

**GIRAUDIELLA INCLUSA (Frauenfeld)**

**BIOLOGY, ECOLOGY GEOGRAPHICAL DISTRIBUTION,  
INTENSITY AND FREQUENCY OF THE ATTACK IN THE  
REED PLOTS OF DANUBE DELTA**

- Synonym — *Dasyneura inclusa*; *Perrisia inclusa*.  
— Order: Diptera  
— Sub-order: Nematocera  
— Superfamily: CECIDOMYOIDEA — Malloch — 1917  
— Family: CECIDOMYIIDAE — Roodani — 1856  
— Subfamily: CECIDOMYIINAE — Schiner — 1864

T. ROMAN,

In this work data are given concerning the insect *Giraudiella inclusa*, a very important pest from the economical point of view for the Reed Plots of Danube Delta. Frequency and intensity of the attack under various hydro-pedo-climatic conditions, the number of the yearly generations of adults and the periods of appearance, as well as the most important distribution area in the Reed Plots of Danube Delta are analysed. The data refer to the period 1961—1968.

Spread under the form of compact masses and in fairly uniform environmental conditions, the reed is an optimum host for the development of very many animal and vegetable pests. Some of these pests cause great damages in the reed plots of Danube delta, being the most important reason in the diminution of the reed stock. Thus, it is obviously essential to undertake the biologic and ecologic study of these pests, which should allow both the practical means for fighting against them and the optimum periods of application to be established. In this work we give some data on *Giraudiella inclusa* — the fly of the reed stems.

*Giraudiella inclusa* is a pest frequently encountered in the reed plots of Danube delta. The insect is monophagous stenomerous producing internal galls on the stems around which the plant tissues, when coming to maturity, lignify, become friable and break very easily. For this reason, the reed plots attacked by *Giraudiella inclusa* are characterized by a population showing heterogeneous biometric characteristics and a low productivity.

In the reference literature, *Giraudiella inclusa* is described by Giraud in 1863, Rübssamen and Hedicke in 1925, Formius in 1927, Barnes in 1946, Nijveldt in 1954, Skuhrova in 1960—1963.

In Romania, this pest is mentioned for the first time by Borcea in 1912. It is dealt with again in Borcea's works (1938; 1946). In 1964, it is then mentioned by Rudescu and by Neacșu (1965).

Though *Giraudiella inclusa* is known since long, the reference literature includes, however, but few data on the biology and ecology of this insect. That is why our research works deal especially with the study of these aspects. Given the importance of the reed as raw material, we also undertook studies of the geographical distribution, the intensity and frequency of the attack as well as of the damages brought about by this pest in the reed plots of Danube delta.

### Methods

The investigations began in 1961. As methods in field, the following were used:

- the itinerary method, i.e. the study by phytogeographical profiles or the study of the delta, in the main;
- the stationary method.

By the itinerary method, the frequency of the attack and the geographic areal were studied classifying and mapping out the reed plots of the zones of Puiu-Puiulet and Roșu-Roșuleț-Lumina in 1961, the Șuntea complex in 1962, the zone of Lopatna in 1963, the zones of Rusca and Letea in 1964, the complexes of Pardina and Ostrovul Babina-Cerneața in 1965, the zone of Mustaca-Danavăț-Belciug-Palade in 1966, the zones of Carasuhai and Ostrovul Ceamurlia in 1967, the complexes of Gorgova, Canal Ceamurlia, Liteov, Perivolofca in 1968.

In stations, the biology, the ecology, the intensity and the frequency of the attack were studied; under various hydropedoclimatic conditions, the damages caused by this pest in the reed plots of Danube delta were noted too.

The investigations were carried out in 54 stations of an area about 25 m<sup>2</sup> each located in various places of the considered region both under controlled hydrological and free flood conditions. The criteria in locating these stations were the characteristic of the surface flora, the height and the nature of the ground, the flooding conditions of the reed plots. In the involved region, the stations were located as follows:

- according to the characteristic of the flora — in reed masses as well as in masses where the reed was associated with 50–80% sedge or 50–80% bulrush.

