SCIENTIFIC AND TECHNICAL REPORTS

RAPPORTS SCIENTIFIQUES ET TECHNIQUES

AN UPPER CRETACEOUS AMMONITE AND INOCERAMIDS FROM THE HONNA FORMATION, QUEEN CHARLOTTE ISLANDS, BRITISH COLUMBIA

Project 800026

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Riccardi, A.C., An Upper Cretaceous ammonite and inoceramids from the Honna Formation, Queen Charlotte Islands, British Columbia; in Current Research, Part C, Paper 81-1C, p. 1-8, 1981.

Abstract

The lower part of the Honna Formation contains the Turonian bivalve species ***Mytiloides labiatus*** *(Schlotheim) s.l., and* ***Inoceramus*** *sp. cf.* ***I. multiformis*** *Pergament, whereas its uppermost beds have yielded the presumably Santonian ammonite* ***Plesiotexanites****? sp. indet. Therefore the formation appears to range from the early Turonian to the Santonian. The presence of* ***Mytiloides labiatus*** *s.l. in the upper part of the underlying Haida Formation suggests the absence of a prolonged hiatus between the two formations and confirms their partial interfingering.*

Introduction

The Honna and Skidegate formations of the Queen Charlotte Islands have yielded only a few generically and specifically indeterminate ammonite and inoceramid fragments to date. Therefore, they were assigned only a general Late Cretaceous (i.e. post-early Turonian) age by Sutherland Brown (1968, p. 98). The post-early Turonian age of the Honna Formation was indicated by the presence of the "**Inoceramus**" **labiatus** fauna in the immediately underlying Haida Formation (Sutherland Brown, 1968, p. 92).

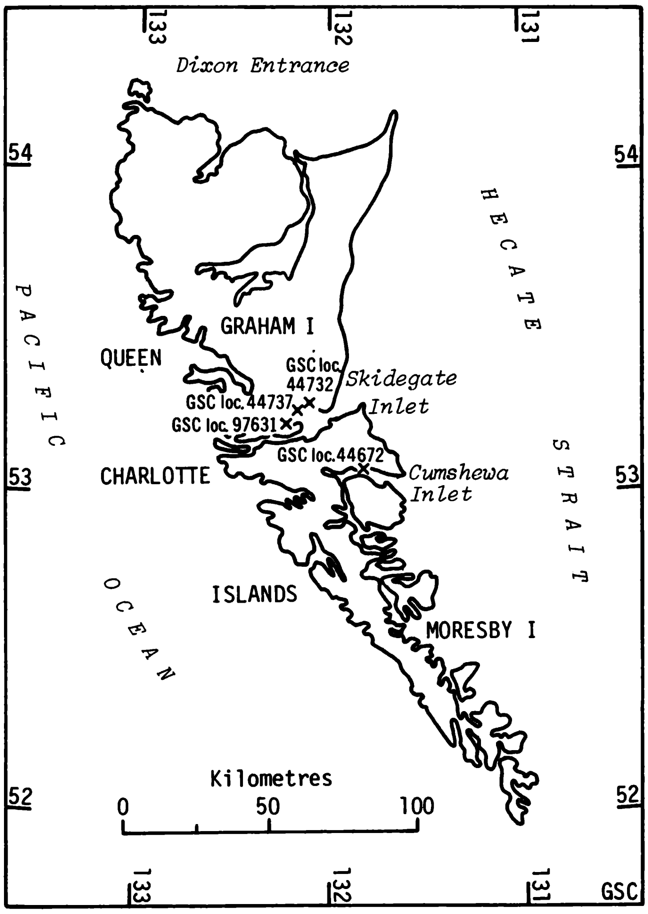
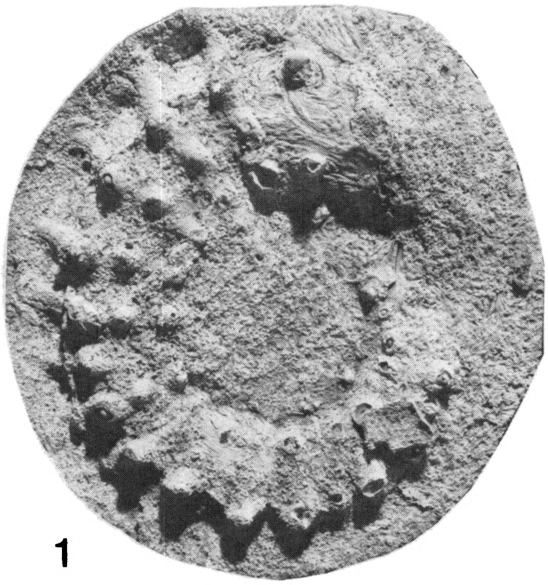


