of ovipositing eggs 25 grass stems of each species together with florescences, collected from places of most plentiful occurrence of imagines, were analyzed.

M. recticornis cultures were carried out in 1980–1982, using different methods (Fig. 2). In quantitative studies the Gibson's method (4) was applied because it gave good survival rate and provided with most credible figures. Glass tubes with grass stems fixed in moist sponge (Fig. 2) served as isolators. In each of the tubes 5 L_1 or 2–5 imagines were located.

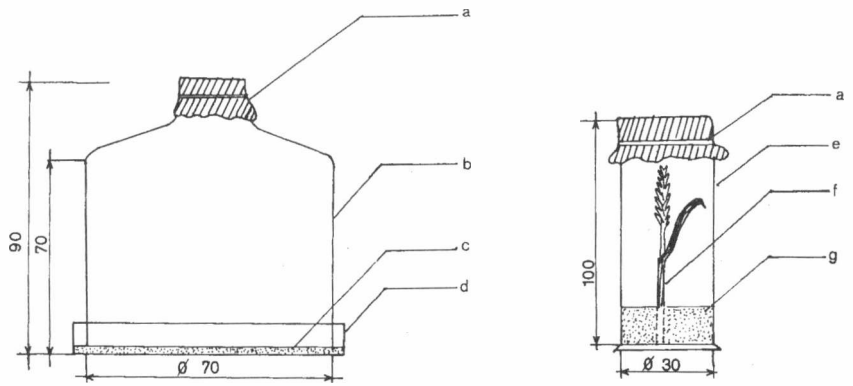

Fig. 2. Isolators used in the culture: a — ventillation opening covered with gauze, b — glass cover, c — layer of filter paper, d — Petri dishes, e — glass tubes, f — grass stem, g — sponge layer

The cultures were established in 10–20 repetitions. The plants were changed every second day. In examinations of postembryonic development grass stems with florescences in either flowering stage or seed-setting stage were used as food. The selection of the species was determined on the basis of field observations, reference data, results of food tests. In experiments for food selectivity the insects were fed on either different parts of grass stems or stems of specified species.

In order to determine the fertility of females necessary parts of grass stems were analysed for the presence of eggs. In order to find out the number of oviposited eggs it was necerssary to check all spikelets because the eggs were not visible from the outside. After females' death their abdomens were prepared and eggs remaining on ovaries counted.

On examining embryonic development in each experiment 100 eggs newly prepared from spikelets were placed on Petri dishes lined with filter paper which was moistened every few days. From July to October Petri dishes with eggs were kept at room temperature. Then they were placed in the refrigerator (temperature 0–4°C) for 6 months and the moistening of rearing ground was reduced. At the turn of April the scales with eggs were placed at room temperature again and the rearing ground was moistened each day, until the hatch of larvae.

The cultures were carried out at 16–22°C temperature and 60–70% air humidity.

BIOLOGY

1. The embryonic development

The embryonic development of *M. recticornis* was studied in laboratories. By keeping eggs at different temperatures in successive periods following the hatching natural conditions of diapause were simulated. The course of morphogenesis has been observed through the egg's chorion.

During the development the eggs changed their colour: from milk-white after hatching to cream-yellow after 5–7 days. From the 10th to 14th day the

intensity of colouring increased gradually to orange. The change of colour was due to pigmentation of serosa. In this period called prediapause (1) the development of the embryo up to the non-segmented stripe stage took place. It was observed that eggs kept in the refrigerator just after oviposition (in 0–4°C of temperature) did not obtain orange pigmentation. Orange colour remained to the end of duration of the proper diapause stage. The eggs had to be subject to low temperature so that the development of the embryo would be continued.

After 8–10 days of incubation at room temperature (16–20°C) the change of eggs' colouring from light-orange through straw-yellow to celadon was observed. Together with the development the egg's colour became more intensively green and diversified. After 10–12 days most of the eggs had a narrow red stripe close to the neck. 1–2 days later in the same place red eye spots shone through the integument. After next two days in the ventral side of the egg segmented antennae and legs were visible. The embryo, ready for hatching, filled almost the whole length of the egg.

The first larvae hatched after 14 days of eggs' incubation at room temperature, then the hatching took place within the subsequent 3–5 days. About 25% of the eggs were not hatched. Part of them did not reactivate the postdiapause development.

