

The presence in Morocco of the late Famennian genus *Hadyrhyncha* HAVLÍČEK, 1979 (rhynchonellid, brachiopod)

by Paul SARTENAER

Abstract

A new species, *Hadyrhyncha meridionalis*, is described from the upper Famennian of southern (Draa Valley, Maïder, Tafilalt, Zemoul) and perhaps central (northern Meseta) Morocco. The only other known species of the genus is the type species, *H. hadyensis* HAVLÍČEK, 1979, from the late Famennian Hady Limestone of Moravia (Czech Republic), and also recorded from south-eastern Thuringia (Germany).

Key-words: *Hadyrhyncha meridionalis* - rhynchonellids - brachiopods - late Famennian - Morocco

Résumé

L'auteur décrit une nouvelle espèce, *Hadyrhyncha meridionalis*, du Famennien supérieur du Maroc méridional (Maïder, Tafilalt, Vallée du Draa, Zemoul); l'espèce est aussi probablement présente au Maroc central (Méséta septentrionale). L'espèce-type, *H. hadyensis* HAVLÍČEK, 1979, du Calcaire d'Hady (Famennien supérieur) en Moravie (République Tchèque) est la seule autre espèce connue du genre; sa présence a aussi été signalée en Thuringe sud-orientale (Allemagne).

Mots-clefs: *Hadyrhyncha meridionalis* - Rhynchonellides - Brachiopodes - Famennien supérieur - Maroc

The description of a second species of the genus *Hadyrhyncha* HAVLÍČEK, 1979 in southern, and perhaps in central, Morocco is important for three reasons: it strengthens the systematic position of the genus; it enhances its stratigraphical significance; and widens its geographical distribution.

Hadyrhyncha meridionalis n. sp.
Plate 1, Figures 1-40

SYNONYMY

- ? 1950 *Calvinaria?* *undulata* nov. sp. - TERMIER, G. & H., p. 71 *pro parte*, p. 99 *pro parte*;
? 1950 *Calvinaria undulata* nov. sp. - TERMIER, G. & H., pl. XCIX (= p. 199), figs 30, 31.

DERIVATIO NOMINIS

Meridionalis, *e* (Latin, adjective) = southern. The name has been chosen because the species occurs commonly in southern Morocco.

TYPES

Holotype, IRScNB a10634 (Pl. 1, Figs 6-10), Paratypes A, IRScNB a10635 (Pl. 1, Figs 1-5), B, IRScNB a10636 (Pl. 1, Figs 16-20), C, IRScNB a10637 (Pl. 1, Figs 11-15), D, IRScNB a10638 (Pl. 1, Figs 26-30), E, IRScNB a10639 (Pl. 1, Figs 21-25), F, IRScNB a10640, G, IRScNB a10641, H, IRScNB a10642, I, IRScNB a10643, J, IRScNB a10644, K, IRScNB a10645. Jebel el Mrakib, N 30° 46,367', W 04° 42,618' (Fezzou 1/100,000 sheet), Maïder, southern Morocco. Level of Famennian do V in the Upper Ibaouâne Formation. Locality 102b. Collector: V. Ebbighausen, 1996.

Paratype L, IRScNB a10646 (Pl. 1, Figs 31-35). Tizi Ibaouâne at the Aguelmous (Msissi 1/100,000 sheet), Maïder, southern Morocco. Famennian do V (probably upper part). MA-75-23. Collector: P. Sartenaer, 1975.

Paratype M (Pl. 1, Figs 36-40). Near Fezzou (Fezzou or Msissi 1/100,000 sheet), Maïder, southern Morocco. Old collection of the "Direction de la Géologie" in Rabat, Morocco.

LOCUS TYPICUS

Jebel el Mrakib, N 30° 46,367', W 04° 42,618' (Fezzou 1/100,000 sheet), Maïder, southern Morocco (see BECKER, 1995, fig. 1, p. 609).

STRATUM TYPICUM

Level of Famennian do V in the Upper Ibaouâne Formation.

