CANADA

DEPARTMENT OF MINES AND RESOURCES

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GEOLOGICAL SURVEY BULLETIN

No. 12

JURASSIC FORMATIONS OF MAUDE ISLAND AND ALLIFORD BAY, SKIDEGATE INLET, QUEEN CHARLOTTE ISLANDS, BRITISH COLUMBIA

BY

F. H. McLearn

OTTAWA

EDMOND CLOUTIER, C.M.G., B.A., L.Ph.,

KING'S PRINTER AND CONTROLLER OF STATIONERY

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PREFACE

The present report, by Dr. McLearn, is an outcome of detailed stratigraphic and palæontological studies conducted by him many years ago on the rocky shores of Skidegate Inlet in the Queen Charlotte Islands of British Columbia. The inlet separates Graham Island on the north from Moresby Island to the south, the two principal components of the island group. Its shores, together with those of its many included islands, have for a full three-quarters of a century been recognized as one of the finest collecting grounds for Jurassic and Cretaceous marine fossils in North America, and to date are the most widely publicized of their kind in the Dominion.

Previous publications by Dr. McLearn, to which he refers in this report, have dealt mainly with descriptions of fossil species, but in this account the author concerns himself with the stratigraphy of, principally, the Jurassic formations as exposed in the two best known localities, and has illustrated his account with detailed maps and structure-sections.

GEORGE HANSON,
Chief Geologist, Geological Survey of Canada

OTTAWA, November 15, 1948

JURASSIC FORMATIONS OF MAUDE ISLAND AND ALLIFORD BAY, SKIDEGATE INLET, QUEEN CHARLOTTE ISLANDS, BRITISH COLUMBIA

INTRODUCTION

A detailed study of the stratigraphy of the Mesozoic formations of Skidegate Inlet, Queen Charlotte Islands, British Columbia, was undertaken in the field season of 1921. Numerous collections of Jurassic and Cretaceous fossils were made, and their positions in both the faunal and lithological succession were carefully recorded. No complete account of this investigation has yet been published. The Jurassic ammonoids were studied in the middle and late twenties, and the results were published in three papers (McLearn, 1927, 1929, 1932)[1], one of which contains a short account of the stratigraphy and the other two mainly of the palæontology. This leaves much of the collected information incompletely published. As the study of the Jurassic ammonoids is almost complete; as the ammonoids form an important part of the faunas; and as most of the Jurassic pelecypods and some of the brachiopods and gastropods have been described by Whiteaves, it seems desirable to consolidate the known information on the Jurassic system of this area in a stratigraphic paper.

The Jurassic formations of Skidegate Inlet are best exposed at the east end of Maude Island and at Alliford Bay on the southeast shore of the inlet.

In the preparation of Figures 2 and 3, it has been found necessary to name small bays and points in order to describe the several stratigraphic units separated in detailed work. The names selected are mostly those of geologists and palæontologists who have contributed to the study of Skidegate Inlet.

ACKNOWLEDGMENTS

Able assistance in the 1921 field work was given by C. H. Crickmay and R. H. B. Jones, then students of the University of British Columbia.

It is to the late J. F. Whiteaves of the Geological Survey that most credit must go for description of the Jurassic species of Skidegate Inlet. In the preparation of the author's papers on ammonoids, grateful acknowledgment is made to Dr. L. F. Spath, of the British Museum of Natural History, for stimulating advice, and to the late Mr. S. S. Buckman, English palæontologist, for previews of illustrations used in his "Jurassic Type Ammonites", for plasticine casts of British specimens of ammonoids, and for helpful advice. Dr. W. J. Arkell of Cambridge University has recently furnished information concerning British specimens of *Chondroceras*.

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[1] Names and (or) dates, in parentheses, are in bibliographic references at end of report.

PREVIOUS WORK

HISTORICAL INTEREST

For more than a quarter of a century no party of the Geological Survey of Canada has visited Skidegate Inlet. Its geological problems are almost forgotten. It was not always so. From 1872, and continuing for nearly 50 years, they were very much in the minds of Canadian geologists. The shores of the inlet were examined successively by six field parties; they were a subject of frequent discussion in the office and around the conference table; and were referred to in numerous reports and papers. Whiteaves, in his "Mesozoic Fossils" (1876, 1884, 1900), made their faunas known to geologists and palæontologists all over the world.

An historical review of the study of Skidegate Inlet is given by Clapp (1914) and also by MacKenzie (1916), and their reports should be consulted by all those who desire a complete account. It will be sufficient here to review only those investigations that were concerned with Jurassic stratigraphy and palæontology.

EARLY FIELD WORK

The earliest geological investigation was that by James Richardson (1873), who divided the strata of Skidegate Inlet into three groups:

Upper shales and sandstones
Coarse conglomerates
Lower shales with coal and iron ore

Billings (1873) reported on the fossils collected by Richardson from the "Lower shales", and concluded that they were partly of Jurassic and partly of Cretaceous age.

THEORY OF ONE FAUNA; FAILURE TO SEPARATE JURASSIC AND CRETACEOUS FAUNAS

Whiteaves continued the study of Richardson's collection of fossils from the "Lower shales". In his first contribution to "Mesozoic Fossils" (1876) he described and illustrated some new species and endeavoured to date the fauna. Like Billings he was puzzled by the mixture of species in the fauna, some resembling well-known Jurassic species and others Cretaceous species. His interpretation of this mixture differed from that of Billings: the latter had inferred that the fossils from the "Lower shales" were partly of Jurassic and partly of Cretaceous age; that is, he assumed the presence of more than one fauna; Whiteaves, on the other hand, inferred that only one fauna was present and explained that the resemblance of some of the species to Jurassic European forms was "often of a very general character, and can scarcely . . . be shown to amount to actual specific identity". He considered that the resemblance to Cretaceous species was better defined than to Jurassic species, and of greater significance, and concluded by suggesting a "probable geological position . . . near the base of the Lower Cretaceous or top of the Upper Jurassic" and by proposing that the fossils "exhibit a blending of the life of the Cretaceous period with that of the Jurassic". It was unfortunate that Whiteaves failed to realize he was dealing not with one fauna, but with a mixture of

Jurassic and Cretaceous faunas, for this misconception led to confusion and to errors in correlation and mapping that were not entirely corrected until the publication of MacKenzie's report in 1916.

Six years after Richardson's visit, Dawson (1880) made a thorough examination of Skidegate Inlet, and was able to recognize two new divisions of strata in addition to those described by Richardson. His section comprised the following:

A. Upper shales and sandstones
B. Conglomerates
C. Lower shales and sandstones
D. Agglomerates
E. Lower sandstones

Dawson considered that all five divisions were parts of the one series, which he described under the heading of "Cretaceous Coal-bearing Rocks". He did, indeed, see some evidence of unconformity between Divisions C and D, but believed it was only a "partial unconformity" and "essentially unimportant", and at Alliford Bay thought that he could recognize transitional beds between these divisions. He found numerous fossils in Division C and some in Division E, lying respectively above and below the agglomerates of Division D, and thought that some of the fossils in E were identical with species in C. He noted that "the whole [the Cretaceous coal-bearing rocks] rests unconformably on older rocks, probably for the most part Triassic . . . and consisting of argillites, limestones, etc." Just as Whiteaves insisted on the oneness of the fauna, and failed to separate the Jurassic from the Cretaceous faunas, so Dawson failed to separate the Jurassic from the Cretaceous beds in the field.

