

DIPLOLEPIS ROSAE

Life history, development and the associated community of the bedeguar gall

The common rose gall wasp and its inquilines, parasitoids and hyperparasitoids

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1. Overview

Diplolepis rosae (Linnaeus, 1758) reproduces predominantly by thelytokous parthenogenesis and forms the conspicuous, multi-chambered bedeguar gall on wild roses. The species is native to the western Palearctic and was introduced to North America in the nineteenth century. The gall is not simply a shelter for the gall former: it is a small ecological community containing an inquiline, primary parasitoids, hyperparasitoids, predators and occasional secondary occupants.

- The species is normally univoltine, with one generation per year.
- Galls are initiated in spring or early summer, grow mainly during summer and become mature and increasingly woody by autumn.
- The developing gall wasp overwinters inside the gall; adults generally emerge during the following spring.
- *Periclistus brandtii* is the principal regular inquiline.
- Important parasitoids include *Orthopelma mediator*, *Glyphomerus stigma*, *Torymus bedeguaris* and *Pteromalus bedeguaris*.
- *Caenacis inflexa* and *Eurytoma rosae* are particularly associated with *P. brandtii*.
- The species composition varies geographically; a list of species known from *D. rosae* does not mean that all occur in every gall.

2. Taxonomy and nomenclature

Kingdom Animalia; phylum Arthropoda; class Insecta; order Hymenoptera; superfamily Cynipoidea; family Diplolepididae (historically included in Cynipidae); genus *Diplolepis* Geoffroy; species *Diplolepis rosae* (Linnaeus, 1758).

Common names include bedeguar gall, mossy rose gall and Robin's pincushion. German Bedeguargalle and related vernacular names refer to the same gall type.

3. Distribution and host plants

3.1 Native range

Diplolepis rosae has a broad Palearctic distribution, extending across much of Europe and into parts of North Africa and Asia. It is widespread in suitable rose habitats in central and western Europe.

3.2 North America

The species was introduced to North America with European roses during the nineteenth century and is now widespread there. Recent comparative work found the North American gall community to be markedly poorer in associated natural enemies than the western Palearctic community, consistent with an enemy-release effect [1].

3.3 Host plants

In the western Palearctic, *D. rosae* uses numerous *Rosa* species. *Rosa canina*, *R. dumalis* and *R. rubiginosa* are among the frequently reported hosts. One review reports at least 14 *Rosa* host species in the western Palearctic. Genetic work on *R. canina*, *R. corymbifera* and *R. rubiginosa* found no clear host-associated differentiation in the wasps studied [6].

4. Habitat and gall position

The galls develop on actively growing rose tissues. They may arise from leaf buds, flowering or fruiting structures, young shoots or shoot tips. In a two-year study in the Brno region, 85.1% of galls developed on developing leaves and 14.9% on flowers or fruits; 63.5% were lateral on shoots and 36.5% were terminal [7].

The mature gall commonly remains attached to the rose through winter. This is ecologically important because the gall provides a protected overwintering environment for *D. rosae* and many members of its associated community.

5. Formation and structure of the bedeguar gall

The female inserts eggs into suitable young rose tissue. The developing larva and the physiological signals associated with oviposition induce extensive plant reorganisation and formation of nutrient-rich gall tissue. The precise biochemical mechanism is complex and not completely resolved.

- The gall is multilocular: individual chambers may contain individual larvae.
- The inner gall tissue is soft and nutrient-rich.
- The outer surface develops the characteristic dense, moss-like covering of filamentous structures.
- Large galls can reach several centimetres in diameter and become woody with age.
- In the Brno study, a gall contained on average about seven fused partial galls and about 54 chambers; the observed ranges were 1–20 partial galls and 1–225 chambers [7].
- Gall size alone does not predict survival because parasitoids, inquilines and vertebrate predators exert different effects.