MATERIAL

Sixty-eight haematized internal moulds of which thirty-two are in a satisfactory state of preservation, and thirty-six fragmental. Fifty-two specimens come from the Maïder, one from the Tafilalt, one from the Draa Valley, and fourteen from the Zemoul (see further information in the chapter on stratigraphical range and geographical distribution of the species).

DESCRIPTION

General external characters

Size medium (generally) to large. Unisulcate. Both valves low, subequally and uniformly convex, and subequally high. Contour sub-elliptical in ventral and dorsal views. In frontal view the contour has the shape of a biconvex lens. Commissure sharp, protruding, slightly undulated or

crenulated by the median costae, and slightly undulated by the lateral costae when present. Umbonal regions with moderate relief. Postero-lateral margins concave near the commissure. Ventral fold and dorsal sulcus start imperceptibly at a distance from the beak varying from 21 to 36 per cent of the shell-length (most values varying from 31 to 36 per cent) or from 25 to 40 per cent of the unrolled length of the valve.

Pedicle valve

Very low fold widening slowly anteriorly, and reaching its maximum width (50 to 69 per cent of the shell-width, most values varying from 56 to 67 per cent) at the junction of the frontal and lateral commissures. In the anterior two-thirds of the valve the fold is separated from the flanks by low and wide grooves corresponding to hog-back ridges in the brachial valve. In 60 per cent of specimens the part of the fold between the external costae is depressed; in the remaining 40 per cent the top of the fold is flat. Beak small, slightly incurved, and slightly overhanging the hinge line. Interarea narrow (40 to 48 per cent of shell-width), very low, and well delimited.

Brachial valve

Umbonal region not inflated. Very shallow sulcus with flat to slightly convex bottom. Tongue wide, very shallow, trapezoidal with sharp borders and standing out clearly. Its top is always – sometimes considerably – lower than the top of the shell. The tongue is elongated anteriorly.

Ornament

The general costal formula, which is a grouping of at least 75 per cent of the specimens in median, parietal and lateral categories, is: $\frac{3 \text{ to } 6}{2 \text{ to } 5}$; 0; 0 to 8. (Remark: on account of the unisulcate nature of the shell, the number of costae of the ventral fold is in numerators, and the number of costae of the dorsal sulcus in denominators.)

The distribution of median costae in specimens upon which such a counting was possible is as follows: 3/2: 11 sp. (21.5%); 4/3: 17 sp. (33.4%); 5/4: 8 sp. (15.7%); 6/5: 10 sp. (19.6%); 7/6: 3 sp. (5.9%); 8/7: 2 sp. (3.9%).

Median costae start a short distance from the beaks, posterior to the beginning of fold and sulcus. Median costae are irregular on account of the following costal pattern. Generally (on twenty-seven out of the forty specimens on which such an observation was possible) the bounding costae of the ventral fold are wider (generally 3 to 4 mm, exceptionally to 5 mm) anteriorly than the other median costa(e) (generally 1 to 1.5 mm, rarely to 2 mm) from which they are rarely separated by a wide furrow; the median costa(e) is (are) also commonly lower than the bounding costae; this results in a wide slight median depression on the fold. The external costae are rarely divided, while one or two divisions, with corresponding intercalations in the dorsal sulcus, have

been observed in, respectively, 18 and 4 specimens, while the 15 remaining specimens amongst the 37 specimens in which such observations were possible, did not show any division; it is highly probable that the wearing away of costae (i.e. the state of preservation) explains why not more divisions have been observed. This is also the reason why lateral costae could be counted in only a few specimens, and then generally small in number (0: 23 sp. ; 1/2: 2 sp. ; 3/4: 2 sp. ; 4/5: 3 sp.), but on 3 specimens 7 to 8 costae seem to be present.

The lateral costae and the middle median costae are flat-rounded whilst the wide median bounding costae are angular with a rounded top, generally moderately elevated, and, exceptionally, elevated.

No parietal costae.

Dimensions

Measurements of ten specimens, of which four have been photographed, are given in Table 1.

