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BIOCHRONOLOGY OF JURASSIC-CRETACEOUS TRANSITION BEDS IN CANADA

J. A. Jeletzky

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CONTENTS

Illustrations

ABSTRACT

Fossil-rich, marine uppermost Jurassic and earliest Cretaceous sections recently discovered in western British Columbia, Richardson Mountains-Porcupine Plain trough, and Sverdrup Basin are characterized by the complete development of the Jurassic-Cretaceous boundary beds and persistence of high marine regime across the Jurassic-Cretaceous boundary. Some Berriasian beds of these sections in western British Columbia have yielded mixed faunas of Tethyan ammonites, boreal ammonites and buchias.

It was possible to correlate the Jurassic-Cretaceous boundary beds of these regions with one another and with the classical ammonite zones and stages of the Tethyan and boreal realms of Europe. The Jurassic-Cretaceous boundary in Canada is placed between the basal Berriasian *Buchia okensis* s.str. and the latest Tithonian (= latest Volgian) *Buchia terebratuloides* s.lato - *Buchia* n.sp. aff. *okensis* zones. Time equivalents of the Canadian zones are present in the type area of the upper Tithonian and Berriasian stages in southeastern France. They appear, however, to be largely absent due to nondeposition (?) or subsequent erosion in the type area of the Volgian and Ryasanian stages on the Russian Platform.

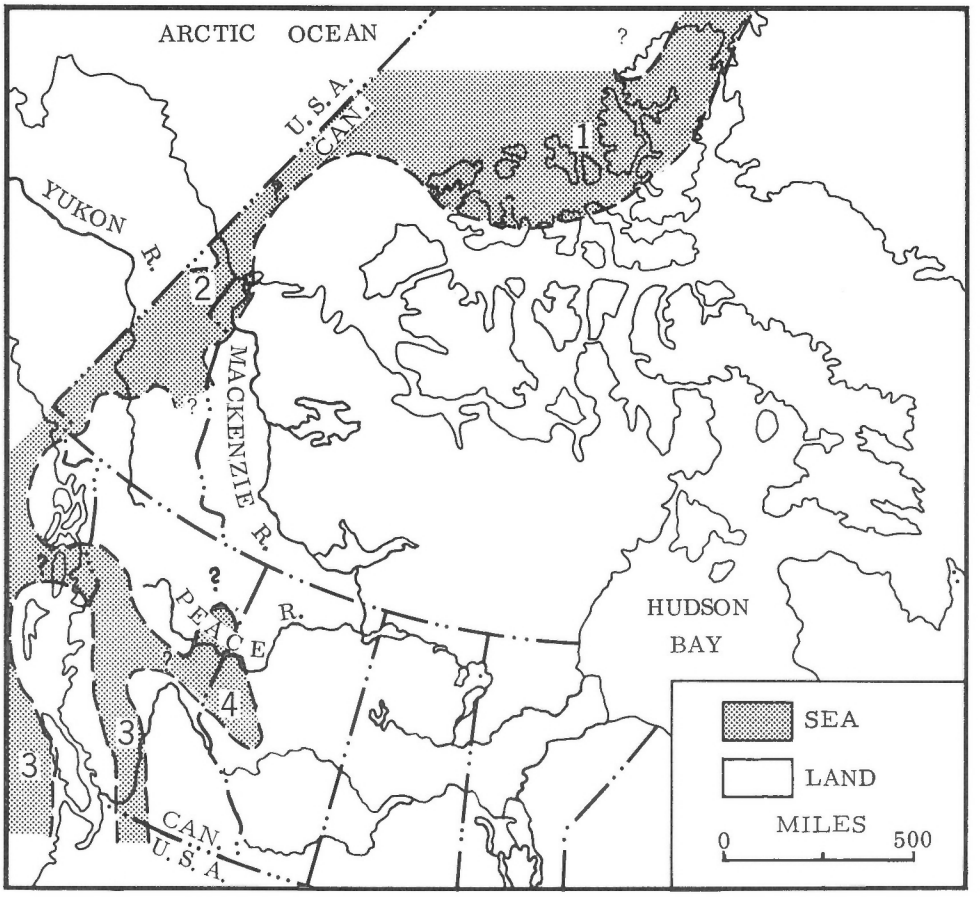

Figure 1. Latest Upper Jurassic (upper Tithonian) and earliest Lower Cretaceous (Berriasian) paleogeography of Western and Arctic Canada. Numbers refer to marine depositional basins discussed in the text.