- according to the ecotypes of reed — in reed masses which are characteristic of the biotopes such as no. 2 flooded "grind"<sup>1</sup>, no. 4 „mlăștină"<sup>2</sup>, no. 3 floating "plaur"<sup>3</sup>, and no. 10 "sărătură"<sup>4</sup>.

- according to the height and the nature of the ground — on alluvial soils of a high and very high "grind", on alluvially humiferous and peaty

<sup>1</sup> "grind" — form of relief resulted from alluvial deposits

<sup>2</sup> "mlăștină" — marsh.

<sup>3</sup> "plaur" — reed islet.

<sup>4</sup> "sărătură" — salt marsh.

humiferous soils of a high or low level, on silted "plaur", floating "plaur" and sandy soils.

— according to the hydrological conditions — permanent flood, temporary flood, high flood and permanent draining.

The data were recorded every month thus observing the evolutive cycle and the time required by the different development stages, the intensity and the frequency of the attack, the number of the yearly generations of adults, the resistance of the various reed biotopes to the attack of this insect, the forms under which it appears on the host plant. The investigations carried out in field were supplemented by laboratory works by breeding this insect in specially intended small boxes.

#### Results and Discussion

##### *Ecological conditions for the development of the insect, the behaviour and the effect on the host plant.*

*Giraudiella inclusa* was found to be present in the reed plots of Danube delta every year without exception. Its attack is more intense in those years when the precipitations are not too abundant and the Danube shows a low evel. On the reed stem, *Giraudiella* produces lignified internal galls and the perforation of the walls, so that the affected part becomes friable and the plant breaks easily when coming to maturity. *Giraudiella* grows on the reed stem since the laying of eggs till the appearance of the adults. It lays its eggs on the aerial organs of the plant only. The infestation takes place during the whole vegetative period beginning with the plantlet up to the completely ripe reed.

The attack on the reed plantlets is found to occur in spring and in autumn both in the drained dammed reed units and under natural conditions on grounds such as "grind" of a high level. The attack is more frequent for the generations of autumnal plantlets because of the low level of flooding waters, but it is also noted for the spring generation in the years when the Danube shows a low level. In this period, the insect affects the internodes which are very near by the soil, that is those between the collet and the meristems (Fig. 1 a). When the attack is

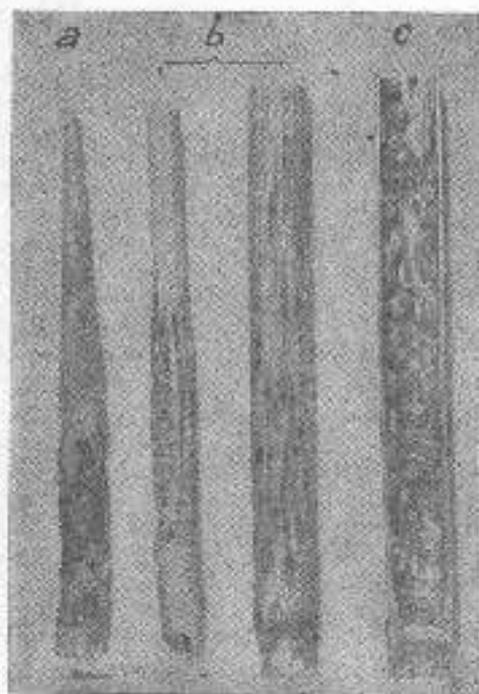


Fig. 1 a, b, c — Attack of *Giraudiella inclusa* on the reed plantlet and stem (Original)

intense, the meristems can be damaged and the reed plantlets can stop their growth.

For the following steps in the vegetative period of the reed, the eggs are laid on the stem internodes at various intervals simultaneously with the growth and the development of the plant, the attack being found to move more and more to the top (Fig. 1 b). Because the insect is present in the reed



Fig. 2 — The look of the reed stem after the appearance of *Girardinella inclusus* adults (Original)

plots and it lays its eggs throughout the vegetative period, one reed stem shows 4—8 attacked internodes at the end of the autumn. The fact that the attack occurs permanently near the top of the stem seems to be determined by the gradual lignification of the basal internodes which, thus, are no more favourable to the development of the insect.

