

Failed hibernation of the gall-maker significantly reduces parasitoid and inquiline density in some gall communities of *Diplolepis rosae* (L.) (Hymenoptera: Cynipidae) in Bulgaria

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Abstract:

Gall communities of the Rose Bedeguar wasp, *Diplolepis rosae* (L.), were analyzed in 12 mountainous localities in Bulgaria. Most of the emerged species are common in rose bedeguar galls. Among the sampled localities *D. rosae* was represented with maximum of 5 % in one sample from Western Stara Planina Mts. Emerged material from six localities was free of *D. rosae* adults. The overall abundance of the species varied among samples, with total dominant role of *G. stigma* and *P. bedeguaris*. All parasitoids and the inquiline were in extremely low density in all samples. Possible reasons for this community composition and structure are discussed. Two species are new records for Bulgaria. One species association with the bedeguar galls is newly revealed. Unknown species belonging to *Stepanovia* was reared from two different localities. In addition, Shannon-Wiener diversity index was calculated for the parasitoid members of the gall community.

Results

Nineteen species were identified in the community (Fig. 2). Two species are recorded as new for the Bulgarian fauna - *Eurytoma caninae* and *Eupelmus fulvipes*. The gall association of *Oomyzus galerucivorus* is new for science. Spearman Rank Order test ($p < 0,05$) revealed two interspecific correlations between mean total individuals per gall - *Eurytoma rosae*-*Periclistus brandtii* ($r = -0,924$) and *Eupelmus urozonus*-*Orthopelma mediator* ($r = 0,898$). One species - *Caenacis inflexa*, correlates positively with the mean total abundance of the community members ($r = 0,812$). Adults of the gall-maker were reared in very low number. Parasitoid species density (mean number of individuals per gall) was significantly lower compared to the results from Vitosha Mts. (Todorov et al. 2012) (Fig. 3), but Shannon-Wiener diversity index was similar for the studied mountains (Fig. 4).