BIOCHRONOLOGY OF JURASSIC-CRETACEOUS TRANSITION BEDS IN CANADA

INTRODUCTION

This paper attempts to bring up to date and to summarize briefly the information now available about the zonal sequence and interregional correlation of the Jurassic-Cretaceous transition beds of Western and Arctic Canada. Much of the information is scattered in several regional stratigraphical and paleontological reports of the author. Although reasonable in the light of the information available, some of the conclusions offered may have to be revised later when the rocks and faunas concerned are studied in a greater detail[1]. Except for the ? latest Jurassic *Tollia (Subcraspedites?)* n. sp. of Sverdrup Basin and *Buchia terebratuloides* s.lato fauna of western British Columbia, all Canadian faunas discussed in this report have already been figured and most have been described.

DISTRIBUTION AND GENERAL FEATURES

Fossil-rich, marine uppermost Jurassic (upper Tithonian or upper Volgian) and basal Cretaceous (Berriasian or Infravalanginian) rocks occur in the following depositional basins of Western and Arctic Canada indicated by numbers on the accompanying palaeogeographical map (Fig. 1):

1. Sverdrup Basin in the Canadian Arctic Archipelago;
2. Intracratonic trough of Richardson Mountains and Porcupine Plains in northern Yukon and Mackenzie District of Northwest Territories;
3. Geosynclinal (= eugeosynclinal) troughs of Western Cordillera of British Columbia; and
4. Depositional basin of Peace River Foothills and Plains in northeastern British Columbia.

Only the rocks of the first three depositional basins will be considered in this paper as the partly nonmarine and mostly poorly fossiliferous uppermost Jurassic and basal Cretaceous rocks of northwestern British Columbia are too poorly known at present.

In the first three above mentioned depositional basins sections are known in which the uppermost Jurassic rocks grade imperceptibly into the basal Cretaceous rocks. Ammonite, belemnite and *Buchia* (= *Aucella*) faunas of these sections are connected by many transitions. This indicates the complete development of the uppermost Jurassic and basal Cretaceous rocks and the persistence of a high marine regime across the biochronologically defined systemic boundary

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[1] This paper was submitted for publication in the Proceedings Volume of the 2nd International Colloquium on the Jurassic System on April 15, 1967. The substance of this paper was presented orally at one of the scientific sessions of this symposium on July 20th at Luxembourg. Publication of the Proceedings Volume has been indefinitely delayed; the principal conclusions are still valid and the paper is presented here in the original form except for a few footnote comments.

