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The inhabitants of the galls of *Mikiola fagi* HTG. (*Itonididae*). Part II. Materials for the morphology and development of the species *Hyperteles* FÖRST. and *Torymus* DALMANN (*Chalcididae*)

[Pl. XIII—XIX]

Mieszkańcy galasów bukowych. Część II. Materiały do znajomości morfologii i rozwoju gatunków *Hyperteles* FÖRST. i *Torymus* DALMANN (*Chalcididae*)

Обитатели галлов бука. Част 2. Материалы к познанию морфологии и развития видя *Hyperteles* FÖRST. и *Torymus* DALMANN (*Chalcididae*)

1. INTRODUCTION

In the first part of my work on the inhabitants of the beechgalls of the Cecidomyid *Mikiola fagi* HTG. (1961) I dealt with the development of the latter and its endoparasite *Secodes coactus* RTZB. I have designed the second part for discussing such species of *Chalcididae* as *Hyperteles elongatus* FÖRST., *Hyperteles luteus* and *Torymus cultriventris* RTZB.

These Chalcids as well as others were frequently obtained from beech-galls and identified by various authors. Consequently we find rather numerous references to them in the professional literature. These are listed below. I put the date of publication beside the author's name, then the name of

the Chalcid according to the nomenclature applied by SCHMIEDEKNECHT (1909) and, in brackets, the name used by the author in his work.

FÖRSTER A. (1841). *Hyperteles elongatus* FÖRST. *(Eulophus elongatus)*.

FÖRSTER A. (1856). *Hyperteles elongatus* FÖRST. *(Hyperteles elongatus)*.

RATZEBURG J. T. (1844). *Hyperteles elongatus* FÖRST. (*Entedon macroneurus* RTZB.).

RATZEBURG J. T. (1852). *Hyperteles luteus* RTZB. (*Eulophus luteus* RTZB.).

RATZEBURG J. T. (1848). *Secodes coactus* RTZB. (*Entedon coactus* RTZB.).

WALKER Fr. (1872). *Hyperteles elongatus* FÖRST. (*Eulophus elongatus* FÖRST.).

WALKER Fr. (1872). *Entedon collega* RTZB. (*Eulophus collega* RTZB.).

WALKER Fr. (1872). *Pteromalus suspensus* RTZB. (*Pteromalus suspensus* RTZB.).

WALKER Fr. (1872). *Pteromalus einersbergensis* RTZB. (*Pteromalus einersbergensis* RTZB.).

WALKER Fr. (1872). *Torymus bedeguaris* L. (*Callimome Försteri* RTZB.).

WALKER Fr. (1872). *Torymus cultriventris* RTZB. (*Callimome cultriventris* RTZB.).

MAYR G. (1874). *Torymus fulgens* FABR. (*Torymus fulgens* FABR.).

MAYR G. (1874). *Torymus speciosus* BOH. (*Torymus speciosus* BOH.).

MAYR G. (1874). *Torymus cultriventris* RTZB. (*Torymus cultriventris* RTZB.).

THOMSON C. G. (1878). *Hyperteles elongatus* FÖRST. (*Tetrastichus elongatus* FÖRST.).

THOMSON C. G. (1878). *Torymus fulgens* FABR. (*Torymus fulgens* FABR.).

THOMSON C. G. (1878). *Secodes coactus* RTZB. (*Derostenus coactus* RTZB.).

BRISCHKE C. G. A. (1881). *Hyperteles elongatus* FÖRST. (*Oxymorpha elongata* FÖRST.).

BRISCHKE C. G. A. (1881). *Hyperteles luteus* RTZB. (*Oxymorpha lutea* RTZB.).

BRISCHKE C. G. A. (1881). *Torymus cultriventris* RTZB. (*Callimome cultriventris* RTZB.).

BÜSGEN W. (1895). *Hyperteles elongatus* FÖRST. (*Eulophus elongatus* FÖRST.).

BÜSGEN W. (1895). *Torymus cultriventris* RTZB. (*Torymus cultriventris* RTZB.).

SCHMIEDEKNECHT O. (1909). *Secodes coactus* RTZB. (*Secodes coactus* RTZB.).

The work of BRISCHKE represents a special value for the subject treated in this study, and this is for two reasons: it was BRISCHKE who elaborated the *Ichneumonidae* of Northern Poland, and the specimens of *Chalcididae* collected by him were identified by G. MAYR, the well-known Austrian authority on that family.

Some remarks on the *Chalcididae* emerging from the galls of *M. fagi* HTG. are to be found in the recent manuals, too. SCHMIEDEKNECHT, for instance, in SCHRÖDER'S „Die Insecten Mitteleuropas", including the sub-family *Toryminae*, mentions — probably after MAYR (1874) — three species of *Chalcididae*, that is to say *Torymus fulgens* FABR., *T. speciosus* BOH. and *T. cultriventris* RTZB. (1925). And ESCHERICH (1942) mentions the *Chalcididae Hyperteles elongatus* FÖRST. and *Torymus cultriventris* RTZB., probably after BÜSGEN (1895).

In the foregoing specification the names of the Chalcid genera *Hyperteles* FÖRST., *Secodes* FÖRST. and *Torymus* DALMANN repeat most frequently.

Besides *Secodes coactus* RTZB., some Chalcids similar to *H. elongatus* FÖRST. or occasionally to *H. luteus* RTZB. emerged very often from the galls of *M. fagi* HTG. collected in the regions of Kraków and Krzeszowice. In spite of a considerable likeness, some divergences from the diagnoses given for them by FÖRSTER (1856) and SCHMIEDEKNECHT (1909) were noticeable in their appearances. Those divergences were to be seen in the structure of the antennae and raised a suspection that the specimens represented new genera. Therefore there was a necessity for comparing the Polish specimens with those obtained from the beech-galls collected in the countries bordering Poland.

Then I addressed myself for help, as usual, to Prof. J. STACH, Director of Section in the Zoological Institute of the Polish Academy of Sciences in Kraków, who, in turn, applied to Prof. H. SACHTLEBEN, Manager of the Deutsches Entomologisches Institut in Berlin and asked him to send us the specimens of *Hyperteles elongatus* FÖRST. and *Hyperteles luteus* RTZB. being in the possession of his Institute.

The mail from the Berlin Institute arrived in Kraków and contained 10 dry specimens of *H. elongatus* FÖRST. (8 females, 2 males) as well as 1 microscopic preparation of a whole female of *H. elongatus* FÖRST. In addition there were also 3 dry specimens of *H. luteus* RTZB.

On that account I would offer my hearty thanks to Dir. J. STACH and Prof. H. SACHTLEBEN for enabling me to compare the specimens of *Chalcididae H. elongatus* FÖRST. and *H. luteus* RTZB. from Southern Poland with those from the collection of the Entomologic Institute in Berlin.

The comparison shows that the Polish *Chalcididae H. elongatus* FÖRST. reared from the galls of *M. fagi* HTG. are remarkably similar to the dry specimens borrowed from the Berlin Institute. The borrowed material comprised the specimens probably from Germany (locality not given, insects identified by FÖRSTER and RATZEBURG) and in addition some from Hungary identified by Dr. ERDÖS and from Czechoslovakia classified by BOUČEK. The above-mentioned preparation presented a female of *H. elongatus* FÖRST. The insciption on the label read: *J. P. Kryger* prep., Stródam, Galle PAD(?) BóG, 10, 1929, Kl_2 1930. I quote it in detail, as I am going to refer to this preparation in the further parts of my work.

Besides, I received from the Institute 3 Chalcids *H. luteus* RTZB. Two of them, females, erroneously identified by FAHRINGER as *H. elongatus* FÖRST., were used by me for the comparison with *H. luteus* RTZB. from Krzeszowice.

Similarly to *H. elongatus* FÖRST. also these specimens bore a considerable resemblance to the specimens from Krzeszowice. Nevertheless there were some differences between the Krzeszowice specimens and the diagnosis made by RATZEBURG for *H. luteus* (1852).

This brings me to present my own diagnoses for both the

species. I am the more ready to do this, because the diagnoses of the old authors treat chiefly the coloration of the Chalcids and only in a small measure the features connected with the structure of their organs.

II. IMAGINES: *H. ELONGATUS* FÖRST. AND *H. LUTEUS* RTZB.

A. *H. elongatus* FÖRST.

The female is 3.5—4.5 mm long. Its head is somewhat narrower than the thorax. The abdomen is cylindrical, uniformly tapering distad. Besides, it is about twice as long as the head and thorax together. The terminal section of the terebra projects beyond the abdominal apex (Pl. XIII, Fig. 1 and Tab. I).

The head is ochre-red; a black spot is always present in the vicinity of three ocelli disposed almost in line. The occiput is black, too. The black and brown antennae are situated far from the clypeus and they consist of the scape, pedicel, vestigial anellus or ring-joint, four free joints of flagellum (*funiculus* of THOMSON, 1878, and Fadenglieder of SCHMIEDEKNECHT, 1909) and 3-jointed club (*clava* of THOMSON, 1878). The longest joint of the antenna, the scape, is only slightly shorter than the club and more than twice as long as the pedicel (Tab. II). The pedicel is a cone joined to the scape at the vertex, while its circular base is directed towards the next joint. In most *Chalcididae* a short, narrow, cylindrical and membranous stalk arises from the centre of this base, a member by means of which the next, minute joint of the antenna, the so-called anellus, is articulated with the pedicel. In the Chalcid genus *Hyperteles* this stalk, called by me the articulary process of pedicel, has a special, different shape. It resembles a cup whose stem coalesces with the circular base of pedicel (Pl. XIII, Fig. 6 pr). Its opposite end widens cup-like and joins the minute, vestigial anellus. The latter is membranous, and its surface is smooth, without setae. Its appearance therefore differs from that of the normal joints of the funicle. The shape of the anellus resembles a disk of an uneven thickness; its optical section is

Table I

Body dimensions of males and females of *H. elongatus* FÖRST. and *H. luteus* RTZB.

Name of Chalcid	Sex	Part of body	Dimensions in mm					
			Specimen I		Specimen II		Specimen III	
			Length	Width	Length	Width	Length	Width
Hyperteles elongatus FÖRST.	♀	Head with thorax	1.6	0.75	1.34	0.67	1.28	0.64
		Abdomen	2.95	0.85	2.7	0.80	2.25	0.7
		Whole	4.55	—	4.04	—	3.53	—
	♂	Head with thorax	1.4	0.6 0.56	1.3	0.7 0.6	1.3	0.6 0.5
		Abdomen	1.4	0.56	1.4	0.6	1.1	0.45
		Whole	2.8	—	2.7	—	2.4	—
Hyperteles luteus RTZB.	♀	Head with thorax	1.55	0.7 0.9	1.4	0.8 0.9	1.2	0.6 0.64
		Abdomen	2.9	0.9	2.4	0.9	2	0.6
		Whole	4.45		3.8		3.2	
	♂	Head with thorax	1.1	0.56 0.5	0.9	0.5 0.4		
		Abdomen	0.9	0.3	0.8	0.4		
		Whole	2		1.7			

like that of a wedge with dimensions of 5—13 microns at the ridge and 0.9—3.2 microns at the edge. Consequently it is so small that cannot be seen but under the microscope, and even then only in the antennae macerated in KOH (Pl. XIII, Fig. 6 a).

The vestigial anellus is connected with the first joint of the funicle, which is here considerably shorter than the next one. The first joint is often shorter than the half of the next, (Pl. XV, Fig. 22), but rarely as short as the half of the pedicel. All the joints of the funicle are cylindrical and covered with relatively short setulae, which are scattered irregularly over their surface. The plate-like sensoria, the so-called rhinaria, are present besides the setulae on the joints of the funicle except

for the first one. They also occur on the joints of the club and here more numerously on the last joint, close to the cylindrical apiculus (Pl. XIII, Fig. 8 a). The female's apiculus has a conical tip, and a seta grows out below the tip.

Besides the rhinaria, on the joints of the funicle and the club there are few, rod-shaped sense organs, each held at the base by a bright ring. These are probably trichoid olfactory sensillae (Pl. XV, Fig. 23).

Black spots are present on the ochre-reddish background of the female's thorax. The middle and the front of the steep pronotum are marked with a black spot each, and so are its sides. Another big black patch occurs on the so-called scutum in the mesonotum and it resembles the equilateral trapesium in shape. Its longer parallel side is directed to the pronotum and the shorter one to the scutellum. The shape and the blackness of this patch are variable (Pl. XVI, Fig. 26—29). Observations have been made on 50 specimens. There were 2 specimens (4%) with the patch like that in Fig. 26, 15 (30%) like that in Fig. 27, 31 (62%) resembled the patch in Fig. 28 and 2 (4%) the patch in Fig. 29. Consequently the mesonotum is only rarely as bright as in Fig. 26 and as black as in Fig. 29.

The scutellum of the female is almost always dimmed. Stripes darker than the background occur on it among four longitudinal lines. The scutellum is only occasionally as black as in Fig. 29.

Finally some black little spots appear on the scapulae and on the axillae. The specimens from the German Entomological Institute were darker. No 213 from Radnal, identified by Dr. ERDÖS, might be regarde as a melanotic specimen.

Four setae are disposed bilaterally on the mesonotum, at the internal side of either notaula (Pl. XIII, Fig. 1). The longest of them is the seta next to the scutellum. On the scutellum there are two pairs of stout setae, the anterior and the posterior ones. The anterior setae lie in the medial part of the scutellum, the posterior ones on its caudal margin. A scutellar pore (circular, light area with a dark rim) is present between the two setae bilaterally (Pl. XVI). The whole propodeum is darkened, almost black.

Both pairs of wings are hyaline and with the exception

Table II

Length of antennal joints in males and females of *H. elongatus* FÖRST. Length is given in scale marks of micrometric ocular, 1 mark = 3.2 microns. Abbreviations: l — left antenna, r — right antenna, I—IV — joints of funicle, 1—3 — joints of club

		No of preparation	27		56		60		79		83	
			l	r	l	r	l	r	l	r	l	r
Females		Scape	86	85	90	92	74	74	85	85	74	77
		Pedicel	37	37	39	38	35	35	37	36	32	33
		Anellus										
	funicle	I	20	17	23	22	16	16	19	20	25	20
		II	57	57	53	57	47	46	48	47	40	40
		III	45	45	50	49	40	40	42	42	37	37
		IV	39	40	41	42	38	37	40	38	32	33
	club	1	34	35	37	36	33	32	35	33	30	28
		2	35	37	36	37	35	35	32	31	33	33
		3	24	21	25	23	25	25	21	27	20	21
		No of preparation	24		30		31		41		96	
Males		Scape	77	80	85	85	79	77	83	83	63	67
		Pedicel	34	33	37	37	31	30	35	35	28	28
		Anellus										
	funicle	I	37	40	35	36	35	36	32	32	27	28
		II	57	58	59	60	55	55	58	57	42	43
		III	58	57	68	63	54	56	62	62	45	45
		IV	58	57	65	66	56	55	61	61	47	47
	club	1	50	49	53	55	46	49	48	51	38	39
		2	49	50	52	?	50	50	51	51	42	40
		3	50	51	55	?	55	53	?	?	40	41

of the almost quite naked bases covered with short hairs. The wing venal index S:M:R:P is 4:5:1:0 where S = subcosta, M = ramus marginalis, R = radius and P = ramus postmarginalis. The radius is here always as short as the fifth of the ramus marginalis. It widens distad into a small club (*clava* of THOMSON, 1878). On the club there is a conical protuberance and, laterally, a cylindrical uncus (Pl. XIII, Fig. 4). The anterior and outer margins of the fore-wing are covered with setae. The setae on the ramus marginalis are longer and stouter than those on the veinless anterior and outer margins. The apex of the hind-wing is acute (Pl. XIII, Fig. 1).