Figure 1.1. *GSC localities mentioned in the text.*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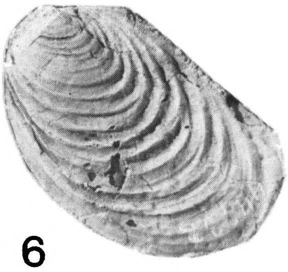
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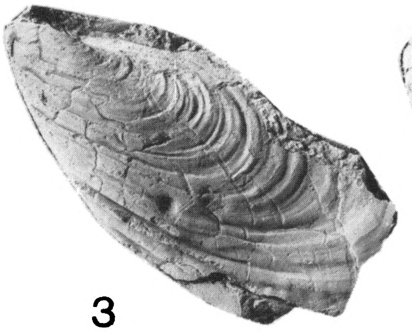
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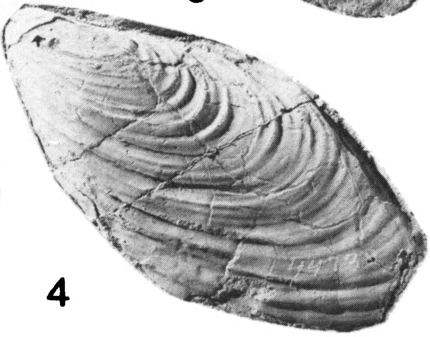
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Plate 1.1

Figure 1. **Plesiotexanites**? sp. indet., GSC 67006, uppermost Honna Formation, GSC loc. 97631. Lateral view.

Figure 2. **Inoceramus** sp. cf. **I. multiformis** Pergament, GSC 67007, basal beds of Honna Formation, GSC loc. 44737. Left valve.

Figures 3-7. **Mytiloides labiatus** (Schlotheim) s.l.

3-6, left valves, GSC 67008 to 67011, upper Haida Formation, GSC loc. 44732.

7, right valve, GSC 67012, basal beds of Honna Formation, GSC loc. 44672.

An ammonite mold was recently found by C.J. Yorath in the uppermost beds of the Honna Formation and its rubber cast was submitted for identification to the writer. This cast proved to be generically identifiable as **Plesiotexanites**? and closely datable (probably Santonian). Its study has stimulated a reappraisal of all fossil material previously found in the Honna Formation by Dr. A. Sutherland Brown. An extensive preparation of inoceramids (only generically determined previously) from the lower part of the formation (see Sutherland Brown, 1968, p. 98) resulted in their assignment to the well-known early to mid-Turonian species **Mytiloides labiatus** and **Inoceramus** sp. cf. **I. multiformis**. To verify the somewhat unexpected stratigraphic range of these inoceramid species, the writer has also studied the inoceramid material previously found in the upper part of the type section of the underlying Haida Formation (Sutherland Brown, 1968, p. 88). This material, also identified as **M. labiatus**, is described and figured in this paper for comparative purposes.

Illustrated Specimens	Fossil Localities
GSC 67008 to 67011	**Mytiloides labiatus** (Schlotheim) s.l., GSC loc. 44732. Type section of Haida Formation (3390' [1034 m]), Bearskin Bay, locality 29 in Sutherland Brown, 1968, p. 88 and Table IX (notice that on Table IX the GSC loc. is wrongly given as 44739 instead of 44732). A. Sutherland Brown coll. 1960.
GSC 67012	**Mytiloides labiatus** (Schlotheim) s.l., GSC loc. 44672. Basal beds of Honna Formation, Conglomerate Point, Cumshewa Inlet. A. Sutherland Brown coll. 1960.
GSC 67007	**Inoceramus** sp. cf. **I. multiformis** Pergament, GSC loc. 44737. Basal beds of Honna Formation, western Lina Island. A. Sutherland Brown coll. 1960.
GSC 67006	**Plesiotexanites**? sp. indet., GSC loc. 97631. Uppermost Honna Formation, 53°12.0'N Lat., 132°10.4'W Long., C.J. Yorath coll. 1980.