Dawson appears to have been imbued with the idea of the unity of Divisions C, D, and E. In 1883, Whiteaves had casually introduced the name Queen Charlotte Island group, defining it merely as the upper part of the Lower Cretaceous, Shasta group of California. In 1889, Dawson reintroduced the name, as the Queen Charlotte Islands formation, to embrace his Divisions C, D, and E. Twelve years later Dawson (1901) again includes these divisions in the Queen Charlotte Islands formation.

Following the field work by Dawson, Whiteaves returned to the study of the fossils, and again described and illustrated new species from Skidegate Inlet (Whiteaves, 1884). He gave lists of fossils from many separate localities, mostly from Division C. He noted that the species from some localities had Jurassic affinities, but decided that the preponderance of evidence, based on collections from all localities, was definitely in favour of a Lower Cretaceous (Gault) age for the fauna of this division. He also listed a few species from the "Lower sandstone" or Division E, and concluded that they, too, were of Cretaceous age.

In 1895 and 1897, Dr. C. F. Newcombe of Victoria made a large collection of fossils from Skidegate Inlet. To illustrate and describe the many excellent specimens of this collection, Whiteaves (1900) prepared and issued his third and last contribution to the Cretaceous fossils of Skidegate Inlet in "Mesozoic Fossils". He gave complete lists of species from each of the five divisions. He still admitted that some species had a Jurassic aspect, but maintained that the resemblance was more apparent than real and that Division C contained only one fauna, which was of Cretaceous age.

SEPARATION OF THE JURASSIC FROM THE CRETACEOUS FAUNAS

The obstruction raised by Whiteaves' insistence on the oneness of the fauna was fortunately to be removed in time, as it had impeded all progress in the correlation and dating of the faunas and in the interpretation of the dynamic history. It gradually came to be realized that the Jurassic element in the fauna could no longer be ignored. In 1905, Stanton and Martin, referring to a collection of undoubted early Middle Jurassic fossils from Alaska, noted that the "Lower shales" of the Queen Charlotte Islands "have yielded ammonites and a few other forms that evidently belong to this fauna and have no connection with the Cretaceous fauna from other localities on Queen Charlotte Islands, supposed to be in the same formation".

The following year, Dowling (1906), impressed with Stanton and Martin's statement, proposed that the fossils previously listed from the "Lower shales", that is Division C, were from two formations, and that "the Queen Charlotte Island series, if again studied, might allow this subdivision to be made". This decision to admit the presence of more than one fauna paved the way for new interpretations in field relations.

Ells (1906) was the next geologist to examine the shores of Skidegate Inlet. He separated the igneous rocks, including diabase, felsite, and agglomerates, substantially Dawson's Division D, from the overlying coal-bearing beds and dated them pre-Cretaceous.

Clapp (1914) went further than Ells in his revolt against the opinions of Dawson and Whiteaves. He retained in the Cretaceous system the beds that Dawson had placed in his Divisions A, B, and C, gave them new formational names, respectively Skidegate, Honna, and Haida, and united them in what he called the Queen Charlotte series, using this name in a manner very different from that of Dawson in 1889. All the older strata, the argillites, the slaty shales, and the volcanic beds, partly equal to Division D of Dawson, were placed in the Vancouver group, and an unconformity was recognized between his Queen Charlotte series and this group. Clapp discovered the presence of batholithic intrusions and dated them Upper Jurassic. He reviewed the faunal lists of Whiteaves; observed that the species from some localities had Cretaceous affinities and those from other localities had Jurassic affinities; and concluded that those with Jurassic affinities had come presumably "from the argillites and sandstones of the Vancouver group".

It was MacKenzie (1916) who completed the revision of Dawson's stratigraphy and produced a satisfactory classification of the Jurassic of Skidegate Inlet and Graham Island. He incorporated the Jurassic beds in two formations, the Maude below and the Yakoun above. His Maude formation embraced all of Dawson's Division E and the greater part of the older rocks that Dawson had placed unconformably below his Cretaceous, coal-bearing series. His Yakoun formation comprised Dawson's Division D and a part of the beds that Dawson had placed in his Division C, the part with Jurassic fossils. MacKenzie claimed that the lower beds of the Yakoun were similar lithologically to the sandstones of the Cretaceous, Haida formation, that Dawson had failed to separate them from the Cretaceous beds, and that he had mixed the fauna from these Jurassic beds with the fauna from the Cretaceous, Haida formation. He stressed the importance of the unconformity between the Cretaceous Haida and the Jurassic Yakoun formations and stated that the Jurassic beds had been folded and eroded to the stage of a deeply dissected topography prior to the deposition of the Haida sediments. MacKenzie listed a Lower Jurassic fauna from the Maude formation, a fauna originally described by Whiteaves as the fauna of Dawson's Division E, and a Middle Jurassic fauna from the Yakoun, in which can be recognized some of the Jurassic elements in Whiteaves' list of fossils from Dawson's Division C. MacKenzie's faunal lists, however, were incomplete, because a large collection of his fossils was, unfortunately, lost in transit to the mainland.

STRATIGRAPHY

TABLE OF FORMATIONS

		Stage	Formation (Thickness in feet)	Lithological zone (Thickness in feet)	Faunas
Jurassic	Upper	Tithonian			
		Kimmeridgian			
		Oxfordian			
		Callovian	Yakoun	Marine sandstones and shale 430+	Upper Yakoun fauna *Kepplerites* *(Seymourites)*
	Middle	Bathonian		Massive and bedded agglomerate and tuff 1,200 to 1,500	Rare belemnoids, brachiopods
		Bajocian	2,200+	Marine tuff, agglomerate, tuff-aceous shale, and sandstone 200+	Lower Yakoun fauna *Stephanoceras and Chondroceras* *(Defonticeras)*
			Maude	Fine agglomerate and argillite 600 to 800	Rare belemnoids
	Lower	Toarcian	2,300+	Marine argillite, quartzite, and calcareous beds 500 to 1,500	*Harpoceras* and *Fanninoceras*
		Pliensbachian			
		Sinemurian			
		Hettangian			

Preceding pages record how, in the course of investigation, knowledge of the Jurassic succession has increased; how, at first, the Jurassic beds were confused with those of Cretaceous age; and how, finally, they were separated from the Cretaceous and incorporated in the Maude and Yakoun formations. It is now possible to add to this knowledge and describe, in greater detail than hitherto possible, the lithological and faunal succession.