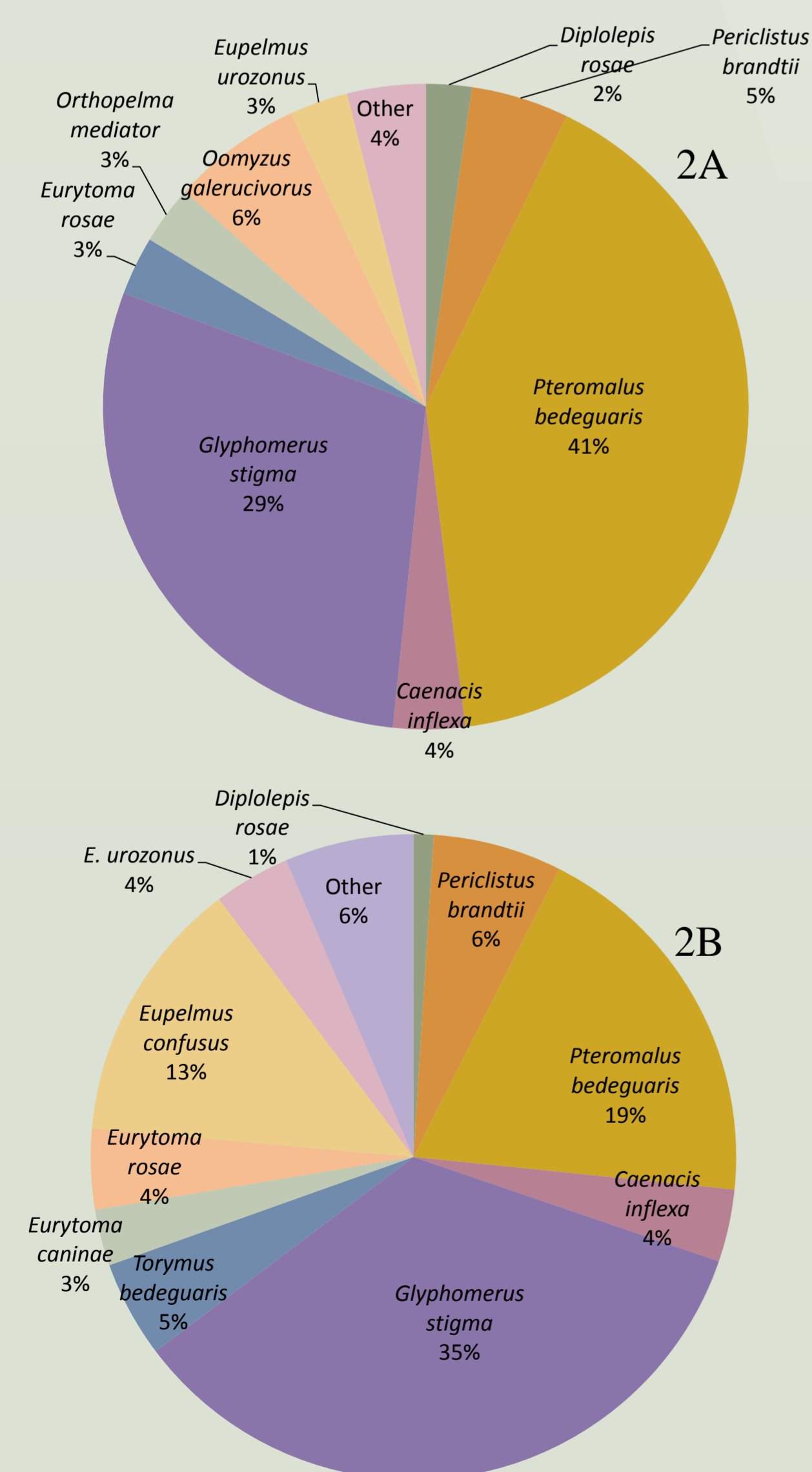


Fig. 2. Relative abundance of the gall inhabitants in the rearings from the Rhodope Mts. (2A) and Stara Planina Mts. (2B).

Materials and Methods

At least 488 mature galls induced on *Rosa canina* were collected at altitudes between 340 m and 1372 m during the autumn of 2018 from the Western Rhodope Mountains and Stara Planina Mountains, respectively. The gall material was stored for minimum of one year in laboratory at room temperature and without a period of hibernation. Reared inhabitants were counted and fixed weekly. Their abundance, number of individuals per gall and Spearman Rank Order test were calculated using Microsoft Excel and STATISTICA program functions. The results obtained in this study were partly compared to the results from Vitosha Mts. recorded by Todorov et al. (2012) for *R. canina*. Shannon-Wiener diversity index was calculated for the Rhodope Mts, Stara Planina Mts and Vitosha Mts for all gall samples collected from *R. canina*.