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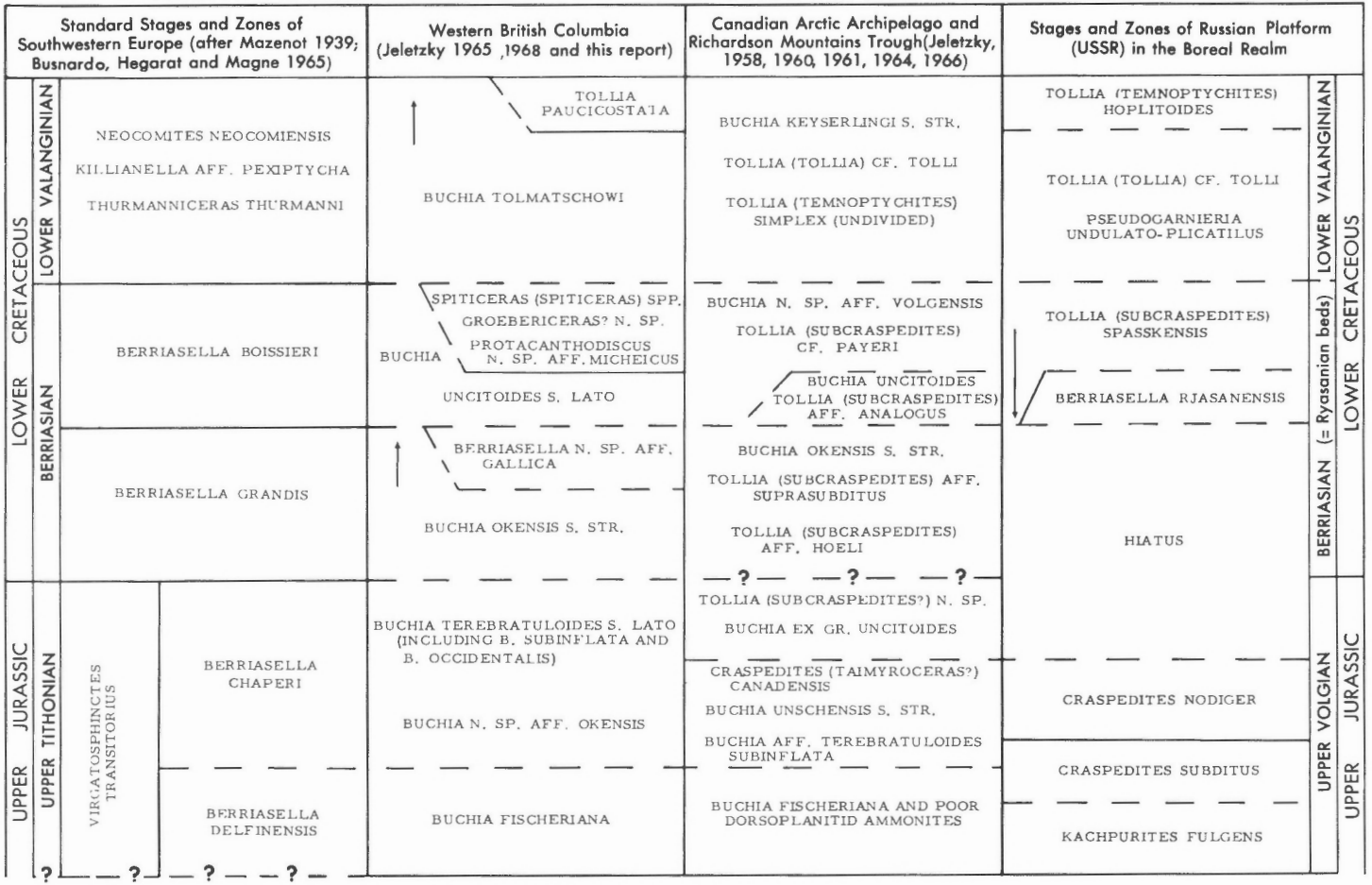
FIGURE 2. CORRELATION OF JURASSIC - CRETACEOUS TRANSITION BEDS OF CANADA WITH THOSE OF S.W. EUROPE AND RUSSIAN PLATFORM (USSR).



at least in the central parts of these basins. This circumstance alone makes these sections valuable interregional standards of reference. The value of these sections for the purposes of regional and interregional correlation of the Jurassic-Cretaceous transition beds is, however, further increased by the circumstance that the first two basins contain typical boreal ammonite and *Buchia* faunas while the third contains several basal Cretaceous (Jeletzky, 1965, p. 56) faunas characterized by a rather unusual association of Tethyan (mostly Andean or Indo-Pacific) ammonites with the well known boreal ammonites, belemnites and buchias. This permits the clarification of time-relationships between several classical upper Tithonian and Berriasian ammonite zones of the Tethyan Realm and the equally well known ammonite and *Buchia* zones of the upper Volgian and early Neocomian (= Infravalanginian) stages of the Boreal Realm.

ZONAL SUBDIVISION AND INTERREGIONAL CORRELATION

The zonal subdivision and interregional correlation of Jurassic-Cretaceous transition beds of Western and Arctic Canada are summarized in Figure 2. Only the type areas of classical Tethyan and boreal stages are considered for the purposes of interregional correlation. Because of the apparent absence of diagnostic Tethyan ammonites[2], the upper Tithonian stage of western British Columbia is defined, somewhat arbitrarily, as an equivalent of the upper Volgian stage of the Boreal Realm in its traditional interpretation (e.g. Sasonov, 1956a, p. 25). The recent proposal of Gerassimov and Mikhailov (1966, p. 120) to unite lower and upper Volgian stages and to subdivide this Volgian stage into three substages is not followed in this report. The upper Volgian stage can be relatively easily recognized in the Sverdrup Basin of the Canadian Arctic Archipelago because of the presence of several standard *Buchia* and ammonite zones widespread in central Russia and northern Siberia (Jeletzky, 1966).