Top of pedicle valve located posteriorly at a point varying between 28 and 46 per cent of the shell-length anterior to the beak. Top of brachial valve located posteriorly at a point varying between 28 and 39 per cent of the shell-length anterior to the ventral beak.

Width is by far the greatest dimension. Maximum width occurs at a point between 50 and 57 per cent of the shell-length anterior to the ventral beak.

Both valves are low and have subequal thicknesses and unrolled lengths.

Apical angle varying from 138° to 148°. Angle of the cardinal commissure varying from 145° to 157°.

Top of tongue 20 to 40 per cent lower than point of maximum thickness of brachial valve.

DISCUSSION OF SYNONYMY

The synonymy indicated above is questionable, because it includes a reference to two specimens from the oued Aricha (northern Moroccan Meseta) illustrated only by poor drawings of their apical view, and which I was unable to find at the "Direction de la Géologie" in Rabat. The unisulcate character ("commissures à sinus inverse") of the genus *Hadyrhyncha* is mentioned by TERMIER, G. & H. (1950, explanation of pl. XCIX, p. 198), and the age given, Famennian V, corresponds to the age of the genus elsewhere.

Calvinaria undulata TERMIER, G. & H., 1950, the definition of which is imposed by the choice of lectotype by DROT (1964, p. 169), has nothing in common either with *Hadyrhyncha meridionalis* n. sp. or with the genus *Hadyrhyncha*. The lectotype does not belong to the genus *Pseudoleiorhynchus* ROZMAN, 1962 as stated by DROT nor to the genus *Trifidorostellum* SARTENAER, 1961, of which the former is a junior synonym.

If future collecting of topotypical material should confirm the generic identity of the species mentioned in the synonymy, then the geographical distribution of the genus *Hadyrhyncha*, and possibly of the species *H. meridionalis* n. sp., would be extended further to the north in Morocco.

in mm	Paratype A a 10635	Holotype a 10634	Paratype F a 10640	Paratype G a 10641	Paratype H a 10642	Paratype C a 10637	Paratype I a 10643	Paratype J a 10644	Paratype E a 10639	Paratype K a 10645
l	22.80	21.30	21.40	20.80	20.90	20	20.20	18.70	18.80	17.90
w	35.10	30.60	30.50	28.40	28.40	27.80	26.50	25.90	26	(25.70)
lpv unrolled	(28)	(25)	(27)	(24)	(24)	(23.50)	(23.50)	(22.50)	(22)	(22)
t	13.50	12.80	12.40	11.50	11.60	11.30	(11)	11.20	10.90	10.40
tpv	7.30	6.20	7.40	5.50	5.50	5.80	(5.80)	5.40	5.60	5.10
tbv	6.20	6.60	5	6	6.10	5.50	5.20	5.80	5.30	5.30
l/w	0.65	0.70	0.70	0.73	0.74	0.72	0.76	0.72	0.72	(0.70)
t/w	0.38	0.42	0.41	0.40	0.41	0.41	0.42	0.43	0.42	(0.40)
t/l	0.59	0.60	0.58	0.55	0.56	0.57	(0.54)	0.60	0.58	0.58
apical angle	148°	145°	138°	139°	147°	138°	138°	144°	139°	147°
angle of the commissure	(157°)	152°	145°	146°	152°	146°	?	148°	(146°)	153°

l = length; t = thickness; w = width; bv = brachial valve; pv = pedicle valve. Measurements shown in parentheses indicate a reasonable estimate on a damaged specimen.

Table 1.

COMPARISONS

According to V. Havlíček (personal communication) abundant separated valves of *H. hadyensis* HAVLÍČEK, 1979 are sometimes observed on bedding planes. But, the only material of this species available to the author in PRAGUE in April 1980 consisted of two specimens, one of them, the only complete specimen, being the holotype figured by HAVLÍČEK (1979, pl. II, figs 6-9). On the base of this study the new species differs from the Moravian one by: a larger size, a ventral fold often depressed in its median part, costae starting further away from the beaks, and lateral costae shorter, smoother and often absent.