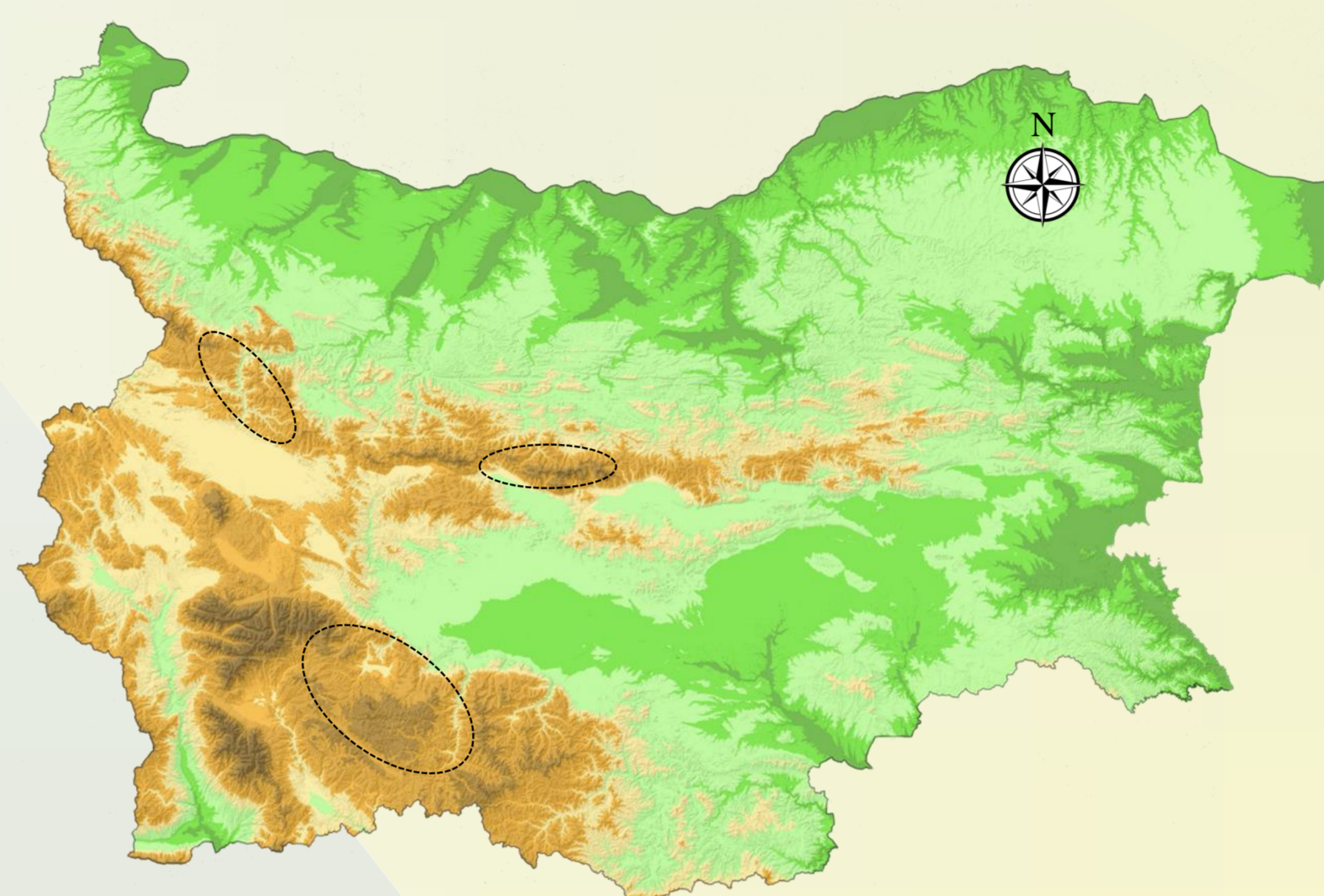


Fig. 1. Sampling areas visited for collection of *D. rosae* galls on the territory of the Rhodope Mountains and Stara Planina Mountains. Figures 1A and 1B present typical appearance of mature bedeguar gall and a female of the gall-maker, respectively.

