

THE UPPER DEVONIAN GASTROPOD *ORECOPIA* IN WESTERN CANADA

by A. E. H. PEDDER

ABSTRACT. The distribution of *Orecoxia* is reviewed. Apart from a possible Famennian occurrence in Nevada, the genus as presently known is confined to the Frasnian of western North America and eastern Europe and is represented by five described species. *Orecoxia mccoysi* and *O. uchtensis* are refigured and a new species, *O. cotei*, is erected for specimens from British Columbia and the Northwest Territories.

It is suggested that the Tathlina Formation of the southern Northwest Territories may be late, rather than middle Frasnian.

GASTROPODS now referred to *Orecoxia* have been known from Timan and Latvia since 1846 and from Nevada since 1884. Although subsequently numerous specimens have been identified from eastern Europe and cordilleran U.S.A., the genus has only once been reported in Canada, and then without either geographical or stratigraphical location. The present paper confirms that *Orecoxia* is present in Canada and describes a new species of late Frasnian age from British Columbia and the Northwest Territories.

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SYSTEMATIC PALAEOLOGY

The collections containing types are abbreviated as follows:

GSC Geological Survey of Canada, Ottawa.
USNM United States National Museum, Washington.

Family OMPHALOTROCHIDAE Knight
Genus ORECOPIA Knight 1945

Type species (original designation). *Platyschisma? mccoysi* Walcott 1884, p. 188, pl. 17, fig. 1. 'Central portion of the Devonian limestone; Newark Mountain Eureka District, Nevada.' In terms of current stratigraphical nomenclature the type horizon probably lies in the upper part of the Hayes Canyon Member of the Devils Gate Limestone (Nolan *et al.* 1956) and is early Frasnian. Merriam (1940, pl. 11, fig. 3) has subsequently figured one of the syntypes and Knight (1945, pl. 80, fig. 1a-d, g) has figured the specimen, which he designated as lectotype, and also three paralectotypes.

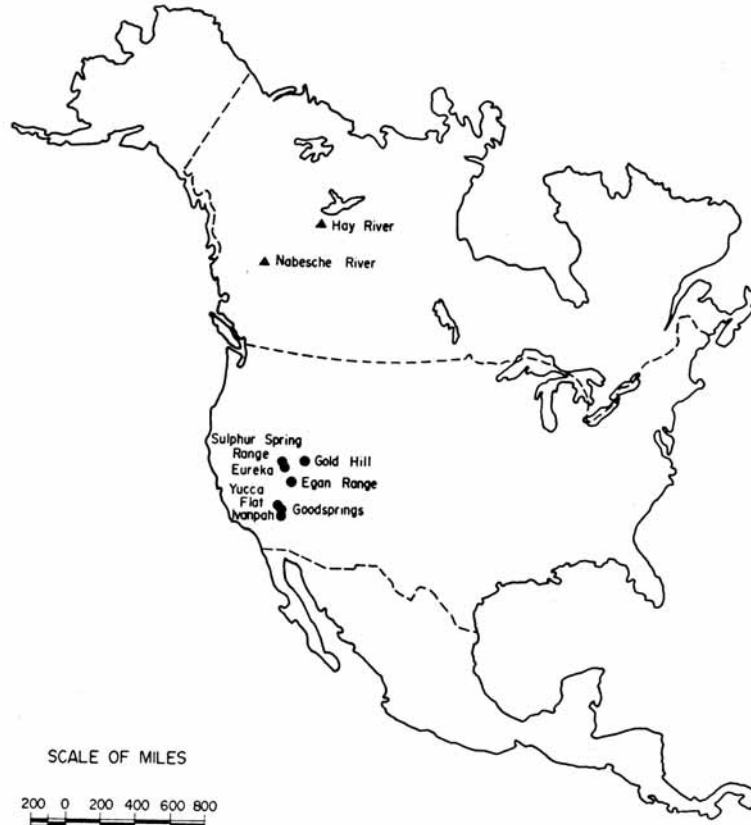
Diagnosis. See Knight 1945, p. 586.

