

PRELIMINARY TERTIARY MOLLUSCAN BIOSTRATIGRAPHY
OF THE ALASKA PENINSULA, SOUTHWESTERN ALASKA.

by
Louie Marinovich, Jr. and Charles L. Powell, II

This report summarizes the stratigraphic occurrence, age and general correlations of Tertiary marine mollusks that have been collected from nine measured stratigraphic sections and numerous spot samples on the Alaska Peninsula and adjacent islands of southwestern Alaska. The paleontological and biostratigraphic data presented here are intended to supplement the meager information previously reported from this region. This progress report is presented for the purpose of making available biostratigraphic data that have accumulated in U. S. Geological Survey collections since the only previous overview of Alaska Peninsula Tertiary molluscan faunas, by F. S. MacNeil (in Burk, 1965). The senior author collected the majority of the specimens reported on here and is responsible for taxonomic identifications. All fossil localities are prefixed with an "M," indicating that they are housed in U. S. Geological Survey collections in Menlo Park, California.

It must be emphasized that this is a progress report. The senior author is currently making detailed biostratigraphic and faunal studies of the Alaska Peninsula Tertiary molluscan sequence that will undoubtedly modify some of the results presented here.

Mollusk-bearing Tertiary marine strata crop out along both the Bering Sea and Pacific sides of the Alaska Peninsula. Most such outcrops occur along or adjacent to coastlines or on neighboring Pacific islands (Burk, 1965). This belt of discontinuous outcrops extends about 360 km, from just south of Fort Heider (latitude 56°55'N., longitude 158°41'W.) to the distal end of the Alaska Peninsula (latitude 54°48'N., longitude 163°20'W.) (Burk, 1965; McLean et al., 1978; McLean, 1979; Marinovich, 1983; Marinovich and McCoy, 1984). Tertiary marine molluscan faunas in this region range in age from late middle Eocene to late Miocene, although the stratigraphic sequence containing them is incomplete. Tertiary marine microfossils and terrestrial plant megafossils are known from the Alaska Peninsula (Burk, 1965), but mollusks have provided the principal means of dating and correlating Alaska Peninsula Tertiary strata.

Tertiary mollusks of the Alaska Peninsula were first noted by Grewingk (1850), from strata now assigned to the Bear Lake Formation (Burk, 1965; Marinovich, 1988a). Dall (1896, 1908) was the first scientist to personally collect Tertiary fossils from this region, and also was the first to attempt dating them by relating the taxa to faunas in the U. S. Pacific Northwest (Dall, 1904). A long hiatus in molluscan studies of this region was broken by a summary of Alaska Peninsula Cenozoic mollusks by F. S. MacNeil in the monumental reconnaissance study of the Alaska Peninsula by Burk (1965). Since then, Tertiary mollusks have been described or recognized from occasional finds made in the course of geological field work (MacNeil, 1970, 1973; Allison and Addicott, 1976; Lyle et al., 1979; Lindberg and Marinovich, 1988; Marinovich, 1981, 1988a). Tachlini Formation mollusks were monographed by Marinovich (1983), and Tolstoi Formation mollusks were described and illustrated by Marinovich (1988d). Taxa from several formations were included in monographs of the bivalves *Mya* (MacNeil, 1965) and Pectinidae (MacNeil, 1967) and the gastropod family Neptunidae (Nelson, 1974). Allison (1978) provided a useful summary of Gulf of Alaska Cenozoic molluscan faunas, including those from the Alaska Peninsula.

The oldest Tertiary marine mollusks of the Alaska Peninsula are in the Tolstoi Formation, which contains plant megafossils of Paleocene and possibly earliest Eocene age (Burk, 1965). The Tolstoi marine facies was recently dated as late middle Eocene in age by species-level correlations with faunas of California, Washington, Kamchatka and Chukotka (Marinovich, 1988d). The Stepovak Formation was considered to be of late Eocene and Oligocene age by MacNeil (in Burk, 1965) and Marinovich and McCoy (1984), but was found to contain only Oligocene mollusks in this study. The Bear Lake Formation is challenging to date because of abundant endemic species. However, comparisons with eastern Asian faunas have recently yielded more precise dating from some Bear Lake outcrops, including the oldest ones of early middle Miocene age (Marinovich and McCoy, 1984; Marinovich and Kase, 1986; Marinovich, 1988a, b, c). The precise placement of the youngest Bear Lake faunas within the late Miocene is still uncertain. The Tachlini Formation is known to be of late Miocene age based on numerous species that co-occur in faunas of the U. S. Pacific Northwest and eastern Asia (Marinovich, 1983).

REFERENCES CITED

Allison, R. C., 1978, Late Oligocene through Pleistocene molluscan faunas in the Gulf of Alaska region: *Veliger*, v. 21, p. 171-188.

Allison, R. C. and Addicott, W. O., 1976, The North Pacific Miocene record of *Mytilus* (*Plicatomytilus*), a new subgenus of Bivalvia: U. S. Geological Survey Professional Paper 962, 22 p.