The foregoing table lists the main lithological components of the Maude and Yakoun formations, and indicates the faunas represented and their correlation with various stages of the Jurassic system. Measurements of thickness are approximate only.

MAUDE FORMATION

Definition

The Maude formation was established by MacKenzie (1916) to embrace banded, slaty, and flaggy, partly carbonaceous argillites and lesser amounts of hard, massive sandstones, quartzites, calcareous beds, tuffs, and agglomerates lying conformably below the Yakoun formation. The formation is said by MacKenzie to be typically exposed on the south (southeast) side of Maude Island, in Skidegate Inlet, and on the shores of South Bay in Skidegate Inlet. The base of the formation is nowhere exposed in the inlet, but conglomerates at Pillar Bay, on the northwest coast of Graham Island, were thought by MacKenzie to occupy this position.

Lithological and Faunal Succession

Southeast Coast of Maude Island (*See* Figure 2). The Maude formation underlies a wedge-shaped area on the southeast side of Maude Island, and is exposed at intervals along the shore from Jones Bay to Crickmay Point. The lower zone is exposed from Locality M1 on the north side of Jones Bay to M5 near Crickmay Point; it consists of about 1,500 feet of banded argillite, quartzite, and calcareous beds. The structure along the shore indicates many changes of strike and dip and some faults and highly contorted folds in the argillites on the east side of Jones Bay. At Locality M4, a small downfaulted block of sandstone was noted. The actual contact with the overlying Cretaceous, Haida formation in Jones Bay is not visible, but appears to be that of an angular unconformity, the coarse sandstones of the Haida resting discordantly on the argillites of the Maude formation.

The argillites and quartzitic, calcareous beds of the Maude formation carry fossils at Locality M3 on the west side of Ells Bay, where the following Lower Jurassic (Toarcian) species were collected in 1921: *'Rhynchonella' maudensis* Whiteaves, *Pecten carlottensis* Whiteaves, *Cardium tumidulum* Whiteaves, new and mostly dwarf species of *Oxytoma, Lima, Modiolus, Pleuromya, Astarte,* and *Cardium,* and *Fanninoceras fannini, F. bodegai, F. kunai, F. kunai* var. *crassum,* and *F. kunai* var. *latum.* Dawson's collection from this locality, made in 1878, contains the following species not present in the 1921 collection: *Discina semipolita* Whiteaves, *Fanninoceras dolmagii, F. carlottense,* and *F. lowrii.* The following species from MacKenzie's (1916)

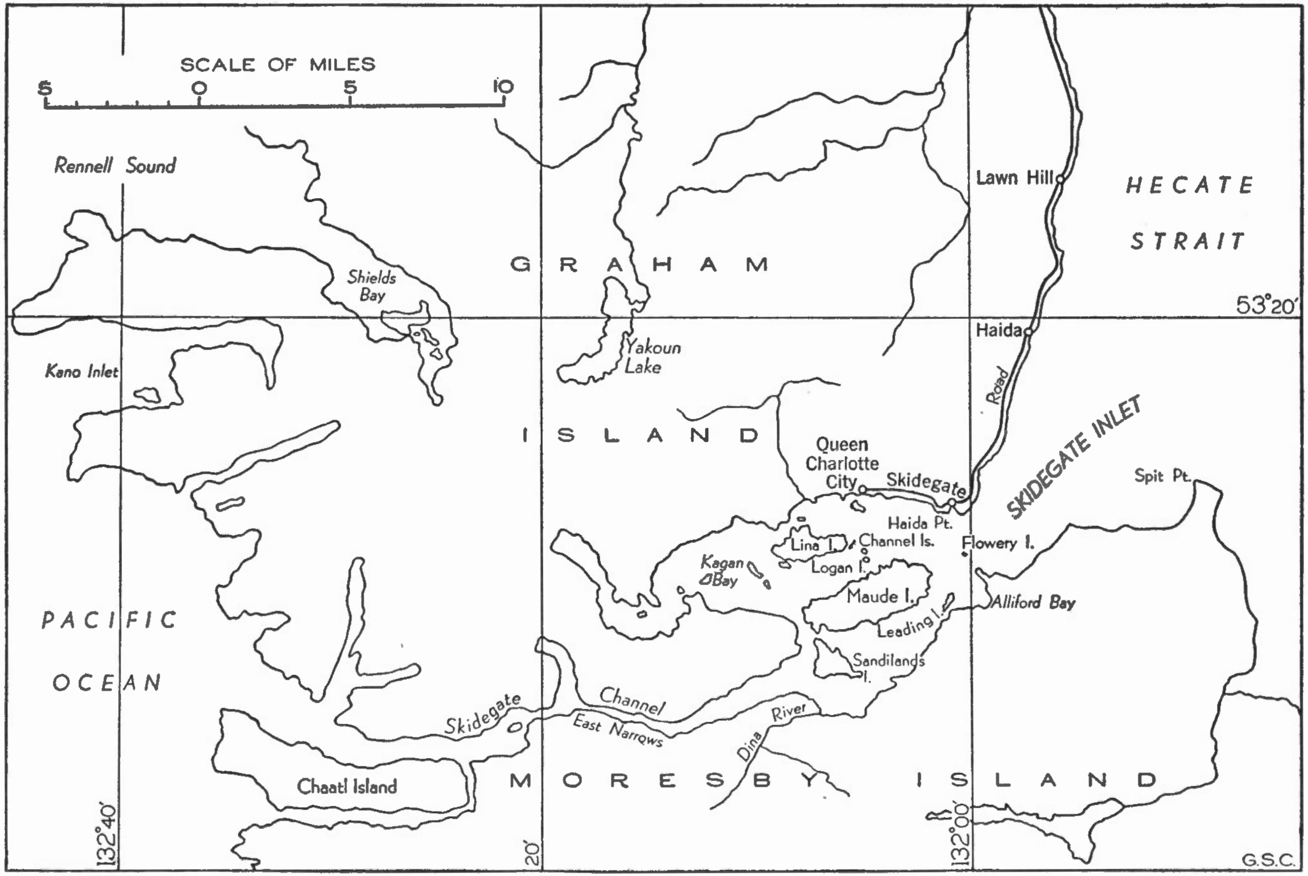

Figure 1. Index map of Skidegate Inlet and vicinity, Queen Charlotte Islands, showing geographic features referred to in text beyond the boundaries of Figures 2 and 3.

list are probably from this locality and horizon: *Discina semipolita* Whiteaves, *Avicula* cf. *whiteavesi* Stanton (=*Oxytoma* n.sp.), *Pecten carlottensis* Whiteaves, and *Cardium tumidulum* Whiteaves.