6. Reproduction

Diplolepis rosae reproduces predominantly by thelytokous parthenogenesis: females can produce daughters without fertilisation. Males occur but are generally uncommon in central European populations. *Wolbachia* infection is widespread in some studied populations and has been discussed as a possible contributor to unisexual reproduction [2, 6].

The male proportion can vary strongly among regions. Therefore a value from one population should not be treated as a universal figure for central Europe.

7. Annual life cycle

Period	Stage / process	Notes
March–April	End of overwintering; pupation	Pupae may occur from mid-March [7].
April–June	Adult emergence	Timing varies regionally; adults may appear into July [7, 11].
April–June/July	Oviposition	Females seek young, actively growing rose tissues.
May–June	Egg hatch and early larva	In Brno, larvae hatched about 7–10 days after oviposition [7].
June–August	Larval development	Gall growth and differentiation of nutritive tissue.

July–October	Later larval stage / diapause preparation	Some larvae remain in an earlier stage through winter [7].
June–October	Main gall growth	Strongest growth generally in June and July; maturation continues into autumn.
Autumn	Mature gall	Larvae or prepupae remain protected inside the gall.
Winter	Diapause / overwintering	Cold conditions are important for normal subsequent development.

7.1 Larval development

Development is not perfectly synchronous. The Brno study showed that after the growing season some individuals had reached the prepupal stage while others overwintered as more advanced larvae and completed development only during the following season [7]. This does not make the species normally biennial: *D. rosae* remains fundamentally univoltine, but individual developmental trajectories can extend across an additional winter.

7.2 Adult emergence

In central Europe, adult emergence is best described as spring to early summer rather than by one fixed month. In the Brno region adults were recorded from April to July; in Sicily, emergence from overwintered galls occurred mainly from March to June [7, 11].

8. Rearing and collecting galls

For a faunistic rearing programme, late summer and autumn are excellent collection periods because mature galls can be collected intact while their occupants are still protected inside.

1. Collect intact, mature galls and do not open them initially.
2. Give every gall a unique code and record date, locality and rose host.
3. Keep each gall separately if quantitative data are desired: one gall = one rearing unit.
4. Keep the galls cool over winter. A recent experimental study used winter temperatures of roughly –10 to +5 °C and then exposed galls to about 15–25 °C to induce emergence [1].
5. In spring, place galls in well-ventilated containers and inspect them regularly.
6. Record every emerging insect with date, gall ID, species and sex where possible.
7. Do not discard a gall immediately after *D. rosae* emerges; later parasitoids and inquiline may emerge afterwards.
8. For difficult Chalcidoidea, consider voucher specimens and/or DNA barcoding.

9. Associated community

The bedeguar gall is a multi-trophic community. Besides *D. rosae*, it contains the inquiline *P. brandtii*, several primary parasitoids and species that may attack other parasitoids or the inquiline and therefore function as hyperparasitoids. Trophic status can change with the host used.

Species	Family	Role	Main relationship	Status
<i>Diplolepis rosae</i>	Diplolepididae	gall former	<i>Rosa</i> spp.	core species

<i>Periclistus brandtii</i>	Cynipidae	inquiline	gall tissue in <i>D. rosae</i> galls	regular core associate
<i>Orthopelma mediator</i>	Ichneumonidae	primary endoparasitoid	mainly <i>D. rosae</i>	very frequent
<i>Glyphomerus stigma</i>	Torymidae	parasitoid; trophic level may vary	<i>D. rosae</i> , <i>P. brandtii</i>	very frequent
<i>Torymus bedeguaris</i>	Torymidae	ectoparasitoid; occasional hyperparasitoid	<i>D. rosae</i> , <i>P. brandtii</i> , <i>O. mediator</i>	frequent
<i>Pteromalus bedeguaris</i>	Pteromalidae	parasitoid; trophic level may vary	<i>D. rosae</i> and other gall inhabitants	frequent
<i>Caenacis inflexa</i>	Pteromalidae	parasitoid of <i>P. brandtii</i> ; may be hyperparasitoid	especially <i>P. brandtii</i>	regular, less frequent
<i>Eurytoma rosae</i>	Eurytomidae	mainly parasitoid of <i>P. brandtii</i>	<i>P. brandtii</i> ; regional reports vary	regional / uncommon
<i>Eupelmus urozonus</i>	Eupelmidae	polyphagous parasitoid	<i>D. rosae</i> and <i>P. brandtii</i> possible	occasional
<i>Eupelmus vesicularis</i>	Eupelmidae	parasitoid	gall community	occasional
<i>Exeristes roborator</i>	Ichneumonidae	parasitoid	<i>D. rosae</i> ; broader host range	regional
<i>Torymus rubi</i>	Torymidae	rare parasitoid record	<i>D. rosae</i> reported	rare / regional
<i>Stepanovia eurytomae</i>	Eulophidae	gregarious parasitoid	<i>D. rosae</i> galls	regional
<i>Mesopolobus sericeus</i>	Pteromalidae	primary parasitoid	<i>D. rosae</i> galls	very rare

