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MILAN MIŠÍK*

THE ALGA HALICORYNE CARPATICA N. SP. FROM UPPER TRIASSIC OF WESTERN CARPATHIANS

(Fig. 1, Pls. 2)

Abstract: The genus *Halicoryne* is significantly older than assumed before. *H. carpatica* n. sp. is frequent in limestones and dolomites of Carnian, Norian and Rhaetian of the Western Carpathians.

Резюме: Род *Halicoryne* является значительно старшим чем он считался раньше. *H. carpatica* n. sp. находится часто в известняках и доломитах карнийского, норийского и рэтского ярусов Западных Карпат.

Introduction

Němejc (1959, p. 288) mentions that there are no known fossile representants of the genus *Halicoryne* HARVEY. From Czechoslovak Neogene (Sarmatian) has been described the species *Chalmasia morelleti* POKORNÝ (1949); it is already known also from Sarmatian of Hungary, Romania, Poland and Yugoslavia (Miletić—Spajić, 1961; Małecki, 1974; Stancu—Tautu, 1974). Valet—Segonzac (1969) classed this species with the genus *Halicoryne* and they have also attributed *Halicoryne* sp. from the Eocene of France. Bassoulet et al. (1979, p. 431) give, in a table of stratigraphic range of *Dasycladales*, the range of the genus *Halicoryne* as Upper Paleocene to recent. Valet (1979a, p. 855) states that the genus *Halicoryne* is older than the genus *Acetabularia* and that it probably developed in Upper Jurassic from the type *Actinoporella*.

We have nevertheless found out that in Western Carpathians the representants of the genus *Halicoryne* occur abundantly in Upper Triassic (Fig. 1). This was mentioned for the first time by Mišík (in Marschalko et al., 1976, accepted for publishing in 1974, p. 63, Tab. XXIV, Figs. 5—6), Further data are in the contributions Mišík—Borza (1976, p. 27, Tab. XIX, Fig. 7), Borza (1975, p. 226, Tab. VI, Figs. 7—12), Mišík—Jablonský—Mock—Sýkora (1981, p. 25), Gross—Köhler—Borza (1982, p. 77), Soták (1986). Dragastan—Bucur—Demeter (1978, p. 28, Pl. XII. Figs. 5—6) described a new species *Halicoryne nerae* from Upper Barremian—Lower Aptian (according to the picture I consider the attribution of this species to the genus *Halicoryne* to be very doubtful) and they mention also occurences of the genus *Halicoryne* from Upper Triassic and Bathonian, but without a more precise specification. On the other hand, the specimens depicted by Istocescu—Dragastan (1978, Pl. IV, Figs. 3—4) from Ladinian—Carnian as *Chalmasia* sp. represent the genus *Halicoryne* and they correspond to our material.

* Prof. RNDr. M. Mišík, DrSc., Department of Geology and Paleontology, Faculty of Natural Sciences of the Comenius University, Mlynská dolina B-2, 842 15 Bratislava.

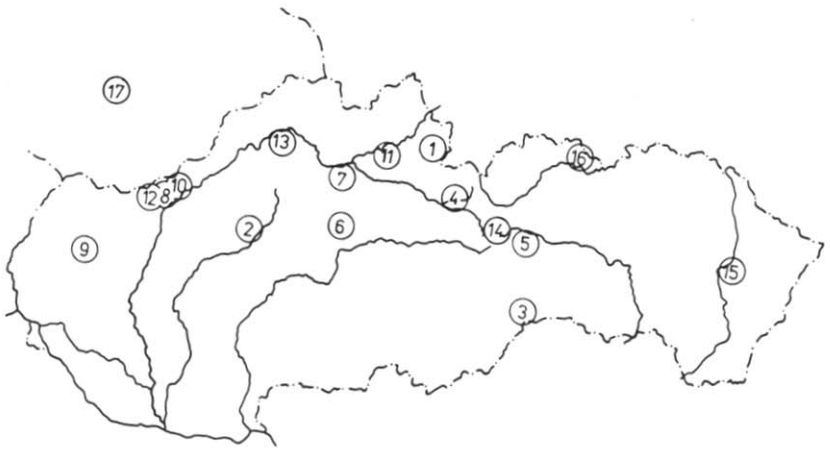


Fig. 1. Localities with occurences of algae of the *Halicoryne* genus in carbonate rocks of Upper Triassic of Western Carpathians in Slovakia (eastern part of Czechoslovakia).