Beyond a concealed interval, corresponding to from 150 to 200 feet of strata, the argillites and quartzites of the Maude formation are overlain by more than 600 feet of fine agglomerate with small, even-sized, rudely sorted or unsorted fragments, some tuffaceous sandstone, and, at the top, a little argillite; these beds are exposed at intervals across Crickmay Point and from Locality M6 to M7 (*See* Figure 2) and are included in the Maude formation. The agglomerates and accompanying sediments are unfossiliferous.

Westward across Maude Island, both the argillite and fine agglomerate zones of the Maude formation pass below and are buried beneath the Haida beds west of Jones Bay and south of MacKenzie Bay, and do not reappear on the northwest or south shores.

Southwest of Alliford Bay (*See* Figure 3). The Maude formation also outcrops on Moresby Island, on the southeast shore of Skidegate Inlet, southwest of Alliford Bay, and on the southwest limb of the Alliford Bay syncline. Here, as on Maude Island, a lower argillite zone and an upper, fine agglomerate zone can be recognized.

About 500 feet of banded argillite, slate, quartzitic sandstone, and concretionary bands are exposed on the northeast side of Whiteaves Bay, from Locality M8 to M11 (*See* Figure 3), and contain fossils at two localities, M9 and M10. The fossils at M9 have not been studied, but those collected at M10 include *Dactylioceras kanense, D.* cf. *kanense, Harpoceras maurelli, H. allifordense, H. propinquum* (Whiteaves), and *Harpoceras* sp. The specimen of *H. propinquum* collected by Dawson and selected as the lectotype of this species probably came from this locality. All beds are concealed between Localities M10 and M11 on Whiteaves Point.

About 800 feet of interbedded, banded argillite, fine agglomerate, and tuff are exposed intermittently from Locality M11 to M12, all the way around Dawson Bay. Throughout this section the structure is fairly uniform, with a northerly dip. The beds are unfossiliferous except near the top where a few specimens of belemnoids were found. The agglomerates are composed of small, fairly even-sized fragments of volcanic rocks, quartzite, and argillite. Compared with what are tentatively considered to be similar beds at the same horizon, that is at the top of the formation, at Crickmay Point on Maude Island, these upper beds at Dawson Bay have more and thicker beds of argillite interbedded with the agglomerate.

Other Localities. The Maude formation outcrops at several places in Skidegate Inlet, but is nowhere so well exposed or so fossiliferous as on Maude Island and in Whiteaves and Dawson Bays.

Southwest of Whiteaves Bay and continuing along the shore of Moresby Island almost to Dina River (*See* Figure 1) are beds of argillite, sandstone, tuff, and agglomerate. They are for the most part unfossiliferous. However, at one locality, very large fragments of dark calcareous siltstone, with the late Upper Triassic pelecypod *Monotis subcircularis* Gabb, are embedded in tuff. The position in the stratigraphic column of these beds between Whiteaves Bay and Dina River is not exactly known, but they may be some lower part of the Maude formation.

Argillites, together with some light grey limestone at the southeast end of Sandilands (South) Island (*See* Figure 1), may be, as suggested by MacKenzie, of the Maude formation.

Mode of Origin

Most, if not all, of the Maude formation is of marine origin. All known fossils are marine; the thin, even bedding and the fine grain and carbonaceous contents of the argillites suggest deposition in quiet, possibly stagnant, waters. The well preserved fossils are in hard, calcareous and quartzitic beds of coarser grain than the argillites.

Pyroclastic material, indicative of volcanic activity, occurs in the upper part of the formation at Crickmay Point on Maude Island, and on the northeast shore of Dawson Bay, southwest of Alliford Bay. If the tuff, agglomerate, and other beds between Whiteaves Bay and Dina River are of the Maude formation, they indicate earlier stages of volcanic activity in Maude time; the large blocks of *Monotis*-bearing Triassic siltstone embedded in tuff, east of Dina River, record explosive activity of considerable strength and a nearby source.

Age

The Maude formation contains two known Lower Jurassic faunas, the *Fanninoceras* fauna on Maude Island and the *Harpoceras* fauna on Whiteaves Bay, southwest of Alliford Bay. *Harpoceras* and *Dactylioceras* establish a Toarcian, or late Lower Jurassic, age, and *Fanninoceras* is also probably of the same age. It is not known, however, whether the *Fanninoceras* and *Harpoceras* faunas are contemporaneous or whether they occur in distinct faunal zones within the Toarcian stage; nor, if they are in distinct local zones, is it known what their relative position is. These late Lower Jurassic faunas date the argillites of Ells and Whiteaves Bays.

The age of the argillites and fine agglomerates at the top of the Maude formation cannot be determined by fossil evidence at present, as only rare specimens of belemnoids have been found in them. Unless a disconformity is present in the section on the southeast shore of Maude Island, some beds between the *Fanninoceras* beds at Ells Bay and the *Stephanoceras-Chondroceras* (*Defonticeras*) beds at Richardson Bay must be of early Bajocian age, that is early Middle Jurassic, and this may be the age of the higher, agglomerate-bearing beds of the Maude formation.

No faunal zones of the Hettangian, Sinemurian, and Pliensbachian stages of the Lower Jurassic have been recognized around the shores of Skidegate Inlet or in any part of Graham Island. Compared with the numerous faunal zones recorded in the Lower Jurassic of some parts of the world, the zones at Skidegate Inlet make only a poor showing. It is possible that the Maude at some localities includes beds of pre-Toarcian age; thus, MacKenzie has collected Triassic fossils on Frederick Island and at Lepas Bay, in the northwest part of Graham Island, in calcareous argillites apparently referable to the Maude. If part of the Maude is Triassic, a part must also be of pre-Toarcian, Jurassic age, unless intervals of non-deposition are represented in the succession. As already noted, the beds between Whiteaves Bay and Dina River may be of early Lower Jurassic time.

YAKOUN FORMATION

Definition

The Yakoun formation was established by MacKenzie (1916) to embrace strata overlying and conformable with the Maude formation and consisting "largely of pyroclastic rocks and in great part of waterlain agglomerates and tuffs. Effusive types also are found . . . The formation is dominantly sub-silicic, augite andesites and basalts being the usually occurring varieties . . .

"In the lower part of the formation [are] very well-bedded tuffs and tuffaceous sandstones . . ." MacKenzie notes that the Yakoun formation "is well exposed on Skidegate inlet and at Yakoun Lake, and takes its name from the latter locality."

On Maude Island and in the vicinity of Alliford Bay the Yakoun is overlain with angular unconformity, by the late Lower Cretaceous Haida formation.

Lithological and Faunal Succession

Southeast Shore of Maude Island (*See* Figure 2). Although intersected by a few faults, a good section of the Yakoun formation is exposed along the southeast shore of Maude Island from Richardson Bay to Robber Point. It is more than 1,800 feet thick, and embraces 200+ feet of basal tuffaceous sandstone, etc., 1,200 feet of massive and bedded agglomerate and tuff, and, at the top, 430 feet of sandstone and shale.