1A



1B

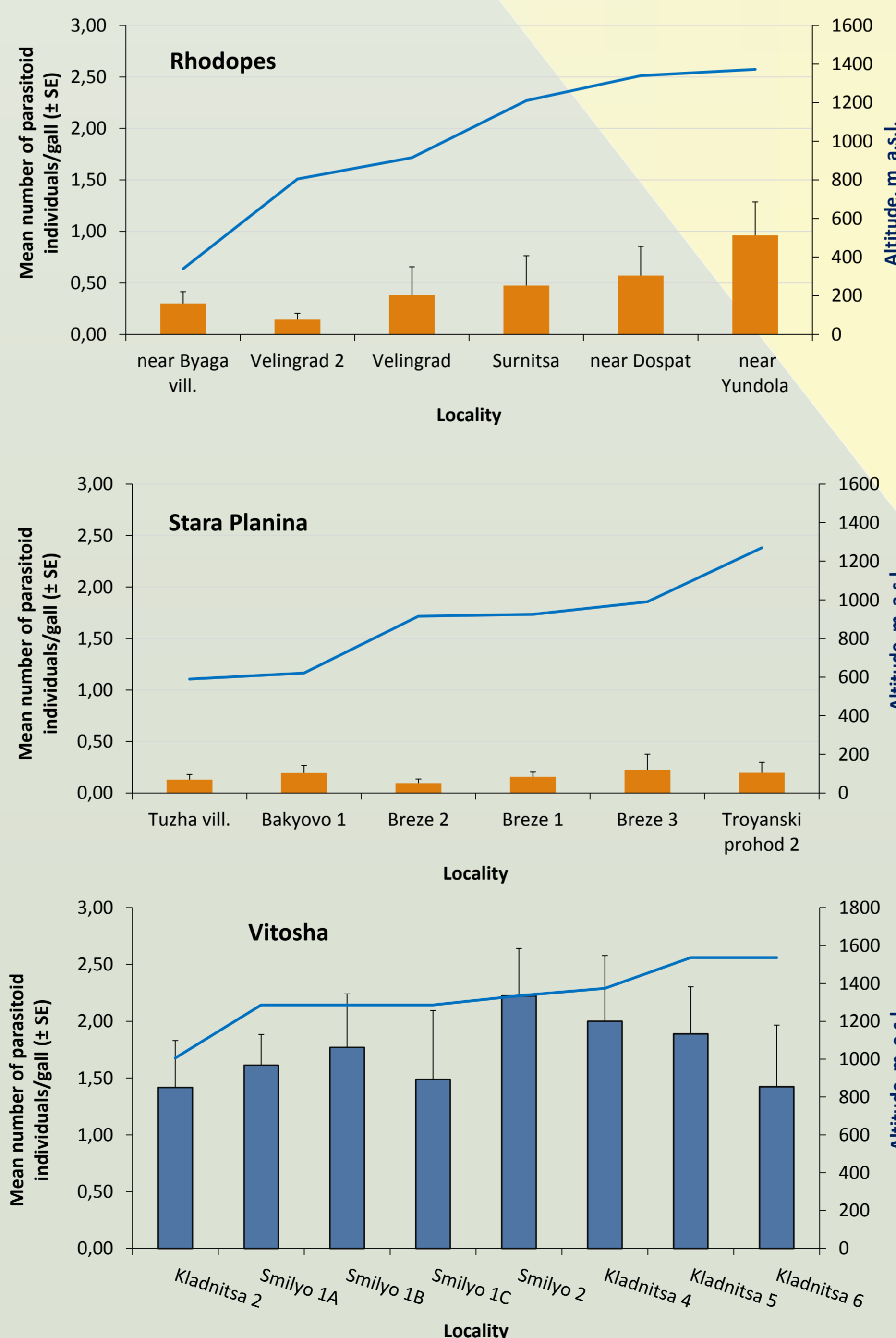


Fig. 3. Mean number of parasitoid specimens/gall in the rearings from the Rhodope Mts., Stara Planina Mts. and Vitosha Mts., with \pm SE for every sample.