The tarsi of the legs are 4-jointed. The 1st, 2 nd and 4th segments in the tarsi are subequal, the 3rd segment is the shortest one. The 2nd calcar is biggest, almost as long as the metatarsus, whereas the 1st one is badly developed. The legs are rather long, relatively thin and yellow. Only the coxae are partly black. The abdomen is of a considerable length, approximately twice as long as the head and the thorax together (Tab. I). It is coloured dark brown, and light patches are commonly present laterally.

The male is somewhat smaller than the fenale (Tab. I). The length of its body ranges from 2.4 mm, to 2.8 mm. Its head is, unlike the head in the female, a little broader than the thorax, and its body is almost quite black. Only the legs are light yellow, but the coxae are partly black, and so are the femora of the 2nd and of the 3rd pairs. The longitudinal lines on the scutellum are occasionally yellowish.

The antenna of the male has the same number of joints as that in the female. The scape, however, is here shorter than the club and has a rod-shaped, black sense organ on its distal ventral part (Pl. XV, Fig. 24 s). In the female this organ is lacking. By this black rod we can immediately distinguish the male of the genus *Hyperteles* FÖRST. from the males of other genera of *Chalcididae* emerging from the galls of *M. fagi* HTG.

Further differences in the structure of the male antenna are to be seen in the joints of the funicle. The latter are also four in number, but not so uniformly cylindrical as in the female. In the male the funicle joints show asymmetrical, unilateral thickenings in their proximal portions (Pl. XV, Fig. 19). The first joint of the funicle equals the pedicel in length or even exceeds it a little, but is remarkably shorter than the other joints of the funicle, sometimes as short as the half of any of them. On all joints of the funicle and on the 1st and the 2nd joints of the club there are very long and rigid setae, which cling to them. They grow out from the basal part of each of the above-mentioned joints and have a ring-like arrangement. There is one such ring on each joint. Besides those stout setae, there are some shorter ones on the joints and these are disposed irregularly.

The joints of the funicle and of the club, like the corresponding joints in the female, are provided with the rhinaria and trichoid olfactory sensillae. The latter are here more numerous than in the female. At the top of the third club joint there is an apiculus, just like in the female. However, the seta is here situated on the top and not on the side of the apiculus. At the base of the apiculus there is always a trichoid olfactory sensilla, missing in this place in the female (Pl. XIII, Fig. 9).

The structure of the radius resembles that in the wing of the female. Here it is about as short as the quarter of the ramus marginalis.

In the male two bright semi-circular areas are well visible on the black background of the ventral side of the medial abdominal segments (Pl. XIII, Fig. 3). Similar light areas, confined by the appropriately cut-out sternites of the abdomen can be seen in the males of *Secodes coactus* Rtzb. They are not to be distinguished in the females.

Below the aforecited patches, in the terminal section of the abdomen there are the male copulatory organs. At their removal from the abdomen they are followed by the reproductive organs, which, being connected with them, slip to the outside. The reproductive system of the male (Pl. XIV, Fig. 14) — like in other *Chalcididae* — consists of a pair of baglike testes (Fig. 14 t). Either of these is joined to a bifid vesicula seminalis (Fig. 14 vs) by means of a vas deferens. The broader part of the vesicula communicates with the vas deferens and the narrower one opens into a duct, which receives the secreta from the large accessory gland (Fig. 14 ga) and then unites with the similar duct of the opposite side to form a common ejaculatory duct. The latter is joined to the aedeagus (Fig. 16 ae).

The structure of the male copulatory apparatus is normal. It is composed of the aedeagus, shaped in the same manner as in *Secodes coactus* Rtzb. and *Torymus cultriventris* Rtzb. The phallotheca is narrow, long and ovally rounded in its cephalad portion. The clavate hypomers (titillatores autorum) are arranged on the right and left sides of the anal edge of the phallotheca. Each of the hypomers has a hook-like process at its distal end. The process is curved cephalad. The hy-

pomers have a movable attachment with the phallotheca owing to the abductor and adductor muscles (Fig. 16 m, n).

Such is the diagnosis of the species *H. elongatus* FÖRST. based on the analysis of the male and female specimens emerging from the galls of *M. fagi* HTG. in the southern part of Poland. As was said before, this diagnosis differs a little from those made by FÖRSTER (1856) and SCHMIEDEKNECHT (1909).

FÖRSTER (1856) is the author of the genus and the species names *H. elongatus*. At first (1841) he reckoned the species „*elongatus*", found by him, in the genus *Eulophus* GEOFFR. But in 1856 he isolated it from the genus *Eulophus* GEOFFR. and included in a new genus, called by him *Hyperteles*. The word *Hyperteles*, of Greek origin, means that something is extraordinarily big. Here the name refers to the anellus.

According to FÖRSTER both sexes of *Hyperteles elongatus* have the 10-jointed antennae, and no minute segment, called anellus, connecting the pedicel to the first joint of the funicle in other *Chalcididae*, can be distinguished. He adds (1856) that it cannot be seen even when the specimen is magnified 240 times.

On acount of this fact he inferred as follows:

Since at least one anellus (generally very small) is to be found in all *Chalcididae*, it should be assumed that *H. elongatus* FÖRST. has also one, but in an enlarged form. „So darf hier die Behauptung nicht zu gewagt erscheinen, dass das Ringel (i. e. anellus) durch eine übermässige starke Entwicklung den übrigen Geisselgliedern gleich kommt" (FÖRSTER, 1856, p. 86). Then according to FÖRSTER the anellus in *H. elongatus* has not undergone an atrophy but, on the contrary, a multiple enlargement, up to a size of a normal joint of the antennal funicle.

SCHMIEDEKNECHT presents the matter similarly (1909). When characterizing the genus *Hyperteles* FÖRST., he writes: „Fühler zehngliedrig, ein Ringglied fehlt, oder wenn man ein solches annimmt, den übrigen Fadengliedern and Grösse gleich".

The Chalcids, classified above as *H. elongatus* FÖRST., emerging from the beech-galls collected in the environs of Kraków and Krzeszowice, have a vestigial anellus in the antennae; consequently their structure is different from those described by the aforecited authors. They have also a different number of joints. According to FÖRSTER (1856) and SCHMIE-

DEKNECHT (1909) the *H. elongatus* FÖRST. has 10 joints in the antenna, though these authors do not differentiate the anellus in it. On the other hand, the Polish *H. elongatus* FÖRST. has 9 joints excluding the anellus, and it is only with this that the number is 10. Therefore the differences are essential. A question arises, whether the *H. elongatus* FÖRST., found by FÖRSTER and as such probably West-German, really differs from the Polish specimens by the lack of the anellus and the increased number of the joints, or whether the mentioned differences result from a misunderstanding caused by want of attention on the part of FÖRSTER. As to the presence of the vestigial anellus in the antennae of *H. elongatus* FÖRST., it must be remarked that THOMSON did not take any notice of it, too. In the antenna of *Tetrastichus elongatus* FÖRST. (syn. *Hyperteles*) he distinguished the scape, pedicel, 4-jointed funicle (the first joint of which he considered to be the anellus) and 3-jointed club. His opinion differs only as to the number of the joints in the antenna. For he finds 9 and not 10 joints in it. The Chalcids identified as *H. elongatus* FÖRST. and sent us from the G. D. R. have 9 joints in the antennae and not 10. It was impossible to state if the anellus was wanting, as the vestigial anelli are unrecognizable in dry specimens. To ascertain their presence or lack it would be necessary to make preparations from the borrowed material, for which we had no permission. I was only able to make use of the microscopic preparation made by *J. P. Kryger* (this has been mentioned in the Introduction). This preparation represents a female of *H. elongatus* FÖRST., which has no anellus in the right antenna, but seems to have one in the left, though not so distinct as in the Polish specimens. The number of the antennal joints amounts to 9.

From this preparation we can only say that some individuals of *H. elongatus* FÖRST. may possibly have no anelli, but as for now, it is impossible to decide if this is a common feature of the species in some region, as FÖRSTER believed. If it was proved that *H. elongatus* FÖRST. in Western Europe has the antennae always without anelli and in Eastern Europe always with them, a new subspecies should be erected for the eastern type of *H. elongatus* FÖRST. As to the number of

the antennal joints, 10 or 9 without the anellus, we must presume that FÖRSTER made a mistake (1856) and SCHMIEDEKNECHT (1909) repeated the number 10 without checking it. The drawing which the latter author included in his work gives evidence of that. It presents a female of *H. elongatus* FÖRST. of a dark, almost uniformly chocolate colour, with few yellow brightened areas and with 9 joints in the antenna, just as they are in reality.

B. *Hyperteles luteus* RTZB.

It is a Chalcid very similar to *H. elongatus* FÖRST. and like the latter develops in the galls of *M. fagi* HTG. It was attained from the same source by BRISCHKE (1881), when he was working at the *Hymenoptera* of Northern Poland. This is, however, a rare species as compared with *H. elongatus* FÖRST. In the course of three years' investigation (1957—1959) carried out in the environs of Krzeszowice I bred only 5 males and 15 females in confinement. A male of *H. luteus* RTZB. has been described by RATZEBURG (1852) under the name of *Entodon luteus* RTZB. and by THOMSON (1878) as *Tetrastichus luteus* RTZB. The latter author took notice of the differences between *H. luteus* RTZB. and *H. elongatus* FÖRST., but in his concise diagnosis he confined himself to presenting a few most important characteristics, referring probably to both sexes. And this is how SCHMIEDEKNECHT (1909, p. 467) understood this description. Instead the Chalcids regarded by me as *H. luteus* RTZB. exhibit so distinct differences between males and females that it becomes necessary to discuss each sex separately. Their sizes are given in Table I.

The male *H. luteus* RTZB. is as a rule light yellow, and this coloration distinguishes it from the almost black males of *H. elongatus* FÖRST. Besides, its head is broader than the thorax, and the thorax broader than the abdomen, which is cylindrical (Pl. XIV, Fig. 11). The head is light yellow, eyes and ocelli ruby-red, antennae yellow, but the long setae, clinging to the joints, are brownish-black. Only in the region of the ocelli there is a black spot, but none on the occiput.

Nearly the whole of the thorax is yellow. There are only

some mid-dorsal and lateral dark little spots on the prothorax (Fig. 11). A black, longitudinal streak is still visible on the external side of both axillae. On the other hand, the propodeum, fused with the thorax, is black as far as the stigmae. The legs, including the coxae, are yellow, but the pulvilli dark. The whole wings are hyaline.

The abdomen is sessile, light yellow and its terminal third black.

The female is coloured somewhat differently. Its head, like that of the male, is light yellow with the ruby-red eyes and ocelli, and yellow antennae, but besides a black spot in the region of the ocelli, it has another on the occiput. On the prothorax there are dark spots resembling those in the male (Pl. XIV, Fig. 13), but the mesoscutum is rarely uniformly yellow (Pl. XVI, Fig. 30). The shape of the dark brown patch which generally occurs here is various (Pl. XVI, Fig. 31—33), most frequently like that shown in Fig. 33, exceptionally like in Fig. 34. The bifurcation at the rear of the patch is characteristic of it. Thus the shape of the patch on the mesoscutum differs from that in *H. elongatus* FÖRST. and has a taxonomic value. Besides the dark brown patch on the mesoscutum, the female *H. luteus* RTZB. has some little spots on the scapulae and axillae. Its scutellum is always ochreyellow, and the metathorax, being dark laterally, has a light yellow dorsellum. The propodeum is dark, partly black, as far as the stigmae. In the borrowed German specimens of female *H. luteus* RTZB. the mesoscutum is light yellow and without black spots, thus correposnding with Fig. 30 in Pl. XVI of the present work. In the Krzeszowice *H. luteus* RTZB. the coxae and tibiae are ochre-yellow, the remaining parts of legs yellow except for the sternite plates, which are black. The female's abdomen, approximately twice as long as the head and thorax together, is sessile. It is marked dorsally with dark spots of variable outlines on the yellow background.

In addition to the differences in the body coloration of both sexes there are some in the structure of the antennae (Pl. XV, Fig. 17 and 18). The latter differences are of the same character as in *H. elongatus* FÖRST. and therefore there is no need to repeat them (Cf. Tab. II and III).

On the other hand, the comparison of the two related species, *H. luteus* RTZB. and *H. elongatus* FÖRST. may be valuable, the more so, as they both emerge from the galls of *M. fagi* HTG.

M. luteus RTZB.	*H. elongatus* FÖRST.
1. Rare species.	1. Common species.
2. Male's head and thorax light yellow, occiput spotless, abdomen yellow with black terminal section.	2. Males black subtotally.
3. Black patch of various shape and size on female's mesoscutum (Pl. XVI, Fig. 30—33). Specimens without patch occur, but more frequently those with a large patch bifurcated at back (Fig. 33).	3. Black patch on mesoscutum always present and less variable (Pl. XVI, Fig. 26—29), not forked at back, at most with a small indentation, like in Fig. 1 and 28.
4. Two antennal anelli present, of which proanellus developed better than anellus (Fig. 33).	4. One antennal anellus present (Pl. XIII, Fig. 6 a).
5. 1st joint of funicle long, little shorter than 2nd joint, especially in antennae of female (Pl. XV, Fig. 21, Tab. III).	5. 1st joint of funicle short, in females equals the half or the third of 2nd joint (Pl. XV, Fig. 22, Tab. II).
6. Pedicle shorter than 1st joint of funicle in both sexes (Tab. III).	6. Pedicle longer than 1st joint of funicle in females (Tab. II).
7. Number of long setae on joints II—IV of funicle and on 1st joint of club less than 10 in a circle (Tab. IV).	7. In males number of long setae on joints of funicle and on 1st joint of club greater than 10 in a circle (Tab. IV).
8. Rhinaria present in all joints of funicle and club in both sexes (Pl. XV, Fig. 21).	8. Rhinaria missing in 1st joint of funicle (Pl. XV, Fig. 22).

9. Radius in fore-wing without conical protuberance on small clava (Pl. XIII, Fig. 5).
10. Hind-wing with rounded apex (Pl. XIII, Fig. 2).
11. Testis acute, cephalad portion of phallotheca narrowed (Pl. XIV, Fg. 15).i
12. Zoophage.