The base of the Yakoun formation is exposed at intervals between Localities Y1 and Y3 in a faulted section in Richardson Bay (*See* Figure 2). The section comprises more than 200 feet of beds, dipping at various angles. Individually, they are 3 inches to 25 feet thick, and are composed of dark shale with concretions, tuffaceous shale and sandstone, and tuff and agglomerate. At Locality Y2 they carry species of *Pinna, Inoceramus, Brachidontes, Ostrea, Astarte?, Camptonectes, Pleuromya,* and *Pholadomya,* and *Stephanoceras skidegatense* var. *laperousii, Chondroceras* (*Defonticeras*) *colnetti, C.* (*Defonticeras*) *ellsi,* and belemnoids. Other species, obtained from talus at Richardson Bay, are: *Chondroceras* (*Defonticeras*) *defontii, C.* (*Defonticeras*) *marchandi,* and *C.* (*Defonticeras*) *maudense.* The type specimen of *Stephanoceras skidegatense* (Whiteaves), collected by Richardson in 1872, and *Chondroceras* (*Defonticeras*) *oblatum* Whiteaves may have come from this horizon and locality. The *Stephanoceras* sp. *a* and *Stephanoceras* sp. *b,* listed by MacKenzie (1916), are of the Lower Yakoun fauna and either from this locality or from Logan Island (*See* Figure 1).

Overlying the basal beds are about 1,200 feet of mostly massive, partly bedded, agglomerate and tuff, which are exposed along the shore from Locality Y3 to Y4, that is, from the north end of Richardson Bay to the south end of Cairnes Bay. Details of this 1,200-foot section follow, in descending order:

	Feet (Approximate)
Tuff, granular	15
Tuff, partly bedded; a few pebbles in lower part	20
Tuff, roughly bedded, granular; wood fragments 4 inches long	15
Tuff, thinly bedded; tuff, granular; conglomerate; all in beds 3 inches to 8 feet thick; pebbles ½ inch to 2 inches	20
Tuff, massive, granular	60
Tuff, bedded, roughly sorted; tuff, granular in 3-inch to 1-foot layers, crossbedded on large scale; beds alternately fine and coarse grained	60
Agglomerate, roughly banded, angular; fragments 4 inches to 1 foot	28
Tuff, dark and light banded, granular	4
Conglomerate; pebbles up to 2 inches	1
Agglomerate, massive; fragments up to 2 inches	38
Tuff, bedded, granular	20
Agglomerate, fine, with *'Rhynchonella'* sp.	2
Tuff, granular and massive	37
Tuff, fine, granular	27
Agglomerate, massive; tuff, granular, massive; fragments 1 inch to 3½ feet	460
Tuff, hard, massive	100
Tuff, fine, massive; with a few, large fragments	70
Agglomerate; tuff, fine	25
Sandstone, tuffaceous, with wood fragments	10
Agglomerate, coarse, massive	90
Agglomerate and tuff, in thick beds	80
Tuff, finely banded	10
Agglomerate, massive	8
Total thickness	1,200

Except for the one layer in the upper part of the section that contains a few marine fossils, this 1,200-foot section of agglomerate and tuff is unfossiliferous, unless a few wood fragments be considered fossils. The middle beds of the section are particularly massive, the lower beds somewhat less so, and the upper part of the section more thinly bedded, with rounded pebbles indicating a working over by waves and currents and so forming a transition to the overlying marine-laid sandstones and shales.

The overlying, marine beds represent the highest Jurassic strata on Maude Island. and extend along the shore from Locality Y4 on Cairnes Bay to Y6 at Robber Point. The section is as follows, in descending order:

	Feet (Approximate)
Sandstone, flaggy, coarse; at Locality Y6 on Robber Point, with *Pinna* sp., *Isognomon skidegatensis* (Whiteaves), *Ostrea skidegatensis* Whiteaves, *Trigonia charlottensis* Packard?, *Etolium* sp., *Modiolus persistens* Whiteaves, *Pleuromya laevigata* (Whiteaves), *P.* n.sp.?, *Thracia semiplanata* Whiteaves, *Astarte carlottensis* Whiteaves, *Protocardium subsimile* Whiteaves, and belemnoids	35
Sandstone, yellowish, concretionary	5
Concealed	40
Conglomerate with 1- to 6-inch pebbles	0·5
Sandstone, green, tuffaceous; with belemnoids	3
Conglomerate, fine	0·1
Sandstone, massive, crossbedded, tuffaceous?	7
Sandstone, green, tuffaceous; with pebbles	1

	Feet (Approximate)
Sandstone, hard, tuffaceous, in 1- to 6-inch layers	15
Sandstone, tuffaceous?, partly banded	13
Sandstone, fine, dark grey, shaly	1
Sandstone, shaly; sandstone in 1- to 6-inch layers	2
Sandstone, shaly, fine; sandstone, tuffaceous	5
Shale, dark, finely friable, with small concretions and a few 1- to 2-inch hard bands; all at Y5, Cairnes Bay, with *'Rhynchonella' obesula* Whiteaves?, *Parallelodon (Gilbertwhitea) simillimus* (Whiteaves), *Trigonarca tumida* Whiteaves, *Gervillia (Bakevellia) newcombii* Whiteaves, *Gryphaea persimilis* Whiteaves, *Trigonia (Costatae* group), *Camptonectes* sp., *Astarte carlottensis* Whiteaves, *Corbula concinna* Whiteaves, and *Pleuromya* sp.	35
Concealed	62
Sandstone, tuffaceous, concretions up to 2 feet	60
Concealed	5
Sandstone, slabby to massive	30
Concealed	75
Sandstone, coarse, crossbedded	10
Conglomerate	15
Concealed	10
Total thickness	430

The pelecypods at both Locality Y5 and Y6 are evidently of the same fauna. No ammonoids were found at these two localities; however, the same pelecypods are associated with ammonoids at Newcombe Bay on the north side of Maude Island, where the same sandstone is exposed on an upfaulted block or low arch. The Yakoun sandstone at Newcombe Bay directly underlies the sandstone of the Haida formation, and can scarcely be distinguished from it except with the aid of fossils. Indeed, MacKenzie (1916) mapped this patch of outcrop of Yakoun as Haida, and the writer in his first traverse of the north shore of Maude Island identified it as Haida sandstone. The Yakoun sandstone at this locality bears the following species of the Upper Yakoun fauna, collected in 1921: *'Terebratula' skidegatensis* Whiteaves?, *'Rhynchonella' obesula* Whiteaves?, *Cucullaea ponderosa* Whiteaves, *Trigonarca tumida* Whiteaves?, *Isognomon skidegatensis* Whiteaves, *Gervillia (Bakevellia) newcombii* Whiteaves, *Ostrea skidegatensis* Whiteaves, *Trigonia charlottensis* Packard?, *Trigonia* n.sp.?, *Camptonectes* sp., *Modiolus persistens* Whiteaves, *Pleuromya carlottensis* Whiteaves, *P. laevigata* (Whiteaves), *P.* n.sp.?, *Pholadomya* n.sp., *Thracia semiplanata* Whiteaves, *T. semiplanata* var., *Astarte carlottensis* Whiteaves, *Protocardium subsimile* Whiteaves, *Pleurotomaria skidegatensis* Whiteaves?, *Kepplerites (Seymourites) abruptus, K. (Seymourites) gitinsi, K. (Seymourites) multus, K. (Seymourites) plenus, K. (Seymourites) torrensi,* and *Phylloceras* sp. Dawson's collection from the east end of Maude Island, made in 1878, was from this horizon and included the following species of the Upper Yakoun fauna: *Parallelodon (Gilbertwhitea) simillimus* (Whiteaves), *Trigonarca tumida* Whiteaves, *Gryphaea persimilis* Whiteaves, *Pleuromya laevigata* (Whiteaves), *Thracia semiplanata* Whiteaves, *Astarte carlottensis* Whiteaves, and *Protocardium subsimile* Whiteaves. E. L. Packard collected *Ctenostreon* n.sp. from the northeast corner of Maude Island and Newcombe also collected specimens of this Upper Yakoun fauna from the north side of Maude Island, and probably from Newcombe Bay, including *Gervillia*