Buchia fischeriana zone of Sverdrup Basin (Jeletzky, 1966, p. 30, Pl. VII, figs. 2; Pl. VIII, figs. 2-6, 8) is of the early upper Volgian age and corresponds approximately to *Kachpurites fulgens* and *Craspedites subditus* zones of the Russian Platform (Fig. 2). This is indicated by its stratigraphic relationships in both the Sverdrup Basin and the Richardson Mountains-Porcupine Plain trough. There it is underlain immediately and gradationally by beds containing late lower Volgian *Buchia* fauna consisting of: *B. piochii* (Gabb) (= *B. russiensis* Pavlow), *B. piochii* var. *mniovnikensis* (Pavlow), and *B.* aff. *fischeriana* (d'Orbigny). In at least one section in Sverdrup Basin *Buchia fischeriana* zone is overlain immediately and gradationally by beds containing *Craspedites (Taimyroceras?) canadensis* and *Buchia unschensis* s.str. (Jeletzky, 1966, p. 43 and Fig. 2 of this paper) and corresponding to the late upper Volgian (presumably part or all of *Craspedites nodiger* zone).

Buchia fischeriana zone of western British Columbia appears to have about the same age limits as its boreal counterpart and so provides an important datum-plane for zonal correlation of Jurassic-Cretaceous transition beds of these two regions. It is directly and gradationally underlain by late lower Volgian *Buchia piochii* s.str. zone and overlain by *Buchia terebratuloides* s. lato-*Buchia* n.sp. aff. *okensis* zone. The latter zone includes beds equivalent to the upper part of the upper Volgian because of its occurrence directly underneath the lower *Berriasian Buchia okensis* zone, the late upper Tithonian affinites of the ammonite fauna of its Californian counterpart (see below), and the presence of *Berriasella (Paradontocerous) callistoides* (see Footnote 2).

Craspedites (Taimyroceras?) canadensis and *Buchia unschensis* beds of Eureka Sound, Ellesmere Island can be confidently correlated with the late

[2]Since this was written *Berriasella (Paradontoceras) callistoides* (Behrendsen) has been identified by the writer from the arenaceous facies of *Buchia terebratuloides* s.lato and *Buchia* n.sp. aff. *okensis* zone in the Taseko Lakes map-area (GSC loc. 56484). This discovery confirms the correlation of the upper Volgian and upper Tithonian stages favoured by the writer.

upper Volgian stage of Central Russia and northern Siberia (Jeletzky, 1966). Elsewhere in Sverdrup Basin and in Richardson Mountains-Porcupine Plain trough these beds are recognizable because of local occurrence of *Buchia unschensis* s.str. in largely unfossiliferous unit occurring between *Buchia fischeriana* and *Buchia okensis* zones (Jeletzky, 1967, pp. 33-34).

A still undescribed ammonite and *Buchia* fauna occurring on Axel Heiberg Island about 28 feet below the base of *Buchia okensis* and *Tollia (Subcraspedites)* aff. *suprasubditus* zone (Fig. 2) is tentatively placed in the uppermost Jurassic rather than in the basal Cretaceous. This zone does not seem to be represented in the upper Volgian stage of Central Russia (see below).

Buchia terebratuloides s. lato (including *B. subinflata* Pavlow and *B. occidentalis* Anderson) and *Buchia* n.sp.aff. *okensis* Pavlow (= *B. trigonoides* Anderson, 1945 non Lahusen, 1888) zone of the western Cordillera of British Columbia can be confidently correlated with the late upper Tithonian on the one hand and the late upper Volgian on the other. In California this zone (Calif. Acad. Sci., loc. 28037; *see* Anderson, 1945) contains a number of partly misidentified late upper Tithonian ammonites. In Central Russia its *Buchia* forms (e.g. *B. terebratuloides* var. *subinflata* Pavlow) are largely restricted to the late upper Volgian (*Craspedites nodiger* zone). Its direct and gradational superposition on *Buchia fischeriana* zone confirms this conclusion.

The direct and gradational superposition of *Buchia okensis* zone on *Buchia terebratuloides* s.lato-*Buchia* n.sp.aff. *okensis* zone precludes the reference of the latter to any part of the Berriasian or Infravalanginian stages (Jeletzky, 1968, pp. 102-103).

In the Sverdrup Basin (Jeletzky, 1966) *Buchia terebratuloides* s.lato-*Buchia* n.sp.aff. *okensis* zone corresponds to part or all of *Craspedites (Taimyroceras?) canadensis* and *Tollia (Subcraspedites?)* n.sp. zones because of the entirely similar stratigraphic relationships of the latter zones (Fig. 2). The rare presence of *Buchia* aff. *terebratuloides* var. *subinflata* (Pavlow) in *Craspedites (Taimyroceras?) canadensis* zone (Jeletzky, 1966) confirms this conclusion.