Halicoryne carpatica n. sp.
(Pl. I, Figs. 1—5; Pl. II, Figs. 2—3)

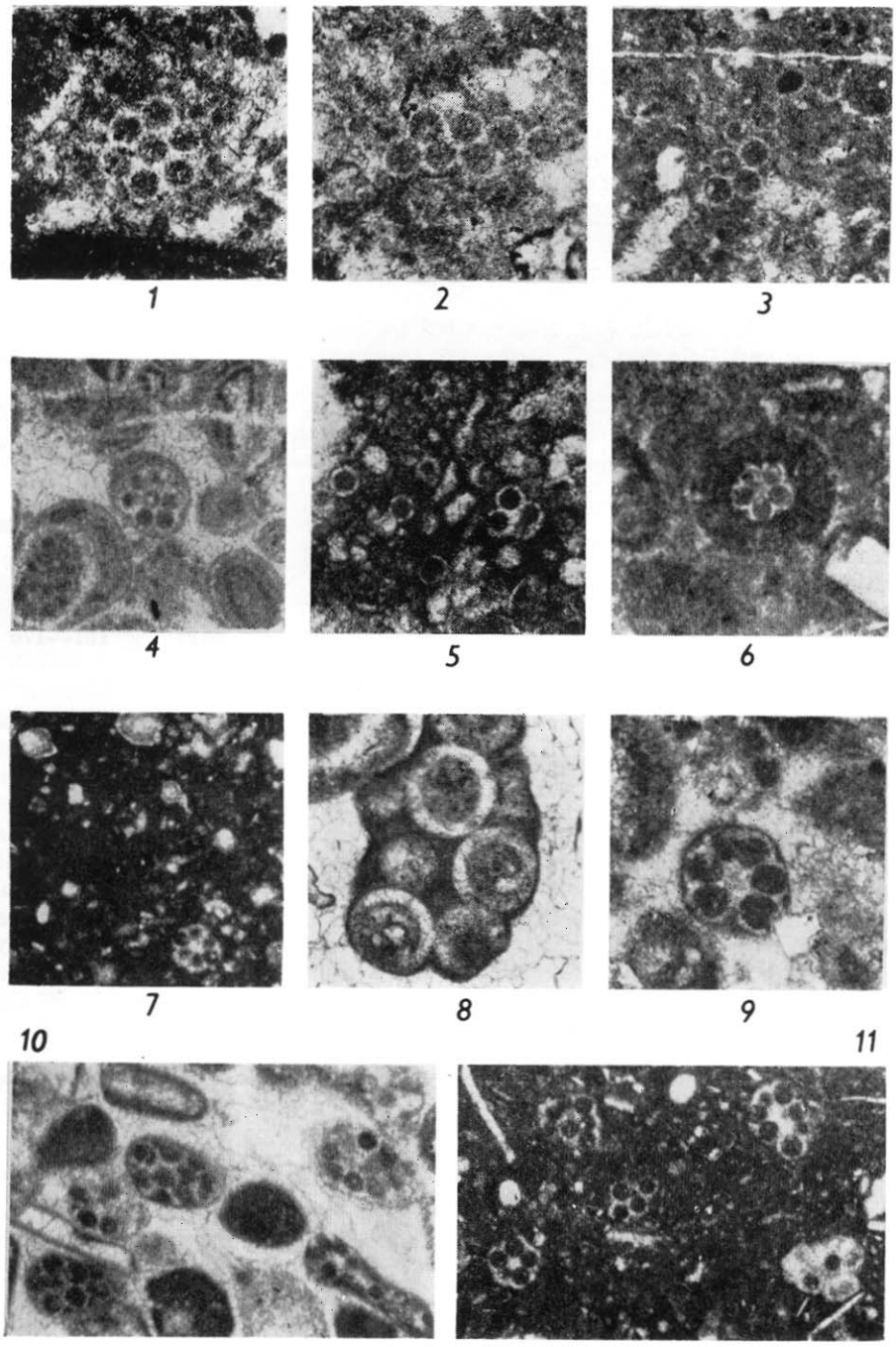
Order: *Dasycladales*
Family: *Acetabulariaceae* (ENDLICHER) HAUCH, 1884
Tribus: *Halicoryne* VALET, 1969