The first stage of embryogenesis (prediapause) took place directly after oviposition of eggs at the temperature of 17–22°C and lasted only 15–21 days. Lack of orange colour of the eggs kept since oviposition at the temperature of 0–4°C proves that prediapause stage takes place at the temperature of over +4°C. It was found that the minimum temperature of postdiapause stage in *M. recticornis* is higher than +4°C. This stage of morphogenesis at room temperature (16–20°C) lasted 14–19 days.

This information is concurrent with Braune's (1) data relating to embryogenesis of *Leptopterna dolobrata*, a representative of *Stenodemini*, with a similar to *M. recticornis* life cycle. The range of temperatures he gives for prediapause is 5–23°C, and for postdiapause 10–23°C. Dark serosa pigmentation in the front part of the eggs which was found in *L. dolobrata* (1) has not been observed at the end of the diapause proper.

The earlier described disturbances in postdiapause development of *M. recticornis* eggs have been probably caused by thermal factor. Braune (1) found out that only 30% of *L. dolobrata* eggs have reactivated postdiapause development at the constant temperature of +15°C.

2. Larval development

The phase of larval development can be divided into 5 stages delimited by successive moultings. The following periods of stages growth have been determined (there were analysed the periods of development 100–80 L_1 and L_2 as well as 80–70 L_3, L_4, L_5) — Table 1. The average periods of growth of the particular stages and duration of the whole larval development slightly differed in both years of studies.

Table 1. Larval development of *M. recticornis* in the culture in 1981–1982

Larval stage	Duration of developmental stages in days					
	1981			1982		
	min.	max.	mean	min.	max.	mean
L_1	3	6	3.5	2	5	3.0
L_2	2	4	3.0	3	4	3.0
L_3	3	4	3.0	3	5	3.5
L_4	3	5	4.0	4	6	4.5
L_5	4	7	5.0	4	9	6.5
Total period of larval development	16	20	19.0	16	22	20.5

The course of larval development in 1981–1982 is illustrated in Figs. 3. and 4 showing percentage share of the successive stages in the particular days of rearing. In both years of investigations after 7 days of rearing nearly half of the individuals were in the third stage of development, after 11 days — over 85% of the larvae moulted for the third time. Slight differences were marked only in the duration of growth periods of the last larval stages. In 1981 on the 14th day of culture the larvae L_1 constituted 84% of all individuals, the first imagines appeared on the 16th day of rearing, the maximum duration of larval development was 20 days. In 1982, on the 16th day of rearing first adult insects appeared, the larvae L_5 constituted 76% of the individuals. The imaginal moulting of the last L_5 took place on the 22nd day of their development.

In field conditions the quantitative share of the particular stages was differentiated depending on the stage of larval development (Figs. 5 and 6). In the examined habitat the larval forms occurred for one month and a half (1981) or one week shorter (1982). The duration of larval development from hatching of eggs to the occurrence of imagines was 26 days in both years.

The effect of food factor on the survival and growth of larvae was analysed. It was found that larvae of all stages in case of spikes attainability did not feed on vegetative parts of grasses. An experiment was carried out in which larvae from the moment of hatching were fed vegetative parts of stem

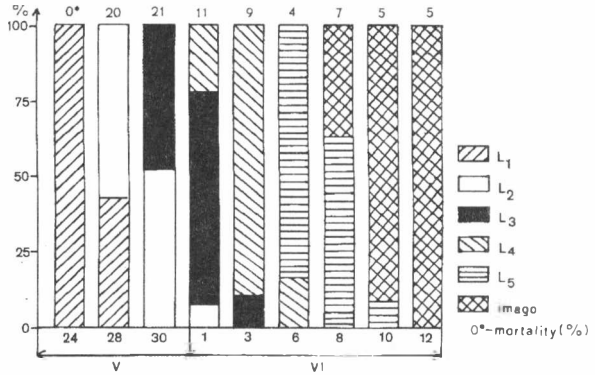

Fig. 3. Larval development of *M. recticoris* in the culture, 1981 (percentage share of developmental stages in successive stages of development)