(Bakevellia) newcombii Whiteaves. From the east end of Maude Island he collected *Cucullaea ponderosa* Whiteaves, *Modiolus persistens* Whiteaves, and *Anatina semiradiata* Whiteaves. MacKenzie includes the following species from the Upper Yakoun fauna in his list of fossils from the Yakoun formation:*Pleuromya carlottensis* (Whiteaves), *P. laevigata* (Whiteaves), and *Thracia semiplanata* Whiteaves.

Northwest Shore of Maude Island (*See* Figure 2). The section on the northwest shore of Maude Island is not as satisfactory for study as the one on the southeast shore; the beds are faulted and folded, and their succession is not easily understood. Some attempt has been made, however, to identify on the northwest shore the lithological and faunal zones of the southeast shore.

It seems possible to identify the basal tuffaceous shale and tuff zone on the northwest shore; for between MacKenzie and Clapp Bays, that is between Localities Y7 and Y8, are thin-bedded, dark, tuffaceous shale, tuff, and agglomerate in beds 1 inch to several feet thick, similar to the basal Yakoun beds in Richardson Bay. They also carry a fauna similar in age although different in composition. The fauna here contains *Oxytoma* sp., *Zemistephanus richardsoni* (Whiteaves), *Z. funteri, Z. vancouveri, Normannites (Kanastephanus) canadensis, N. (Kanastephanus) mackenzii, N. (Kanastephanus) altus, N. (Kanastephanus) crickmayi,* and a belemnoid. In addition, *Teloceras itinsai* was found in talus. The type specimen of *Zemistephanus richardsoni* (Whiteaves) collected by Richardson in 1872 was probably from this locality. Shale, tuff, and agglomerate continue along the shore northeast of Clapp Bay, but in thicker layers than in the section between MacKenzie and Clapp Bays. They belong to the basal tuffaceous shale and tuff zone, or are beds transitional to the massive agglomerate and tuff zone.

Tuff and agglomerate, in thin to thick massive layers, outcrop between Maude and Downie Bays and probably correspond with, and form an extension of, part of the massive and bedded agglomerate and tuff zone on the southeast shore between Richardson and Cairnes Bays. Banded quartzite, argillite, dark shale, tuff, and agglomerate on the west side of Downie Bay are difficult to place, and may even be of the Maude formation; they are, however, mapped tentatively as part of the massive and bedded agglomerate and tuff zone of the Yakoun formation. Massive tuff and agglomerate at Downie Point and on the southwest side of Contact Bay correspond with the middle of the massive agglomerate and tuff zone between Richardson and Cairnes Bays on the southeast shore.

The marine sandstone and shale zone at the top of the section on the southeast shore, exposed from Cairnes Bay to Robber Point, evidently disappears to the west, for it does not reappear on the northwest shore. It is, doubtless, buried beneath the Cretaceous Haida formation west of Newcombe Bay.

Alliford Bay (*See* Figure 3). The Yakoun formation is well exposed on both limbs of the Alliford Bay syncline, a structure recognized by Dawson, from Dawson Point to Alliford (Kwuna) Point. Although somewhat modified, the zones of the Yakoun formation distinguished on Maude Island can also be recognized in the Alliford Bay section.

Overlying the beds of argillite and fine agglomerate, at the top of the Maude formation, at Locality Y9 on the south side of Dawson Point, are nearly 200 feet of thin- to thick-bedded shale, tuffaceous sandstone, and agglomerate in beds 1 inch to several feet thick. A few specimens of belemnoids were found in these beds, and although the beds do not carry the diagnostic ammonoids and pelecypods of the Lower Yakoun fauna they can be compared, on the basis of similar lithology and stratigraphic position, with the beds containing this fauna on Maude Island at Richardson Bay and between MacKenzie and Clapp Bays.

Above these bedded shales and tuffaceous beds and extending from Dawson Point to Fossil Point, on the south shore of Alliford Bay, are massive to bedded tuffs and agglomerates similar to those between Locality Y3 on Richardson Bay and Y4 on Cairnes Bay on Maude Island. Because of faulting, the thickness cannot be accurately measured; an estimate of about 1,500 feet is made. The agglomerate and tuff occur mostly in thick, massive, unsorted masses. In places, however, the agglomerate fragments are rudely sorted as to size and arranged in layers or are even conglomerate-like, with water-worn fragments. In places tuff and agglomerate are arranged in separate, fairly thin beds. Fossils are very rare, but *'Rhynchonella'* sp. was collected at Locality Y10 on the south shore of Brock Bay. Along the south shore of Alliford Bay, and from the fault at Fault Bay to Locality Y11 at Fossil Point, are the highest beds of the agglomerate and tuff zone, which consists of fairly well-bedded ash, agglomerate, and some conglomerate; the strike, where it could be determined, is almost parallel with the shore, so that no great thickness of beds is exposed. At Locality Y11 these volcanic beds grade upward into tuffaceous sandstone and sandstone and into the overlying sandstone and shale zone. Massive and roughly bedded agglomerate and tuff are exposed at intervals on the north limb of the Alliford Bay syncline and along the north shore of the bay from Locality Y14 to Alliford (Kwuna) Point, and follow around this point to the shore on the north side of Agglomerate Peninsula.

As on Maude Island, the beds of the sandstone and shale zone of the Yakoun formation are the highest Jurassic strata at Alliford Bay. However, instead of occurring in several sandstone and shale beds, as on Maude Island, they consist of a single, thick sandstone overlain by shale. The sandstone is exposed on the south shore of the Bay at Fossil Point and on islands close to the north shore from Locality Y14 to Y15. The dark shale lies on the axis of the syncline and is exposed at intervals at the head of the bay from Locality Y12 to Y13. As on Maude Island the sandstone and shale member carries the Callovian or early Upper Yakoun or *Seymourites* fauna.