Description: The spicules contain ball-like cysts distributed in the form of a corn-ear. They are always at least partly disintegrated, frequently broken down to individual cysts (this phenomenon is known also from the recent species *Halicoryne spicata* — Valet—Segonzac, 1964, p. 127). In longitudinal

Plate I

Figs. 1—5: *Halicoryne carpatica* n. sp., transversale sections of spicules of rosette shape (1, 4), approximately longitudal sections (2, 3) and isolated cysts (5).
Fig. 1 — Rhaetian limestone, pebble from Paleogene conglomerates, Hromoš-m, No. 4332, enlargement 66x; Fig. 2 — as Fig. 1, No. 4437, enlarg. 66x; Fig. 3 — the same, No. 4436, enlarg. 55x; Fig. 4 — Norian limestone, Hyby, No. 6313, enlarg. 45x; Fig. 5 — Hauptdolomite, Upper Triassic, Neporádza, No. 5056, enlarg. 55x.
Figs. 6—7: *Halicoryne* sp. 2;
Fig. 6 — Rhaetian limestone, Bzince, No. 6316/F; Fig. 7 — Upper Carnian limestone, pebble from Albian conglomerates, Bošáca-d, No. 10470, enlarg. 48x.
Fig. 8: *Halicoryne moreletti* (POKORNÝ), Sarmatian limestone, Šalov near Želiezovce, enlarg. 50x.
Fig. 9—10: *Halicoryne* sp. 2;
Fig. 9 — Rhaetian limestone, Donovaly, No. 6857, enlarg. 60x; Fig. 10 — as Fig. 9, No. 1508, enlarg. 95x.
Fig. 11: *Halicoryne carpatica* n. sp., Norian limestone, block from Paleogene conglomerates, Jablonové, No. 52044/F, enlarg. 48x.

Plate I



sections, maximally 11 cysts have been found arranged closely in three rows. In transversale sections, the cysts protrude in relief along the perimeter, they have distinctly thin walls. They are characterised by rosette shape with 5—6 cysts, in the centre of spicules there is usually a little sparitic calcite.

Dimensions: The cysts have constant dimensions. Average diameter from 20 measurements: 70 μm; maximal value: 75 μm (locality Hromoš). As the measurements have been done on thin sections, the maximal values are nearest to the actual diameters. Wall thickness: 10 μm. Width of spicules (rosette sections): 161 μm—180 μm. Sections of the cysts are round, exceptionally elliptical (mechanical deformation).

Derivation of the name: From the Carpathian Mts.

Stratigraphic range: Carnian—Rhaetian, with a maximum in Norian.

Holotype: Tab. II, Fig. 2; deposited in the collections of the Department of Geology and Paleontology, Comenius University, Bratislava, under the No. 63941/F.

Comparison: *H. carpatica* is the smallest of the known species. Its dimensions are similar to *H.* sp. described from Eocene by Valet—Segonzac (1969); all dimensions are in μm:

	H. spicata	*H. morelleti*	*H.* sp. (Eocene)	*H. carpatica*
Diameter of cysts	150—270	200—400	100	75
Wall thickness	30—40	30—35	15—20	10
Number of cysts	10—30	10—50	> 12	> 11
Width (of rosettes)	500	1130	250—315	161—170