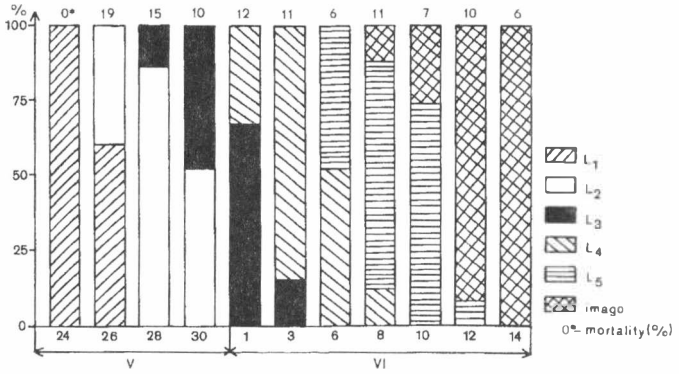

Fig. 4. Larval development of *M. recticoris* in the culture, 1982 (percentage share of developmental stages in successive stages of development)

of different grass species: *D. glomerata, P. pratensis, F. rubra, B. mollis.* The observation was made that larvae preferred leaves of *P. pratensis* and *F. rubra.* The subsequent moultings took place: after 5–6 days since hatching (moulting I), after 5 days (moulting II), after 6 days (moulting III) and after 6 or 7 days of larvae's growth (moulting IV). The size of larvae of the first three stages was normal, while the larvae of the last two stages were distinctly smaller than those collected in the area or those which in culture were fed generative grass organs. All individuals L_5 died before the last moulting. The mortality of larvae was big — out of 100 L_1 used for establishing the culture, only 5 L_5 were obtained.

There was also examined the effect of food plant on the survival and growth of larvae (Table 2). *P. pratensis*, as a food plant gave good survival and growth of larvae L_1–L_3. *F. pratensis* and *F. rubra* were used as food for larvae L_4 and L_5, their survival rate was 75–100% and pe-

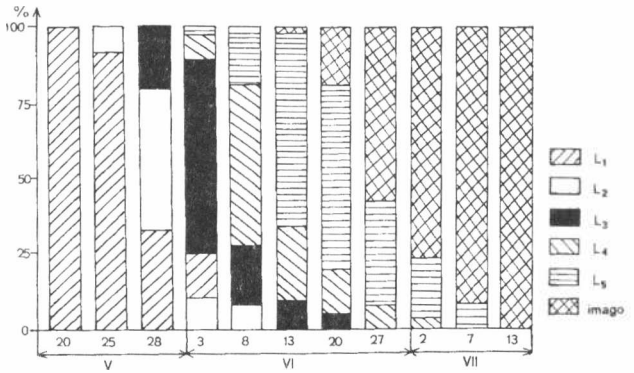

Fig. 5. Percentage share of development stages in different periods of *M. recticornis* population development (1981)

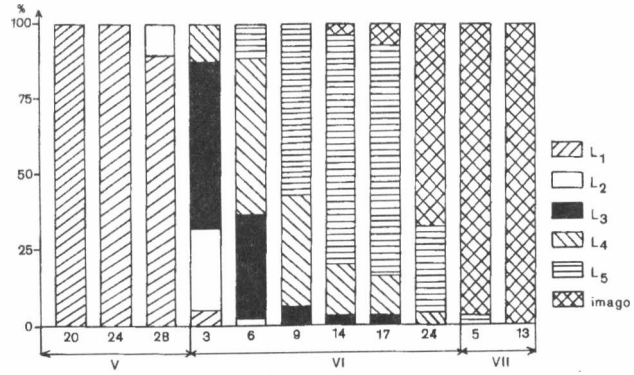

Fig. 6. Percentage share of development stages in different periods of *M. recticornis* population development (1982)

riods of growth 4 and 6 days, respectively. The survival rate of larvae L_5/L_1, informing about the percentage of initial amount of larvae reaching the last stage of development, amounted to 70% on the average. The larval development of individuals fed *L. perenne* lasted 21 days on the average and lasted slightly longer than in the previously described variant of culture (Table 2). This plant gave a very good survival of all stages of larvae, the rate being 60–100%, 74% on the avarage.

In summing up it should be stated that the species of food plant used in the culture had a smaller effect on the process of larval development than the respective development stage of food plant. *M. recticornis* cannot terminate its larval development without grasses spikes' attainability. Their lack was the cause of heavy mortality and a considerable elongation of the growth period of larvae.