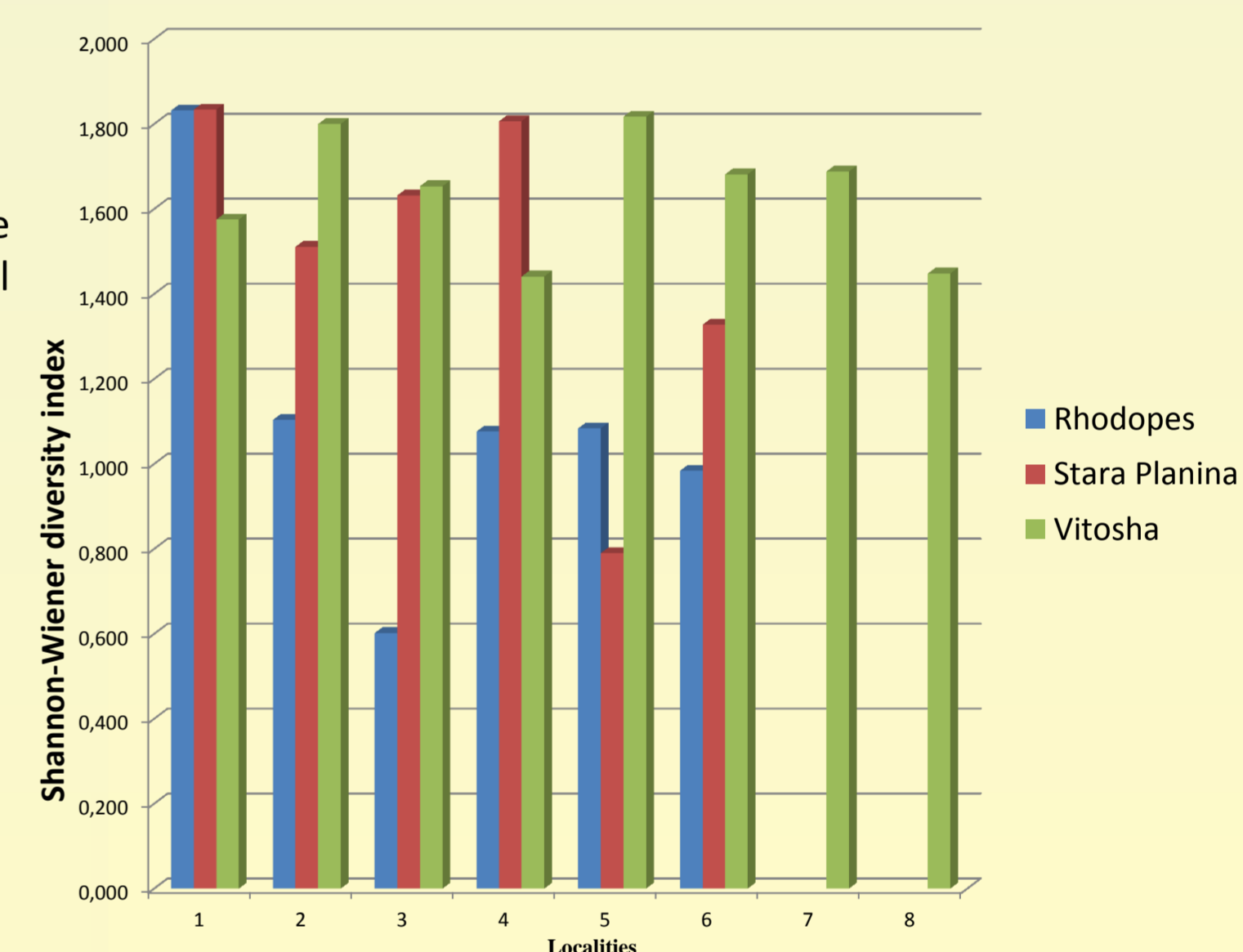


Fig. 4. Shannon-Wiener diversity index calculated for the parasitoid gall community on *R. canina* from the Rhodope Mts., Stara Planina Mts. and Vitosha Mts.

Discussion

Laboratory rearing of the gall material with no cold storage results in failed hibernation and high mortality rate of the gall-maker. Logically, this mortality decrease parasitoid density in the gall community, as is shown on the Fig. 3. Mean number of parasitoid specimens/gall significantly differs compared to the results from Vitosha Mts. where the gall material was gathered after a short period of cold weather on the field and hibernation of *D. rosae* larvae was started naturally. However, species composition of the material from the Rhodopes and St. Planina was rich and similar as structure to the results from Vitosha - the most abundant species were *G. stigma* and *P. bedeguaris* with lower percentages of the rest species. Statistics for the pair *Eurytoma rosae*-*Periclistus brandtii* ($r = -0,924$) confirm the previously recorded by Todorov et al (2012) ($r = -0,546$). We consider it is most likely that *E. rosae* is a primary parasitoid of *P. brandtii* at least in the Bulgarian populations. However, although the disturbance in the gall community according to the failed hibernation and high rates of mortality, species diversity was not significantly decreased and the Shannon-Wiener diversity index was similar for the studied mountains, including the results for Vitosha Mts. The reasons for that high diversity are possibly hidden into the similar rate of survival of the species and their complicated interspecific relationships in the community.

Acknowledgements

This study was supported by the project "Biodiversity of families Eulophidae and Pteromalidae (Hymenoptera: Chalcidoidea) in mountainous habitats. Barcoding and distinguishing of close species", funded by the National Science Fund of the Republic of Bulgaria.

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This poster was presented at the Youth Scientific Conference "Kliment's days", hosted by the Faculty of Biology (Sofia University "St. Kliment Ohridski") on 5-th of November, 2020 in Sofia, Bulgaria.