STRATIGRAPHICAL RANGE AND GEOGRAPHICAL DISTRIBUTION

The following specimens are part of the old collections of the "Direction de la Géologie" in Rabat, Morocco, and are poorly documented: Maïder [near Fezzou (Fezzou and Msiissi 1/100,000 sheets): 1 sp. (no further information), 2 sp. (beds with "*Oxyclymenia*", now *Kosmoclymenia*), 5 sp. (ds 515, Famennian V)]; Tafilalt [1 sp., Famennian IV or V]; Draa River [Boû Na'ilat on the left bank of the Draa River (Aïn Boû Mellous 1/100,000 sheet): 1 sp. (late Famennian)]; Zemoul [14 sp., 966 (field number in an unpublished document by P. Jacquemont, 1955), late Famennian].

Recent collections from Maïder have provided the following information: Boû Tlidat at the Aguelmous, 3.5 km NE of Fezzou (Fezzou 1/100,000 sheet): 3 sp., MA-79-10d, Famennian do V (probably upper part), collected by P. Sartenaer, 1979; Tizi Ibaouâne at the Aguelmous (Msiissi 1/100,000 sheet): 10 sp., MA-75-23 = MA-84-7f, Famennian do V (probably upper part), collected by P. Sartenaer, 1975, 1984;

Jebel el Mrakib (Fezzou 1/100,000 sheet): 31 sp., localities 102a (2 sp.) = N 30° 45,410', W 04° 42,757' and 102b (29 sp.) = N 30° 46,367', W 04° 42,618', level of Famennian do V in the Upper Ibaouâne Formation, collected by V. Ebbighausen between 1990 and 1996.

In short, *Hadyrhyncha meridionalis* n. sp. is found in a restricted area of southern Morocco [Maïder, Draa Valley, Tafilalt and Zemoul]. The presence of the species in the oued Aricha in the Sidi-Bettache Depression of the northern Moroccan Meseta remains questionable.

The age of the species based on the most reliable information is Famennian do V.

Stratigraphical range and geographical distribution of the genus *Hadyrhyncha*

Information on the Moroccan species, *H. meridionalis* n. sp., is given above.

In Moravia, the type species, *H. hadyensis*, is found only at Hády Hill near Brno. HAVLÍČEK (1979, p. 99, p. 100) indicates a late Famennian (V and VI) age for the species, but considers its type horizon as Famennian V or VI.

Precise stratigraphical information is available for south-eastern Thuringia, where BARTZSCH & WEYER (1986, pl. I, right column, fig. 6) found *H. hadyensis* at Gositzfelsen-Süd in the Bohlen profile near Saalfeld in the middle part of do V, 0.9 m above the base of the "obere *Clymenia*-Stufe", i.e. 0.9 m above the top of the "Hauptquarzit".

In conclusion, if a do VI age cannot yet be definitely dismissed, the best information points out to a do V age for the genus *Hadyrhyncha*.

Conclusions

What we know about the internal characters of the genus is due to HAVLÍČEK (1979, p. 99), who wrote: "Dental plates probably absent. Brachial valve thin-shelled, dorsal cardinalia minute; hinge plates fine, resting on the valve floor, separated by a shallow pit, extending anteriorly in a pair of blade-like crural apophyses diverging ventrally. Median septum, septalium, and cardinal process absent". Only one of these characters - the blade-like crural apophyses - can be observed in the only transverse serial section of the type species given by HAVLÍČEK (1979, text-fig. 8, p. 99). Therefore the inner structure of the genus still needs to be confirmed by further investigations and illustrations. Unfortunately, the state of preservation of *Hadyrhyncha meridionalis* n. sp. does not allow any useful observation of its internal characters.