Table 2. The effects of food plant on growth and survival of larvae

Developmental stage	Host plant *Poa pratensis* (L_1–L_3) – *Festuca* sp. (L_4–L_5)												C
	I		II		III		IV		V		VI		
	A	B	A	B	A	B	A	B	A	B	A	B	
L_1	5/5	4.0	3/5	3.0	4/4	4.0	4/4	3.0	4/4	3.0	5/6	3.0	3.0
L_2	4/5	3.5	3/3	3.0	4/4	3.0	3/4	3.0	4/4	3.0	4/5	3.0	3.0
L_3	3/4	3.7	3/3	4.0	3/4	3.0	3/3	3.5	4/4	4.0	4/4	3.5	3.6
L_4	3/3	3.5	3/3	4.0	3/3	4.0	3/3	4.5	4/4	3.0	3/4	4.5	4.0
L_5	3/3	6.0	3/1	5.0	3/3	6.0	3/3	7.0	4/4	6.0	3/3	6.0	6.0
L_1–L_5		21.0		19.0		20.0		21.0		19.0		20.0	19.6
Initial number of individuals in cultivation		5		5		4		4		4		6	
Survival rate (in %)		60		60		75		75		100		50	
Life length (in days):													
males		6		6		14		19		8		6	10
females		19		14		–		12		14		14	13

Explanation: I, II, III, IV, V, VI — successive repetitions, A — survival, B — (in days).

Gibson (19) verifies his earlier views referring to *M. recticornis* food preferences. Based on laboratory examinations he found out that termination of larval development was conditioned by grass flowers attainability. In the beginning he definitely numbered this bug among "leaf-feeders" (4, 5).

3. The biology of imagines

In the culture the imaginal moulting of larvae took place after about three weeks from hatching (Figs. 3 and 4). In 1981 in most of culture cages females and males occurred simultaneously. In 1982, in 8 cases out of 20 repetitions male was the first to appear, and in 4 cases — female, whereas in 8 cases — individuals of both sexes appeared at the same time. It was found that life time of imagines ranged from 6–32 days (life time of about 100 ♂ and 100 ♀ was analysed, however most of insects perished between the 15th and 21st day of life). On the average the males lived 6 days shorter than females. Bugs cultivated on *L. perenne* lived 4–7 days longer than those fed *F. pratensis* and *F. rubra* (Table 2). Imagines showed distinct food preference for flowers and developing grass seeds.

The time of imagines' maturing lasted 6–8 days. Pair junction was most often observed on the 7th and 8th day of the insect's life. It was found that females could copulate many times. Insects started copulation

and length of *M. recticornis* imagines life in laboratory culture in 1982

Host plant *Lolium perenne*												
I		II		III		IV		V		VI		C
A	B	A	B	A	B	A	B	A	B	A	B	
5/5	3.0	4/5	3.0	5/5	3.0	5/6	4.0	4/5	3.0	5/5	3.0	3.1
4/5	4.5	3/4	3.0	5/5	3.0	4/5	3.5	3/4	4.0	4/5	4.0	3.6
4/4	4.0	3/3	3.5	5/5	5.0	4/4	4.0	4/4	3.5	4/4	4.0	4.0
4/4	4.0	3/3	4.0	5/5	4.0	4/4	3.0	4/4	3.0	3/4	4.0	3.6
4/4	6.0	3/3	4.0	5/5	6.0	4/4	7.5	4/4	6.5	3/3	5.5	6.0
	21.5		17.5		21.0		22.0		20.0		20.5	20.3
	5		5		5		6		5		5	
	80		60		100		66		80		60	
	21		12		16		14		–		21	17
	22		19		22		21		28		21	22

period of larval growth (in days), C — mean length of growth of larval stages

in "superposition", but soon afterwards they assumed "one beside another" position, the male on the right side of the female (Fig. 7). They remained joined for 10–15 min.

In laboratory conditions, females oviposited the first eggs on the 7th–10th day of life. As a rule, they started the process of oviposition 1 day after the copulation. Time of oviposition of egg masses depending on the number of eggs was 40–90 seconds. Eggs were inserted inside spikelets of food grasses (except for *P. pratensis*) in the definite stage of development: after falling down of stamens or in milk ripeness stage. As the analysis of grass stems in field conditions has shown the spikelets of *F. pratensis* and *F. rubra* served as the place of oviposition.