10. Key species accounts

10.1 *Periclistus brandtii* – the principal inquiline

P. brandtii does not induce its own gall. Its larvae exploit the existing *Diplolepis* gall and feed on gall tissue. Heavy occupation can suppress or eliminate the original gall-wasp larvae. Adults emerge in spring, mate and females seek young *Diplolepis* galls for oviposition. *P. brandtii* is itself attacked by several parasitoids, notably *C. inflexa*, *E. rosae* and *G. stigma*.

10.2 *Orthopelma mediator*

O. mediator is one of the most important parasitoids of *D. rosae*. It is an ichneumonid endoparasitoid whose larva develops inside the gall-wasp host. Its emergence often overlaps the spring emergence of *D. rosae*. It can itself be attacked by higher trophic-level parasitoids, including *T. bedeguaris* and *P. bedeguaris*.

10.3 *Glyphomerus stigma*

G. stigma is among the most frequently encountered chalcidoid associates. It can use *D. rosae* and *P. brandtii*, so its trophic position depends on the host. In some studies its main emergence occurred later than that of the gall former and several early parasitoids.

10.4 *Torymus bedeguaris*

T. bedeguaris is an important ectoparasitoid and may also act as a hyperparasitoid, for example when it attacks *O. mediator*; this higher-trophic association is reported only in some studies. It overwinters in the gall and commonly emerges in spring or early summer.

10.5 *Pteromalus bedeguaris*

P. bedeguaris (older literature: *Habrocytus bedeguaris*) is a frequent associate. Depending on the host relationship, it may occupy a primary or higher trophic position; its exact trophic role should therefore be interpreted from the original host record. It is particularly relevant in studies of the complete parasitoid complex.

10.6 *Caenacis inflexa*

C. inflexa is strongly associated with *P. brandtii*. It is a primary parasitoid of the inquiline and has also been reported as a hyperparasitoid, so its trophic position depends on the host relationship documented in a particular study.

10.7 *Eurytoma rosae*

E. rosae is strongly associated with *P. brandtii* and is generally regarded as a parasitoid of the inquiline, although it can also attack *D. rosae* in some records. Host assignments vary among studies and regions and should therefore be cited with the original source.

10.8 *Eupelmus* species

Eupelmus urozonus and *E. vesicularis* have been recorded from the community. *E. urozonus* can use more than one gall inhabitant and is not as consistently abundant as the core parasitoids.

10.9 *Exeristes roborator*

E. roborator is a broader-host-range ichneumonid and occurs regionally in *D. rosae* galls. It can emerge during the earlier spring–summer phase.

10.10 Rare and regional species

Torymus rubi, *Stepanovia eurytomae* and *Mesopolobus sericeus* have been reported from *D. rosae* galls, but their frequency and ecological status vary considerably. *T. rubi* in particular has been regarded in some literature as an incidental rather than regular associate. These taxa are best treated as rare or regional records unless supported by local rearing data.