The adults appear on the stems at various intervals depending on the time when the eggs were laid by the adults of the previous generation.

Both on the reed stem and the young plant, the insect produces distortions of the wall under the form of internal galls (Fig. 1 c). They are as great as a wheat seed, being extremely lignified and rugous at their outside (Fig. 2). Inside the internode, they are disposed circularly or under the form of a strip orientated to the length of the axis of the reed stem (Fig. 1 c). The galls are monolocular with thin walls (0.3—0.4 mm.) which resist the breaking and bursting very well. There is only one adult developing in one gall. The average number of the galls on an internode amounts to 15—24. They grow solitarily or together, but every gall preserves its individuality (Fig. 1 c). On the outside, the presence of the insect on the stem is rendered evident by the small elliptic blots (Fig. 1 b) which are even and lightly browned, being 10—15 mm. long and 1—1.5 mm. wide. Until the adults appear, the attack is not visible because of the hull of the foliar apparatus which covers the whole length of the reed stem. When the adults appear, the pupa cuts a perfectly circular vent of an average diameter of 1 mm. into the wall of the stem which gets a

pierced look (Fig. 1 b). The last pupal exuviae accompany the adult until this comes out of the gall, continuing to adhere to the wall of the stem under the form of small horns, after which the attack is quite easily identified.

Until the laying of eggs, the adults are generally less lively. But they resist low temperatures very well in the years when springs are early, and are present in the reed plots even from the beginning of March.

*The Evolutionary Cycle, the Development Steps and the Number of Yearly Generations of Adults.*

Though *Giraudiella inclusa* is present in the reed plots of Danube delta about the whole vegetative period of the reed under the local climatic conditions, it has but two yearly generations of adults, namely the spring and the autumn generation of adults (Fig. 3 and 4). The permanent presence of this pest in the reed plots is accounted for by the fact that the adults belonging to a generation appear on the internodes of the stem at various intervals during a long time, the phenomenon depending on the moment the eggs have been laid by the previous generation. The investigations on the field and the laboratory analysis point out, at the same time, that the eggs laid at one time on the same internode do not develop uniformly so that the first adult which comes out from these eggs is finally found to have an advance of 30—35 days as compared to the last one. The phenomenon seems to be determined, beside many other causes, by the different consistency of the stem wall along the internode the middle part of which determines, because of its more loose tissues, an earlier development of the eggs than the basal parts.

The first generation of adults of *Giraudiella inclusa* develops on the old existing reed and results from the eggs laid the previous year by the summer generation of adults. During the cold season, this generation spends the winter in the larval stage and quite seldom as pupa.

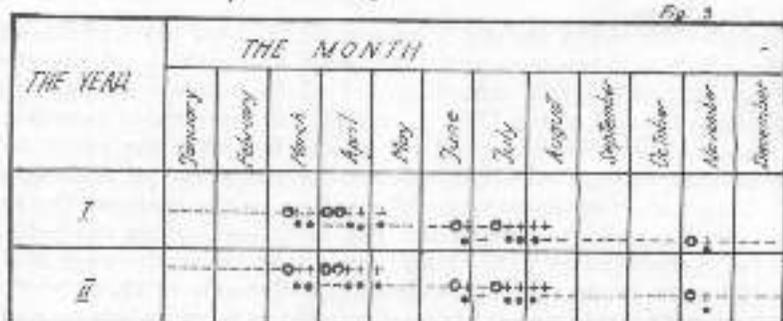
The larval stage lasts three months, on an average, to which about four months of hibernation are added. From the end of February and the beginning of March, the larva transforms gradually into pupa the development of which lasts, on an average, 25 days.

The appearance of adults takes place early in the spring and lasts from the beginning of March to the first ten days of May (Fig. 4). After 2—3 days, the female starts her laying of eggs on the reed plantlets newly sprung from the ground. On the ground, this generation finds the reed in a young development state, thus it will infest the internodes beginning from the base to the middle of the stem. The eggs are laid dispersedly under the hull of the foliar apparatus. The larvae appear 20—25 days after the laying of eggs and they get gradually into the wall of the stem producing internal galls. According to the moment the eggs were laid, beginning from June, these larvae transform gradually into pupae.