Distribution. At the present time five Frasnian species, including *Orecoxia cotei*, described below, are referred to the genus. These are distributed in western North America from southern California to Great Slave Lake and in the Soviet Union from Timan and Latvia

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to the Urals. In addition one of the species may be represented by derived fossils from the North German Plain (Roemer 1885, p. 384, pl. 11, fig. 1a).

Orecoxia mccoysi (Walcott) and comparable forms are widely distributed in the Basin and Range Province of western United States. They have been reported in the higher parts of the Devils Gate Limestone in the Sulphur Springs Range (Carlisle *et al.* 1957,



TEXT-FIG. 1. Known distribution of *Orecoxia* in North America. Occurrences of *Orecoxia mccoysi* (Walcott) indicated by a circle and those of *Orecoxia cotei* sp. nov. by a triangle.

p. 2188), the *Phillipsastrea* Zone and Hayes Canyon Member of the Devils Gate Formation of the Eureka district (Merriam 1940, p. 60; Nolan *et al.* 1956, p. 51), the upper beds of the Guilmette Formation of the Gold Hill mining district (E. Kirk *in* Nolan 1935, p. 21), the upper member of the same formation in the southern Egan Range (Kellog 1963, p. 699), Devils Gate or Sultan equivalent in the Yucca Flat district (Johnson and Hibbard 1957, p. 356), the Valentine Member of the Sultan Formation

in the Spring Mountains of the Goodsprings Quadrangle (E. Kirk *in* Hewett 1931, p. 16; Knight 1945, p. 586 and collections made by R. H. Waines), and in the same formation in the Ivanpah Quadrangle (collected by Hewett, USNM loc. 2220). It is also possible that the species occurs in the upper beds of the Lost Burro Formation of the Ubehebe and Inyo Mountains of California (Merriam 1963*a*, p. 55; 1963*b*, p. 16). In view of the considerable morphological variation in specimens of *Oreocopia* from the Basin and Range Province, particularly in regard to the height of the spire and umbilical width, it is possible that more than one species is represented. Most occurrences are in the early Frasnian *argentarius* Zone and Merriam (1963*a*, p. 55) regards the gastropod as an especially useful indicator of the lower part of the zone. However, he previously reported (1940, p. 60) a comparable species in the slightly younger *Phillipsastrea* Zone northwest of Eureka, and there are sufficient Lime Creek species in the Valentine Member of the Sultan Limestone in the Goodsprings Quadrangle (E. Kirk *in* Hewett 1931, p. 16), to suggest that *O. mccoysi* may range into the Middle Frasnian.

Knight (1945, p. 586) alluded to undescribed specimens of *Oreocopia* from the Devonian of western Canada, but gave no information concerning their occurrence. Neither Dr. Kauffman nor Dr. Yochelson (personal communication, October 1963) has been successful in locating the material to which Knight was referring. The present paper describes *Oreocopia* from north-eastern British Columbia and south-western Northwest Territories and apart from Knight's paper, is the first report of the genus in Canada. Although there is no doubt that the first of these occurrences is late Frasnian, the second, in the Tathlina Formation, is less clearly dated. McLaren (1962, fig. 1) and the writer (*in* House and Pedder 1963, text-fig. 2) have placed the Tathlina Formation high in the middle Frasnian. The upper beds of the underlying Twin Falls Formation contain several species, including *Mictophyllum modicum* Smith, *Thamnophyllum tructense* (McLaren), and *Atrypa ciliipes* Crickmay, which are otherwise known only in the late Frasnian. Their presence below the Tathlina Formation and the presence of *Oreocopia cotei* in it are probably significant and suggest that the Tathlina Formation is late, rather than Middle Frasnian. In this case the *albertensis* Zone would be equivalent to the Twin Falls Formation only, of the Hay River sequence, and the Tathlina would correlate with part of the Nisku and Arcs Dolomites of Alberta.