PALEONTOLOGICAL DESCRIPTIONS

Class Bivalvia (Buonanni, 1681) Linné, 1758
ORDER PTERIOIDA Newell, 1965
Superfamily PTERIACEA Gray, 1847
Family INOCERAMIDAE Giebel, 1852
Genus **Mytiloides** Brongniart, 1822
Mytiloides labiatus (Schlotheim, 1813 [?]) s.l.
Plate 1.1, figures 3-7

1813. **Ostracites labiatus** Schlotheim, Leonhard's Taschenbuch für Mineralogie, v. 7, p. 93 (**fide** Woods, 1911, p. 281, incl. synonym list).

1935. **Inoceramus labiatus** var. **mytiloides** Mantell, Seitz, p. 435, Pl. 36, fig. 1-4; Pl. 37, fig. 4-5; text-fig. 2-3.

1935. **Inoceramus labiatus** var. **opalensis** forma **elongata** Seitz, p. 458; Pl. 38, fig. 4-6; Pl. 39, fig. 2-4; textfig. 14-15.

1935. **Inoceramus labiatus** var. **subhercynica** Seitz, p. 465, Pl. 40, fig. 1-5; text-fig. 17-18.

1968. **Inoceramus** sp. A, Sutherland Brown, p. 98 (loc. 29).

1968. **Inoceramus** sp., Sutherland Brown, p. 98 (GSC loc. 44672).

1977. **Inoceramus labiatus** (Schlotheim), Jeletzky, p. 119.

Material. 4 left (GSC 67008 to 67011), and 1 right (not figured) valves from GSC loc. 44732 (upper Haida Formation); 1 right valve (GSC 67012) from GSC loc. 44672 (basal Honna Formation).

Description. Shell of small to medium size, maximum height about 35 mm, length about 65 mm. Subequivalve, inequilateral, slightly to moderately biconvex. Maximum convexity dorsocentral; anterior and lateral umbonal slope moderately to very steep; shell gradually decreasing in convexity with growth, posterior part flattened.

Shell moderately to strongly prosocline, angle of inclination ranges from about 30° to about 50°, oblique, elongate to ovate in outline, with length greater than height. Beaks anterior, terminal or almost terminal, prosogyrous, slightly projected above hinge line. Posterior auricle small to moderate in size, subtriangular, flattened and separated from umbone by a break in postumbonal slope.

Hinge line straight, ranging from one third to one half of total shell length, an angle of about 90°. Anterior margin curved, passing into a broadly rounded venter; posterior margin nearly straight, forming an obtuse angle with the hinge line and a narrowly curved acute angle with the ventral margin. Juvenile shell similarly elongated or more rounded than adults.

Juvenile and adult ornamentation rather similar, consisting of low, rounded and subevenly to evenly spaced and regularly to subregularly developed rugae, gradually becoming more widely spaced, sometimes becoming weaker on older growth stages. The most unevenly spaced and irregular rugae are present in some of the most inclined specimens, where they can develop two or three riblets or crests in the area of maximum curvature.

Discussion. A systematic review of the **Mytiloides labiatus** lineage from the Americas and Western Europe is now being carried out by E.G. Kauffman (Kauffman, 1975, 1977a,b; 1978a, b; Kauffman in Kauffman and Powell, 1977; Kauffman in Wiedmann and Kauffman, 1978). This worker has already concluded that the "varieties" and "forms" recognized by Seitz (1935) within **M. labiatus** have distinct stratigraphic ranges and should be treated as separate species or subspecies.

Kauffman (in Kauffman and Powell, 1977) has thus recognized five different species within the **M. labiatus** lineage represented in the lower Turonian of northwestern Oklahoma. Furthermore, he (Kauffman, 1977a) has assigned to several different species the material from Japan originally ascribed to "**Inoceramus labiatus** (Schlotheim)" by Matsumoto and Noda (1975).

The morphological range of every one of these "species" based on large, well preserved and stratigraphically closely spaced populations, has yet to be adequately illustrated. Meanwhile, it could be misleading to assign isolated specimens to one or other of the closely related taxa recognized to date within the **M. labiatus** lineage. Therefore, a broad concept of that species has been followed here, all the more as the material from the Queen Charlotte Islands does not seem to fall within the restricted concept of **M. labiatus** (see Woods, 1911, Pl. L, fig. 5; Seitz, 1935, Pl. 38, fig. 1; Kauffman and Powell, 1977, Pl. 7, fig. 5; Jeletzky, 1970, Pl. 26, fig. 6; Kauffman, 1978b, Pl. 4, fig. 9).