It seems likely that the hiatus separating *Craspedites nodiger* and *Berriasella (Riasanites) rjasanensis* zones in Central Russia (Fig. 2) embraces also the upper part of the Canadian *Buchia terebratuloides* s.lato-*Buchia* n.sp. aff. *okensis* zone. This is suggested by the circumstance that *Buchia fischeriana* is common in the *Craspedites nodiger* zone of Central Russia but is rare or absent in the upper part of *Buchia terebratuloides* s.lato-*Buchia* n.sp.aff. *okensis* zone in Canada. No representatives of *Buchia* n.sp.aff. *okensis* (Pavlow), such as are common in the upper part of *Buchia terebratuloides* s.lato-*Buchia* n.sp.aff. *okensis* zone in Canada and California, have furthermore ever been figured from *Craspedites nodiger* zone of Central Russia by Pavlow (1907) and other Russian and Soviet workers.

Buchia okensis f.typ. and var. *canadiana* Crickmay is equally common and occurs in the same stratigraphic position in western British Columbia and Arctic Canada. This provides another important datum plane for zonal correlation of Jurassic-Cretaceous transition beds of these two regions (Fig. 2). In Taseko Lakes map-area of western British Columbia the upper part of *Buchia okensis* zone has yielded a rich but mostly indifferently preserved berriasellid fauna. This fauna includes *Berriasella* n.sp.aff. *gallica* Mazenot, 1939 and *Subthurmannia*? sp. indet.[3] indicative of its Berriasian (and presumably early

[3]The subsequently studied, better preserved material of these ammonites suggests some of them at least being a new species (and possibly a new subgenus) of *Argentiniceras* Spath, 1924 (inclusive of *Andesites* Gerth, 1925). These low whorled ammonites possess a mediolateral row of nodes on the living chamber and part or all of penultimate whorl in addition to the row of umbilical tubercles. They are therefore morphologically similar to *Argentiniceras*? *bituberculatum* Leanza, 1945. The taxonomic revision of these ammonites does not affect the Berriasian dating of beds containing them.

Berriasian) age (Jeletzky and Tipper, 1968, pp. 146, 170). Therefore, and because of the above discussed late upper Tithonian age of the next older *Buchia terebratuloides* s.lato-*Buchia* n.sp.aff. *okensis* zone of the same region, *Buchia okensis* zone is placed in the basal Berriasian and correlated with *Berriasella grandis* zone of southeastern France (see Mazenot, 1939; Busnardo *et al.*, 1965). This conclusion finds further support in the presence of more diversified presumably late Berriasian ammonite fauna (Jeletzky, 1965) in the overlying *Buchia uncitoides* zone of western Vancouver Island (see below and Fig. 2).

As shown by Jeletzky (1965, pp. 33-34) the middle part of *Buchia uncitoides* s.lato zone of western British Columbia locally contains an ammonite fauna of a general Berriasian age. This fauna was already correlated with the *Thurmannites boissieri* zone of southwestern Europe, a conclusion now fully confirmed by the discovery of early Berriasian fauna referable to *Berriasella grandis* zone in the underlying *Buchia okensis* zone (Fig. 2).

The presence of *Buchia uncitoides* s.lato and *Tollia (Subcraspedites)* aff. *analogus* fauna in the lower part of *Buchia* n.sp.aff. *volgensis* (Lahusen) (= *Buchia volgensis* Jeletzky, 1964 non Lahusen, 1888) and *Tollia (Subcraspedites)* cf. *payeri* zone of the Richardson Mountains trough (see Jeletzky, 1964, p. 36, Pl. IV, figs. 1-4) indicates the late Berriasian age of the latter zone. On the western flank of Richardson Mountains *Buchia* n.sp.aff. *volgensis* and *Tollia (Subcraspedites)* cf. *payeri* zone is immediately and gradationally overlain by the lower Valanginian rocks containing *Buchia keyserlingi* s.str., *Tollia (Tollia)* cf. *mutabilis* (Stanton) and indeterminate *Polyptychites*-like ammonites possibly referable to *Thorsteinssonoceras ellesmerensis*, (Jeletzky, 1961, pp. 28, 40).

Buchia n.sp.aff. *volgensis* and *Tollia (Subcraspedites)* cf. *payeri* zone is not represented by fossils anywhere in Sverdrup Basin. It is probably represented by unfossiliferous shales in the middle part of Deer Bay Formation between *Buchia okensis* and *Tollia (Tollia) tolli-Tollia (Temnoptychites) novosemelicus* zones (see Fig. 2).