Three species from the Soviet Union are now referred to *Oreocopia*. *Platyschisma uchtensis*, the first of these, was described by Keyserling (1846, pp. 263, 264, pl. 11, fig. 6) and was said to occur in Devonian calcareous sandstone on the River Uchta (Ukhta), a tributary of the Ishma. In the light of Nalivkin's work (1947, p. 14) the type horizon is probably in either the Sirachoy or Ukhta Series and is late Frasnian. Tschernyschew (1884, p. 53, pl. 1, fig. 2; 1887, p. 35, pl. 5, fig. 4) extended the known geographical range of the species by describing specimens from the Voronezh and southern West Urals regions; in both areas these specimens were associated with '*Spirifer*' *anossofi* and would now be regarded as late Frasnian. Besides reiterating these occurrences Nalivkin (1947, pp. 9–21) reported the species in the Semiluki Formation of the Voronezh region, the Svinord, Ilmen and Buregi Formations of the Main Devonian Field and in the Kultuban Limestone of the southern Urals. Nalivkin regarded all these formations as middle Frasnian. However, Malakhova (1960; 1961) has shown that the foraminifera of the Kultuban Formation at Lake Kultuban indicate that the formation includes both younger and older beds.

Platyschisma kirchholmiensis, the second of Keyserling's (1846, p. 264, pl. 11, fig. 7) species now referred to *Orecoxia*, came from the Dūna (Zap Dvina) River, near Kirchholm, in Livland (Latvia). Keyserling considered the age of *P. uchtensis* and *P. kirchholmiensis* to be 'analagous'. Stuckenberg (1878, pp. 469, 470) placed *Rotella microstoma* Eichwald (1860, p. 1163) in synonymy with *P. kirchholmiensis* and claimed a wide distribution for the species in the southern part of the main Devonian Field and in the Voronezh region. Little is published concerning the exact horizon of these occurrences, but it seems likely from Pacht's (1859) and other work that the species is middle Frasnian in the type region.

Without access to specimens, the generic identity of *Platyschisma? ambiguum* (Walcott 1884, pp. 188, 189, pl. 17, fig. 3) remains in doubt. Walcott regarded it as congeneric with the type species of *Orecoxia*, but the species was not mentioned by Knight in his discussion of the genus. It was originally cited as coming from the 'upper horizon of the Devonian limestone, The Gate, Eureka District'. The wording suggests that the type horizon is in the 'Cyrtospirifer' Zone of the Devils Gate Formation (Merriam 1940, p. 51). This zone is a correlative of the Alexo and Sassenach Formations of Alberta and is early Famennian, consequently if *P. ambiguum* is an *Orecoxia*, it would be the youngest of the species ascribed to the genus.

Orecoxia cotei sp. nov.

Plate 21, figs. 2, 6-9, 11, 12, 14; text-fig. 2b

Name derivation. From L. F. Cote.

Material. Holotype, GSC 17633; paratypes 1-3, GSC 17634-6 respectively. The holotype and paratypes 1, 2 were collected by L. F. Cote in 1959 from an unnamed grey, medium-grained limestone, 140 ft. below the Besa River Formation, near Nabesche River, British Columbia, lat. 56° 17' N., long. 123° 23½' W. The gastropods were accompanied by a typical late Frasnian assemblage including *Phillipsastrea exigua sensu* Smith 1945 non Lambe 1901, *P. vesiculosa* Smith, *Hexagonaria* sp., *Thamnophyllum* sp., 'Ptychophyllum' *kindlei* Smith, *Thamnopora* sp., *Devonoproductus* sp., *Atrypa* sp., *Spinatrypa* sp., and *Theodossia* or *Vandergrachtella* sp. From small collections made 905 and 955 ft. lower in the same section, D. J. McLaren has identified the early Frasnian rhynchonelloid *Leiorhynchus russelli* McLaren.