The specimens here described and figured are instead similar to some of the taxa originally recognized by Seitz (1935) within **M. labiatus** s.l. For example, those figured on Plate 1.1, figures 3-5 (GSC loc. 44732) retain an elongate outline throughout ontogeny. This outline is similar to that of the **M. mytiloides** (Mantell) (see Seitz, 1935, fig. 2a-f, Pl. 37, fig. 5) and **M. submytiloides** (Seitz, 1935, Pl. 37, fig. 1-3). In these specimens, however, the junction between adult and juvenile ornament seems to be less distinct than in the first named species, while there is no posteroventrally trending sulcus such as occurs in the second species. A similar shape and ornament are also present in **M. duplicostatus** (Anderson, 1958, Pl. 17, fig. 3-4) from the lower to middle Turonian of California, as well as in the Alaskan material described by Jones and Gryc (1960, Pl. 20, fig. 5) as **I. labiatus.**

A more rounded valve (Plate 1.1, fig. 6), with more regular adult ornament, which resembles one of the specimens found in the basal part of the Honna Formation (Plate 1.1, fig. 7) also occurs in the sample from the Haida Formation. These specimens, however, seem to differ in inclination and variation of outline throughout the ontogeny. Thus, the upper Haida specimen (Plate 1.1, fig. 6) is slightly more inclined and has a similarly elongated outline throughout the ontogeny. However, the Honna specimen (Plate 1.1, fig. 7) is less inclined and exhibits a clear change from a rounded juvenile to an elongate mature outline. The first specimen resembles **M. subhercynicus** Seitz (1935, Pl. 40, fig. 3-4), whereas the second is close to **M. opalensis** (Böse) (see Seitz, 1935, Pl. 38, fig. 4-6).

The above mentioned forms of **Inoceramus labiatus** s.l. were recorded in the Lower Turonian, except for the **Mytiloides subhercynicus**, which is also present in the lower part of the Middle Turonian.

The specific nature and the early Turonian age of Sutherland Brown's (1968) material derived from the upper beds of the Haida Formation were previously pointed out by Jeletzky (1977, p. 119).

Genus **Inoceramus** J. Sowerby, 1814
Inoceramus sp. cf. **I. multiformis** Pergament 1971
Plate 1.1, figure 2

1968. **Inoceramus** sp. Sutherland Brown, p. 98 (GSC loc. 44737).

1971. cf. **Inoceramus multiformis multiformis** Pergament, p. 61, Pl. IX, fig. 2, 3; Pl. X, fig. 2, 3; Pl. XI, fig. 1, 2; Pl. XII, fig. 1-5; Pl. XXXIII, fig. 3.

Material. One left valve, GSC 67007 from GSC loc. 44737. Basal Honna Formation.

Description. Shell of medium size, height about 62 mm, length about 53.5 mm. Inequilateral, moderately convex. Maximum convexity near the anterior margin, in coincidence with the line of maximum inflexion of the concentric ornament; anterior slope steep, posterior gentler. Shell evenly curved along the growth axis.

Shell suberect, angle of inclination about 70°, ovate-subrectangular in outline, slightly higher than long. Beak anteriorly terminal, narrowly rounded, prosogyrous, slightly projected above hinge line. Posterior auricle moderate in size, subtriangular, continuous with postumbonal slope.

Hinge line relatively long, straight, amounting to about two thirds of the total shell length, forming nearly a right angle with the anterior margin. Anterodorsal margin almost straight, becoming curved to join the rounded ventral margin, which passes into the broadly curved posterior margin. The latter forms an obtuse angle with the hinge line.

Juvenile and adult ornament similar, consisting of about 22 coarse, widely spaced, and rather regular concentric rugae, which are stronger and wider in the central part of the valve. The rugae have an asymmetric curvature, with the point of maximum inflexion close to the anterior margin with which they merge at very low angles. On the posterior part of the valve the rugae are weakly inclined towards the margin but they bend forward near the hinge line, which they reach forming nearly a right angle.