In laboratory culture in 1982 the period of oviposition lasted 6–12 days. From the 8th till the 14th day of life females oviposited 40 eggs on the average, which constitutes 87% of all inserted eggs (Table 3). The average amount of eggs laid by 1 female was 46, the maximum amount being 71 eggs. Within one day the female oviposited 4 eggs on the average or at maximum 15 eggs. The investigations of fertility in culture in 1989 gave similar results (Table 4). Within two weeks each female inserted 44 eggs on the average, that is 3 eggs daily. 80% of total amount of eggs was inserted by females from the 9th to 16th day of life. In the ovaries of dead females 2–21 eggs were found. They did not oviposit then, all the produced eggs. The average

Fig. 7. Copulation position of *M. recticornis*

of eggs produced by females amounted to 55. The oviposition period lasted 10–14 days.

Females oviposited eggs daily or at a few days' intervals and they usually perished 1–2 days after terminating oviposition. No interdependence was found between the amount of inserted eggs and length of females lives, a certain amount of females did not oviposit eggs at all.

It was found that in culture eggs were also inserted by the females which did not copulate, however, the amount of eggs in this group was smaller than in copulating females. It should be assumed that fertilization of eggs was not necessary for starting oviposition. The sperm, then, does not have an inactivating effect on the development and ovipositing eggs, which takes place in many *Miridae* (Hinton, 9, after Gordon and Loher, 1968).

In the literature on the subject there are no data on the process of oviposition in *M. recticornis*, except for a Kamm's mention (10) on finding eggs in the seeds of *F. rubra*.

Table 3. Fertility of *M. recticornis* females in laboratory culture in 1982

Females	Length of female's life								Number of eggs oviposited by females within lifetime
	27–29.6		29.6–2.7		2–5.7		5–8.7		
	A	B	A	B	A	B	A	B	
1	18	9.0	25	8.0	10	3.3	8	2.7	61
2	12	6.0	20	7.0	5	1.7	3	1.0	40
3	22	11.0	8	2.7	–	–	–	–	30
4	30	15.0	33	11.0	8	2.7	–	–	71
5	19	9.5	2	0.7	–	–	–	–	21
6	19	9.5	25	8.0	8	2.7	7	2.3	59
7	27	13.5	4	1.3	–	–	–	–	31
8	28	14.0	20	7.0	8	2.7	2	0.7	58
9, 10	–	–	–	–	–	–	–	–	–
Average number of eggs oviposited by females in particular periods	23	11.0	17	6.0	4	1.3	2.5	0.8	46

Explanation: 9, 10 — females did not oviposit eggs, they lived till 2 July; 30 and 46 eggs were found in their abdomens after preparation, A — amount of eggs inserted by the female in a given life period, B — mean amount of eggs inserted by the female within one day.

REMARKS ON THE SYNCHRONIZATION OF *M. RECTICORNIS* LIFE CYCLE WITH THE DEVELOPMENT OF HOST PLANTS

M. recticornis is a monovalent species. A long period of occurring in the egg stage (about 9 months) was caused by including the diapause in the course of embryonal development. After 3 weeks of morphogenesis, directly after oviposition of eggs (prediapause), the latter ones started the stage of the diapause proper. Further development of the embryo was possible only after a period of low temperature action. The postdiapause development of eggs started in spring in the temperature over +4°C. The hatch of larvae took place in the second or third decade of May and the larval stage lasted for 5–6 weeks (Figs. 8 and 9).

The younger larvae remained in the biotope for 2 weeks, the older ones were caught for 3–4 weeks (Figs. 8 and 9). Adult insects appeared from the half of June till the end of July. Males which have occurred a few days earlier, prevailed in June. Since the beginning of July females appeared in bigger and bigger quantities (Fig. 10). The first oviposited eggs were found 2 weeks after the occurrence of imagines. In August the eggs together with ripe spikes of grasses fell on the ground and diapaused in the sub-surface layer of greenness growth.

The synchronization of insect life cycle with the development of host plants was observed.