Burk, C. A., 1965, Geology of the Alaska Peninsula - island arc and continental margin: Geological Society of America Memoir 99, 250 p.

Dall, W. H., 1896, Report on the coal and lignite of Alaska: U. S. Geological Survey 17th Annual Report, pt. 1, p. 763-875.

Dall, W. H., 1904, Neozoic invertebrate fossils, a report on collections made by the expedition, in v. 4, *Geology and Paleontology of the Harriman Alaska Expedition*: New York, Doubleday, Page and Co., p. 99-122 (reprinted by Smithsonian Institution, 1911).

Dall, W. H., 1908, Another large Miocene *Stalio*: *Nautilus*, v. 22, no. 8, p. 80-81.

Grewingk, C., 1850, Beitrag zur Kenntniss der orographischen und geognostischen Beschaffenheit der Nord-West-Kueste Amerikas mit den anliegenden Inseln: *Verhandlungen der Mineralogischen Gesellschaft zu St. Petersburg*, 1848-49, p. 76-324.

Lindberg, D. R. and Marinovich, L., Jr., 1988, New species of limpets from the Neogene of Alaska (Patellogastropoda: Mollusca): *Arctic*, v. 41, no. 3, p. 167-172.

Lyle, W. M., Morehouse, J. A., Palmer, I. F., Jr., and Bolm, J. G., 1979, Tertiary formations and associated Mesozoic rocks in the Alaska Peninsula area, Alaska, and their petroleum-reservoir and source-rock potential: Alaska Division of Geological and Geophysical Surveys, Geologic Report 62, 65 p.

MacNeil, F. S., 1965, Evolution and distribution of the genus *Mya*, and Tertiary migrations of Mollusca: U. S. Geological Survey Professional Paper 483-G, 51 p.

MacNeil, F. S., 1967, Cenozoic pectinids of Alaska, Iceland, and other northern regions: U. S. Geological Survey Professional Paper 533, 57 p.

MacNeil, F. S., 1970, New Pliocene *Chlamys* (*Swiftpecten*) and *Beringius* from the Alaska Peninsula: *Nautilus*, v. 84, no. 2, p. 69-74.

MacNeil, F. S., 1973, Marine fossils from the Linga Conglomerate Member of the Bear Lake Formation, Cape Aliaksin, Alaska Peninsula, Alaska: *Tohoku University, Science Reports, Series 2 (Geology), Special Volume 6 (Hatai Memorial Volume)*, p. 117-123.

Marinovich, L., Jr., 1981, *Tyrannoberingius rex*, a new genus and species of Miocene gastropod from Alaska: *Journal of Paleontology*, v. 55, no. 1, p. 176-179.

Marinovich, L., Jr., 1983, Molluscan paleontology, paleoecology, and North Pacific correlations of the Miocene Tachlini Formation, Alaska Peninsula, Alaska: *Bulletins of American Paleontology*, v. 84, no. 317, p. 59-155.

Marinovich, L., Jr., 1988a, Miocene mollusks from the lower part of the Bear Lake Formation on Ukolnoi Island, Alaska Peninsula, Alaska: *Natural History Museum of Los Angeles County Contributions in Science*, no. 397, 20 p.

Marinovich, L., Jr., 1988b, Recognition of an earliest middle Miocene warm-water event in a southwestern Alaskan molluscan fauna: Sendai, Japan, Saito Ho-on Kai Special Publication (Professor Tamio Kotaka Commemorative Volume), p. 1-24.

Marinovich, L., Jr., 1988c, Molluscan evidence of major Neogene events in southern Alaska: Shizuoka, Japan, International Geological Correlation Programme, Project 246 (Pacific Neogene events - their timing, nature and interrelationship), October 3-6, 1988, Abstracts, p. 20.

Marinovich, L., Jr., 1988d, Late middle Eocene mollusks of the Tolstoi Formation, Alaska Peninsula, Alaska, and correlations with faunas from California to the Far-Eastern U.S.S.R.: American Association of Petroleum Geologists, Pacific Section, annual meeting, Santa Barbara, California, April 15-19, 1988, *Paleogene Symposium volume*, p. 265-281.

Marinovich, L., Jr. and Kase, T., 1986, An occurrence of *Turritella* (*Hattella*) *sagui* in Alaska: implications for the age of the Bear Lake Formation: *Bulletin of the National Science Museum (Tokyo), Series C (Geology and Paleontology)*, v. 12, no. 2, p. 61-66.

Marinovich, L., Jr. and McCoy, S., Jr., 1984, An overview of Paleogene molluscan biostratigraphy and paleoecology of the Gulf of Alaska region: *Palaeoogeography, Palaeclimatology, Palaecoecology*, v. 47, p. 91-102.

McLean, H., 1979, Tertiary stratigraphy and petroleum potential of Cold Bay-False Pass area, Alaska Peninsula: *American Association of Petroleum Geologists Bulletin*, v. 63, no. 9, p. 1522-1526.

McLean, H., Engelhardt, C. L., and Howell, D. G., 1978, Reconnaissance geologic map of the Cold Bay and False Pass quadrangles, Alaska: U. S. Geological Survey Open-File Report 78-323, 1 map sheet.