The correlation of the Canadian Berriasian zones with those of the Ryasanian beds of Central Russia is rather difficult. *Berriasella (Riasanites) rjasanensis* zone of Central Russia, the validity of which was recently confirmed by investigations of Sasonova (1961, pp. 7-8), appears to be equivalent to the lower part of *Berriasella boissieri* zone of southeastern France (as defined by Busnardo, *et al.* 1965) and younger than any part of *Berriasella grandis* zone of that region. This is indicated by the association of *B. (R.) rjasanensis* and other diagnostic ammonites of its zone with *B. boissieri* in the basal Cretaceous rocks of Caucasus (Rengarten, 1951; Mordvilko, 1956, p. 43, 48). The apparent absence of *Buchia okensis* in *Berriasella (Riasanites) rjasanensis* zone (Sasonova, 1961, pp. 7-8) supports this conclusion. The lower Berriasian rocks (*Berriasella grandis* zone) must, therefore, be either completely absent in Central Russia or still unrecognized there. In Ryazan Province and on Volga River they apparently are only represented by the regional hiatus (Fig. 2), which separates the upper Volgian rocks from the early Lower Cretaceous rocks. This hiatus apparently embraces also the topmost Jurassic rocks (equivalents of part or all of the Canadian *Buchia terebratuloides* s.lato-*Buchia* n.sp.aff. *okensis* and *Tollia (Subcraspedites?)* n.sp. zones; Fig. 2).

The writer follows Bodylevsky (1956, pp. 139-141) and Luppov (1956, pp. 326-327) in rejecting Sasonov's (1956b, pp. 27-29) and Sasonova's (1961, pp. 6, 9-11; 1965, pp. 104-105) conclusion that the Russian specimen of *Olcostephanus stenomphalus* Pavlow, 1889 is diagnostic of the upper part of Ryasanian beds and therefore characterizes beds older than those containing *Pseudogarnieria undulatoplicatilus* and *Proleopoldia kurmyschensis*. In his opinion (Jeletzky, 1965, pp. 41-42, Fig. 1) this specimen is a typical representative of subgenus *Tollia* Pavlow, 1914 (= *Bogoslowskia* Sasonova, 1965) conspecific with or closely related to *T. (T.) tolli* Pavlow s.lato.

The Canadian zone of *Buchia okensis* is therefore interpreted as older than the Central Russian *Berriasella (Riasanites) rjasanensis* zone. It is

apparently completely unrepresented in Central Russia judging by the fact that representatives of either giant forms of *Buchia okensis* or those of *B. okensis* var. *canadiana* are neither figured nor mentioned in Pavlow's (1907) monograph of the genus *Buchia*. The holotype of *B. okensis* figured in this work (Pavlow, 1907, Pl. I, fig. 11a-11c) and found in Ryasanian beds on River Oka, could have been collected either from the topmost part of *Buchia okensis* zone or from its overlap beds with *Buchia uncitoides* zone (Jeletzky, 1965, pp. 23-24).

PALEOGEOGRAPHY

As shown in previous sections, *Buchia* faunas of the Jurassic-Cretaceous transition beds of western British Columbia are commonly identical with or closely related to those of the Canadian Arctic regions. This indicates the existence of an easy marine connection between these two major depositional areas during most or all of that time. The data now available indicate the existence of an apparently fairly wide seaway - here named the Dawson Strait - extending from Kluane Lake - St. Elias area into the Dawson City - Mayo area and thence into the northern Yukon and Richardson Mountains (Fig. 1).

The presumably late Upper Jurassic to early Lower Cretaceous mildly metamorphosed rocks of southern Yukon (Tempelman-Kluit, 1965; 1966, pp. 48, 49) are lithologically similar to the upper Tithonian and Berriasian rocks of northern Yukon and northwestern part of Mackenzie District described by Jeletzky (1958, 1960, 1961) and so were probably deposited within the Dawson Strait. Unfortunately they did not yet yield any diagnostic fossils. However, the Dawson Strait must have existed at least during the *Buchia fischeriana* and *Buchia okensis* time because of virtual identity of these two *Buchia* faunas throughout Western and Arctic Canada. The close similarity of *Buchia terebratuloides* s.lato-*Buchia* n.sp.aff. *okensis* fauna of western British Columbia with the *Buchia* fauna of *Craspedites nodiger* zone of Central Russia suggests the existence of Dawson Strait also during part or all of the late upper Volgian (= late upper Tithonian) time. It is assumed accordingly that this seaway existed throughout the upper Volgian (= upper Tithonian) and Berriasian time.