9. Radius in fore-wing with conical protuberance on somewhat larger clava (Pl. XIII, Fig. 4).
10. Hind-wing with acute apex (Pl. XIII, Fig. 1).
11. Testis rounded, phallotheca uniformly broad (Pl. XIV, Fig. 14).
12. Phytophage.

Table III

Length of antennal joints in males and females of *H. luteus* Rtzb. Length is given in scale marks of micrometric ocular, 1 mark = 3.2 microns. Abbreviations: l — left antenna, r — right antenna. I—IV — joints of funicle, 1—3 — joints of club

H. luteus Rtzb. females		No of preparation	6		7		66		70		87	
			l	r	l	r	l	r	l	r	l	r
		Scape	92	92	93	93	88	88	80	78	89	91
		Pedicel	32	32	36	36	36	38	35	35	34	38
		Anellus										
	funicle	I	41	41	43	44	38	38	36	36	42	42
		II	50	52	49	48	43	41	37	39	47	46
		III	48	47	43	42	38	38	35	34	43	42
		IV	47	46	40	41	26	27	33	34	40	40
	club	1	32	32	30	31	26	28	26	28	30	30
		2	23	24	23	25	26	25	23	20	22	22
		3	24	26	18	20	23	23	20	21	26	26

H. luteus Rtzb. males		No of preparation	11		21		35		93		101	
			l	r	l	r	l	r	l	r	l	r
		Scape	73	73	43	43	67	66	54	55	50	50
		Pedicel	25	25	20	21	22	22	27	27	20	21
		Anellus										
	fuchnie	I	33	33	15	16	26	26	21	18	24	24
		II	44	43	24	23	29	30	34	34	29	29
		III	47	47	28	27	39	40	35	34	31	32
		IV	50	50	25	28	40	38	36	35	32	33
	club	1	30	34	21	22	26	27	27	26	24	24
		2	38	37	22	21	32	32	27	28	30	29
		3	39	38	21	20	40	37	27	26	35	32

Table IV

Number of long setae on particular joints of funicle and club in the antennae of male *Hyperteles elongatus* FÖRST. and *Hyperteles luteus* RTZB.

Chalcid	No of preparation	funicle				club		
		I	II	III	IV	1	2	3
		number of long setae						
Hyperteles elongatus FÖRST. males	9	12	16	13	14	14	6	0
		13	16	13	14	15	4	0
	12	15	14	14	13	14	6	0
		18	18	12	12	13	7	0
	31	16	14	13	16	15	7	0
		16	15	13	12	12	4	0
Hyperteles luteus RTZB. males	11	10	7	6	5	7	0	0
		9	5	6	5	5	0	0
	21	8	5	5	5	5	0	0
		6	5	4	5	5	2	0
	35	9	7	6	7	8	0	0
		10	7	6	6	4	0	0

III. BIOLOGY OF *H. ELONGATUS* FÖRST. AND *H. LUTEUS* RTZB.

The details of the life of the Chalcids belonging to the genus *Hyperteles* FÖRST., presented below, refer almost entirely to *H. elongatus* FÖRST. This species is common in the environs of Kraków and Krzeszowice and therefore well suited — better that the rare *H. luteus* RTZB. — for its development to be watched.

A. Phytophagism of larval *H. elongatus* FÖRST.

At first, like RATZEBURG (1844), FÖRSTER (1856), THOMSON (1878), BÜSGEN (1895) and ESCHERICH (1942), I regarded the Chalcid *Hyperteles elongatus* FÖRST. as a parasite of *M. fagi* HTG. I grounded my opinion on the investigations carried out from July to autumn in the years 1947 and 1948. It was only when I examined the interiors of the gall chambers of

M. fagi HTG. in May and June that I got convinced of my error.

I made my first discovery on 29th May 1949. In 16 of 56 galls collected in Las Wolski near Kraków on that day I found eggs, one in each, freshly laid, beside the dead bodies of *M. fagi* HTG. Similarly on 6th June 1949 among 64 galls collected at the same locality I found 17 with the eggs of *H. elongatus* FÖRST. beside *M. fagi* HTG. being already dead. They were undoubtedly the eggs of this Chalcid, as such were the larvae reared from them in a wet chamber. No egg of *H. elongatus* FÖRST was ever found beside a living or paralysed larva of *M. fagi* HTG. Consequently parasitism is out of question. Necrophagism cannot be assumed as well, and this for the following reasons:

The corpse of *M. fagi* HTG. found on the wall of the gall chamber in the vicinity of the egg and later of the larva of *H. elongatus* FÖRST., which had hatched from the egg, was generally in an uneatable condition. Once the dead larva was covered with dark spots all over its body, frequently it was browned, which indicated that decomposition had started inside. Another time the liquid content poured out of the dead body at an opening in the skin into the gall chamber. Most often, however, the dry skin of the larva was present on the wall of the gall, close to the egg of *H. elongatus* FÖRST. (Tab. V). Such was the case in May and at the beginning of June. Later, the larva of *H. elongatus* FÖRST. lived on the wall of the gall chamber, in which there was alwys the dry skin of *M. fagi* HTG.

The observation of living larvae of *H. elongatus* FÖRST. from their emergence till pupation also denied necrophagism. They appeared to take no interest in the dead bodies of the larvae of *M. fagi* HTG., but only and exclusively in the gall wall from which they drew their nourishment. From hatching in May till the end of their larval life in autumn they stay in the gall chamber, in which they cannot find anything but plant food. Feeding on the sap of beech *Fagus silvatica* L., drawn from the gall walls, they grow, develop and at last pupate.

In consequence we must assume that the larvae of *H. elon-*

Table V

State of the corpses of larval *M. fagi* HTG. in the 16 galls in which living eggs of *H. elongatus* FÖRST. were found on 6th June 1949

No	State of corpse	No	State of corpse
1.	little changed	9.	in decomposition
2.	little changed	10.	dried-up
3.	little changed	11.	dried-up
4.	little changed	12.	dried-up
5.	in decomposition	13.	dried-up
6.	in decomposition	14.	dried-up
7.	in decomposition	15.	dried-up
8.	in decomposition	16.	dried-up

gatus FÖRST. are phytophagous just as the larvae of *M. fagi* HTG.

It sounds rather sensational, because it concerns the Chalcid species never suspected to be phytophagous before. The information on the phytophagism of the larvae of some Chalcid species is no novelty at the present time. Different authors have written on this subject, and the general results have been listed among others by BISCHOF (1927). He reckoned the genera of *Syntomaspis* FÖRST., *Megastigmus* DALM. and *Callimome* SPIN. among the European phytophages of the sub-family *Toryminae*. Their larvae feed on the seeds of *Prunus* L., *Sorbus* L., *Crataegus* L. and those of various conifers. In the phytophages he also counts a number of the relatives of the above-mentioned Chalcids of the group *Isosomini*. Some of them produce galls and some (American) feed on the seeds of various plants. This author, however, does not mention anything about the phytophagism of the Chalcids of the sub-family *Eulophinae*.

Regardless of that I maintain that *H. elongatus* FÖRST. is not a parasite of *M. fagi* HTG. Its females do not look for the living larvae of *M. fagi* HTG. in order to lay their eggs in or on them, but only and exclusively for an empty living space for their progeny. They find this space in gall chambers with *M. fagi* HTG. being dead. In connexion with this the larva of *H. elongatus* FÖRST. hatched from the egg becomes a secondary lodger of the gall or its so-called inquiline.

B. Mortality of larval *M. fagi* Htg.

Then the females of *H. elongatus* Först. search for the galls with the dead bodies of larval *M. fagi* Htg. or, as I call them, the empty galls. These are rather numerous in beech trees from june to autumn, especially during the gradiations of this pest in nature.

The larvae of *M. fagi* Htg. may seem to have perfect living conditions. They grow and develop in concealment, unseen from outside, behind the relatively thick, hard and nutritious wall of a gall. And yet this wall is not a satisfactory shelter for them. Years occur, when an enormous percentage of the larvae of *M. fagi* Htg. perish. In the autumns of 1958 and 1959 there were beeches in the Krzeszowice region, in which the galls with healthy larvae of *M. fagi* Htg. amounted to 1—2%.

So the mortality of the larvae is sometimes very high. The cause of death may be threefold:

a. The larva of *M. fagi* Htg. dies a natural death.

b. An external enemy pierces the gall wall with its proboscis and then sucks the larva out.

c. The larva has been paralysed or killed with the ovipositor of a Chalcid.

Ad a. In some cases the larva of *M. fagi* Htg. perishes, not killed by a predaceous insect, but indeed in a manner which I call natural.

When examining the inside of the gall that hides the corpse of *M. fagi* Htg. carefully under a low-power lens, we occasionally find that the gall wall is whole. Hence the conclusion that in this case an external predaceous insect could not be the cause of death. Such an enemy always leaves a sign in the gall wall in the form of a puncture, through which it has attacked the chamber inhabitant. If there is no such sign, one should suppose that the larva of *M. fagi* Htg. died a natural death, or in other words fell ill and died in the chamber. Such cases occur rather often.

Ad b. Examining carefully the gall chambers and the dead bodies of the larvae of *M. fagi* Htg., we find out that a number of the larvae have been partielly or wholly sucked

by an external perpetrator. A great number of the larvae, particularly the young ones, in the first instar, are doomed to this fate.

The galls, in which these young larvae live, are still very small, soft and succulent. The height of the part above the leaf does not exceed 2 mm. The unknown predator sometimes sucks the larva so thoroughly that the remaining, thin, colourless, transparent skin is hardly noticeable in the gall.

In spite of my efforts I failed to find out the perpetrator. However, it seems to me that the death of *M. fagi* HTG. may have been caused by the predaceous larvae of certain Neuroptera. In May the plant-lice *Phyllaphis fagi* L., covered with white, waxy, flocculent threads, begin to feed on the bottom side of the leaves of beeches. Enemies, including the predaceous larvae of Neuroptera of the family *Hemerobiidae*, appear among the plantlice. Perhaps besides the latter, they also kill the juvenile larvae of *M. fagi* HTG., which are easily accessible from outside at that time (Dziurzyński, Part I, 1961).

The larva in the second instar less frequently die by violence. When sucked wholly at this stage it has a characteristic appearance. An empty, transparent skin with a hole preserved in it and adhered to the hole in the gall wall remains after the sucked larva of *M. fagi* HTG. (Pl. XVII, Fig. 43 o). The skin so prepared differs distinctly from the corpse of the larva which having perished in a different way, underwent slow decomposition and then dried up. For the dried bodies are not colourless and transparent but brown and brownish-black. Thus we are able to recognize from its appearance whether the larva of *M. fagi* HTG. has been sucked out or has died in a different way. Nevertheless, the perpetrator of its death still remains unknown.

It may be supposed that this is an insect possessing a rather long suctorial tube, perhaps some bugs feeding on the blood of insects. As early as in 1927, K. STRAWIŃSKI noticed the appearance of a predaceous bug *Picromerus bidens* L. in our woods. Its presence was also ascertained in the Krzeszowice woods, where the gaals for this study were collected. TEMPEL (1939) reported the mass occurrence of predaceous buds *Pinthaeus sanguinipes* F. and *Troilus luridus* F. in some of

German woods. The presence of *Troilus luridus* in our woods has been stated by W. KOEHLER (1948). So some of the aforecited bugs may be suspected of sucking the larvae of *M. fagi* HTG. Although none of these bugs was to be found on the foliage of beeches in the explored area, the eggs of *Troilus luridus* F. were, however, seen on the leaves of young birches.

At last it happens that the death of the larva of *M. fagi* HTG. is caused by a Chalcid. Some of the *Chalcididae* deposit their eggs in the unparalysed body of the host. To these belong *Secodes coactus* RTZB. The female of *Secodes* normally lays one egg in the body of larval *M. fagi* HTG. The larva hatches from the egg in May and the imago emerges in the spring of the next year. In this case the gall chamber is occupied up to the end and cannot serve as a place for the hatching and developing of a larva of *H. elongatus* FÖRST.

However, occasionaly the course of infestation and development of a parasite can have a different effect. Of 100 galls collected on Mt. Niedźwiedzia Góra on 25th May 1959 22 contained the healthe larvae and 69 were infested by *S. coactus* RTZB. In addition 6 galls were empty, i. e. with dead bodies of larval — *M. fagi* HTG. and 3 showed other contents (Tab. VI, Item 1).

Further 600 galls from the same locality were examined for their contents from May to September 1959. A considerable decrease in the number of the galls with parasitic *S. coactus* RTZB., from 69% in May to 6% in September, was found. On the other hand, the number of empty galls increased up to 39% and that of galls occupied by the larvae of *H. elongatus* FÖRST. or by the larvae of *H. elongatus* FÖRST. with accompanying larvae of *T. cultriventris* RTZB. increased to 36%.

The decrease in the number of the larvae of *M. fagi* HTG. infested by *S. coactus* RTZB. from 69% to 6% may be explained by the fact that they prematurely died in the gall chambers together with their parasites.

The reason for the death of the infested larvae might be as follows: I ascertained that in the spring of 1959 a great number of larvae contained not one, as usual, but several, up to 10 parasitic larvae of *S. coactus* RTZB. I explain the increased number of parasitic larvae in a single *M. fagi* HTG.

Table VI

Death-rate of the larvae of *M. fagi* HTG.

The contents of the chambers of 700 galls, collected on Mt. Niedźwiedzia Góra from 25th May to 29th September 1959 have been examined. Abbreviations: O — empty chamber. Besides, the developmental stages of *Chalcididae*: S — *Secodes coactus* RTZB., H — *Hyperteles elongatus* FÖRST., T — *Torymus cultriventris* RTZB.

Date of collection of each hundred of galls	*M. fagi* HTG. healthy			*M. fagi* HTG. corpse					
	Stage of life			In chamber besides corpse					
	II	III	gall with membrane	O	S	H	H+T	T only	other contents
25 May	22	—	—	6	69	—	—	—	3
7 Aug.	4	—	—	27	15	28	22	3	1
7 Aug.	11	16	—	20	19	17	10	3	4
26 Aug.	1	—	—	18	14	35	27	—	5
26 Aug.	—	5	1	34	14	21	15	6	4
29 Sept.	—	2	1	37	10	21	17	—	12
29 Sept.	—	—	—	39	6	20	16	—	19

by repeated infestations performed at intervals by various females of *S. coactus* RTZB. The defensive reaction of the infested larvae of *M. fagi* HTG. caused the death of some of the parasitic larvae. However, while some of them were perishing, the new ones hatched from the recently laid eggs. It seems that this struggle on the part of the hosts, at first successful, then exhausted them so much as to lead to their premature death.

This phenomenon was undoubtedly abnormal. The multiplied infestation in 1959 can be explained by a remarkable difference in the magnitude of the populations of *H. fagi* HTG. and of *S. coactus* RTZB., in other words, by a small quantity of the galls with healthy larvae of — *M. fagi* HTG. and a great — as compared with it — number of the females of *S. coactus* RTZB.