Most of the fossils occur in the sandstone. The following were collected at Fossil Point in 1921: *'Rhynchonella' obesula* Whiteaves?, *Parallelodon (Nanonavis) cumshewensis* (Whiteaves), *Isognomon skidegatensis* (Whiteaves), *Gervillia (Bakevellia) newcombii* Whiteaves, *G. (Bakevellia) newcombii* Whiteaves var., *Ostrea skidegatensis* Whiteaves, *Trigonia flexicostata* Burwash?, *T. charlottensis* Packard?, *Pleuromya carlottensis* Whiteaves, *P. laevigata* (Whiteaves), *P.* n.sp.?, *Pholadomya* n.sp., *Anatina semiradiata* Whiteaves, *Thracia semiplanata* Whiteaves, *T. semiplanata* Whiteaves var., *Astarte carlottensis* Whiteaves, *Protocardium subsimile* Whiteaves, *Pleurotomaria skidegatensis* Whiteaves?, and *'Belemnites'* sp. Specimens of

Trigonia flexicostata Burwash? were collected from talus at Fossil Point. In the same sandstone and on a small island at Locality Y14 on the north shore of Alliford Bay, west of a fault, the following were collected in 1921: *Ostrea skidegatensis* Whiteaves, *Pleuromya laevigata* (Whiteaves), *Pleuromya* n.sp.?, *Thracia semiplanata* Whiteaves var., *Arctica occidentalis* (Whiteaves), and *Astarte carlottensis* Whiteaves. On another small island at Locality Y15, off the north shore of Alliford Bay, the following were collected from sandstone in 1921: *Pleuromya carlottensis* (Whiteaves), *P. laevigata* (Whiteaves), *P.* n.sp.?, *Pholadomya* n.sp., *Thracia semiplanata* Whiteaves, and *Astarte carlottensis* Whiteaves.

Fossils are rare in the shale that overlies the sandstone. In 1921, *Pleuromya carlottensis* (Whiteaves) was collected in shale at Locality Y12 near the head of Alliford Bay.

Dawson made a large collection of fossils from the Yakoun formation of Alliford Bay in 1878. They were probably obtained from the sandstone member, and include: *Parallelodon (Nononavis) cumshewensis* (Whiteaves), *Oxytoma* sp., *Ostrea skidegatensis* Whiteaves, *Gryphaea persimilis* Whiteaves, *Trigonia charlottensis* Packard?, *T.* n.sp.?, *Pleuromya carlottensis* Whiteaves, *P. laevigata* (Whiteaves), *Thracia semiplanata* Whiteaves, *T. semiplanata* Whiteaves var., *Arctica occidentalis* (Whiteaves), *Astarte carlottensis* Whiteaves, *Protocardium subsimile* Whiteaves, and *Kepplerites (Seymourites) ingrahami*. Richarson's specimen of *Kepplerites (Seymourites) loganianus* (Whiteaves) is from Alliford Bay or the east of Maude Island. The specimen of *Pholadomya ovuloides* Whiteaves, collected by Richardson in 1872, is probably from Alliford Bay and possibly from Fossil Point. Newcombe collected *'Rhynchonella' obesula* Whiteaves and *Kepplerites (Seymourites) newcombii* (Whiteaves) from Alliford Bay; they are of the Upper Yakoun fauna.

Other Localities (*See* Figure 1). Agglomerates and tuffs outcrop on Flowery Island, on Leading Island, and on adjacent islands. They are for the most part unfossiliferous, but fossil fruits of the species *Cycadeocarpus (Divonites) columbianus* Dawson have been found in bedded tuffs on a small island south of Leading Island.

From Maude Island the outcrop of the Yakoun formation extends to the Channel Islands. On Logan Island are tuffaceous sandstone and some agglomerate containing the following Lower Yakoun fauna: species of *Inoceramus, Ostrea,* and *Astarte,* and *Stephanoceras caamanoi, S. yakounense,* and *Normannites (Itinsaites) itinsai.*

Along the south shore of Graham Island, northeast of Haida Point, are exposures of massive agglomerate and tuff.

Mode of Origin

The tuffs and agglomerates in the lower part of the Yakoun formation obviously record volcanic activity. The accumulation was not too rapid to permit some sorting and reworking by current or wave action, and at times deposition of volcanic products was suspended and sands and finer terrigenous sediments were laid down. Accumulation was partly, if not entirely, in the sea, for marine fossils are present.

The thick, massive beds of tuff and agglomerate in the middle of the formation record more intense volcanic activity. Even in this part of the formation, however, some sorting of the volcanic material is recorded, and at one horizon well-bedded deposits carry a few marine fossils, showing that volcanic activity abated at times and that deposition took place in the sea.

Accumulation of volcanic products on the site of Maude Island and Alliford Bay had ceased by Upper Yakoun time, for the sediments of the upper part of the formation consist of sandstone and shale. The presence of abundant marine fossils is sufficient evidence of marine deposition.

Age

The fossils from the lower part of the Yakoun formation at Richardson Bay, between MacKenzie and Clapp Bays, and on Logan Island are apparently all of one fauna, the Lower Yakoun or *Stephanoceras* fauna. Separate lists for each locality have already been given in preceding paragraphs. A combined list is as follows: species of *Pinna, Inoceramus, Ostrea, Brachidontes, Astarte, Camptonectes, Pleuromya*, and *Pholadomya; Stephanoceras caamanoi, S. skidegatense* (Whiteaves), *S. skidegatense* var. *laperousii, S. yakounense, Teloceras itinsai, Zemistephanus funteri, Z. richardsoni* (Whiteaves), *Z. vancouveri, Normannites (Kanastephanus) altus, N. (Kanastephanus) canadensis, N. (Kanastephanus) crickmayi, N. (Kanastephanus) mackenzii, Normannites (Itinsaites) itinsai, Chondroceras (Defonticeras) colnetti, C. (Defonticeras) defontii, C. (Defonticeras) ellsi, C. (Defonticeras) marchandi, C. (Defonticeras) maudense, C. (Defonticeras) oblatum* (Whiteaves), and a belemnoid. *Stephanoceras, Teloceras*, and *Chondroceras* establish the age as Middle Bajocian, in the broad sense, that is Stephanoceratan, the time of the zone of *Stephanoceras humphriesianum*.

The mostly barren beds of tuff and agglomerate in the middle of the formation are difficult to correlate. Stratigraphically they lie between strata with *Stephanoceras* and beds with *Kepplerites (Seymourites)*. If no disconformities are present they belong to a possible time range of late Bajocian and Bathonian, that is late Middle Jurassic time. This is the time of maximum volcanic activity.