During hatching of *M. recticornis* larvae *Poa pratensis* had fully-shaped

Table 4. Fertility of *M. recticornis* females in laboratory culture in 1989

Females	Female's lifetime 22–25.6 A	22–25.6 B	25–29.6 A	25–29.6 B	29.6–6.07 A	29.6–6.07 B	Number of eggs oviposited by female during lifetime	Number of eggs left in dead females' abdomens	Number of eggs produced by one female
1	24	8.0	22	5.5	9	1.3	55	5	60
2	21	7.0	8	2.0	18	2.5	47	9	56
3	42	14.0	5	1.2	9	1.3	56	3	59
4	12	4.0	11	2.3	2	0.3	25	20	45
5	31	10.0	6	1.5	10	1.4	47	7	54
6	13	4.0	23	5.6	10	1.4	46	13	59
7	29	9.5	3	0.7	11	1.5	43	18	61
8	31	10.3	19	4.7	9	1.3	59	2	61
9	14	4.5	13	3.2	8	1.1	35	15	50
10	10	3.3	11	2.7	7	1.0	28	21	49
Average number of eggs oviposited by females in particular periods of life	23	7.5	12	2.9	9	1.3	44	11	55

Explanation: A — amount of eggs laid by the female in a given life period, B — mean amount of eggs inserted by the female within one day.

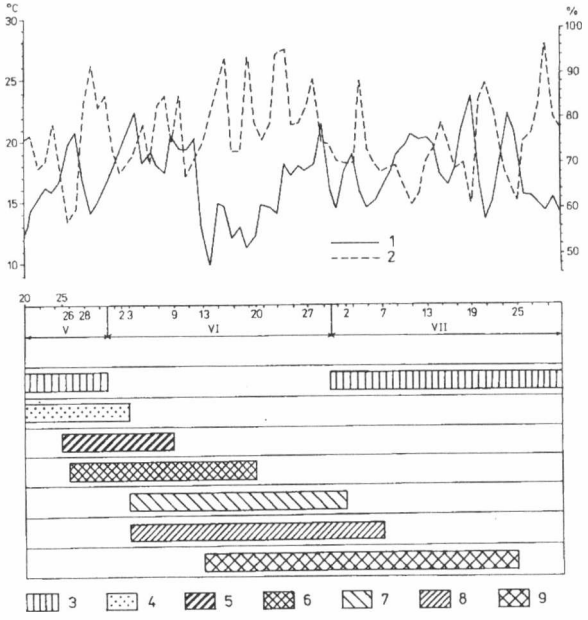

Fig. 8. *M. recticornis* life cycle against temperature and air humidity (1981); 1 — temperature, 2 — humidity, 3 — egg, 4 — L_1, 5 — L_2, 6 — L_3, 7 — L_4, 8 — L_5, 9 — imago

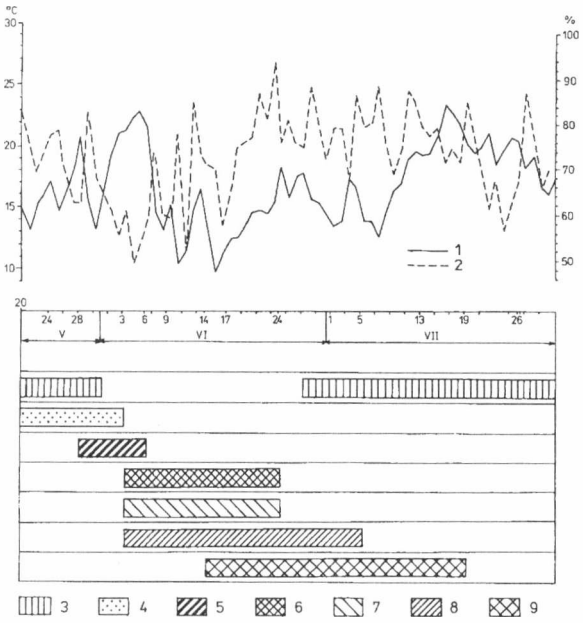

Fig. 9. *M. recticornis* life cycle against temperature and air humidity (1982), for denotations see Fig. 8

panicle and started flowering, *Festuca pratensis* and *Lolium perenne* were in the initial stage of heading, whereas *Festuca rubra* — in its final stage. Probably this involves an abundant occurrence of early-staged larvae on *Poa pratensis*, observed on the turn of May. During seeds' ripening in *P. pratensis* spikelets gradual transfer of *M. recticornis* population to further plants was observed: the larvae L_4 and L_5 migrated to *F. pratensis*, which started flowering. The oldest larvae and adult bugs fed there until the end of their occurrence. The population of the species observed on the grasses at the locality 3 was slightly different. Younger larvae were collected from *P. pratensis* and *F. rubra*, whereas L_4 and L_5 as well as adult insects — from *F. rubra* and *L. perenne*.