After the death of the infested larvae of *M. fagi* HTG., the Chalcids *H. elongatus* FÖRST. could occupy the emptied galls. Other species of *Chalcididae* act differently than the females of *S. coactus* RTZB. They paralyse the larva of — *M. fagi* HTG. by pricking it with the ovipositor and lay an egg by the

paralysed larva. The larva newly-hatched from the egg feeds on the body of the paralysed one (biophagia). Finally, other females kill the victim and their offspring commit necrophagia.

C. Behaviour of female *H. elongatus* FÖRST. towards the larvae of *M. fagi* HTG.

A question arises, whether the female of *H. elongatus* FÖRST. kills the larvae of *M. fagi* HTG. in order to secure their lodgings. Some observations deny this. If we collect more leaves of beech with several galls on each and examine the contents of their chambers, we shall often notice that only in one gall of each leaf there is a larva of *H. elongatus* FÖRST., whereas the other galls on the same leaf are occupied by living and healthy larvae of *M. fagi* HTG. If the female of *H. elongatus* FÖRST. killed the larvae of *M. fagi* HTG. to gain their gall chambers for its progeny, probably it would not leave the adjacent galls with the living larvae of *M. fagi* HTG. in them.

Besides, it is easy to state that the female of *H. elongatus* FÖRST. most often deposits its egg in a chamber with a decomposing corpse of *M. fagi* HTG. or even with its quite dry body (Tab. V). We can see from this that the death of the Cecidomyid larva had taken place many days before the egg was laid by the Chalcid. Hence we arrive at a certainty that this Chalcid did not cause the death of the larva.

Nevertheless, the possibility of the killing of the larval *M. fagi* HTG. by the females of *H. elongatus* FÖRST. cannot be excluded, but then it must be assumed that, if this happens at all, it happens very rarely and rather only in the years, when the Chalcids appear in the given region in so large a number that empty gall chambers are lacking. This probably occurs very rarely. The comparison of the observational findings presented in Table VII throws some light upon the question. The observations were carried out on 350 galls collected in 1957 at intervals of seven uneven periods of time, 50 galls for a time. They were plucked from one beech-tree growing on Mt. Niedźwiedzia Góra near Krzeszowice. The galls with empty chambers appeared to be present over the whole time

of our researches, from June to September. So the female *H. elongatus* FÖRST. had no trouble in laying eggs that year.

Finally it can be assumed that the female of *H. elongatus* FÖRST. looks for empty galls and in such lays its eggs. Its larvae are phytophagous. They live on the sap drawn from the gall walls, —*M. fagi* HTG. being dead by this time. Consequently they are not its enemies, but secondary lodgers of the gall chambers or their inquilines.

Although the larvae of *H. elongatus* FÖRST. are phytophagous at present, this kind of nourishing has been probably proper to them for a comparatively short period of time. This is suggested by the appearance of their mouth-parts, which do not differ from the mouth-parts of the parsitic larvae of *Chalcididae* (Pl. XVII, Fig. 42). It must be added that the larvae of *H. elongatus* FÖRST. have not lost the instincts of predaceous insects yet. This may be proved, when breeding their eggs in the wet chamber. The larvae that hatch from the eggs first destroy the eggs being near to them or even the other larvae, if they have been able to hatch in the chamber.

To obtain the imagines from the larvae of *H. elongatus* FÖRST. collected early in autumn, the latter must be bred for a rather long stretch of time. It is impossible to feed them with galls, as these dry up quickly, when cut open, and after several days are not suitable as food for the larvae. In spite of that the imagines can be obtained, if a larger number of the larvae are bred all together in a closed small vessel. The larvae collected in October were reared in Petri dishes lined with absorbent paper wetted with water every now and then. At first each larva lay in the half of the gall in which it had been laid. This, however, lasted short, since the larvae left the galls, krept down to the bottom of the dish and gathered there, forming an accumulation numbering several or more individuals.

At that time they attacked one another, sucking out the liquid content of the body of the nearest neighbour. A part of the larvae perished, but the rest reached their maximum growth, despite their premature leaving of the galls, and pupated. Thus in the abnormal conditions of breeding the larvae

of *H. elongatus* FÖRST. became ectoparasites, and what is more, committed cannibalism.

The opinion that the phytophagism of the larvae of this Chalcid arose not long ago is supported by the existence of

Table VII

Inhabitants of 350 galls of *M. fagi* HTG.

All galls collected from the same beech-tree on Mt. Niedźwiedzia Góra near Krzeszowice in 1957. They were plucked at various intervals, 50 galls at a time. Calculated in %. Abbreviations: H — *Hyperteles elongatus* FÖRST., T — *Torymus cultriventris* RTZB.

No	Chamber inhabitants		Instar	When collected						
				19 VI	29 VI	30 VII	13 VIII	20 VIII	14 IX	16 X
1.	living larva of *M. fagi* HTG.	Healthy	II	60	58	28	28	14	—	—
2.			III	—	—	—	30	32	40	2
3.		With endoparasite		—	—	—	2	—	4	—
4.		Paralysed with ectoparasite		—	—	—	—	—	—	2
5.	dead larva of *M. fagi* HTG.	Empty chamber		12	16	22	12	16	12	24
6.		H egg + T egg		—	2	—	—	—	—	—
7.		H egg + T larva	I	—	2	—	—	—	—	—
8.		H larva	I	6	12	6	8	6	—	—
9.		H larva + T egg	I	2	—	2	—	—	—	—
10.		H larva + T larva	I	4	8	32	14	22	—	—
11.		H larva	II	—	—	—	2	6	8	34
12.		H larva + T larva	II I	—	—	—	—	4	20	2
13.		H larva + T larva	II II or III	—	—	—	—	—	14	34
14.		T egg		8	—	—	—	—	—	—
15.		T larva	I	8	2	10	4	—	2	2

its close relation, *H. luteus* RTZB., which parasitizes externally upon the larvae of *M. fagi* HTG. as well as upon those of *H. elongatus* FÖRST.

D. Development of *H. elongatus* FÖRST. and *H. luteus* RTZB.

Egg. The female of *H. elongatus* FÖRST. punctures the gall wall with its ovipositor and lays an egg in the chamber with the dead larva of *M. fagi* HTG. In spring there are sometimes two eggs instead of one in the chamber. They might be laid by a single female or by two ones at various moments of time. In both cases one of the eggs is odd. This odd egg undergoes dustruction by the larva that has hatched first.

The egg of *H. elongatus* FÖRST. is oblong, thin, widened a little at one end, in short, it is club-shaped (Pl. XVII, Fig. 35). Its length ranges from 456 to 557 microns. It is coated with a colourless, smooth and glittering chorion. We are getting convinced of its presence, when watching the embryonic development taking place within it. For in the course of time the embryo occupies only the middle part of the chorion and consequently the empty, in this case, and transparent parts of chorion can be seen at both ends of the egg (Pl. XVII, Fig. 35 and 36).

First larval instar. The embryonic development lasts short. In the case presented in Fig. 35—37 it lasted 62 hours, i. e. a little more than two days and a half, from egg-laying to hatching. The egg was bred in a wet chamber in a temperature of 22°C.

Only one larva of *H. elongatus* FÖRST. lives in the gall chamber. It is covered with a smooth skin with few, very fine setae, which can be seen under a high-power lens. The broad, rounded head with two conical rudiments of antennae can be distinguishes in the body of the larva. The mouth-parts with tongs-like, mobile mandibles are at its ventral side. The head is followed by the three-jointed thorax and then ten-jointed abdomen. On the mesothorax and on the first three abdominal segments 4 pairs of spiracles are seen on the very first day after hatching. The spiracles are located at the ends of short tracheal branches, which arise from the longitudinal side trunk of trachea (Pl. XVII, Fig. 38).

The abdomen is somewhat tapering caudad. The intestine, visible through the skin, is closed in its terminal section. In

connexion with this the larva of *H. elongatus* FÖRST., like other larvae of *Chalcididae* and those of *M. fagi* HTG., does not discharge faeces. It is so till the time preceeding pupation, when the alimentary canal becomes entirely patent. Owing to this arrangement the inside of the gall is clean.

The contents of the intesitne may be colourless, brown, pink and even blood-red. The dimensions of the larva in its first instar are 0.4—1.64 mm in length and 0.15—0.52 mm in width.

Second larval instar. In the second instar the larvae have not 4 but 9 pairs of spiracles (Pl. XVII, Fig. 39). This number of spiracles appears already, when the larva is a little longer than 1.64 mm, and obtains up to the end of its larval life. The spiracles are situated on segments II—X laterally, whereas segments I and XI—XIII are quite deprived of them. The spiracles are connected by means of short branches with 2 lateral tracheal trunks, which at this stage form numerous minute offshoots (Pl. XVII, Fig. 39). There are 2 anastomoses between the trunks: the anterior anastomosis in segment II and the posterior one in segment XI.

The growth of the larva lasts long, from May till autumn. No exuviae were noticed. In the middle of August the larvae reach a length of about 2.5 mm and in October about 4 mm. In addition, they become milk-white and often bend their bodies receiving a horseshoe shape.

On the head of the larva there are its mouth-parts. These are situated in the „mouth space", which has an oval shape (Pl. XVII, Fig. 39 and 42). In the second instar the long axis of this space approximates to 0.15 mm and the short axis to 0.11 mm. An arcuate epistoma can be distinguished among the mouth-parts. It is directed frontad and has two pleurostomae joined to it, which form the articular processes for the mandibles (Fig. 42 pl, md). The transverse line from one margin of the space to the other, approximately at level „md" — „pl" in Fig. 42, is 0.04 mm long in the larvae in the first instar, and in older ones it is almost always 0.8 mm independently of their size. So the growth of the body from 1.64 mm to 4 mm does not bring about the growth of the mouth-parts. This

would indicate that the larva of *H. elongatus* FÖRST. has only two developmental stages.

Besides the mouth orifice and mandibles there are two light, circular areas with dark rims (Fig. 42 s) on both, left and right, sides of the mouth space. Their arrangement and size as well as the distance between the particular ones in pairs are constant and characteristic of the larvae of a definite age, belonging to this species of *Chalcididae*. The larvae of other species possess similar organs, but in different numbers and differently distributed. These are probably their sense organs.

In October a part of larvae, after attaining patency, evacuate their alimentary canal and some dozens of hours later pupate.

The pupae of males are short and have abdomens normally dveveloped (Pl. XVII, Fig. 40), those of females possess long abdomens (Pl. XVII, Fig. 41). When bred in confinement, males and females begin to emerge from the pupae in November of the first year.

Information on the development of *H. luteus* RTZB. is very poor. This results from the rare occurrence of the larva of this Chalcid in the country and from its similarity to other species.

The larvae of *H. luteus* RTZB. were noticed for the first time only in 1957. They seemed to be larvae of *H. elongatus* FÖRST., so much resembled the latter in shape, size and habitat. Externally they differed from them only by their yellowish coloration.

The second time they were found in 1958. They lived in the galls of *M. fagi* HTG. collected on Mt. Niedźwiedzia Góra at the end of summer and at the beginning of autumn. This time they were observed earlier than in the year 1957, and so it was possible to state that their manner of feeding essentially differed from that of the larvae of *H. elongatus* FÖRST. It appeared that the larvae in question are zoophagous, or rather necrophagous, eating up the larvae of *M. fagi* HTG. Imagines issued from the reared larvae as early as December 1958.

The third time the larvae of *H. luteus* RTZB. were found at the end of the summer of the year 1959 in the same place as in 1957 and 1958. This time they fed not on the larvae of *M. fagi* HTG. but on those of *H. elongatus* FÖRST. This may be explained by the fact that the Cecydomyid larvae were scarce in 1959, and the larvae of *H. elongatus* FÖRST. were quite common.

A rather enigmatic phenomenon must be still mentioned here. In one of the beech shrubs growing in the region, where the larvae of *H. luteus* RTZB. were occuring on Mt. Niedźwiedzia Góra, 16 galls with very interesting contents were found on 12th October 1958. In each of them there was a colourless or yellowish Chalcid larva, and a black, perforated, net-like membrane was spread at the base of the gall chamber. A fragment of this net is shown in Fig. 25 of Plate XV. Two females and a male have been reared from the larvae. The received imagines did not differ from *H. luteus* RTZB. in their external appearances. However, the origin of the nets is rather enigmatic.

Probably they were formed in the following manner: At the end of summer the larvae of *M. fagi* HTG. living in the galls are at the last stage of development. In the final period of this stage they cover the bottom of the gall chamber with a white membrane, called here the obturating membrane. They weave it of the excretion of their spinning glands. The galls with the membranes fall down to the ground not long after.

It may be supposed that in September, or a little later, a female of *H. luteus* RTZB. paralysed the larva of *M. fagi* HTG. and laid its egg in the gall just when the latter was weaving the obturating membrane. The paralysed larva could not complete the started work and in consequence left in the gall the unfinished membrane full of apertures, similar to a net. This interpretation of the origin of the enigmatic net is supported by the manner in which the net is attached to the gall wall, strongly resembling the manner commonly used by the healthy larvae of *M. fagi* HTG. However, the colour of the net denies it. For the obturating membrane is snow-white, and the net in question is almost always black.

IV. *TORYMUS CULTRIVENTRIS* RTZB. (SYN. *CALLIMOME CULTRIVENTRIS*)

A. Imago

Torymus cultriventris RTZB. is a very common inhabitant of the galls of *M. fagi* HTG. in the investigated region. The specimens bred from the galls collected in the environs of Kraków and Krzeszowice have a structure conforming to the diagnosis of MAYR (1874), so it seems unnecessary to present the author's own diagnosis of the imago. Hence I give only the description of the male reproductive organs below.

The reproductive organs are paired and symmetrically built. The gonads are situated at both sides on the male's abdomen (Pl. XVIII, Fig. 44 t). They are in the shape of oblong, spindlelike sacs. The testis is joined to the pear-shaped vesicula seminalis (Fig. 44 vs) by means of a short vas deferens. The broader portion of the vesicula communicating with the vas deferens has a cadmiumyellow coloration in the reflected light, instead the narrowed part, lying behind the former, is white. The big, accessory gland, curved in the shape of the letter S (Fig. 44 ga) opens into the ejaculatory duct. All these organs are connected with their counterparts on the other side. In the Chalcids of the genus *Torymus* DALM. at the junction there is an unpaired, cylindrical organ with the reticular surface, probably an accessory gland, but different from that shown in Pl. XVIII, Fig. 44 ga. I have named it the prostate (Fig. 44 pr). This gland communicates with the aedeagus. The reproductive organs shown in Fig. 47 belong to a male *Torymus* DALM. but of another unknown species. It can be easily noticed that the differences are here very little. For they concern only the shape of the testis and prostate.

