

## **GREGARINA VIZRI LIPA, 1968 (APICOMPLEXA: EUGREGARINIDA) RECORDED IN POLAND IN AN EXPANSIVE PLANT PEST THE CEREAL GROUND BEETLE *ZABRUS TENEBRIOIDES* (GOEZE) (COLEOPTERA: CARABIDAE)**

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**Abstract:** An eugregarine *Gregarina vizri* Lipa, originally recorded and described from the cereal ground beetle [*Zabrus tenebrioides* (Goeze)] collected in the Chechnya-Ingushetia (Russian Federation), is reported from the same host insect in Poland. Out of 45 examined adult beetles 19 were parasitized. Morphometric analysis of *G. vizri* trophozoites and gamonts observed in the digestive tract of host specimens originating from Russian Federation and from Poland showed a significant similarity.

**Key words:** *Gregarina vizri* Lipa; Apicomplexa; Eugregarinida; cereal ground beetle, *Zabrus tenebrioides*, Coleoptera, Carabidae, Poland, biocontrol agent,

### **INTRODUCTION**

The eugregarines (Apicomplexa, Eugregarinida), parasitize in the invertebrate digestive systems, including many insects that cause economic damage in agriculture, horticulture and forestry. For this reason they are interesting objects not only for taxonomic and faunistic studies but also as to their potential use as biocontrol agents. It must be emphasized that the state of knowledge on eugregarine occurrence in particular order, families and genera of insects and other arthropods, host spectra and their zoogeographic range is highly unsatisfactory. For example, it is estimated

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that only 0.31% of the known coleopteran species have been checked for eugregarine infection (Levine 1988a, 1988b; Clopton 2002).

## MATERIALS AND METHODS

Adults of *Zabrus tenebrioides* were regularly collected during summer seasons of 2006 and 2007 using pitfalls traps (diameter 21 cm, height 17 cm) or collected manually from rye plant ears at two sites in central-western Poland:

- in the vicinity of Trzcielińskie Bagna, nature reserve Wielkopolski Natural Park (UTM: XT19)
- in experimental fields of the Institute of Plant Protection near Winna Góra, Środa Wielkopolska county (UTM: XT68).

After bringing to the laboratory adult beetles were dissected in physiological salt solution and their digestive tract and other tissues were checked for the presence of gregarine and other protozoan infections. In total 45 adults of *Z. tenebrioides* were examined for gregarine presence out of which 19 adults were found to be parasitized with various numbers of eugregarine developmental stages (Table 1).

Table 1. Records of *Zabrus tenebrioides* adults collected and parasitized by *Gregarina vizri* in 2006–2007 on sites near Winna Góra (XT68) and in Wielkopolski National Park (XT19)

Site (UTM code)	Date of collection	Number of <i>Z. tenebrioides</i> adults examined		Number of gregarine specimens (min. – max. – mean)	Observed developmental stages
		total	parasitized		
XT68	26.VI.2006	2	1	12	associations, trophozoites
XT68	12.VII.2006	1	1	3	trophozoites
XT68	10.VII.2006	1	1	9	trophozoites
XT19	26.VII.2006	7	1	1	associations
XT68	30.VIII.2006	15	12	2 – 41 – 9	associations, trophozoites, cephalonts
XT68	11.IX.2006	9	3	5 – 27 – 16	associations, trophozoites
XT68	25.IX.2006	1	0	–	–
XT68	27.VI.2007	1	0	–	–
XT68	03.VII.2007	3	1	3	trophozoites
XT68	26.VII.2007	3	2	4 – 7 – 5	associations trophozoites
XT68	04.VIII.2007	2	0	–	–
Total:		45	19 (42%)	1 – 41 – 10	

For morphometric analysis the size of 30 gamonts in syzygies and of 33 solitary trophozoites and gamonts were measured. The length of protomerites (LP) and deutomerites (LD) as well as the width of protomerites (WP) and deutomerites (WD) were measured.

The morphology and size parameters of *G. vizri* trophozoites and gamonts from insect hosts originating from Poland were compared to those from Russian Federation.

## RESULTS AND DISCUSSION

This is the first record of *G. vizri* in *Z. tenebrioides* in Poland as it was not listed previously neither by Foerster (1938) nor by Lipa (1967a, 1967b, 1968, 1975). The size of trophozoites and gamonts of *G. vizri* from Poland are on average larger than those of the specimens from host insects originating from Russian Federation (Table 2, Fig. 1) in the species description (Lipa 1968). Maximum length of *G. vizri* gamonts reported from Poland was 470 µm, while for those observed in Russia was 308 µm (Fig. 2).

Table 2. Comparison of size of gamonts and trophozoites of *Gregarina vizri* recorded in *Zabrus tenebrioides* adults in Poland and in Russian Federation (LP – length of protomerite, WP – width of protomerite, LD – length of deutomerite, WD – width of deutomerite, TL – total body length, TLA – total association length)