At Rudnik, at the locality 5 (Fig. 1), *Bromus inernis* and *Brachypodium pinnatum* prevailed among the grasses. Both species start heading at the end of May, flower in the second half of June and in July. Younger larvae (L_1 and L_2) were shaken off from *Poa pratensis* in the last decade of May. Larvae of the three last stages and imagines were found on the inflorescences of *B. pinnatum* in June and July. Food tests fully confirmed the results of field observation.

The presented results show convergence with the data given by Butler (2), Kamm (10) and partly, Gibson (4, 5).

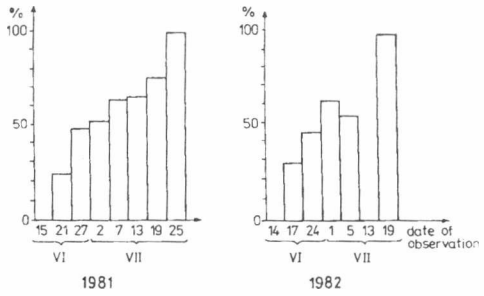

Fig. 10. Percentage share of females in different periods of *M. recticornis* population development

Gibson in his earlier publications (4, 5) mentioned *B. pinnatum* as the basic host plant of *M. recticornis* in its whole life cycle. The above-described scheme of populating the grasses by subsequent developmental forms entitles to put on the list of food plants also: *P. pratensis*, *F. pratensis*, *F. rubra* and *L. perenne*. Nearly all the mentioned species belong to the tribe *Festuceae*. It results from the comparison of *B. pinnatum* phenology with insect life cycle that this grass is not a host preferred by the youngest larval forms because they are "flower-feeders" just as the other life stages.

It should be stressed that Gibson (19) has recently confirmed these findings. The author verifies there his earlier views of *M. recticornis* food preferences. It should be pointed out that not all the attainable grasses in the reproductive stage of development were used by *M. recticornis* as a source of food and place of reproduction. A conclusion can be drawn that this species is a wide-food spectrum oligophage which changes together with insects' age. It was found that the attainability of the host plant in the proper stage of development as the source of food and place of oviposition affects to a large degree the presence of the discussed species in a given habitat. This species was relatively rarely reported by heteropterologists examining the fauna of grassy communities. Probably, the habitats populated by this species, as being little characteristic, were rarely examined.

REFERENCES

1. Braune J. H.: An ecophytosociological analysis of the mechanisms controlling embryonic diapause in *Leptoptera dolobrata* (*Heteroptera, Miridae*). Zool. J. Syst. **107**, 92–112 (1980).
2. Butler E. A.: A Biology of the British *Hemiptera-Heteroptera*. London 1923.
3. Eyles A. C.: Further new genera and other new combinations for species previously assigned to *Megaloceroea* (*Heteroptera: Miridae: Stenodemini*). J. Nat. Hist. **9**, 153–167 (1975).