The aedeagus is shaped as shown in Fig. 44 ae and it is somewhat longer than the phallotheca. In its caudal part, which extends outside, it has a shape of a boat with its bottom turned dorsad. The cephalad part, which always remaines in the abdomen, consists of two long processes. In the insect's life-time the whole lies in the short trough-like phallotheca (Fig. 44 ph). The bottom of the trough is turned downwards

and the concave upwards. The hypomers are situated ventrally near the symmetry axis on the anal edge of the phallotheca (Fig. 45 h). The hypomers, called by some authors titillatores, have a mobile junction with the phallotheca. Both are in the shape of a trapezoid plate. This plate is joined to the phallotheca along its shorter side, whereas on the opposite side it has three thorns (hooks), strongly sclerosed, serving for holding the female during copulation. So the hypomers of the male of *T. cultriventris* RTZB. are tridentate. Besides the specimens with the tridentate hypomers, those with the four-tooth hypomers appear occasionally. The difference in the hypomer structure, however, does not indicate the presence of two different species of these Chalcids, and this is so because some specimens of male *T. cultriventris* RTZB. occur, whose hypomers have unequal number of teeth, e. g. the left one with three teeth and the right one with four (Pl. XVIII, Fig. 45). Of 37 male specimens from Las Wolski near Kraków 27 had tridentate hypomers, 6 with 4 teeth and 4 with unequal number of teeth.

B. On the life and development of *T. cultriventris* RTZB.

According to BÜSGEN, besides *H. elongatus* FÖRST., *T. cultriventris* RTZB. is a parasite of *M. fagi* HTG.

This erroneous supposition must be rejected. Several years' investigation of the larvae of *Chalcididae* in the galls of *M. fagi* HTG. proved that the larvae of *T. cultriventris* RTZB., although they parasitize in the galls of *M. fagi* HTG., are not parasites of this Cecidomyid. Instead they parasitize upon the larvae of *H. elongatus* FÖRST.

The egg and the first larval instar of *T. cultriventris* RTZB. An egg of *T. cultriventris* RTZB. (Pl. XVIII, Fig. 48) can be easili distinguished from that of *H. elongatus* FÖRST. because it has a different shape, size and chorion structure.

It is oval in shape, narrowed at both ends and dorso-ventrally flattened. Numerous, minute, rod-shaped prominences are present on the surface of the chorion, by which this egg can be differentiated from the quite smooth, oblong

and clavate egg of *H. elongatus* FÖRST. at first sight. Its dimensions are approximately 0.6 mm by 0.18 mm.

The larva that hatches from the egg has the yellow head capsule, 3-jointed, colourless thorax and 10-jointed abdomen also colourless (Pl. XVIII, Fig. 50). On the dorsal side of the head there are the minute, at this stage of life rod-like antennae, and on the ventral side the mouth-parts, built similarly to those in other *Chalcididae*. Their diameter amounts to 0.067 mm. Two characteristic sense organs are present between the mandibles in the mouthspace (Pl. XVIII, Fig. 51 x). The body of the larva is covered with setae. On the head the setae are comparatively few, hardly 6 pairs of them. Considering their location, they can be called setae pro- sub- post- antennales, verticales, laterales and ventrales. On the other hand, the surface of the thorax and abdomen is covered with the thicket of fine setulae with few but long setae growing out among them. The last abdominal segment has no long setae but two fleshy, naked prehensile processes at the end.

The larva has no legs, but nevertheles it moves very fast on the wall of the gall chamber in a manner similar to that of leeches and moths caterpillars of the family *Geometridae*. For this purpose they use their mouth-parts and anal prehensile processes.

Larva I has 4 spiracles at either side. The 1st pair of these lies on the mesothorax and the remaining three pairs on the first three abdominal segments. After leaving the chorion it is about 0.6 mm long, therefore it is in general bigger than the larva of *H. elongatus* FÖRST. at the same age. Hence it occurs in spring that a host smaller than its parasite feeds in the gall.

The female of *T. cultriventris* RTZB. does not search for the galls with the living larvae of *M. fagi* HTG. in them to secure them for its offspring, but for those in which they are already dead. So it behaves similarly to the female of *H. elongatus* FÖRST. In consequence it often happens that both these females deposit their eggs in an empty gall chamber nearly at the same time. But it may also happen otherwise, that is to say, only one of the mentioned Chalcids has laid its egg in the empty chamber. If this is the egg of *H. elongatus* FÖRST.,

the larva hatched from it, being a phytophage, will develop on and produce an imago finally. If, however, the only egg present in the gall is that of *T. cultriventris* RTZB., the larva hatched from it, after waiting a spell for its victim, will die of hunger. Hence it occurs that in a gall with the corpse of *M. fagi* HTG. there is also a dead larva of *T. cultriventris* RTZB. The detailed results of the computation concerning the year 1959 are given in Table VIII. The interiors of 1000 gall chambers have been examined. Of these 307 galls were empty, i. e. with dead bodies of *M. fagi* HTG. and without any living larva of a Chalcid. Of the 307 galls 141, nearly 46%, contained a dead larva of *T. cultriventris* RTZB. beside the corpse of *M. fagi* HTG.

The following fact may be seemingly not understandable. The dead body of a larva of *T. cultriventris* RTZB. happens to be present beside a living and normally developing larva of *H. elongatus* FÖRST., in other words, the corpse of a parasite beside its living host. One might suppose that the latter larva has killed the former. This, however, is hardly possible, as the larva of *H. elongatus* FÖRST. does not react to the attacks of its parasite at all. But it can be explained in another, equally simple manner and quite probable too. The female of *T. cultriventris* RTZB. had laid an egg in the empty gall chamber some time earlier than *H. elongatus* FÖRST. did. The parasitic larva hatched from the egg but did not live to see its host and died of hunger. Some time later the gall was found by the female of *H. elongatus* FÖRST., which laid its egg in it. Among 1000 galls examined (Tab. VIII) there were 219 galls with living larvae of *H. elongatus* FÖRST. Of them 35, nearly 16%, contained dead larvae of *T. cultriventris* RTZB.

Most frequently, however, the young larva of *T. cultriventris* RTZB. finds a larva of *H. elongatus* FÖRST. in the chamber. It is interesting that the female of *T. cultriventris* RTZB. does not paralyse the larva of *H. elongatus* FÖRST. The latter remains in the chamber alive and undamaged, moves in it and feeds quite normally. The paralysing of the larva of *H. elongatus* FÖRST., under the living conditions discussed above, would be rather harmful than beneficial to the progeny of the parasitic Chalcid. In spring the larva of *H. elongatus* FÖRST. is so small

Table VIII

Number of dead larvae of *T. cultriventris* RTZB. in empty gall chambers and in galls with living larvae of *H. elongatus* FÖRST. Ten hundreds of galls of *M. fagi* HTG. were examined in August and September 1959. Abbreviations: O — empty chamber, T — dead larva of *Torymus cultriventris* RTZB. in the first instar, H — larva of *Hyperteles elongatus* FÖRST.

Serial No of hundred of galls	When collected	Dead larva of *M. fagi* HTG. in gall (dried body on wall) Besides, in chamber were				Other contents of chamber
		O	T	living H only	living H + T	
1.	20. VIII.	12	23	15	6	44
2.	20. VIII.	13	20	20	8	39
3.	26. VIII.	8	10	25	10	47
4.	26. VIII.	13	9	20	4	54
5.	26. VIII.	24	10	18	3	45
6.	24. IX.	18	11	15	3	53
7.	24. IX.	20	19	20	0	42
8.	24. IX.	24	13	21	0	42
9.	24. IX.	17	15	26	1	41
10.	24. IX.	17	11	4	0	68
	Total:	166	141	184	35	474

that it could not feed up a relatively big parasite such as *T. cultriventris* RTZB. with its body. So it must live and grow simultaneously with its persecutor. It cannot escape from the small chamber without an outlet. The larva of *T. cultriventris* RTZB., which moves much faster, will find it here without difficulty.

The larva of *T. cultriventris* punctures the skin of its host occasionally, sticks to the hurt place and sucks its body out. In the first instar it does not do continuously. It leaves its host alone very often and creeps along the chamber wall in a manner similar to that of a leech. Besides it moves its head as the larva of *H. elongatus* FÖRST. does, when it sucks food out of the gall wall. It is sometimes possible to see the movements of its pharyngeal muscles through the microscope. They are like the movements performed by the larvae of *Chalcididae*, when they are sucking. Hence it may be inferred that the larva of *T. cultriventris* RTZB., being zoophagous, feeds also on plant food in the first instar of its life. The plant food

drawn out of the gall wall would serve here as supplementary food, which is not sufficient to keep the larvae alive and must be completed with the food from the body of *H. elongatus* FÖRST. This results from the fact that the larva of *T. cultriventris* RTZB. dies, if that of *H. elongatus* FÖRST. has not appeared in time.

Lastly, it happens, though quite exceptionally, that the female of *T. cultriventris* RTZB. deposits the egg in the chamber, in which a healthy larva of *M. fagi* HTG. feeds. Of above 21000 galls whose chambers were examined during the present studies only 3 exhibited this abnormality. It may be presumed that this happens by chance, and in this case the larva of *T. cultriventris* hatched from the egg dies. For it can parasitize only on the larvae of *H. elongatus* FÖRST. but not on those of *M. fagi* HTG.

The second and third instars. The first instar of the larva of *T. cultriventris* RTZB. lasts long. In late August the larvae in the first instar prevail in the galls over the larvae that have started the second instar. After shedding the skin, i. e. in the second instar the larva of *T. cultriventris* RTZB. differs from that in the first instar in the following details:

Its head is almost spherical and colourless with the stubby antennae; only the mandibles are yellow. The body of the larva is thinly covered with long but flaccid setae arranged in transverse, single rows on the particular segments in a manner shown in Pl. XIX, Fig. 52. The setae are longer on the dorsal side than on the ventral side. The prehensile anal processes remain unchanged.

In the second instar the parasite changes its behaviour towards the larva of *H. elongatus* FÖRST., which at that time reaches its maximum size. The larva of *T. cultriventris* RTZB. becomes uncommonly aggressive towards it. Now it is not satisfied with pricking the skin of its host and sucking the juice through the puncture. It attacks the host, tears the skin asunder, inserts its head into the body through the broad opening and devoursit slowly. At last the larva of *H. elongatus* FÖRST. has been eaten up completely, and only a wet spot remains on the gall wall, where it was feeding previously.

This wet spot dries up quickly and vanishes leaving no sign behind. Now, only the larva of *T. cultriventris* RTZB. remains in the gall chamber.

After eating up the host it changes its appearance. At present it is bigger, stumpy and broader in proportion to its dimensions in the second instar. Its head is slightly differentiated and no prehensile processes can be seen at the end of the abdomen. The arrangement of the flaccid setae is like that in the second instar but the setae are considerably longer. The second exuviation has not been noticed. Nevertheless the difference between the present state and the previous one is so marked

Table IX

Development of *T. cultriventris* RTZB. in the galls of *M. fagi* HTG. collected on Mt. Niedźwiedzia Góra near Krzeszowice from 24th August to 2nd October 1957. Abbreviations: T — *Torymus cultriventris* RTZB. I, II, III — three larval instars

Series and date	Number of examined galls	Number of galls with T	Developmental stages of T				
			egg	I	II	III	pupa
L. IV g. 24. VIII.	50	13	1	12	—	—	—
L. IV h. 24. VIII.	50	11	1	10	—	—	—
W. 1. 7. IX.	100	13	—	11	2	—	—
W. g. 7. IX.	100	17	—	12	5	—	—
X. f. 14. IX.	100	15	—	6	2	7	—
Y. b. 26. IX.	100	17	—	—	3	14	—
Ż. a. 16. X.	100	16	—	—	—	16	—
Ż. c. 16. X.	100	26	—	—	—	26	—
Ż. d. 2. XI.	100	15	—	—	—	5	10 (4♂ 6♀)
Total	800	143	2	51	12	68	10

that we are justified to speak about the third instar of the larva of *T. cultriventris* RTZB.

After arriving at the third instar the larva does not grow any more. It rests in the chamber motionless. In early autumn it evacuates its alimentary duct of faeces, fastens itself to the gall wall and pupates. The female pupa is easily distinguishable from the male one by its ovipositor bent over the back of the body in a characteristic manner. When bred in confinement the imagines emerge in autumn, both male and female. It is interesting that at that time the males stay beside the unfertilized females without taking any interest in them at all. In nature the imagines issue from the galls in late April or early May. Some closer data concerning the development of *T. cultriventris* RTZB. are given in Table IX.

V. FIRST DEVELOPMENTAL STAGES OF AN UNKNOWN CHALCID OF THE SUB-FAMILY *TORYMINAE*

On 28th August 1957 300 beech galls were found on Mt. Niedźwiedzia Góra. The following interesting phenomenon could be noticed in 12 of them:

Besides the corpse of *M. fagi* HTG. and the living larva of *H. elongatus* FÖRST., alone or oppressed by the larva of *T. cultriventris* RTZB., there was also a fine, white little net on the wall of each of the 12 galls, resembling a piece of surgical gauze (Pl. XIX, Fig. 56). An egg or a larva, hatched from the egg, of an unknown Chalcid lay under the net. The egg had a normal shape and smooth chorion, and its dimensions were 340 by 150 microns (Pl. XIX, Fig. 55). The drawing of the net, as true as possible, is given in Fig. 56. Here it seems to be flat, but, in reality, its thickest part, covering the egg, was concave in proportion to the size of the egg-cell.

In the available literature dealing with the biology of Hymenoptera I did not find a mention of a similar example of the care of progeny. The matter seems rather enigmatic. For here we have to do with the covering of the egg, which the female has blindly deposited in the gall chamber, with something like a web.

This covering of the egg with a net may be regarded as a sign of the female's care of its offspring, for the chambers in which the eggs were laid and covered with the nets were not empty. In the gall chamber, besides the egg, there was a larva of *H. elongatus* FÖRST. in 6 cases, the latter accompanied by the larva of *T. cultriventris* in 4 cases and the larva of *T. cultriventris* RTZB. alone in 2 cases.

The larva hatched from the egg with the net resembled that of *T. cultriventris* RTZB. by its shape, yellowish head as well as colourless thorax and abdomen (cf. Pl. XVIII, Fig. 50 and Pl. XIX, Fig. 57). However, the larvae were not identic. At first sight already they differ from each other by chaetotaxy. Besides the rod-like antennae, they have three pairs of small setae, only ventrally, on their heads. Here there are also their mouth-parts with well developed epistomae, pleurostomae and hypostomae (Pl. XIX, Fig. 58) different in shape from those in the larvae of *T. cultriventris* RTZB.

The larva in question had its longer thoracic and abdominal setae only on the dorsal surface. Besides, it had no minute setae so characteristic of the larva of *T. cultriventris* RTZB. in its first instar. In spite of these differences we may suppose with much probability that the larvae found in the galls belonged to the *Chalcididae* of the sub-family *Toryminae*. The genus and species are unknown as for present.