Discussion. The specimen here described is close to the material from the Coniacian of the Pacific Coast of the USSR that Pergament (1971, Pl. IX, fig. 3; Pl. X, fig. 2-3; Pl. XII, fig. 1-5; Pl. XXXIII, fig. 3) has included in **Inoceramus multiformis multiformis** Pergament. The Canadian specimen, however, seems to have a smaller inflation, less prominent umbo and more regular concentric rugae.

A related species seems to be **Inoceramus waltersdorfensis** Andert (1934, p. 112, Pl. 4, fig. 2, 3, 4-7) from the highest Turonian and lower Coniacian of Euramerica. However, as pointed out by Pergament (1971, p. 64), the inflation of Andert's species seems to be larger and the curvature of its concentric rugae is more asymmetric. Nevertheless, the two are connected by transitional specimens (cf. Tröger, 1967, Pl. 12, fig. 1, 3; Pergament, 1971, Pl. 12, fig. 1, 4; Kauffman, 1978b, Pl. 1, fig. 9; 1978c, Pl. 2, fig. 2, 10).

Inoceramus multiformis also bears some resemblance to **Inoceramus lusatiae** Andert, from the late Turonian of Europe (see Andert, 1934, fig. 14a-b; Tröger, 1967, Pl. 8, fig. 3b), although the latter seems to have a less asymmetric outline with a projected anterior margin (see Andert, 1934, Pl. 7, fig. 2; Kauffman, 1978b, Pl. 2, fig. 5), and a finer and more irregular ornament.

Kauffman (1977a, p. 178) has considered **I. multiformis** to be a junior subjective synonym of **I. (I.) teshioensis** Nagao and Matsumoto (1939, Pl. 24, fig. 6, 7, 9; Pl. 26, fig. 7; Noda, 1975, Pl. 35, fig. 2-7) from the late Turonian and (?) lowest Coniacian of Japan. However, as already pointed out by Pergament (1971, p. 64), his species seems to differ in the extended wing and outline of the concentric ornament. The same differences appear to be present in the European material figured by Tröger (1967, Pl. 9, fig. 1-9; Pl. 10, fig. 3), and Heine (1929, fig. 13), but not in that of Andert (1934, Pl. 4, fig. 10), which Kauffman (1977a, p. 178) included in **I. (I.) teshioensis** Nagao and Matsumoto.

The material available to the author is insufficient to take a definite stand on this issue. Furthermore, a change of specific names would not substantially change the age of the Canadian material. Therefore, Pergament's name is used here tentatively.

The type material of **I. multiformis** Pergament comes from the Coniacian of the Pacific coast of the USSR. The same or related species seems to occur in the Upper Turonian and Lower Coniacian of Euramerica (Kauffman, 1977a, p. 178).

The specimen described here was found at an isolated locality. However, it could indicate a slightly younger age for the basal part of the Honna Formation than the above described specimens from GSC loc. 44672 included in **M. labiatus** s.l.

SUBCLASS AMMONOIDEA Zittel, 1884
Superfamily ACANTHOCERATACEA de Grossouvre, 1894
Family COLLIGNONICERATIDAE Wright and Wright, 1951
Subfamily Texanitinae Collignon, 1948
Genus **Plesiotexanites** Matsumoto, 1970
Plesiotexanites? sp. indet.
Plate 1.1, figure 1

Material. Rubber cast of a whorl fragment. GSC 67006, from GSC loc. 97631. Uppermost Honna Formation.

Description. The specimen is about 63.4 mm in diameter and consists of one very evolute whorl (U/D=0.46). The line of overlap with the preceding (not preserved) whorl apparently lies immediately outside of a row of tubercles which is located in a ventro-lateral position. The whorl section appears to be subquadrate and perhaps as wide as high, with the broadest part in the middle of the flanks. The umbilical wall is low and somewhat inclined.

Ornament consists primarily of 3 to 4 rows of nodes, which are superposed on low, flat and very weak ribs. The ribs are almost straight on the lower part of the flanks and acquire a slight forward projection on the ventro-lateral shoulder. The interspaces are two times wider than the ribs. There are about 12 ribs on the last half whorl, and the entire whorl seems to have approximately 20 ribs.