11. Trophic network

Rose (*Rosa* spp.) → gall formation → *Diplolepis rosae* → parasitoids such as *O. mediator*, *G. stigma*, *T. bedeguaris*, *P. bedeguaris* and *E. roborator*.

Diplolepis gall → inquiline → *Periclistus brandtii* → *C. inflexa*, *E. rosae*, *G. stigma* and other parasitoids.

Orthopelma mediator → higher-level parasitoids including *T. bedeguaris* and *P. bedeguaris*.

The arrows indicate documented host relationships, not exclusive relationships. Several species can occupy different trophic levels depending on which host they attack.

12. Phenology of the associated fauna

Taxon	Typical European emergence	Comment
D. rosae	April–July; regionally March–June	main spring emergence
O. mediator	spring–early summer	often overlaps D. rosae
T. bedeguaris	spring–early summer	may attack O. mediator
E. roborator	spring–early summer	regional
E. urozonus	spring–early summer	early emergence possible
P. brandtii	spring	overwinters inside the gall
G. stigma	spring to later season	later peak possible
P. bedeguaris	spring to later season	late emergence possible
E. rosae	often later	strongly dependent on P. brandtii
C. inflexa	variable	depends on occurrence of P. brandtii

13. Regional variation

The community is geographically variable. A large 2024 comparison of western Palearctic and North American galls recovered 6,370 individuals from the western Palearctic sample and 3,180 from North America. The western Palearctic community contained the gall former, *P. brandtii*, two ichneumonids and nine chalcidoid taxa, whereas the introduced North American community was substantially poorer [1].

Local climate, rose species, landscape, enemy pool and invasion history can all influence community composition and relative abundance.

14. Predators, fungi and accidental occupants

Birds and small mammals can open mature galls and consume larvae and pupae. Such damage is distinct from the small emergence holes produced by parasitoids.

Old or damaged galls may also contain accidental occupants such as sawfly larvae, ants, earwigs, neuropteran larvae or spiders. These should not automatically be considered regular members of the *D. rosae* community.

Fungal colonisation can occur in old galls; rust fungi such as *Phragmidium* species have been reported in association with bedeguar galls.

15. Is the development really biennial?

Diplolepis rosae is fundamentally univoltine. The evidence supports delayed development in a proportion of individuals rather than a normal two-year generation. Some larvae can overwinter before reaching the prepupal stage and complete development during the following season [7].

For rearing, failure to obtain an adult in the first spring therefore does not prove that a gall is empty. The same caution applies to parasitoids and inquilines, whose phenology is not synchronised with that of the gall former.

16. Recommended rearing protocol 2026/27

Step	Recommendation
1. Collection	September–October: collect mature, intact galls.
2. Labelling	Assign a unique ID to every gall.
3. Metadata	Record locality, date, Rosa species, gall position and size.
4. Individual rearing	One gall per container for quantitative work.
5. Winter	Keep cool and avoid excessive drying.
6. Spring	Warm gradually and inspect frequently.
7. Emergence	Record date, species, sex and gall ID.
8. Continued observation	Keep the gall after <i>D. rosae</i> emergence.
9. Identification	Use morphology; DNA barcoding may help with difficult chalcidoids.
10. Final examination	Only open or discard the gall after the observation period is complete.

Minimum dataset per gall

Gall ID; collection date; locality/coordinates; Rosa host; gall position; gall dimensions; estimated chamber number; date of every emergence; species and sex; number of empty/occupied chambers if the gall is finally opened; photographs; notes on predation, fungi or damage.

17. How to analyse the rearing data

Link every emerged insect to its individual gall ID. Useful measures include emergence curves, species richness per gall, the proportion of galls containing *P. brandtii*, the ratio of gall former to inquiline and parasitoids, the frequency of hyperparasitoids, and the time lag between *D. rosae* emergence and later parasitoid emergence.

- Do not pool all galls if you want to study community structure.
- Keep voucher specimens for uncertain identifications.
- Record absence as carefully as presence.