The latest Jurassic to basal Cretaceous depositional basin of northeastern British Columbia contains marine faunas closely related to or identical with those of the geosynclinal troughs of western British Columbia (Jeletzky, 1964, p. 30, Pl. I, figs. 2, 6, 7, 10, 11; Warren and Stelck, 1958). These depositional areas must therefore have been connected by another seaway - the Vanderhoof Strait. This seaway presumably extended from the headwaters of Skeena River into the Carbon Creek area connecting Bowser Basin with the Peace River Basin (Jeletzky and Tipper, 1968, p. 83 and Fig. 1 of this paper). It is not known whether or not the marine regime within the Vanderhoof Strait persisted throughout the upper Tithonian and Berriasian time.

REFERENCES

Anderson, F.M.
1945: Knoxville Series in the California Mesozoic; *Bull. Geol. Soc. Am.*, vol. 56 (10), pp. 909-1014, 15 pls.

Bodylevsky, V.I.
1956: O znachenii nekotorykh ammonitov dlya stratigraphii yurskich i nizhemelovykh otlozhenii Russkoi platformy. (The value of some ammonites for the stratigraphy of Jurassic and Lower Cretaceous deposits of Russian platform); *Vsessoyuzniy Neft. Nauchn.-Issled. Geol.-Razved. Inst. (VNIGRI), Trudy Vsessoyuzn. Sovestchaniya po Razrabotke Unifitsirovannoi Skhemy Stratigr. Mesozoiskich Otlozhenii Russkoi Platformy*, Leningrad, pp. 137-142.

Busnardo, R., Le Hégarat, G. and Magné, J.
1965: Le Stratotype du Berriasien; *Bureau Féch. Géol. et Minieres Mem. No. 34, Colloque Sur le Crétacé Inferieur* (Lyon, Sept. 1963). pp. 5-33, 9 tables, 3 text-figs.

Gerassimov, P.A. and Mikhailov, N.P.
1966: Volzhskii yarus i yedinaya stratigraficheskaya shkala verkhnego otdela yurskoi systemy (Volgian stage and the unified scale of the upper series of Jurassic System); *Izv. Akad. Nauk SSSR, ser., geol.*, 1966, No. 2, pp. 118-138, 2 tables, 6 text-figs.

Jeletzky, J.A.
1958: Uppermost Jurassic and Cretaceous rocks of Aklavik Range, northeastern Richardson Mountains, Northwest Territories; *Geol. Surv. Can.*, Paper 58-2, 84 pp., 1 corr. chart, 1 geol. map.

1960: Uppermost Jurassic and Cretaceous rocks, east flank of Richardson Mountains between Stony Creek and Lower Donna River, Northwest Territories; *Geol. Surv. Can.*, Paper 59-14, 31 pp., 1 corr. chart, 1 geol. map.

1961: Upper Jurassic and Lower Cretaceous rocks, west flank of Richardson Mountains between headwaters of Blow River and Bell River, 116P and 117A (parts of); *Geol. Surv. Can.*, Paper 61-9, 42 pp., 1 corr. chart, 2 text-figs.

1964: Illustrations of Canadian Fossils. Lower Cretaceous marine index fossils of the sedimentary basins of Western and Arctic Canada; *Geol. Surv. Can.*, Paper 64-11, 101 pp., 36 pls., 1 table.

1965: Late Upper Jurassic and early Lower Cretaceous fossil zones of the Canadian Western Cordillera, British Columbia; *Geol. Surv. Can.*, Bull. 103, 70 pp., 22 pls., 4 text-figs.

1966: Upper Volgian (Latest Jurassic) ammonites and buchias of Arctic Canada; *Geol. Surv. Can.*, Bull. 128, 51 pp., 8 pls., 2 text-figs.

1967: Jurassic and (?) Triassic rocks of the eastern slope of Richardson Mountains, northwestern District of Mackenzie; *Geol. Surv. Can.*, Paper 65-50, 170 pp., 10 pls., 3 figs.

1968: Jurassic-Cretaceous transition beds, Pacific Slope of North America; *Geol. Soc. Am.*, Sp. Paper 101, pp. 102-103.

Jeletzky, J.A. and Tipper, H.W.
1968: Upper Jurassic and Cretaceous rocks of Taseko Lakes map-area and their bearing on the geological history of southwestern British Columbia; *Geol. Surv. Can.*, Paper 67-54, 218 pp. 14 figs.