In June-July and the first half of August, the adults of the summer generation are found to appear in the reed plots. Just like the previous generation, they lay their eggs under the hull of the foliar apparatus. This generation finds the reed in its maximum growth and development, in the blooming and fruit bearing state, so that it will infest the internodes between the middle and the top of the reed stems. The fact is noted that the eggs are no more laid on the basal internodes because of the lignification of the tissues. After

**GIRAUDIELLA INCLUSA**

*The evolutive cycle and the time required by the different development stages*



--- Larva; ○ Pupa; + Adult; •• Laying of eggs.

**GIRAUDIELLA INCLUSA**

*The periods of the appearance and the number of the yearly generations of adults*



Fig. 3—*Giraudiella inclusa*— the evolutive cycle and the time required by the different development stages

Fig. 4—*Giraudiella inclusa*— the periods of appearance and the number of the yearly generations of adults

the attack of the adults of the spring generation and that of the adults belonging to the summer generation, the reed stem shows 3–5 internodes which are completely safe, thereafter the attack of each generation can be identified quite easily. When coming the winter the summer generation presents larvae whose stages of development are different. Next spring, they transform gradually into pupae and adults, whence the evolutive cycle starts again.

During the years when autumns are very late, a small number of the adults belonging to this generation can appear until the coming of the winter (in November), which leads to an additional infestation of the reed plantlets newly sprung from the ground (Fig. 3).

### The Intensity and the Frequency of the Attack

The determinations were carried out on 100 reed stems. The results concern the reed of the biotope no. 2 flooded "gziud", no. 4 "mlaştină", no. 8 floating "plaur" and no. 10 "sărătură", which are the basis of the reed stock.

The intensity and the frequency of the attack was studied under various hydro-pedo-climatic conditions, the 1968 year being compared to 1969. Unlike the 1969 year — abundant precipitations, high flood for a long time, late spring and cool summer the 1968 year was characterized by little precipitations, a low level of the flooding waters, an early spring, a hot and draughty summer (Table 1).

As shown by the data included in Table no. 2, 20% of the reed stems were found to be attacked, on an average, in 1968, as compared to only 8% in 1969. The remark is thus made that one of the best conditions for the development of *Giraudiella inclusa* is as low a level of the flooding waters as possible together with early and warm springs which allow the precocious development of the insect and the infestation of the reed plantlets even in the first vegetative stages.

By observing the distribution, by number, of the galls on the reed stem and the number of the internodes attacked by the adults of every gene-

**COMPARATIVE DATA FOR 1968 AND 1969 CONCERNING  
THE HYDROLOGICAL AND CLIMATIC CONDITIONS OF THE REED  
PLOTS OF THE OSTROV MALIUC ZONE AND THE COMPLEX  
OF ŞONTEA**

Table No. 1

THE MONTH  THE YEAR	CLIMATIC CONDITIONS								AGRICULTURAL CONDITIONS area in H A.			
	Precipitation mm		Humidity %		Average temp °C		Sun light hours/day		REED AREA			
	1968	1969	1968	1969	1968	1969	1968	1969	1968	1969	Şonlea	Maluc
January	71	29	84	74	-3.3	-3.8	2.1	2.4	49	95	116	153
February	25	92	85	78	-2.2	-2.8	3.3	4.4	94	125	156	248
March	4	39	66	76	+3.8	+4.4	6.8	5.6	115	161	228	322
April	7	20	60	83	13.8	13.7	12.2	11.8	116	154	160	255
May	4	5	60	82	22.1	22.8	19.2	14.4	169	168	193	192
June	0	80	64	60	22.9	22.7	11.0		160	167	166	205
July	36	39	76	68	22.9	22.4	8.0		128	160	71	228
August	44	1	76	64	22.7	23.3	8.8		107	154	166	113
September	29	58	73	74	19.1	19.9	5.6		190	195	98	90
October	5	7	69	69	16.6	12.5			64	82	120	51
November	38	3	80	82	12	12.4			50	58	93	52
December	50	150	83	82	2.2	2.8			62	84	104	86