18. Main biological conclusions

- The bedeguar gall is a multi-species ecological system rather than a single-species structure.
- *Periclistus brandtii* is the principal regular inquiline and can strongly alter the fate of *D. rosae* larvae.
- *O. mediator*, *G. stigma*, *T. bedeguaris* and *P. bedeguaris* are among the most important parasitoids.
- *C. inflexa* and *E. rosae* are particularly associated with *P. brandtii*.
- Several parasitoids can occupy more than one trophic level.
- Community composition varies geographically.
- Emergence is asynchronous; late-emerging associates are important for complete rearing.
- *D. rosae* is univoltine, but individual development can be delayed across an additional winter.
- For a complete faunistic study, individual gall rearing is preferable.

19. References

- [1] László, Z., Looney, C., Prázsmári, H., Poor, E. & Shorthouse, J. D. (2024). The cynipid gall wasp *Diplolepis rosae* is more successful in North America than in Europe because of enemy release. *Insect Conservation and Diversity* 17: 800–810. DOI 10.1111/icad.12745.
- [2] Schilthuizen, M. & Stouthamer, R. (1998). Distribution of *Wolbachia* among the guild associated with the parthenogenetic gall wasp *Diplolepis rosae*. *Heredity* 81: 270–274.
- [3] László, Z., Sólyom, K., Prázsmári, H., Barta, Z. & Tóthmérész, B. (2014). Predation on rose galls: parasitoids and predators determine gall size through directional selection. *PLOS ONE* 9(5): e97709.
- [4] László, Z. & Tóthmérész, B. (2011). Parasitism, phenology and sex ratio in galls of *Diplolepis rosae* in the Eastern Carpathian Basin. *Entomologica Romanica* 16: 33–38.
- [5] László, Z. & Tóthmérész, B. (2006). Inquiline effects on a multilocular gall community. *Acta Zoologica Academiae Scientiarum Hungaricae*.
- [6] Kohnen, A., Wissemann, V. & Brandl, R. (2011). No host-associated differentiation in the gall wasp *Diplolepis rosae* on three dog rose species. *Biological Journal of the Linnean Society* 102: 369–377.
- [7] Urban, J. (2018). *Diplolepis rosae* (L.) (Hymenoptera: Cynipidae): Development, Ecology and Galls in the Brno Region. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* 66(4): 905–925.
- [8] Zhang, Y. M. et al. (2020). UCE data reveal multiple origins of rose gallers in North America: Global phylogeny of *Diplolepis* Geoffroy. *Molecular Phylogenetics and Evolution* 153: 106949.
- [9] Sardón-Gutiérrez, S., Gil-Tapetado, D., Gómez, J. F. & Nieves-Aldrey, J. L. (2021). Ecological niche modelling of species of the rose gall wasp *Diplolepis* on the Iberian Peninsula. *European Journal of Entomology* 118: 31–45.
- [10] László, Z. et al. (2025). A robust multigenerational laboratory rearing methodology for *Diplolepis mayri* and *Diplolepis rosae* on wild roses (*Rosa* spp.). *Entomologia Experimentalis et Applicata* 173: 1091–1096.
- [11] Rizzo, M. C. & Massa, B. (2006). Parasitism and sex ratio of the Bedeguar gall wasp *Diplolepis rosae* in Sicily.
- [12] Todorov, M. et al. (2012). Studies on the gall community of *Diplolepis rosae* in Vitosha Mountain, Bulgaria. *Acta Zoologica Bulgarica*, Supplement 4: 27–38.
- [13] Biggs, J. (2006/2007). Study of the Rose Bedeguar Gall and its inhabitants. *Proceedings of the Isle of Wight Natural History and Archaeological Society* 22.

20. Source criticism and scope

This document is intended as a working reference for field observation, rearing and faunistic documentation. 'Known from *D. rosae* galls' does not mean 'regular in every gall'. Rare records, older names and higher-level host relationships should be checked against the original source before being used as a definitive species account. The 2024 western-Palearctic/North-American study is particularly valuable because it used a large emergence dataset and provides a modern baseline for the associated fauna.