The further researches for these Chalcids at older, developmental stages, carried out in the same region on 24 th September 1959 failed. Though 3 galls with nets in their chambers were found, but there were no larvae neither under the nets nor in the chambers.

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STRESZCZENIE

Pracę podzielono na 5 części. Część I przeznaczono na wstęp. W nim znajdują się między innymi wiadomości z literatury o bleskotkach wyhodowanych przez różnych autorów z galasów bukowych. W części II A podano obszerną diagnozę gatunku *H. elongatus* Först. (Pl. XIII, XV, XVI, a w części II B diagnozę *H. luteus* Rtzb. (Pl. XIV, XV, XVI). Następnie zestawiono różnice między obu gatunkami.

Diagnoza, podana w części II A dla *H. elongatus* Först., różni się w dwu ważnych punktach od diagnozy podanej dla

tego gatunku przez FÖRSTERA (1856) i SCHMIEDEKNECHTA (1909). Polski *H. elongatus* FÖRST. posiada dziesięcioczłonowe czułki. W skład czułka wchodzi scapus (u samca z wałeczkowatym, czarnym narządem zmysłowym, Pl. XV, fig. 24 s), pedicellus, jeden maleńki, szczątkowy anellus, cztery człony funiculus, z których pierwszy jest stale znacznie krótszy od następnego (Pl. XV, fig. 22) i trójczłonowa clava.

Natomiast według diagnozy FÖRSTERA i SCHMIEDEKNECHTA *H. elongatus* FÖRST. ma dziesięcioczłonowy czułek, w którym nie ma szczątkowego anellus, ale jest anellus ponad normalną miarę zwiększony; ma on nawet dorównywać wielkością normalnemu członowi funiculus. A więc 10 członków w czułku bez anellus. Polski zaś *H. elongatus* FÖRST. ma wprawdzie także 10 członów w czułku, lecz jeden z nich jest szczątkowym anellus. Odszukanie szczątkowego anellus w czułku *H. elongatus* FÖRST. zasługuje na uwagę. Na braku tegoż u *Eulophus elongatus* oparł bowiem FÖRST. utworzenie nowego rodzaju, któremu dał nazwę *Hyperteles*.

W części pracy III A omówiony został rozwój *H. elongatus* FÖRST. i *H. luteus* RTZB. Okazało się, że samice *H. elongatus* FÖRST. dla złożenia jaj poszukują galasów z pustą komorą, tzn. z nieżyjącą już larwą *M. fagi* HTG. Larwy tej bleskotki nie są pasożytami, lecz larwami roślinożernymi, czerpiącymi pokarm ze ścian galasa. Natomiast larwy *H. luteus* RTZB. są pasożytami zewnętrznymi larw *M. fagi* HTG., a w razie ich braku także larw *H. elongatus* FÖRST.

W części III B i C omówione zostały przyczyny przedwczesnej śmierci larw *M. fagi* HTG. Jej larwy giną często w galasach z różnych przyczyn. Niektóre giną śmiercią naturalną, niektóre wysysane są przez nieznanych sprawców, inne wreszcie zabijane przez bleskotki. Uśmiercanie ich przez samice *H. elongatus* FÖRST. nie zostało stwierdzone i wydaje się być mocno wątpliwe.

W części III D przedstawiono rozwój *H. elongatus* FÖRST. (Pl. XVII, fig. 35—42) i niektóre szczegóły z rozwoju *H. luteus* RTZB. Między innymi zwrócono uwagę na istnienie zagadkowych sieci występujących w sąsiedztwie larw *H. luteus* RTZB. Wykryte one zostały w nasadowych częściach komór galasów *M. fagi* HTG. w październiku 1958 r. na Niedźwiedziej Górze

ad Krzeszowice. Sieci miały barwę brązowo czarną, a strukturę, jak Pl. XV, fig. 25.

IV A. W czwartej części pracy omówiono bleskotkę *T. cultriventris* Rtzb., której larwy należą do najpospolitszych mieszkańców komór galasów *M. fagi* Htg. Pominięty został opis imago — jako znany (v. Mayr 1874) — a uwzględniony jedynie opis narządów rozrodczych i kopulacyjnych samca (Pl. XVIII, fig. 44—46). W narządach rozrodczych, na ogół podobnie zbudowanych jak u innych bleskotek, znajduje się nieparzysty narząd o sieciowatej powierzchni (fig. 44pr). Nie ma go w narządach rozrodczych samców takich bleskotek, jak np. *S. coactus* Rtzb., *H. elongatus* Först., *H. luteus* Rtzb. oraz wielu innych. Występuje natomiast w narządach rozrodczych innych gatunków bleskotek rodzaju *Torymus* Dalm. (Pl. XVIII, fig. 47). W kopulatywach uderza zmienność hypomerów (titillatores autorum), najczęściej występują hypomery trójzębiaste (Pl. XVIII, fig. 46), rzadziej czterozębiaste, a najrzadziej jeden z trzema, drugi z czterema zębami (fig. 45).

IV B. W tej części omówiono szczegóły z życia i rozwoju *T. cultriventris* Rtzb. Samica *T. cultriventris* Rtzb. poszukuje galasów z nieżyjącą już larwą *M. fagi* Htg. lub takich, w których prócz trupa tej pryszczarki znajduje się larwa *H. elongatus* Först. i w takich galasach składa jajo (Pl. XVIII, fig. 48). Z jaja lęgnie się larwa (Pl. XVIII, fig. 50). Larwy nie są pasożytami larw *M. fagi* Htg., jak dawniej przypuszczano, lecz tylko i jedynie larw *H. elongatus* Först. W I okresie życia (Pl. XVIII, fig. 50) wysysają one od czasu do czasu młode, nieporażone larwy *H. elongatus* Först. i zapewne prócz tego korzystają jeszcze z pokarmu roślinnego czerpanego ze ściany galasa.

Pokarm roślinny nie jest jednak wystarczający; bez żywicielki larwa *T. cultriventris* Rtzb. ginie (tab. VIII). Pod koniec lata lub z początkiem jesieni larwa *T. cultriventris* Rtzb. linieje i w stadium II (Pl. XIX, fig. 52) pożera w całości larwę *H. elongatus* Först. Potem bez linienia przechodzi w stadium III (fig. 53), a następnie przepoczwarcza się. Imagines lęgną się w maju.

V. Piąta i ostatnia część pracy obejmuje kilka szczegółów z pierwszych stadiów rozwojowych nieznanej bleskotki z pod-

rodziny *Toryminae*. Samice składają jaja (fig. 55) w komorach galasów *M. fagi* Htg. zajętych przez innych żywych mieszkańców wtórnych. Jaja te nakrywają siatką, przypominającą szczępek gazy chirurgicznej (fig. 56). Larwa w pierwszym okresie życia (fig. 57) podobna jest do pierwszej larwy bleskotki *T. cultriventris* Rtzb.

РЕЗЮМЕ

Настоящая работа поделена на 5 частей. Часть 1 посвящена вступлению. Она содержит, кроме иных сведений, данные из литературы о *Chalcididae*, которые были выведены различными авторами из галлов бука. В части 2 A приведен обширный диагноз вида *H. elongatus* Först. (Pl. XIV, XV, XVI), а в части 2 B, диагноз вида *H. luteus* Rtzb. (Pl. XIV, XV, XVI). Далее сопоставлены разницы между обоими видами.

Диагноз, приведенный в части 2 A для *H. elongatus* Först. отличается двумя важными пунктами от диагноза, приведенного Ферстером (1856) и Шмидекнехтом (1909) для этого вида. Польский *H. elongatus* Först. имеет десятичлениковые усики. В состав усика входит *scapus* у самца с вальцевидным черным чувственным органом (Pl. XV fig. 24s), *pedicellus* один маленький остаточный *anellus* четыре членика *funiculus* из которых первый всегда значительно короче второго (Pl. XV, fig. 22) и трехчлениковая *clava*.

По диагнозу Ферстера и Шмидекнехта *H. elongatus* Först. имеет десятичлениковый усик, в котором нет остаточного анеллюса, зато анеллюс по величине превосходит нормальную длину. В размерах он равен нормальному членику *funiculus*. И так, 10 члеников усика без *anellus*. Польский *H. elongatus* Först имеет также десятичлениковый усик, однако, один из члеников, это остаточный *anellus*. Находка остаточного *anellus* в усике *H. elongatus* Först. заслуживает особого внимания. Опираясь на отсутствии этого членика у *Eulophus elongatus*, Ферстер установил новый род, который был им назван *Hyperteles*.

В 3 A части работы описана биология *H. elongatus* Först. и *H. luteus* Rtzb. Оказывается, что самки *H. elongatus* Först. для

кладки яиц, ищут галлы с пустой камерой, значит с неживущей уже личинкой *M. fagi* Htg. Личинки этого вида *Chalcididae* не являются паразитами, но личинками, питающимися растительной пищей, черпающими корм со стенок галла. Личинки *H. luteus* Rtzb. это внешние паразиты личинок *M. fagi* Htg. а при их недостатке, личинок *H. elongatus* Först.

В части 3 В оговорены причины преждевременной смерти личинок *M. fagi* Htg. Личинки эти часто умирают в галлах по разным причинам. Некоторые погибают натуральной смертью, иные высасывают неизвестные хищники, иные наконец убивают *Chalcididae*. Умерщвление их самками *H. elongatus* Först. не было констатировано и кажется очень сомнительным.

В части 3 представлено развитие *H. elongatus* Först. (Pl. XIII, fig. 35—42) и приведены некоторые подробности, касающиеся развития *H. luteus* Rtzb. Между прочим, автор обратил внимание на присутствие загадочных сеток, находящихся в соседстве личинок *H. luteus* Rtzb. Они были найдены в основных частях камер галлов *H. fagi* Htg. в октябре 1958 г. на Медвежьей Горе вблизи Кржешовиц. Сетки эти были коричневато черного цвета, а структура как на (Pl. XV fig. 25. IV A).

В 4 А части работы автор оговорил вид *T. cultriventris* Rtzb., которого личинки являются обыкновенными обитателями галлов *M. fagi* Htg. Автор пропустил описание имаго, считая его общеизвестным (Ф. Мейр 1874). Автором описан лишь генитальный и оплодотворяющий аппарат самца (Pl. XV, fig. 44—46). В оплодотворяющем аппарате, в общем в своем строении похожим на других *Chalcididae* находится непарный орган с сетчатой поверхностью. Отсутствует в оплодотворяющих аппаратах самцов таких *Chalcididae* как *S. coactus* Rtzb., *H. elongatus* Först., *H. luteus* Rtzb. и многих других. Находится однако в оплодотворяющих аппаратах других видов *Chalcididae* из рода *Terymus* Dalm. (Pl. XVIII, fig. 47). В генитальных аппаратах бросается в глаза изменчивость гипомеров (*tityllatores autorum*). Чаще всего встречаются гипомеры с тремя зубцами (Pl. VI, fig. 46), реже с четырьмя зубцами, а еще реже — один с тремя, а другой с четырьмя зубцами (рис. 45).

IV B. В этой части оговорены детали из жизни и развития *T. cultriventris* Rtzb. Самка этого вида ищет галлы с неживущей уже личинкой *M. fagi* Htg. или таковые, в которых кроме трупа

M. fagi Htg. находится личинка *H. elongatus* Först. и в таких галлах откладывает яйцо (Pl. XVIII, fig. 48). Из яйца вылупляется личинка (Pl. XVIII, fig. 50), которая не является паразитом личинки *M. fagi* Htg. как это раньше предполагалось, а паразитирует исключительно на личинках *H. elongatus* Först. В первой стадии развития (Pl. XVIII, fig. 50), личинки эти сосут от времени до времени молодые, здоровые личинки *H. elongatus* Först. и вероятно, кроме того принимают еще растительную пищу, черпаемую со стенок галла. Растительная пища не является однако достаточной. Без кормилицы-личинки *T. cultriventris* Rtzb. умирает (табл. 8). В конце лета или в начале осени, личинка *H. elongatus* Rtzb. линяет и во второй стадии (Pl. XIX, fig. 52) пожирает целиком личинку *H. elongatus* Först. Потом, без линки переходит в третью стадию (рис. 53), а затем окукляется. Зрелые насекомые появляются в мае.

Пятая и последняя часть работы содержит несколько деталей, касающихся первых стадий развития неизвестных еще *Chalcididae* из подсемейства *Toryminae*. Самки откладывают яйца (рис. 55) в камерах галлов *M. fagi* Htg. занятых живыми вторичными обитателями. Яйца эти покрывают сеткой, напоминающей обрывок хирургической марли (рис. 56). Личинка в первой стадии похожа на личинку *T. cultriventris* Rtzb.

Plate XIII

Fig. 1. Female *Hyperteles elongatus* FÖRST. from a larva found in the gall of *M. fagi* HTG. on Mt. Niedźwiedzia Góra near Krzeszowice on 10th October 1958. × 25.

Fig. 2. Outline of apical portion of hind-wing in *H. luteus* RTZB. × 25.

Fig. 3. *H. elongatus* FÖRST. Ventral view of male abdomen showing two bright, semi-circular areas characteristic of males. × 25.

Fig. 4. Radius in wing of *H. elongatus* FÖRST. Magnified more than 100 times.