Table 1 — Comparative data for 1968 and 1969 concerning the hydrological and climatic conditions for the reed plots of the Ostrov Maline zone and the complex of Şonlea



**GIRAUDIELLA INCLUSA**

*The intensity and the frequency of the attack produced by the adults of the spring and summer generations on various biotopes of reed (average values for period 1961-1968)*

THE BIOTOPE OF THE REED	NATURE OF SOIL	water saturation mm. above 100	No. of attacked internodes			No. of galls on an internode			Total number of galls on the stem	Average number of galls per stem
			Base	Middle	Top	Base	Middle	Top		
2 FLOODED GRIND	Alluvial loess	50	2	1	3	5	40	2	50	12
4 MŁAȘTINA*	Peaty loess	120	0	2	6	0	50-150	3	100-300	28
6 PLAȘA*	Floating plain	-	2	0	0	5	0	0	10	5
10 SĂRĂTURĂ*	Sand	30	0	1	2	0	8-16	1	15-20	2

Table 3—*Giraudiella inclusa*—the intensity and the frequency of the attack produced by the adults of the spring generations on various biotopes of reed. Average values for the period of 1961-1968.

because the early maturation of the plant, whose tissues are not favourable to the development of the insect.

*The Geographical Distribution and the Damages Caused by Giraudiella inclusa in the Reed Plots of Danube Delta.*

The attacks of *Giraudiella inclusa* in the reed plots of Danube delta show a generalized characteristic. Out of the very many ecotypes of reed studied, the most resistant to the attack of this insect proves to be the biotopes such as no. 8 floating "plaur" and no. 10 "sărătură". For these biotopes, the phenomenon seems to be determined by a more compact consistency of the stem wall as well as by an earlier impregnation of the plant tissues with silica. The biotopes such as no. 2 flooded "grind" and, especially, no. 4 "młaștină", show a great responsiveness to the attack of *Giraudiella inclusa*. For this reason, the most important distribution area of this insect is that situated upstream the Danube delta where the attack can affect up to 40% of the total number of reed stems (Fig. 5).

Studying the effect of the attack of *Giraudiella inclusa* on the host plant, losses in height up to 30% and in the weight of the mass of the reed stem up to 50% (table no. 4) are noted as compared to the normally developed plants. These damages result from the breaking of the reed stems after the maturation of the plant whose part attacked by this insect becomes very friable.

In this work data are given concerning the biology, the ecology, the geographical distribution, the intensity and the frequency of the attack produced by *Giraudiella inclusa* cecidomyde in the reed plots of Danube delta.