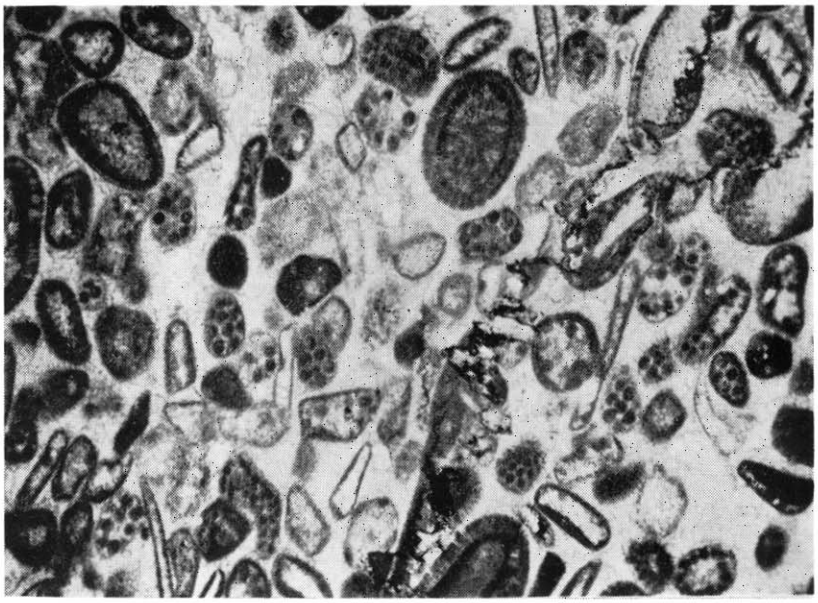
Halicoryne carpatica has some characteristics in common with *Holosporella siamensis* PIA described by Pia (1930) from the border region of Burma and Thailand. This occurs also in Upper Triassic, it has globule-like cysts with thin walls (membranes) with the same wall width of 0.01 mm. But the cyst diameter is larger — 0.12 mm and especially the diameter of the "cylinder" (cross-sections) is substantially larger — 0.4 mm. The main difference is the presence of a wide central chanel ("axial perforation piercing") in the genus *Holosporella*, the presence of 10 globules (cysts) in the cross-section ("rosette") in contrast to 5—6 in *Halicoryne carpatica*. *Holosporella* did not break up into individual cysts after perishing, but it was rounded by transportation until the formation of hemispherical depressions on the outer perimeter (Pia, 1930,

Plate II

Fig. 1 — Microfacies with *Halicoryne* sp. 2 in oolitic, fine lumachelle Rhaetian limestone, Donovaly, No. 6857, enlarg. 55x.
Figs. 2—3: *Halicoryne carpatica* n. sp.;
Fig. 2 — Holotype, Norian limestone, Huty, No. 63941/F, enlarg. 48x; Fig. 3 — Rhaetian limestone, pebble from Paleogene conglomerates, Hromoš-m, No. 9331, enlarg. 48x.

From author's material photos taken by L. Osvald

Plate II



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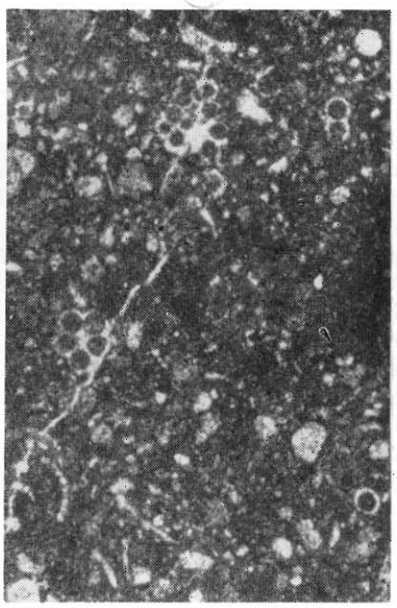

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Pl. 4, Fig. 2), what has never been observed on the material of *Halicoryne carpatica*. Short age of data does not enable an eventual re-classification of *Holosporella* with the genus *Halicoryne*. P i a (1930) expressed the opinion that *Holosporella* represents the sporangium tube of an endospore *Dasycladaceae* comparable with *Diplopora phanerospora*, which was not calcified except for this tube. I would like to point out that no *Dasycladaceae* have been found in the association from the material of 17 localities of *Halicoryne carpatica*, except sporadic *Aciculella* sp.

Halicoryne sp. 2
(Pl. I, Figs. 6—7, 9—10; Pl. II, Fig. 1)

This form differs from *H. carpatica* n. sp. by a less regular arrangement of cysts and their smaller dimensions. From 20 measurements on loc. 6, where this form represents the whole population, the average diameter is 50 μm, max. 60 μm. On the locality 16, where it is accompanied by *Halicoryne carpatica* n. sp., the average diameter was 49 μm, max. 52 μm.