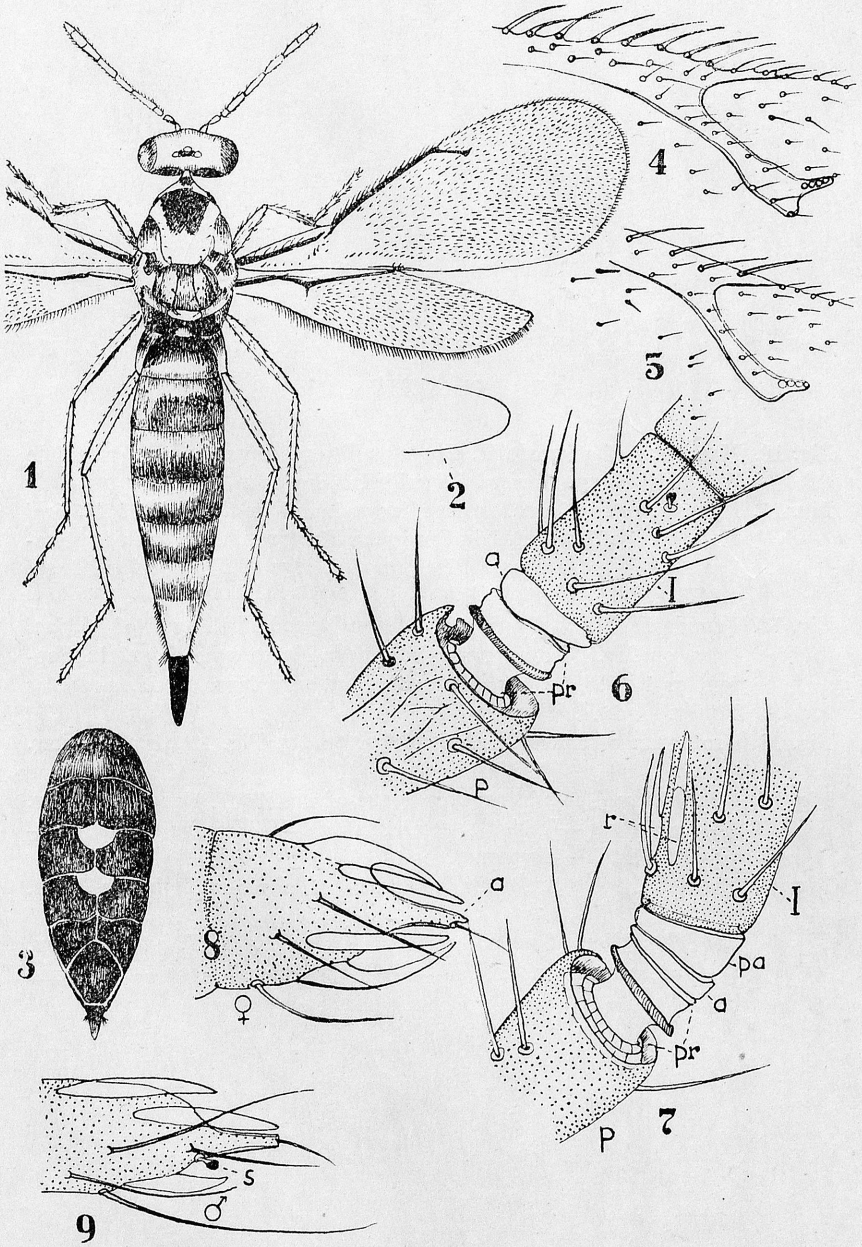
Fig. 5. Radius in wing of *H. luteus* RTZB. Magnified more than 100 times.

Fig. 6. Portion of the antenna of a female *H. elongatus* FÖRST. p — pedicel, pr — processus articularis pedicelli, a — anellus, I — 1st joint of funicle, regarded as anellus by FÖRSTER. × 350.

Fig. 7. Portion of the antenna of a female *H. luteus* RTZB. p — pedicel, pr — processus articularis pedicelli, a — anellus, pa — postanellus, I — 1st joint of funicle with rhinaria on it. × 350.

Fig. 8. Last joint of the club of a female *H. elongatus* FÖRST. a — apiculus with seta lying aside.

Fig. 9. Last joint of the club of a male *H. elongatus* FÖRST. a — apiculus with apical seta; club-shaped sense organ at base (s).



Auctor del.
A. Dziurzyński

Plate XIV

Fig. 10. Mandibles of a female *H. elongatus* FÖRST. (upper) and of a female *H. luteus* RTZB. (lower). Magnified more than 130 ×.

Fig. 11. Male *H. luteus* RTZB. from a larva found in the gall of *M. fagi* HTG. on Mt. Niedźwiedzia Góra near Krzeszowice on 24th September 1959. The larva parasitized upon a larva of *H. elongatus* FÖRST. × 25.

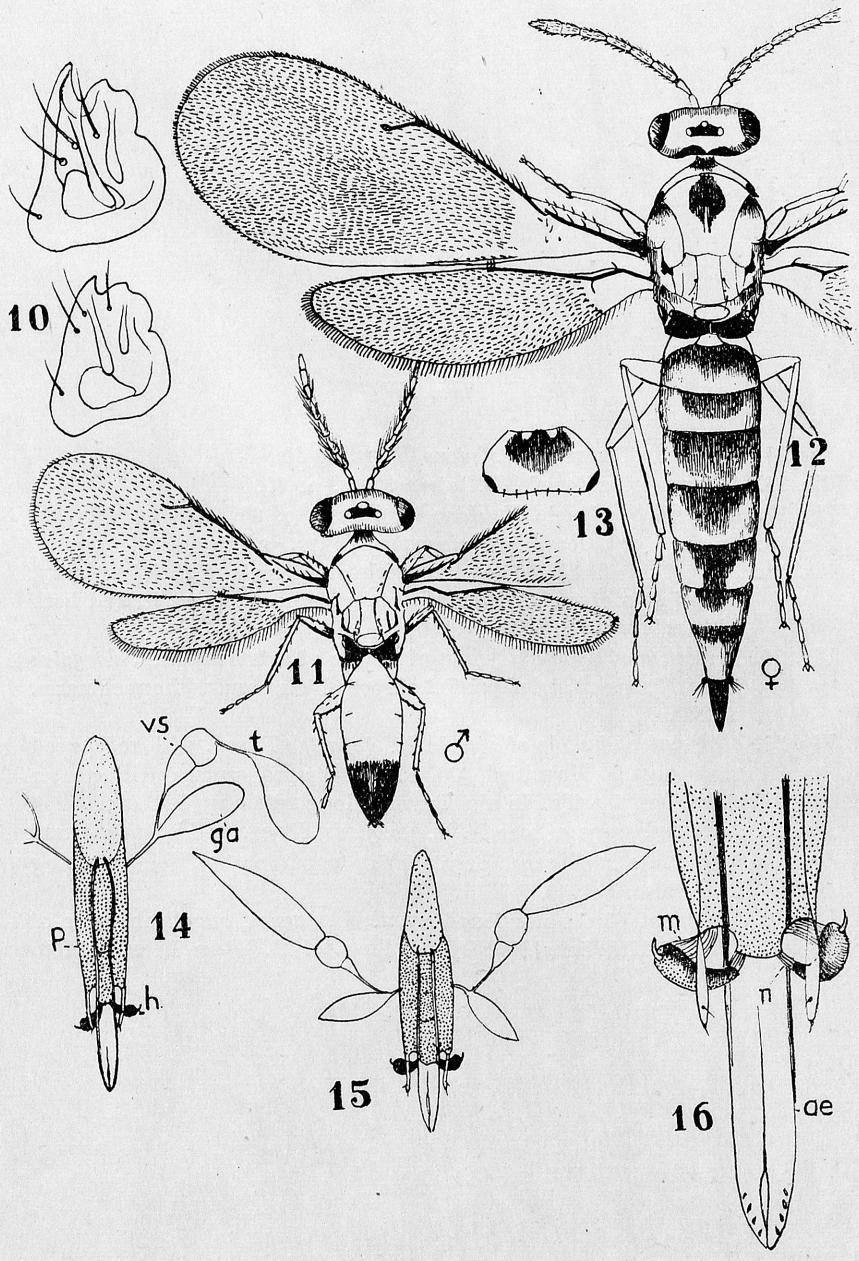
Fig. 12. Female *H. luteus* RTZB from a larva found in the gall of *M. fagi* HTG. on Mt. Niedźwiedzia Góra near Krzeszowice on 24th September 1959. The larva parasitized upon a larva of *H. elongatus* FÖRST. × 25.

Fig. 13. Prothorax of a female *H luteus* RTZB. (v. Fig. 12), frontal view. × 25.

Fig. 14. Genitalia and copulatory apparatus of a male *H. elongatus* FÖRST. t — testis, vs — vesicula seminalis, ga — accessory gland, p — phallotheca, h — hypomer. × 60.

Fig. 15. Genitalia and copulatory apparatus of a male *H luteus* RTZB. × 60.

Fig. 16. Caudal portion of male copulatory apparatus of *H. luteus* FÖRST. m — adductor muscle, n — abductor muscle, ae — aedeagus. × 230.



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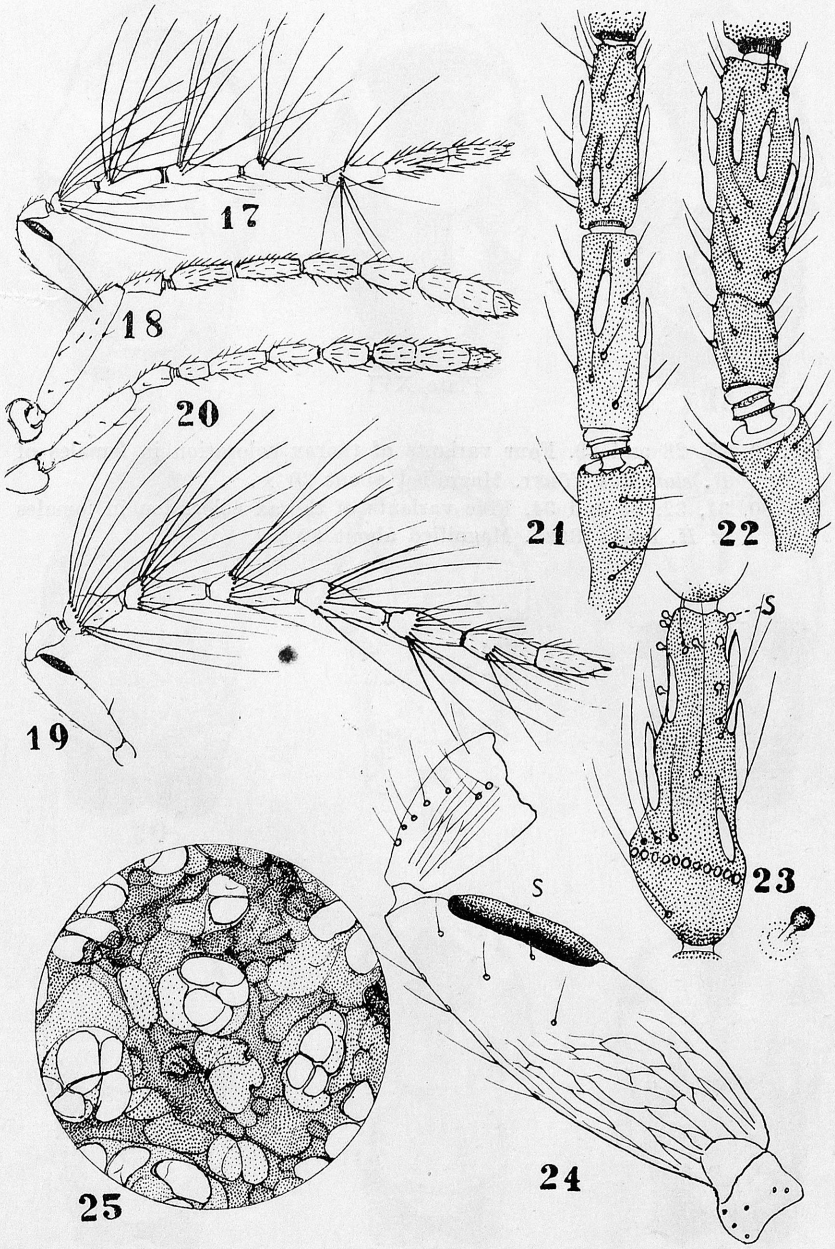

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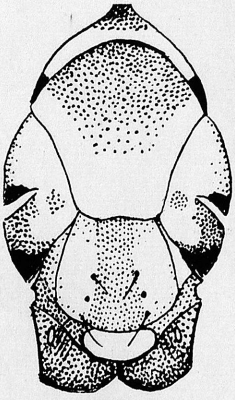
Plate XV

Fig. 17. Antenna of a male *H. luteus* RTZB. × 60.
Fig. 18. Antenna of a female *H. luteus* RTZB. × 60.
Fig. 19. Antenna of a male *H. elongatus* FÖRST. × 60.
Fig. 20. Antenna of a female *H. elongatus* FÖRST. × 60.
Fig. 21. Pedicel, anelli and 2 joints of funicle of a female of *H. luteus* RTZB. Both joints of funicle approximately of the same length and both with rhinaria. × 230.
Fig. 22. Pedicel, anellus and 2 joints of funicle of a female of *H. elongatus* FÖRST. 1st joint as long as 1/2 of second joint and without rhinaria. × 230.
Fig. 23. 4th joint of funicle of a male *H. elongatus* FÖRST. with rodshaped sense organs. Magnified 230 ×. Rod-shaped organ (s) in greater enlargement aside. In the drawing long setae are left out.
Fig. 24. Antennal scape of a male *H. elongatus* FÖRST. or *H. luteus* RTZB. with rod-shaped sense organ (s) in upper part of joint, lacking in females. × 230.
Fig. 25. Fragment of the net found at the bottom of a gall chamber of *M. fagi* HTG. inhabited by the larva of *H. luteus* RTZB. × 130.

Plate XVI

Fig. 26, 27, 28 and 29. Four variants of thorax coloration in females of *H. elongatus* FÖRST. Magnified about 30 ×.

Fig. 30, 31, 32, 33 and 34. Five variants of thorax coloration in females of *H. luteus* RTZB. Magnified about 30 ×.



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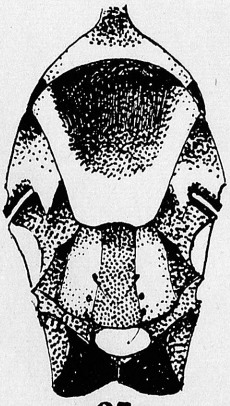

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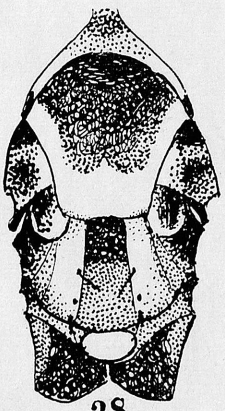

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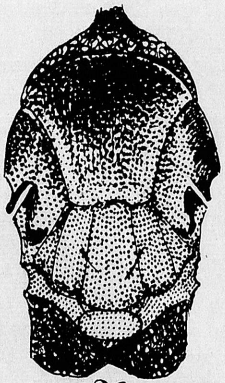

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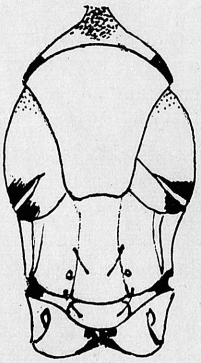

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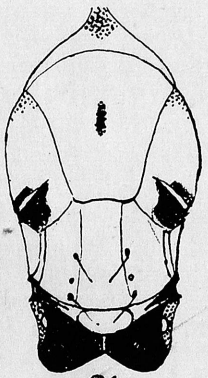

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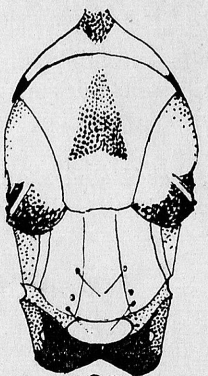

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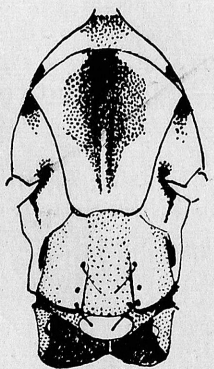

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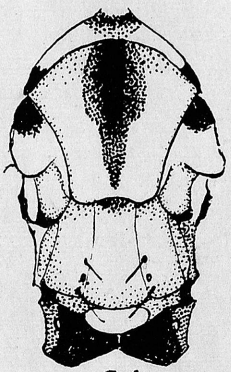

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Auctor del.
A. Dziurzyński

Plate XVII

Fig. 35. An egg of *H. elongatus* FÖRST., laid on 18th June 1958 at 3 p. m., drawn 17 hours later. Dimensions: 0.52 by 0.11 mm. × 60.