Luppov, N.P.
1956: Critical comments on N.T. Sasonov's paper; *Vsessoyuzniy Neft. Nauchn.-Issled. Geol.-Razved. Inst. (VNIGRI), Trudy Vsessoyuzn. Sovestchaniya po Razrabotke Unifitsirovannoi Skhemy Stratigr. Mesozoiskich Otlozhenii Russkoi Platformy*, Leningrad, pp. 325-327.

Mazenot, G.
1939: Les Palaeohoplitidae tithoniques et berriasiens du sud-est de la France; *Soc. géol. France, Mém., sér. nouv.*, No. 41, 303 pp., 40 pls., 7 tables, 7 text-figs.

Mordvilko, T.A.
1956: Unifitsirovannaya skhema stratigrafii nizhnemelovykh otlozhenii Severnogo Kavkaza i Predkavkaziya (Standardized stratigraphic scheme of Lower Cretaceous deposits of Northern Caucasus and Caucasian Foothills); *Vsessoyuzniy Neft. Nauchn.-Issled. Geol.-Razved. Inst. (VNIGRI), Trudy Vsessoyuzn. Sovestchaniya po Razrabotke Unifitsirovannoi Skhemy Stratigr. Mesozoiskich Otlozhenii Russkoi Platformy*, Leningrad, pp. 37-55, 2 corr. tables.

Pavlow, A.P.
1907: Énchainement des aucelles et aucellines du crétacé Russe; *Nouveaux Mém. Soc. Imp. Natur. de Moscou*, t. 17, 93 pp., 6 pls., 18 text-figs.

Rengarten, V.P.
1951: Paleontologicheskoye obosnovanie stratigrafii nizhnego mela Bol'shogo Kavkaza. (The palaeontological basis of the Lower Cretaceous stratigraphy of Greater Caucasus); *Akademija Nauk SSSR Sbornik pamjati akademika A.D. Arkhangel'skogo. Voprossy stratigrafii i litologii SSSR*, Moscow, pp. 35-66, 1 text-fig.

Sasonov, N.T.
1956a: Unifitsirovannaya skhema stratigrafii yurskich otlozhenii Russkoi platformy (Standardized stratigraphical scheme of Jurassic deposits of Russian platform) (project); *Vsessoyuznyi Neft. Nauchn.-Issled. Geol.-Razved. Inst. (VNIGRI), Trudy Vsessoyuzn. Sovestchan. po Rasrabotke Unifitsirovannoi Skhemy Stratigrafii Mesozoiskich Otlozhenii Russkoi Platformy*, Leningrad, pp. 19-26.

1956b: Unifitsirovannaya skhema stratigrafii nizhnemelovykh otlozhenii Russkoi platformy (Standardized stratigraphical scheme of Lower Cretaceous deposits of Russian platform) (project); *Vsessoyuznyi Neft. Nauchn.-Issled. Geol.-Razved. Inst. (VNIGRI), Trudy Vsessoyuzn. Sovestchan. po Rasrabotke Unifitsirovannoi Skhemy Stratigrafii Mesozoiskich Otlozhenii Russkoi Platformy*, Leningrad, pp. 26-37.

Sasonova, I.G.
1961: Unifitsirovannaya skhema stratigrafii nizhnemelovykh otlozhenii Russkoi platformy (Standardized stratigraphical scheme of Lower Cretaceous deposits of Russian platform) (project); *Vsessoyuznyi Nauchn.-Issled, Geol.-Razved, Neft. Inst. (VNIGNI), Trudy*, No. XXIX, pp. 5-28, 2 corr. tables.

1965: Nizhnevalanzhinskie ammonity (Lower Valanginian ammonites); *Vsessoyuznyi Nauchn.-Issled. Geol.-Razved, Neft. Inst. (VNIGNI), Trudy*, No. XLIV, pp. 100-108, 1 pl.

Tempelman-Kluit, D.
1965: Tombstone River (116B/7) map-area; *Geol. Surv. Can.*, Paper 65-1, pp. 35-36.

1966: "Keno Hill Quartzite" in Tombstone River and upper Klondike areas; *Geol. Surv. Can.*, Paper 66-1, pp. 48-49.

Warren, P.S. and Stelck, C.R.
1958: The Nikanassin-Luscar Hiatus in the Canadian Rockies; *Roy. Soc. Can., Trans.*, ser. III, sect. IV, vol. LII, pp. 55-62, 4 text-figs.