**GIRAUDIELLA INCLUSA—THE ECONOMIC IMPORTANCE AND THE EFFECT ON THE HOST PLANT  
DATA FOR 1966**

Table No. 4

REGION	LOCATION ZONE	NATURE OF SOIL	PRODUCTION	NUMBER OF THE HOST PLANT	NUMBER OF BEES		NUMBER OF BEES PER HOST PLANT	PERCENT OF THE BEES	PERCENT OF THE BEES PER HOST PLANT	PERCENT OF THE BEES PER HOST PLANT	PERCENT OF THE BEES PER HOST PLANT
					PERCENT OF THE BEES	PERCENT OF THE BEES PER HOST PLANT					
MADRID	1. MADRID	Heavy humiferoso	Almonds	1	100	100	100	100	100	100	100
				2	100	100	100	100	100	100	
	2. MADRID	Heavy humiferoso	Almonds	3	100	100	100	100	100	100	100
				4	100	100	100	100	100	100	
	3. MADRID	Heavy humiferoso	Almonds	5	100	100	100	100	100	100	100
				6	100	100	100	100	100	100	
	4. MADRID	Heavy humiferoso	Almonds	7	100	100	100	100	100	100	100
				8	100	100	100	100	100	100	
	5. MADRID	Heavy humiferoso	Almonds	9	100	100	100	100	100	100	100
				10	100	100	100	100	100	100	
BILBAO	1. BILBAO	Heavy humiferoso	Almonds	11	100	100	100	100	100	100	100
				12	100	100	100	100	100	100	
	2. BILBAO	Heavy humiferoso	Almonds	13	100	100	100	100	100	100	100
				14	100	100	100	100	100	100	
	3. BILBAO	Heavy humiferoso	Almonds	15	100	100	100	100	100	100	100
				16	100	100	100	100	100	100	
	4. BILBAO	Heavy humiferoso	Almonds	17	100	100	100	100	100	100	100
				18	100	100	100	100	100	100	
	5. BILBAO	Heavy humiferoso	Almonds	19	100	100	100	100	100	100	100
				20	100	100	100	100	100	100	
MADRID	1. MADRID	Heavy humiferoso	Almonds	21	100	100	100	100	100	100	100
				22	100	100	100	100	100	100	
	2. MADRID	Heavy humiferoso	Almonds	23	100	100	100	100	100	100	100
				24	100	100	100	100	100	100	
	3. MADRID	Heavy humiferoso	Almonds	25	100	100	100	100	100	100	100
				26	100	100	100	100	100	100	
	4. MADRID	Heavy humiferoso	Almonds	27	100	100	100	100	100	100	100
				28	100	100	100	100	100	100	
	5. MADRID	Heavy humiferoso	Almonds	29	100	100	100	100	100	100	100
				30	100	100	100	100	100	100	

Table 4 — *Giraudiella inclusa* — the economic importance and the effect on the host plant. Data for 1966.

*GIRAUDIELLA INCLUSA* - THE DISTRIBUTION AREA AND THE INTENSITY OF THE  
ATTACK IN THE REED PLOTS OF DANUBE DELTA.

- PERCENTAGE -

 THE ATTACKED AREA

 THE DISTRIBUTION AREA

Fig 5



Fig. 5 — *Giraudiella inclusa* — the distribution area and the intensity of the attack in the reed plots of Danube delta

Under the local climatic conditions, this pest is shown to have two yearly generations of adults, and the development of the insect is found to be promoted by the low level of the flooding waters as well as by early and warm springs. In the reed plots of Danube delta, the attacks of *Giraudiella inclusa* show a generalized characteristic, the most important distribution area of this pest being however that situated upstream the delta. In the years when the hydrological and climatic conditions are very favourable to the development of this pest, it can affect up to 40% of the total number of reed stems. The most intense attack is that of the summer generation of adults. At the same time, the reed biotopes such as no. 8 floating "plaur" and no. 10 "sărătură" are shown to resist the attack of this pest, while the biotopes such as no. 2 flooded "grind" and no. 4 "mlaștină" are extremely sensitive to it.

## GIRAUDIELLA INCLUSA (Frauenfeld)

Biologie, ecologie, areal geografic, intensitatea și frecvența atacului în stufăriile din Delta Dunării.

## REZUMAT

În lucrare se expun date cu privire la biologia, ecologia, arealul geografic, intensitatea și frecvența atacului produs de cecidomyidul *Giraudiella inclusa* în stufăriile din Delta Dunării. Se arată că în condițiile climatice locale, acest dăunător prezintă anual două generații de adulți și că dezvoltarea insectei este favorizată de nivelul scăzut al apelor de inundație și de primăveri timpurii și calde. În stufăriile din Delta Dunării, *Giraudiella inclusa* produce atacuri cu caracter generalizat. Zona de masivă răspândire a acestui dăunător o formează însă partea din amonte a deltei. În anii cu condiții hidrologice și climatice optime pentru dezvoltarea acestui dăunător, el poate afecta pînă la 40% din totalul firelor de stuf. Cel mai intens atac este produs de generația adulților de vară. Se menționează totodată că biotopurile de stuf 8 (plaur plutitor) și 10 (sărătură) sînt rezistente la atacul acestui dăunător, pe cînd biotopurile de stuf 2 (grind inundat) și 4 (mlaștină) sînt intens infestate.

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