References

- BARTZSCH, K. & WEYER, D., 1986. Biostratigraphie der Devon/Karbon-Grenze im Bohlen-Profil bei Saalfeld (Thüringen, DDR). *Zeitschrift für geologische Wissenschaften*, **14** (2): 147-152.
- BECKER, R.T., 1995. Taxonomy and evolution of late Famennian Tornocerataceae (Ammonoidea). *Berliner geowissenschaftliche Abhandlungen*, E, **16.2** (*Miscellanea Palaeontologica* 4, Festschrift Gundolf ERNST): 607-643.
- DROT, J., 1964. Rhynchonelloidea et Spiriferoidea siluro-dévo-niens du Maroc pré-saharien. *Notes et Mémoires du Service Géologique du Maroc*, **178**, 287pp.
- HAVLÍČEK, V., 1979. Upper Devonian and Lower Tournaisian Rhynchonellida in Czechoslovakia. *Věstník Ústředního ústavu geologického*, **54** (2): 87-101.
- JACQUEMONT, P., 1955. Etude du Paléozoïque du bord nord du Bassin de Tindouf. Document Bureau des Recherches de Pétrole, Paris. Unpublished.
- ROZMAN, Kh.S., 1962. Stratigrafiya i Brakhiopody famenskogo yarusa Mugodjar i smezhnykh raionov. *Trudy geologicheskogo instituta, Akademiya Nauk SSSR*, **50**, 196 pp.

Still, as the genus *Hadyrhyncha* is known so far only by its type species, the assignment of a second species to it is useful. In particular, the description of *H. meridionalis* n. sp. enables additions to the original diagnosis of the genus by HAVLÍČEK (1979, pp. 98-99). The following diagnostic features are, by definition, also to be found in the type species: shell unisulcate; apical angle and angle of the cardinal commissure very wide; tongue very shallow, elongated anteriorly with top always located lower than top of shell; median costae commonly divided or intercalated (a triplicated costa can be observed in the ventral fold of the holotype of the type species as well as an intercalated costa in the dorsal sulcus).

Acknowledgments

The author is grateful to V. Ebbighausen, Odenthal, who put his collection at his disposal. He also wishes to express his thanks to R.T. Becker, D.K. Loydell and N.M. Savage for critically reading the manuscript, and for their helpful comments.

SARTENAER, P., 1961. Late Upper Devonian (Famennian) rhynchonelloid brachiopods. *Bulletin de l'Institut royal des Sciences naturelles de Belgique*, **37** (24), 10 pp.

TERMIER, G. & H., 1950. Paléontologie marocaine, II, Invertébrés de l'Ere primaire, fascicule II, Bryozoaires et Brachiopodes. *Notes et Mémoires du Service Géologique du Maroc*, **77**, 254 pp.

Paul SARTENAER
Département de Paléontologie
Section des Invertébrés Fossiles
Institut Royal des Sciences
naturelles de Belgique
rue Vautier 29
B - 1000 Brussels
Belgium

Typescript submitted June 30, 1997

Revised typescript submitted November 17, 1997

Explanation of Plate 1

All figures are natural size

Hadyrhyncha meridionalis n. sp.

- Figs. 1-5 — Paratype A, IRScNB a10635. Ventral, dorsal, frontal, apical, and lateral views. Costal formula: 6/5; 0; (0)
Figs. 6-10 — Holotype, IRScNB a10634. Ventral, dorsal, frontal, apical, and lateral views. Costal formula: 6/5; 0; 0.
Figs. 11-15 — Paratype C, IRScNB a10637. Ventral, dorsal, frontal, apical, and lateral views. Costal formula: 6/?; 0; ?
Figs. 16-20 — Paratype B, IRScNB a10636. Ventral, dorsal, frontal, apical, and lateral views. Costal formula: 5/4; 0; (0).
Figs. 21-25 — Paratype E, IRScNB a10639. Ventral, dorsal, frontal, apical, and lateral views. Costal formula: 6/5; 0; (0).
Figs. 26-30 — Paratype D, IRScNB a10638. Ventral, dorsal, frontal, apical, and lateral views. Costal formula: ?/4; 0; (0).
Figs. 31-35 — Paratype L, IRScNB a10646. Ventral, dorsal, frontal, apical, and lateral views. Costal formula: 4/3; 0; (0).
Figs. 36-40 — Paratype M. Ventral, dorsal, frontal, apical, and lateral views. Costal formula: 3/2; 0; 0.

PLATE I