Paratype 3 was collected by the author in 1958 from the Tathlina Formation on Hay River, opposite mile 59.1 of the original Mackenzie Highway, Northwest Territories. It occurred in a fawn, fine-grained limestone containing fine detrital quartz and was accompanied by *Nervostrophia* sp., *Devonoproductus* sp., *Atrypa ciliipes* Crickmay, *Atrypa* sp., *Tenticospirifer* sp., and *Theodossia* or *Vandergrachtella* sp. As discussed above, the precise age of the fauna is in doubt, but is either late Middle, or early Late Frasnian.

Diagnosis. Umboniform species of *Orecoxia* having a mean spire angle of about 110°. Periphery low in the whorl section and carinate. Growth-lines with a very marked forward projection at the periphery.

Description. Shell umboniform, having a mean spire angle of about 110° after the formation of five whorls. In early stages the umbilicus is relatively wide, but is reduced during growth, so that the shell is narrowly, or even minutely phaneromphalus in late stages. Protoconch unknown. Sutures very shallow. The whorl section is gently arched from the suture to the periphery and immediately under the periphery, but is almost

flat along much of the base; the periphery is marked by a distinct, although variable carina; the adaxial region of later whorls is apparently much thickened, however the interior of the sectioned paratype is poorly preserved, and the later whorls in text-fig. 2*b* are liberally reconstructed in the adaxial region. Growth-lines are re-entrant below the suture giving rise to a broad asymmetrical sinus on the upper abaxial surface of the whorl. Towards the periphery they project forward prominently, but immediately under



TEXT-FIG. 2. Cross-sections of *Orecozia*. Both $\times 2$. *a. Orecozia mccoysi* (Walcott), GSC 17638. Collected by R. H. Wainnes from the Sultan Formation in the Spring Mountains, Goodsprings Quadrangle, southern Nevada. *b. Orecozia cotei* sp. nov., paratype 1, GSC 17634. Unnamed late Frasnian limestone, 140 ft. below base of the Besa River Formation, near Nabesche River, British Columbia.

the periphery are abruptly swept back again; another more gentle projection is present near the umbilicus; thus over the base the growth-lines are sigmoidal. The largest specimens seen have about five whorls and are between 20 and 25 mm. in diameter and between 10 and 12 mm. high.

Comparisons. The new species resembles *Orecozia uchtensis* more than *O. kirchholmiensis* or *O. mccoysi*. The spire angle is similar in both species, but the whorl profile and growth-lines are different; in *O. cotei* the periphery is more acute and carinate, is also nearer the base, and the forward projection of the growth-line at the periphery is much more pronounced.

Orecozia kirchholmiensis has a higher spire and more rounded whorl periphery.

Most specimens of *Orecozia mccoysi* differ considerably from the new species by having a much higher spire, deeper sutures, and a well-marked angulation on the upper abaxial surface. The specimen shown in text-fig. 2*a* is a low-spired example of *O. mccoysi* and yet the mean spire angle of about 95° is distinctly less than that of *O. cotei*.

EXPLANATION OF PLATE 21

All figures $\times 2$.

Figs. 1, 3, 4. *Orecozia mccoysi* (Walcott). GSC 17637, collected by R. H. Wainnes from the Sultan Formation (early or middle Frasnian), Spring Mountains, Goodsprings Quadrangle, southern Nevada.