Localities and associations

Localities are depicted on Fig. 1 with the same numbers as in the descriptions. Foraminifers have been determined by O. J e n d r e j á k o v á (except 3, 5, 17).

1. Upper Norian (Sevatian). Holica near Huty, Western Tatra Mts., Choč Nappe. Grey nodular limestone, biomicrite. Abundantly with *Aulotortus gaschei* (KOEHN—ZANINETTI et BRÖNNIMANN), *A. tenuis* (KRISTAN), *A. tumidus* (KRISTAN—TOLLMANN), *A.* aff. *impressus* (KRISTAN—TOLLMANN), *Frondicularia woodwardi* HOWCHIN, ostracodes, *Aciculella* sp., bioturbation with polarity textures in relics of burrow cavities; cavities after leached skeletons partly filled with dolomite.

2. Carnian—Norian. Neporádza — cemetery, Strážovské Mts., Choč Nappe, hauptdolomite, dolodismicrite. Rarely with *Aulotortus* cf. *gaschei* (KOEHN—ZANINETTI et BRÖNNIMANN), ostracodes, small gastropods.

3. Norian. Silická Brezová, Slovak Karst, Silica Nappe. Hallstatt limestone, red nodular, biomicrite. Rarely with calcified radiolarians, "fibres" (juvenile lamellibranchs), *Globochaete alpina* LOMBARD, ostracods, sporadic echinoderm segments and calcified siliceous sponge spines.

4. Norian. Hybe, Nízke Tatry Mts., Choč Nappe. Dachstein limestone, oobiosparite. Rarely with *Angulodiscus tenuis* (KRISTAN) and fragments of lamellibranchs.

5. Norian. Localities Veľká Lúka, Goštanová, Tepličné, Rangaska; Stratenská hornatina Mts., Silica Nappe (B o r z a , 1975). Dachstein limestone with *Aulotortus gaschei* (KOEHN—ZANINETTI et BRÖNNIMANN), *A. tumidus* (KRISTAN—TOLLMANN), *Involuntina minuta* (KOEHN—ZANINETTI), *Gemeridella minuta* BORZA et MIŠÍK, *Frondicularia* sp., ostracods, gastropods, lamellibranchs, crinoid segments.

6. Rhaetian. Mt. Zvolen near Donovaly, Nízke Tatry Mts., Krížna Nappe. Oointrabiosparite. Abundant *Halicoryne* sp. with rounded fragments of lamellibranchs, terebratulid brachiopods, small gastropods, echinoderm segments, *Aciculella* sp.; frequent oolites and autigene plagioclases.

7. Rhaetian. Podhradie, Veľká Fatra Mts., Krížna Nappe. Oobiomicrite. Rare.

8. Norian—Rhaetian. Bzince, Čachtice Mts., Choč Nappe. Dachstein limestone, oobiomicrite. Rare.

9. Upper Norian (Sevatian) — Lower Rhaetian. Ježovka near Plavecký Peter, Malé Karpaty Mts., Choč Nappe. Biomicrite, partly re-crystallised. Rarely with *Angulodiscus tenuis* (KRISTAN), "*Glomospirella*" *friedli* KRISTAN—TOLLMANN, *Aulotortus gaschei* (KOEHN—ZANINETTI et BRÖNNIMANN), *A. tumidus* (KRISTAN—TOLLMANN), *Frondicularia* sp., rarely lamellibranchs, gastropods, ostracods, cavities probably caused by drying of the sediment.

Findings in the form of pebbles in younger formations

10. Upper Carnian (Upper Tuvalian). Bošáca-d, pebble from Albian conglomerates. Biomicrite. Rarely with ostracods, calcified spines of siliceous sponges. "fibres" (juvenile lamellibranchs), gastropods, *Frondicularia woodwardi* HOWCHIN, *Nodosaria* sp. Abundant autigene quartz full of calcite inclusions and autigene plagioclases with no inclusions. By extraction were obtained conodonts *Metapolygnathus abneptis abneptis* (HUCKRIEDE) and *M.* sp. and sclerites of holoturians *Achistrum triassicum* GUTCHICK, *Irinella canalifera* (KRISTAN—TOLLMANN), *Theelia immisorbiculata* MOSTLER (Mock in Mišík et al., 1981).