Fig. 36. The same egg drawn 39 hours after its being laid by the female in the gall chamber. × 60.

Fig. 37. A larva of *H. elongatus* FÖRST., sized 0.45 mm. × 0.12 mm., drawn on the first day after hatching, 62 hours after the egg was laid by the female in the gall chamber. × 60.

Fig. 38. A larva of *H. elongatus* FÖRST. in the first instar, sized 0.57 mm. by 0.15 mm., drawn on 11th June 1958. In the drawing, presenting the larva laterally, the left side of the tracheal system is marked. × 130.

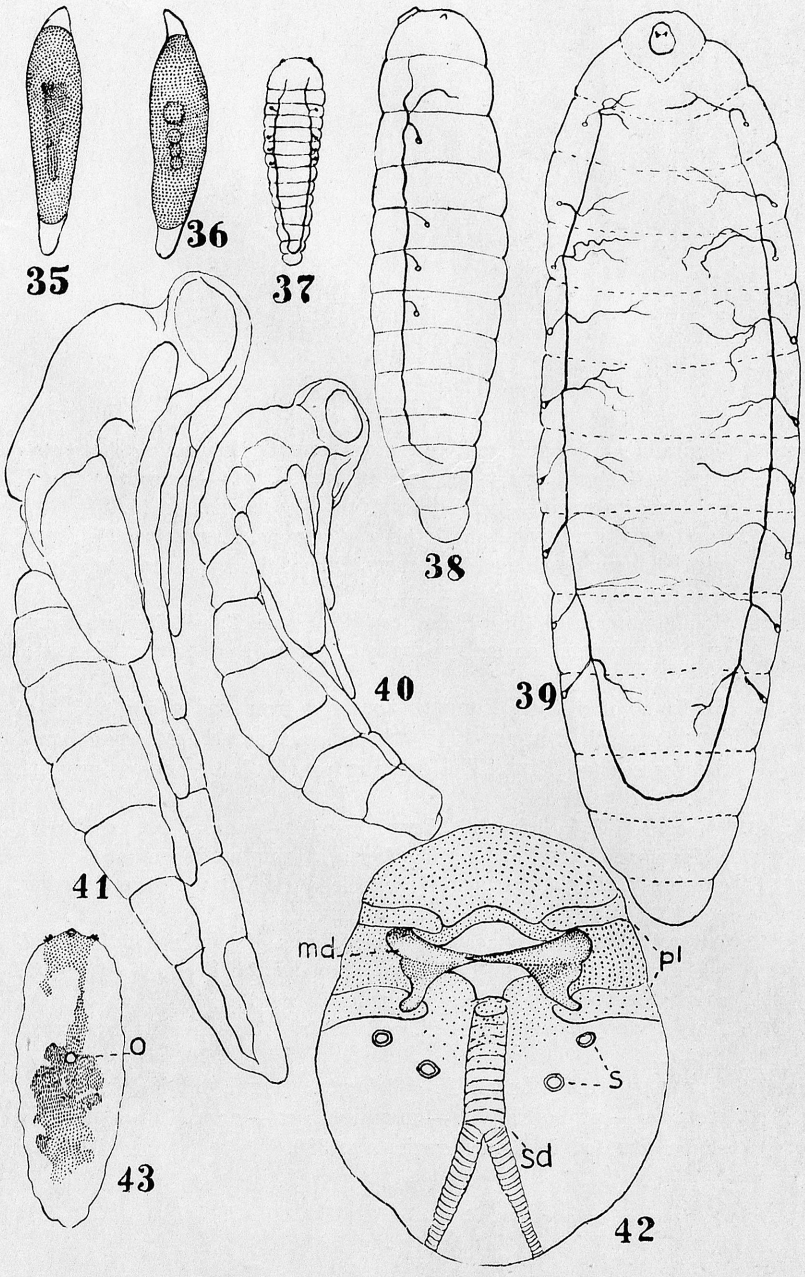
Fig. 39. A larva of *H. elongatus* FÖRST. in its second instar, sized 3 mm. by 1.1 mm., ventral view. Whole tracheal system shown in the drawing. It must be noted that the first three pairs of spiracles are to be seen dorsally and not ventrally. × 38.

Fig. 40. A pupa of male *H. elongatus* FÖRST. × 25.

Fig. 41. A pupa of female *H. elongatus* FÖRST. × 25.

Fig. 42. Mouth-parts of larval *H. elongatus* FÖRST. md — mandible, pl — pleurostoma, sd — salivary duct with spiral wall thickenings, s — 2 pairs of sense organs characteristic of the larva of this species. × 390.

Fig. 43. A larva of *M. fagi* HTG. in its second instar, sucked almost completely by an unknown perpetrator. o — opening in the skin used for sucking. Magnified about. × 40.



Auctor del.
A. Dziurzyński

Plate XVIII

Fig. 44. Genitalia and copulatory apparatus of male *Torymus cultriventris* Rtzb. t — testis, vs — vesicula seminalis, ga — accessory gland, pr — prostate, ph — phallotheca, ae — aedeagus. × 60.

Fig. 45. Caudal section of the phallotheca of a male *T. cultriventris* Rtzb. with abnormally shaped hypomers. One of the hypomers is threeto-othed, the other four-toothed. × 230.

Fig. 46. Caudal section of the phallotheca of a male *T. cultriventris* Rtzb. with hypomers normally shaped. Both hypomers tridentate. × 230.

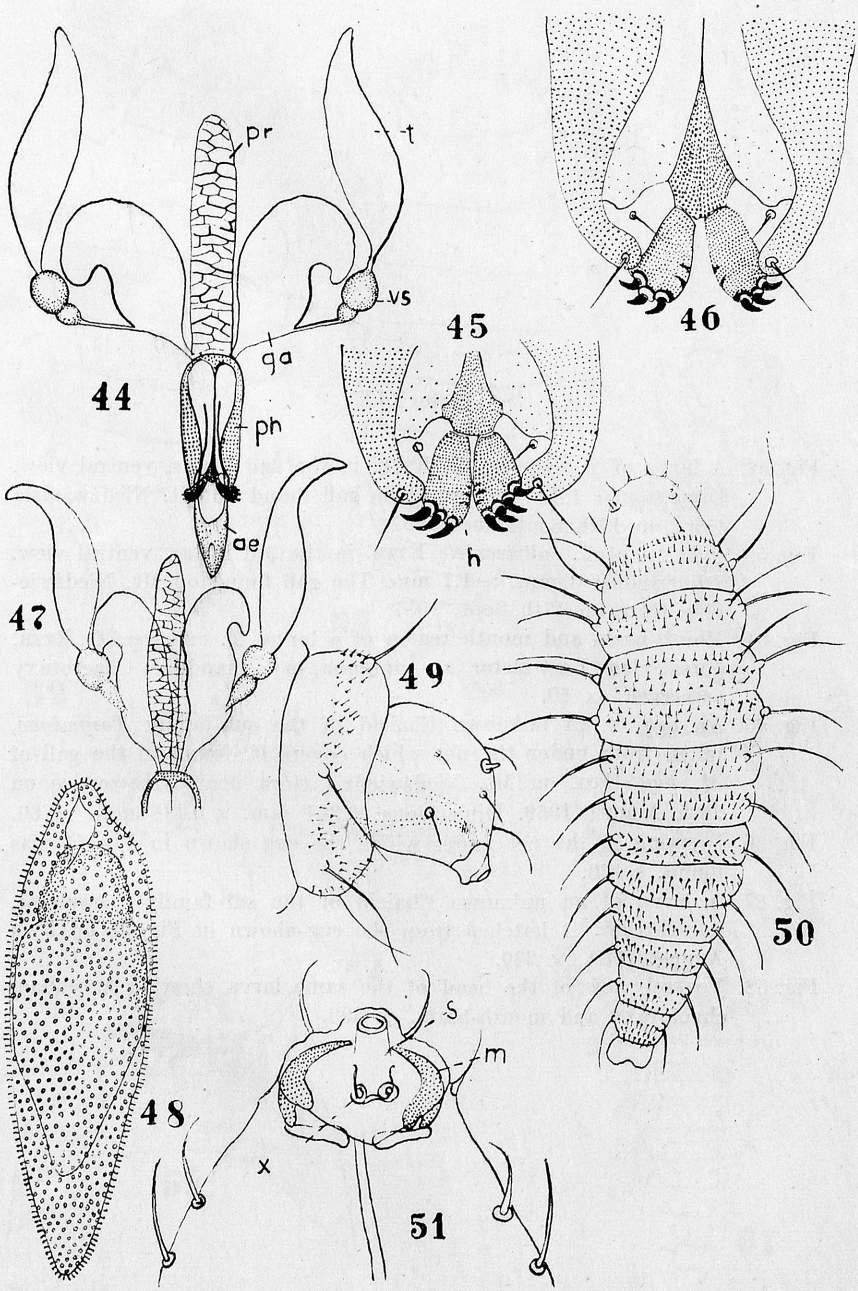
Fig. 47. Genitalia of a male *Torymus sp.* bred from the gall of *M. fagi* Htg. on 11th October 1958, whose larva parasitized upon larval *Secodes coactus* Rtzb. The drawing provided for comparing with Fig. 44.

Fig. 48. An egg of *T. cultriventris* Rtzb., sized 0.6 mm. × 0.2 mm., with a developed larva inside. The larva attempted to get out of the chorion through the opening visible at the top of the drawing. × 130.

Fig. 49. Lateral view of the head and prothorax of the larva of *T. cultriventris* Rtzb. in its 1st instar, showing the chaetotaxy as well as the oesophagus and salivary duct. × 130.

Fig. 50. Dorsal view of a larva of *T. cultriventris* Rtzb. in the 1st instar. × 130.

Fig. 51. Mouth-parts of a larval *T. cultriventris* Rtzb., 1st instar, ventral view. s — proboscis, m — mandible, x — organ of enigmatic shape situated in mouth region. × 380.



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A. Dziurzyński

Plate XIX

Fig. 52. A larva of *T. cultriventris* RTZB. in the 2nd instar, ventral view. Dimensions: 1.8 × 0.6 mm. The gall found on Mt. Niedźwiedzia Góra on 17th September 1957.

Fig. 53. A larva of *T. cultriventris* RTZB. in the 3rd instar, ventral view. Dimensions: 3 mm. × 1.1 mm. The gall found on Mt. Niedźwiedzia Góra on 17th Sept. 1957.

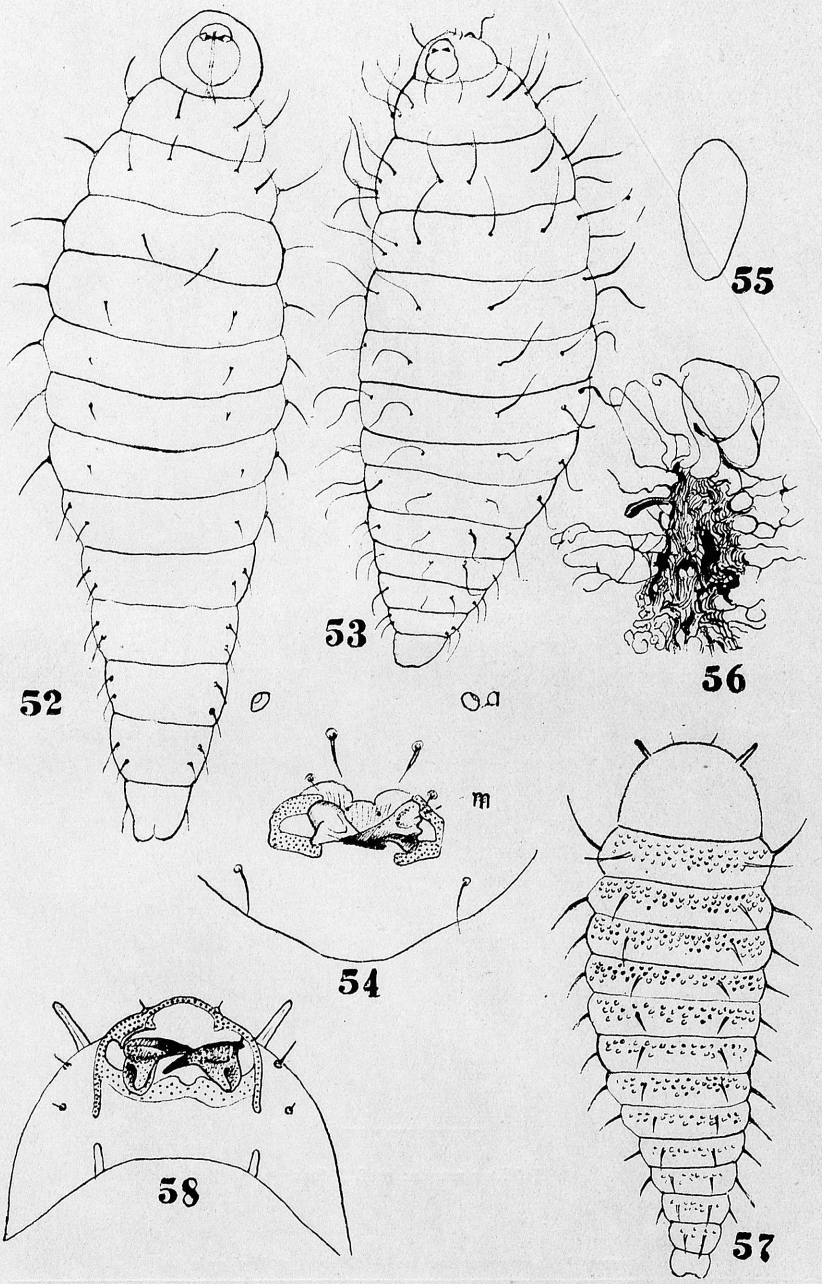
Fig. 54. Mouth-parts and mouth region of a larval *T. cultriventris* RTZB. dorsal view. Last instar. a — antenna, m — mandible. Chaetotaxy preserved. × 60.

Fig. 55. An egg of an unknown Chalcid of the sub-family *Toryminae*, taken from under the net which covers it, found in the gall of *M. fagi* HTG. on Mt. Niedźwiedzia Góra near Krzeszowice on 26th August 1959. Dimensions: 0.341 mm. × 0.146 mm. × 60.

Fig. 56. Drawing of the net under which the egg shown in Fig. 55 was found. × 60.

Fig. 57. A larva of an unknown Chalcid of the sub-family *Toryminae*, dorsal view. It hatched from the egg shown in Fig. 55 on 28th August 1959. × 230.

Fig. 58. Ventral view of the head of the same larva showing antennae, chaetotaxy and mouth-parts. × 390.



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