The innermost whorls are not preserved. The earliest part of the preserved whorl with the diameter of 45 mm exhibits 3 rows of nodes. Although the venter is not visible these rows are interpreted respectively as the umbilical, ventro-lateral and ventral (umbilical, marginal and external of Collignon's 1948 nomenclature). The umbilical tubercles are located on the umbilical shoulder and are rounded and relatively small. The ventro-lateral (or marginal) nodes are more prominent and separated by a concave and wide depression from the ventral ones, which are almost spinose. At a diameter of about 45 mm, lateral tubercles begin to differentiate just below the marginal ones. Farther adorally, the lateral tubercles increase in size and shift into a more median position on the flanks. Finally, at the greatest preserved diameter the four rows of nodes are nearly equidistant and almost equal in size. Up to 50 mm in diameter there are some occasional secondary ribs intercalated on the upper part of the flank, which also bear ventro-lateral (marginal) and ventral (external) nodes.

The suture line is not visible.

Dimensions (in mm)

Diameter	Umbilical Width (% of Diameter)		Height of Whorl (% of Diameter)	
63.4	29	(0.46)	c. 21.2	(0.33)
47.4	23.8	(0.50)	13.6	(0.29)
43.7	20.6	(0.47)	13.3	(0.30)

Discussion. All described features are those of the Acanthocerataceae, within which the closest affinities are with the Texanitinae. The systematics of these ammonites have been dealt with by Collignon (1948), Matsumoto (1955, 1970), and Klinger and Kennedy (1980). These workers have mainly relied on the number of tubercle rows and the order in which they develop throughout the ontogeny for the recognition of texanitid genera and species.

The presence in our specimen of 3 rows of nodes, followed by the development of a 4th (lateral) row are features characteristic of **Protexanites (Anatexanites)** Matsumoto. However, all species included in the subgenus **Anatexanites**, i.e. **P. (A.) fukazawai** (Yabe and Shimizu, 1925, Pl. 30, fig. 1; Pl. 31, fig. 1-2; Pl. 33, fig. 1-2), **P. (A.) nomii** (Yabe and Shimizu, 1925, Pl. 32, fig. 1-3) and **P. (A.) reymenti** Matsumoto (1970; see Reyment, 1955, Pl. 23, fig. 3, text-fig. 46a), have a more prominent ribbing combined with relatively less conspicuous tubercles.

Paratexanites Collignon (1948, see Klinger and Kennedy, 1980, p. 13-19) has four rows of tubercles, umbilical, submarginal, marginal and external, in the adult stage. However, it does not exhibit lateral tubercles and its submarginal and marginal tubercles are approximated, sharing a single base, in the early growth stages.

The Canadian specimen could correspond to the inner whorls of a large species which would acquire a pentatuberculate stage in the outer whorls. If that were the case it would have to be included in **Plesiotexanites** Matsumoto. Such assignment is supported by the circumstance that some species, e.g. **Plesiotexanites thompsoni** (Jones, 1966) from the Early Santonian of California, and **P. yezoensis** Matsumoto (1970, p. 99, fig. 79-83) from the Santonian of Japan and South Africa exhibit an intermediate growth stage similar to that found in **Protexanites (Anatexanites)** due to the delayed doubling of the ventrolateral tubercles compared with the appearance of the lateral tubercles.

P. thompsoni and **P. yezoensis**, however, have more prominent and numerous ribs than our specimen, and their umbilical and lateral tubercles are relatively smaller while the ventrolateral (marginal) become more prominent. **P. matsumotoi** has relatively stronger and spinose ventrolateral tubercles combined with better defined ribs.

The specimen from the Honna Formation has a general resemblance to the inner whorls of other Santonian species of **Plesiotexanites**, such as **P. stangeri** (Baily) and **P. collignoniforme** Klinger and Kennedy (see Young, 1963, Pl. 42, fig. 3-4; Pl. 43, fig. 2-4; Pl. 71, fig. 1-4; Collignon, 1966a, Pl. 484, fig. 1958; Kennedy et al., 1973, Pl. 5, fig. 2; Klinger and Kennedy, 1980, fig. 68, 70), although in those species the ventrolateral tubercles split into two rows (marginal and submarginal) before the lateral tubercles begin to appear.