11. Upper Triassic (probably Norian). Pucov, Orava, pebble from Paleogene conglomerates (Gross et al., 1982). Brown limestone.

12. Norian — Lower Rhaetian. Hrušové-d, pebble from Senonian conglomerates, Čachtické Karpaty Mts., Dachstein limestone, biomicrite. Sporadically with rounded lamellibranch fragments, with "*Glomospirella*" cf. *friedli* KRISTAN—TOLLMANN, sporadic gastropods, echinoderm segments, *Protococcaoae* (?), initial oolites.

13. Upper Norian (Sevatian). Jabloňové, block in Paleogene conglomerates (Ilerdian). Biomicrite. Abundantly with *Aulotortus tumidus* (KRISTAN—TOLLMANN), *A. gaschei* (KOEHN—ZANINETTI et BRÖNNIMANN), *A. sinuosus* WEYNSCHENK, *A. tenuis* (KRISTAN), *Semiinvoluta clari* KRISTAN, *Frondicularia woodwardi* HOWCHIN, small gastropods, rarely echinoderm segments, lamellibranchs, ostracods, juvenile amonite. An analogous finding from this locality is mentioned also by Borza (1975).

14. Lower Rhaetian. Dobšiná Ice Cave — 68, pebble from Senonian conglomerates (Santonian—Lower Campanian). Biomicrite. Rarely with *Aulotortus tenuis* KRISTAN), *A. tumidus* (KRISTAN—TOLLMANN), *A. sinuosus* WEYNSCHENK, "*Glomospirella*" *friedli* KRISTAN—TOLLMANN, *Semiinvoluta clari* KRISTAN, *planiinvoluta carinata* LEISCHNER, *Frondicularia woodwardi* HOWCHIN, *Aciculella* sp. 1, ostracods, rarely gastropods.

15. Upper Triassic. Jasenovo, pebble from Albian (?) conglomerates, biomicrite, rarely.

16. Upper Triassic. Hromoš-m, pebble from Paleogene conglomerates. Fine-coquina limestones, biomicrite. Frequently with *Glomospirella shengi* HO, *Oberhauserella* sp., lamellibranchs, terebratulide brachiopods, rarely gastropods, crinoid and ophiurid segments, sea-urchin spines, *Acicularia* sp., ostracods, microoncolites of *Cyanophyceae*, phosphatised fish tooth; abundant epigenetic pyrite.

17. Norian. Zástřizly, Magura flysh zone. Pebble from Paleogene conglomerates. Biointramicrite with *Auloconus permodiscoides* (OBERHAUSER); *Aulotortus sinuosus* WEYNSCHENK, *Angulodiscus* cf. *falsotumidus* SALAJ, BORZA et SAMUEL (Soták, 1986).

Ecology

On the localities 2, 6, 13, 16 is *Halicoryne* so abundant that we can talk about a "microfacies with *Halicoryne*". There are mostly biomicrites, in which they are associated with foraminifers, of the family *Involutinidae* and small gastropods (inner platform, microfacies SMF-9 according to Wilson, 1975) and also oosparites (barrier environment, "winnowed edge sands" SMF-15 according to Wilson). On the basis of foraminifers it is possible to make a comparison with the facies No. 4 of Hohenegger—Piller (1975): detritic facies with algae and foraminifers (*Dasycladales* are not damaged as the environment was only slightly agitated; presence of big involutinides) and with facies No. 1: oolites from strongly agitated environment with *Glomospirella*.

Only a few specimens have been found transported into a more deep environment (localities 3, 10, where they are in association with conodonts, nevertheless only sporadic).

The ecology of recent *Halicoryne spicata* (KÜTZING) SOLMS—LAUBACH has been described by VALET (1979a). This species grows in littoral zone on clay-sand substrate, but also in reef environment of the Indo-Pacific region. In New Caledonia it has been observed also in hypersaline as well as in brackish environments.

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