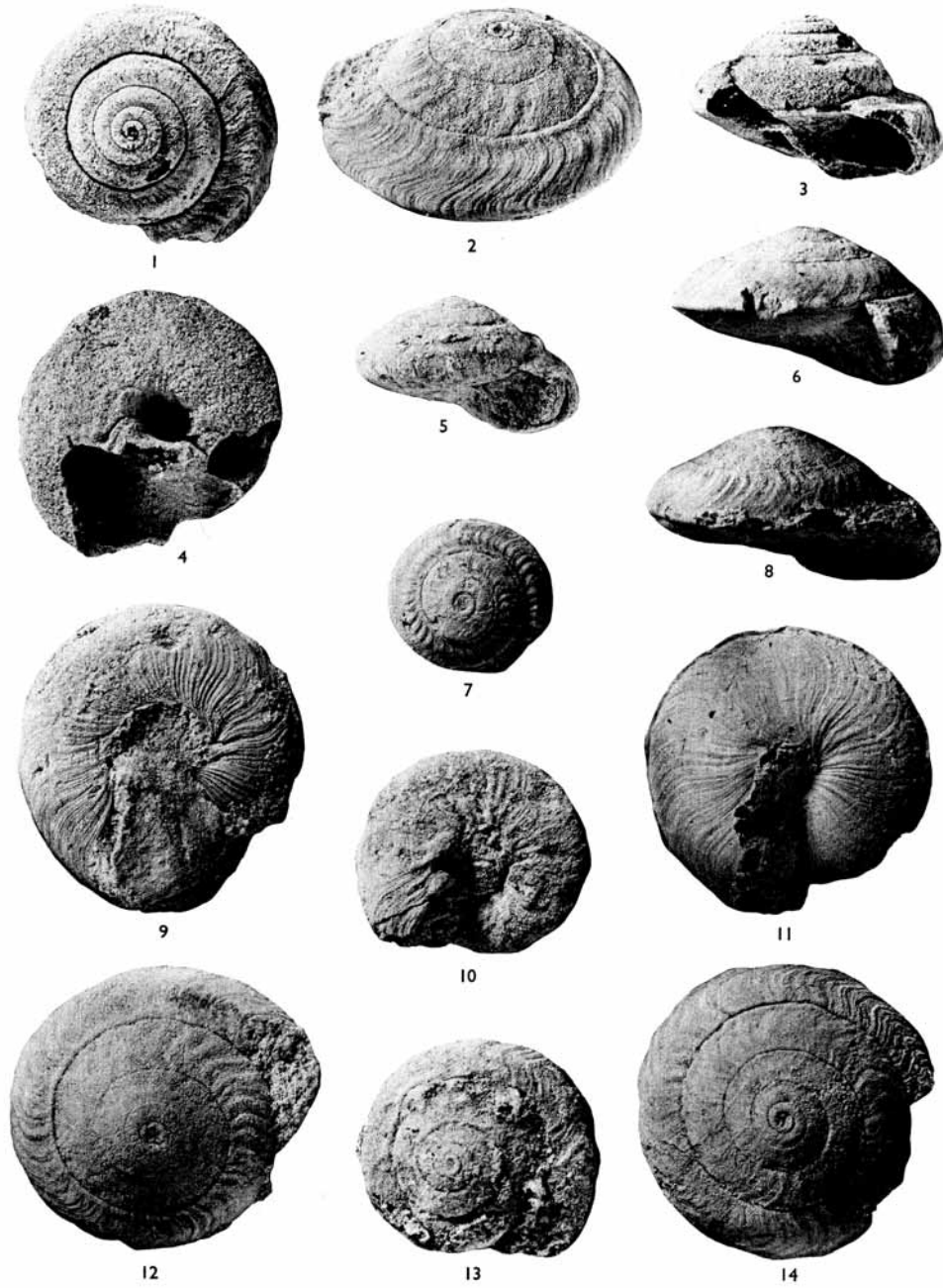
Figs. 2, 6-9, 11, 12, 14. *Orecozia cotei* sp. nov. 2, 8, 9, 12, holotype, GSC 17633, unnamed limestone (late Frasnian), Nabesche River region, north-eastern British Columbia. 6, 11, 14, paratype 1 (before sectioning), GSC 17634, same horizon and locality as the holotype. 7, paratype 3, GSC 17636, lower part of the Tathlina Formation (middle or late Frasnian), Hay River, Northwest Territories.

Figs. 5, 10, 13. *Orecozia uchtensis* (Keyserling). Topotype? USNM 60907, Ukhta River, Timan. An early label indicates that the specimen was originally in the Museum of the Mining School at St. Petersburg and gives the age, presumably mistakenly, as Lower Devonian.

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A. E. H. PEDDER
 Department of Geology,
 University of New England,
 Armidale, N.S.W.,
 Australia



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