Measurements	Material from Poland [minimum–maximum (mean ± standard deviation)]			Material from Russian Federation
	Trophozoites	Associations		Gamonts
		Primites	Satellites	
LP	25.00–61.00 (40.05 ± 84.03)	25.00–52.00 (36.87 ± 8.45)	17.00–49.50 (32.43 ± 8.47)	25.00–58.00 (34.69 ± 10.56)
WP	30.00–104.00 (58.70 ± 15.87)	35.00–87.00 (56.91 ± 13.01)	44.00–96.00 (63.14 ± 15.04)	35.00–66.00 (46.23 ± 10.24)
WP/LP	1.00–2.69 (1.49 ± 0.40)	1.00–2.40 (1.58 ± 0.37)	1.00–3.69 (2.08 ± 0.75)	0.72–2.64 (1.44 ± 0.55)
LD	75.00–400.00 (229.36 ± 81.33)	131.00–339.00 (235.27 ± 55.28)	174.00–426.00 (270.04 ± 73.17)	119.00–275.00 (175.00 ± 45.53)
WD	35.00–145.00 (81.65 ± 26.61)	52.00–139.00 (80.50 ± 24.57)	52.00–131.00 (78.23 ± 22.96)	55.00 – 99.00 (76.08 ± 16.33)
WD/LD	1.37–4.19 (2.87 ± 0.80)	1.85–4.09 (3.03 ± 0.70)	2.43–4.35 (3.49 ± 0.48)	1.63 – 3.22 (2.36 ± 0.62)
TL	100.00–444.00 (269.41 ± 84.03)	166.00–391.00 (272.13 ± 60.38)	191.00–470.00 (302.47 ± 76.41)	148.00 – 308.00 (209.01 ± 47.01)
LP/TL	3.18–13.38 (6.85 ± 2.23)	4.74–10.19 (7.54 ± 1.56)	5.13–14.73 (9.67 ± 2.47)	4.10 – 9.96 (6.38 ± 1.98)
WP/WD	1.09–2.42 (1.39 ± 0.27)	1.10–2.00 (1.42 ± 0.31)	1.00–1.68 (1.24 ± 0.20)	1.26 – 2.29 (1.68 ± 0.39)
TLA		357.00–861.00 (574.60 ± 125.81)		305.00–577.00 (415.33 ± 96.92)

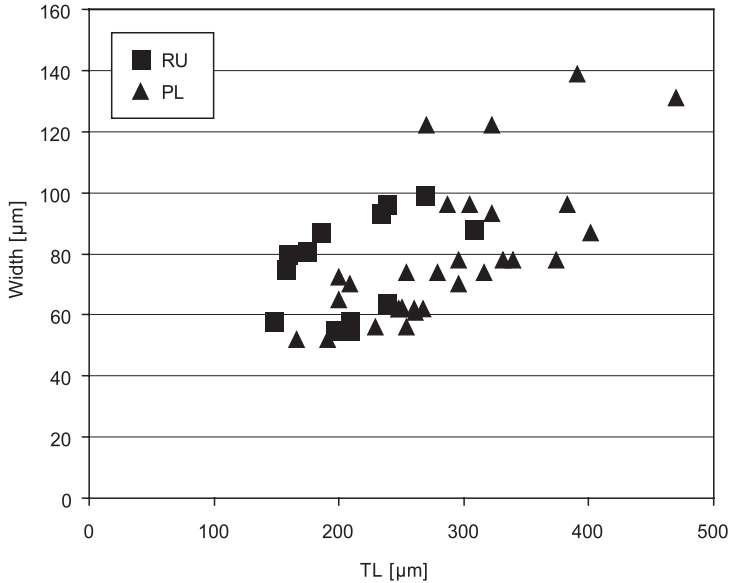


Fig. 1. Comparison of length (TL) and width (WD) of gamonts *Gregarina vizri* LIPA, 1968 from Russian (RU) and Polish (PL) hosts



Fig. 2. Association of gamonts of *Gregarina vizri* recorded in an adult *Zabrus tenebrioides* in Poland

The parasitism level of *Z. tenebrioides* by *G. vizri* in Poland reached the level of 42% among 45 specimens examined. It was much higher than in Russia, where only 3 larvae out of 25 studied specimens were infected (Lipa 1968).

As seen in Fig. 1 morphometric analysis of *G. vizri* gamonts observed in the digestive tracts of host specimens originating from the Russian Federation and from Poland indicate significant similarity.

As other groups of parasitic protozoans, gregarines are among the least studied organisms in Poland. Only 143 species were reported in Poland as compared with nearly 1700 species known worldwide (Lipa 1967a, 1967b; Levine 1988a, 1988b; Clouton 2002, Kazubski 2003). That is why the studies of those protozoans should result in a significant broadening of the knowledge of Poland's biodiversity.

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## POLISH SUMMARY

### *GREGARINA VIZRI* LIPA, 1968 (APICOMPLEXA: EUGREGARINIDA) PIERWOTNIAK STWIERDZONY W POLSCE W EKSPANSYWNYM SZKODNIKU ROŚLIN ZBOŻOWYCH ŁOKASIU GARBATKU – *ZABRUS* *TENEBRIOIDES* (GOEZE) (COLEOPTERA: CARABIDAE)

Gregaryny (Apicomplexa, Eugregarinida) jako pierwotniaki pospolicie występujące w przewodach pokarmowych bezkręgowców, w tym owadów powodujących gospodarcze szkody w uprawach, mogą być ważnym czynnikiem oporu środowiska względem swoich żywicieli. Dotychczas jednak zbadano niewielki procent bezkręgowców pod kątem występowania gregaryn, a ich rola w ograniczaniu liczebności żywicieli nie została rozpoznana.

Pierwotniak *Gregarina vizri*, Lipa 1968 po raz pierwszy został opisany u niewielu larw szkodnika zbóż jakim jest *Zabrus tenebrioides* (Goeze) odłowionych w Czeczeniu. Podczas badań prowadzonych w Polsce w okolicy Poznania stwierdzono jego występowanie w przewodach pokarmowych owadów dorosłych. Dane morfometryczne wskazują na duże podobieństwo populacji *G. vizri* z Polski i Rosji. W materiale z Rosji spasożytowanych było 12% badanych osobników, a z Polski aż 42%. Może to wskazywać na potencjalne duże znaczenie tego pasożyta w ograniczaniu liczebności *Z. tenebrioides*.