In the evolute whorls and strong tubercles the Canadian specimen exhibits some superficial resemblance to some **Texanites** Spath, such as **T. americanus** (Lasswitz, 1904, Pl. 8, fig. 1) from the lower to middle Santonian of the Gulf Coast, **T. texanus** (Roemer, 1852, Pl. 3, fig. 1a-c; Collignon, 1966b, Pl. 33, fig. 1; Klinger and Kennedy, 1980, fig. 123-124) from the Santonian of North America and Africa, **T. rarecostatus** Collignon (1966a, Pl. 487, fig. 1965; Klinger and Kennedy, 1980, fig. 121, 122) from the Santonian of South Africa and Madagascar. However, **Texanites** is characterized by the presence of five rows of tubercles from a relatively early stage (see also Haas, 1942; Collignon, 1966a; Klinger and Kennedy, 1980).

Considering that the venter of the specimen from the Honna Formation is unknown, the existence of yet another row of ventral tubercles cannot be completely ruled out. In such a case the rows that are here regarded as marginal and external should instead be interpreted as submarginal and marginal. This conclusion would only confirm the placement of our specimen into **Plesiotexanites**, unless the number of tubercles in the external row would be larger than in the other two rows, as happens in **Menabites** and **Bevahites** of Collignon (1948).

However, **Menabites** has a trituberculate stage persisting almost to maturity, and the pentatuberculate stage follows almost immediately. Similarly, in **Bevahites** a pentatuberculate stage is attained early in the ontogeny. Furthermore, this last genus is characterized by the proximity of submarginal and marginal tubercles, and due to bifurcations of ribs it has many more external than internal tubercles (see Collignon, 1948; Klinger and Kennedy, 1980).

A tubercle development similar to that described herein is also found in **"Menabites" walnutensis** Young (1963, p. 109, Pl. 58, fig. 1, 4) from the (?) lower Campanian of Texas, which also agrees in size, evolution and preponderance of tubercles over ribs. This species, however, seems to have fewer ribs in the last whorls, i.e. 8 versus 12 on the last half whorl, while the external tubercles are slightly clavate and more numerous than the ventrolateral (marginal), i.e. 13 versus 9 in the last half whorl. Despite the increase in the number of external nodes this species has inner whorls with tubercle development of **Plesiotexanites.**

The Texanitidae are known from the lower Coniacian to the middle Campanian, being most widely represented in the Santonian (see Matsumoto and Haraguchi, 1978; Klinger and Kennedy, 1980). **Plesiotexanites** is known from the Santonian to the lower Campanian, while **Protexanites (Anatexanites)** seems to be restricted to the middle Santonian.

Texanitids are relatively rare in the Upper Cretaceous of the Pacific coast of North and South America (see Benavides Caceres, 1956), while they are abundant in the Gulf Coast, Madagascar, South and Eastern Africa, Europe and Japan. From the Pacific Coast of North America the following species have been described: **Submortoniceras chicoense** (Trask) from the Campanian Chico Formation of California (see Matsumoto, 1959) and Ganges Formation, Nanaimo Group of British Columbia (Ward, 1976); **Plesiotexanites** cf. **P. kawasakii** (Kawada) from the Santonian of California (Matsumoto, 1959) and **Plesiotexanites thompsoni** (Jones) from the Lower Santonian Funks Formation of California (Jones, 1966; Matsumoto and Haraguchi, 1978).

Ages of the Faunas and the Age Limits of the Honna Formation

The affinities of **Plesiotexanites**? sp. indet. suggest a Santonian (s.l.) age for the uppermost beds of the Honna Formation, although the known time range of the Texanitinae, i.e. early Coniacian-middle Campanian leaves an outside possibility of these beds being either slightly older or younger.

The inoceramids found in the basal part of the Honna Formation indicate a Turonian age. Inoceramids of the early-middle Turonian **Mytiloides labiatus** lineage described here occur about 117 m below the top of the underlying Haida Formation (Sutherland Brown, 1968, p. 88) and at the base of the Honna Formation (Sutherland Brown, 1968, p. 98). These data indicate a partial interfingering of the Haida and Honna formations, as was already suggested by Sutherland Brown (1968, p. 84, 93, 98). They appear to contradict the existence of a prolonged hiatus between these formations recently suggested by Jeletzky (1977, p. 121, fig. 4).

All above data suggest an early Turonian-Santonian age for the Honna Formation, unless a paraconformity occurs somewhere between the known fossiliferous levels.

Acknowledgments

This project was initiated at the suggestion of J.A. Jeletzky, who has also provided valuable advice and critically read the original manuscript.

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