4. Gibson C. W. D.: The importance of foodplants for the distribution and abundance of some *Stenodemini* (*Heteroptera: Miridae*) of limestone grassland. Oecologia **25**, 55–76 (1976).
5. Gibson C. W. D., Visser M.: Interspecific competitions between two field populations of grass-feeding bugs. Ecol. Entomol. **7**, 61–67 (1982).
6. Herczek A.: *Miridae* (*Heteroptera*) zespołów roślinnych okolic Dolistowa. Acta Biol. Siles. **10**, 22–29 (1982).
7. Herczek A., Nakonieczny H.: Przyczynek do znajomości tasznikowatych (*Miridae, Heteroptera*) okolic Kalisza Pomorskiego. Acta Biol. Siles. **6**, 99–107 (1987).
8. Herczek A.: Zgrupowania tasznikowatych (*Miridae, Heteroptera*) wybranych zbiorowisk kserotermicznych okolic Pińczowa. Acta Biol. Siles. **6**, 130–148 (1987).
9. Hinton H. E.: Biology of Insect Eggs. Pergamon Press Oxford—New York—Toronto—Sydney—Paris—Frankfurt 1981.
10. Kamm J. A.: Plant bugs: effect of feeding on grass seed development; and cultural control. Environmental Entomol. **8**, 73–76 (1979).
11. Knight H. H.: Taxonomic Review: *Miridae* of the Nevada test site and the Western United States. Brigham Young Univ. Sci. Bull. **9**, 1–282 (1968).
12. Morris M. G.: Responses of grassland invertebrates to management by cutting. II. *Heteroptera*. J. App. Ecol. **16**, 417–432 (1979).
13. Slater J. A.: *Megaloceroea recticornis* (Geoffr.), a mirid new to the Eastern United States, with description of a new genus of *Stenodemini* (*Hemiptera, Miridae*). Proc. Ent. Soc. Wash. **58**, 116–120 (1956).
14. Smardzewska Z.: Morfologia stadiów larwalnych *Megaloceroea recticornis* (Geoffr.) (*Heteroptera, Miridae*). Ann. Univ. Mariae Curie-Skłodowska, sectio C **38**, 295–308 (1983).
15. Smardzewska-Gruszczak Z.: The morphology of immature stages of *Megaloceroea recticornis* (Geoffr.) (*Heteroptera, Miridae*). Ann. Univ. Mariae Curie-Skłodowska, sectio C **46**, 163–173 (1991).
16. Smreczyński S.: Materiały do fauny pluskwiaków (*Hemiptera*) Polski. Fragm. Faun. **7**, 1–146 (1954).
17. Strawiński K.: Badania nad *Hem.-Het.* w projektowanym rezerwacie stepowym koło Gródka (pow. hrubieszowski). Ann. Univ. Mariae Curie-Skłodowska, sectio C **14**, 1–28 (1961).
18. Wagner E.: Die *Miridae* Hahn, 1831, des Mittelmeerraumes und Makaronischen Inseln (*Hemiptera, Heteroptera*). Ent. Abh. Staadt Mus. Tierk. Dresden, **37** (1970–1971).
19. Wetton M. N., Gibson C. W. D.: Grass flowers in the diet of *Megaloceroea recticornis* (*Heteroptera: Miridae*) plant structural defences and interspecific competition reviewed. Ecol. Entomol. **12**, 451–457 (1987).

STRESZCZENIE

Na podstawie badań (1980–1982, 1989) opisano biologię wszystkich stadiów w cyklu życiowym *Megaloceroea recticornis* (Geoffr.). Rozwój zarodkowy i postembrionalny prześledzono w warunkach laboratoryjnych.

Po 15–21 dniach morfogenezy, bezpośrednio po złożeniu (prediapauza), jaja wkraczały w fazę diapauzy właściwej. Rozwój postdiapauzalny zarodka trwał 14–19 dni, rozwój larwalny natomiast 16–22 dni. Generatywne organy traw okazały się niezbędnym źródłem

pokarmu dla larw, aby pluskwiak mógł zakończyć swój rozwój. Długość życia imagines wynosiła 6–32 dni, samce żyły średnio 6 dni krócej od samic. Okres dojrzewania imagines trwał 6–8 dni. Samice składały pierwsze jaja od 7 do 10 dnia życia, okres owipozycji trwał 6–14 dni. Jedna samica składała średnio 55 jaj.

W warunkach polowych obserwowano synchronizację cyklu życiowego pluskwiaka z rozwojem roślin żywicielskich. Ustalono, że roślinami żywicielskimi (pokarm, rozród) *M. recticornis* były *Poa pratensis, Festuca pratensis, F. rubra, Brachypodium pinnatum* i *Lolium perenne*. Larwy i owady dojrzałe preferowały kłoski traw w okresie kwitnienia i rozwoju nasion jako źródło pokarmu i miejsce składania jaj. *M. recticornis* zamieszkiwała siedliska synantropijne o umiarkowanej wilgotności, z bujnym porostem trawiastym, nie użytkowanym rolniczo. Dostępność roślin żywicielskich w odpowiedniej fazie rozwoju wpływała w dużym stopniu na obecność omawianego gatunku w danym biotopie.