The complete *Kepplerites (Seymourites)* or Upper Yakoun fauna, as know to date, comprises the following species: *'Terebratula' skidegatensis* Whiteaves?, *'Rhynchonella' obesula* Whiteaves?, *Parallelodon (Nanonavis) cumshewensis* (Whiteaves), *P. (Gilbertwhitea) simillimus* (Whiteaves), *Cucullea ponderosa* Whiteaves, *Trigonarca tumida* Whiteaves, *Pinna* sp., *Isognomon skidegatensis* (Whiteaves), *Gervillia (Bakevellia) newcombii* Whiteaves, *Oxytoma* sp., *Ostrea skidegatensis* Whiteaves, *Gryphaea persimilis* Whiteaves, *Trigonia charlottensis* Packard?, *Trigonia flexicostata* Burwash?, *Trigonia* n.sp.?, *Trigonia* (*Costatae* group), *Entolium* sp., *Camptonectes* sp., *Ctenostreon* n.sp., *Modiolus persistens* Whiteaves, *Pleuromya carlottensis* Whiteaves, *P. laevigata* Whiteaves, *Pleuromya* n.sp.?, *Pholadomya ovuloides* Whiteaves, *P.* n.sp., *Anatina semiradiata* Whiteaves, *Thracia semiplanata* Whiteaves, *T. semiplanata* Whiteaves var., *Arctica occidentalis* (Whiteaves), *Astarte carlottensis* Whiteaves, *Protocardium subsimile* Whiteaves, *Corbula concinna* Whiteaves?, *Pleurotomaria skidegatensis* Whiteaves, *Kepplerites (Seymourites) abruptus, K. (Seymourites) gitinsi, K.*

(Seymourites) ingrahami, K. (Seymourites) loganianus (Whiteaves), *K. (Seymourites) multus, K. (Seymourites) Newcombii* (Whiteaves), *K. (Seymourites) penderi, K. (Seymourites) plenus, K. (Seymourites) torrensi, Phylloceras* sp., and a belemnoid. This fauna was assigned a Proplanulitan age of the Callovian stage of the European Jurassic (early Upper Jurassic) by S. S. Buckman (in McLearn, 1927). Spath (1932) has discussed the age of the *Seymourites* beds of East Greenland, which he dates Callovian or early Upper Jurassic. There the *Kepplerites (Seymourites)* fauna is the highest in the Vardekloft formation, which, Spath concludes, ranges from Upper Bathonian (late Middle Jurassic) to Lower Callovian (early Upper Jurassic).

The determination of the age of this fauna permits dating the cessation of volcanic activity, or at least cessation of accumulation of volcanic products in the sea, on the site of Maude Island and Alliford Bay, that is by Callovian or early Upper Jurassic time.

Of the remainder of Jurassic time no record exists. No strata of Oxfordian, Kimmeridgian, or Tithonian age are known on Maude Island or at Alliford Bay.

THE UNCONFORMITY BETWEEN THE YAKOUN AND HAIDA FORMATIONS

Both Clapp (1914) and MacKenzie (1916) have stressed the importance of the unconformity between the Jurassic, Yakoun and the Lower Cretaceous, Haida formations. MacKenzie described the contact as one of marked discordance with evidence of deep erosion prior to the deposition of the Haida formation. The magnitude of this erosion is evident on Maude Island: at MacKenzie Bay the Cretaceous sandstone and conglomerate rest on the lower part of the Yakoun formation; at Contact Bay they rest on the middle part of the Yakoun; at Robber Point they rest on the highest known beds of the Yakoun; and at Jones Bay they rest on beds well down in the Maude formation. The discordance is particularly manifest at MacKenzie Bay where the dip of the beds of the Yakoun formation is in the opposite direction to that in the Haida formation.

As the highest beds of the Yakoun formation are of Callovian (early Upper Jurassic) age and the beds of the Haida formation are of Albian (late Lower Cretaceous) age, the time interval registered by the unconformity is a long one. It is equal to the Oxfordian, Kimmeridgian, and Tithonian stages of the Upper Jurassic and the Valanginian, Hauterivian, Barremian, and Aptian stages of the Lower Cretaceous, that is, equal to a large part of the Upper Jurassic and Lower Cretaceous epochs.

It is obvious that folding, uplift, and erosion affecting the Maude and Yakoun formations prior to the deposition of the Lower Cretaceous, Haida formation cannot be accurately dated, but can only be inferred to have taken place at some time in the interval between Callovian and Albian times. All that is proved is that, after these events, marine submergence and aggradation were renewed in Albian time and the sands of the Haida formation accumulated.

It is possible, however, that a detailed study of the Jurassic and Cretaceous beds in other parts of Skidegate Inlet or Graham Island will yield new evidence that will fill some of the gap in our knowledge of late Jurassic and early Lower Cretaceous time and so lead to a more accurate dating of the orogenic history of Skidegate Inlet. The record furnished by the beds of Maude Island and Alliford Bay is not the total record available in the strata of Skidegate Inlet. Beds intermediate in age between the highest part of the Jurassic, Yakoun formation and the lowest part of the Lower Cretaceous, Haida formation are present elsewhere. A broad band of strata crossing Skidegate Channel east of East Narrows (*See* Figure 1) is mapped by MacKenzie (1916) as the Maude formation. An examination reveals the presence of a thick section along the north shore of the channel where sandstone with a fairly high northeast dip, and faulted in places, is exposed. Fossils collected near the base include *Aucella* and *Inoceramus*. The *Aucella* suggests early Lower Cretaceous, and that these sandstones are younger than the highest known beds of the Yakoun formation on Maude Island and at Alliford Bay. Unfortunately, the contact relations of these beds with those of the Yakoun formation are unknown. If conformable with the Yakoun, the folding and pre-Haida erosion must have taken place in Lower Cretaceous time; if unconformable and discordant, the folding, and pre-Haida erosion, were in late Upper Jurassic time.

Enough has been written to indicate an interval or intervals of deformation, uplift, and erosion separating Yakoun and Haida sedimentation, but that much must yet be done before the final chapter of the geological history of Skidegate Inlet can be written.

NOTES ON FOSSILS

No attempt has been made in this stratigraphic account to revise or extend the study of the Jurassic faunas. A few alterations, however, have been made in generic names.

Reinhart (1937) lists *Arca (Nemodon) cumshewensis* Whiteaves as *Parrallelodon (Nanonavis) cumshewensis* and *Arca (Nemodon) simillima* Whiteaves as a species of genus *Parallelodon* and subgenus *Gilbertwhitea*. He has been followed in this report. Arkell (1936), however, considers *Gilbertwhitea* Crickmay to be a synonym of *Beushausenia* Cosmann.

Cox (1940) suggests that the genus *Bakevellia* King be extended in usage to embrace all *Pteria*-like species of *Gervillia*. The name is thus very appropriate for the species *Gervillia newcombii* Whiteaves.

Isognomon Solander is said to have priority over the generic names *Melina* Retzius and *Perna* Bruguiere (Arkell, 1933). It is, therefore, substituted for *Melina* in *Melina skidegatensis* Whiteaves.

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