Nelson, C. M., 1974, Evolution of the late Cenozoic gastropod *Neptunaea* (Gastropoda: Buccinacea): University of California at Berkeley, Department of Paleontology, unpublished Ph.D. thesis, 802 p.

TOLSTOI FORMATION
(EOCENE)

1 TOLSTOI TYPE SECTION
(UPPER MIDDLE EOCENE)

Locality numbers	M1168	M1169	M1170	M1180	M8062	M8375	M8380	M8382	M8386	M8696
Taxa:										
<i>Bivalvia:</i>										
<i>Acartiocardia brewenii</i> (Gabb)	x	x	x	x	x	x	x	x	x	x
<i>Brachidontes ovalis</i> (Weaver & Palmer)	x	x	x	x	x	x	x	x	x	x
<i>Corbicula</i> sp. indet.	x	x	x	x	x	x	x	x	x	x
<i>Glycymeris sigillata</i> (Gabb)	x	x	x	x	x	x	x	x	x	x
<i>Mercenaria conradii</i> (Gabb)	x	x	x	x	x	x	x	x	x	x
<i>Nuculana</i> sp. indet.	x	x	x	x	x	x	x	x	x	x
<i>Solenia</i> sp. indet.	x	x	x	x	x	x	x	x	x	x
<i>Solenia</i> cf. <i>S. clarki</i> (Weaver & Palmer)	x	x	x	x	x	x	x	x	x	x
<i>Tellina</i> sp. indet.	x	x	x	x	x	x	x	x	x	x
<i>Venerocardia clarki</i> (Weaver & Palmer)	x	x	x	x	x	x	x	x	x	x
Gastropoda:										
<i>Cyathina</i> sp. indet.	x	x	x	x	x	x	x	x	x	x
<i>Fusina</i> sp. indet.	x	x	x	x	x	x	x	x	x	x
<i>Neptunia</i> sp. indet.	x	x	x	x	x	x	x	x	x	x
<i>Turritella</i> sp. indet.	x	x	x	x	x	x	x	x	x	x
<i>Turritella</i> cf. <i>T. stewarti</i> Merriam	x	x	x	x	x	x	x	x	x	x

2 HUMPY CREEK SPOT SAMPLE
(UPPER MIDDLE EOCENE)

Locality number	M8888
Taxa:	
<i>Bivalvia:</i>	
<i>Corbicula</i> sp. indet.	x
<i>Nuculana</i> sp. indet.	x
<i>Solenia</i> sp. indet.	x
<i>Tellina</i> sp. indet.	x
<i>Voluta</i> sp. indet.	x
Gastropoda:	
<i>Cyathina</i> sp. indet.	x
<i>Fusina</i> sp. indet.	x
<i>Neptunia</i> sp. indet.	x
<i>Turritella</i> sp. indet.	x

3 KOROVIN ISLAND SPOT SAMPLES
(UPPER MIDDLE EOCENE)

Locality number	M1165	M8006	M8061
Taxa:			
<i>Bivalvia:</i>			
<i>Cassidulus</i> cf. <i>C. loasana mathewsoni</i> (Gabb)	x	x	x
<i>Turrida</i> sp. indet.	x	x	x
Gastropoda:			
<i>Turritella</i> cf. <i>T. stewarti</i> Merriam	x	x	x

4 WEST HEAD SECTION
(LOWER OLIGOCENE)

West Head
(after Burk, 1965)

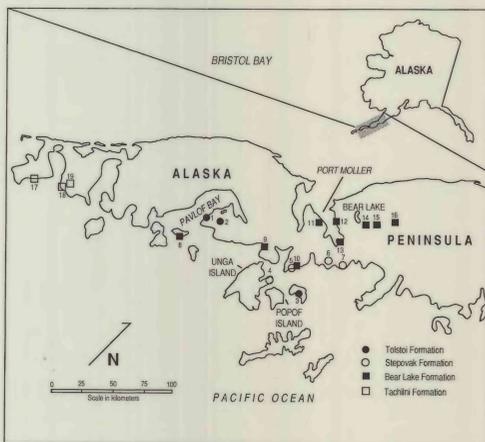
Locality numbers	M8030	M8031	M8032
Taxa:			
<i>Bivalvia:</i>			
<i>Actia</i> sp. indet.	x	x	x
<i>Chlamys</i> sp. indet.	x	x	x
<i>Macoma</i> sp. indet.	x	x	x
<i>Ostrea gaskhanse</i> Krashkevich	x	x	x
<i>Phryganella</i> cf. <i>harmeri</i> Dall	x	x	x
<i>Prothelasma</i> sp. indet.	x	x	x
<i>Tegula</i> sp. indet.	x	x	x
<i>Thracia</i> sp. indet.	x	x	x
<i>Venerocardia</i> sp. indet.	x	x	x
Gastropoda:			
<i>Calyptraea</i> cf. <i>alaskana</i> (Dall)	x	x	x
<i>Crepidula</i> cf. <i>argentea</i> Dall	x	x	x
<i>Fusina</i> sp. indet.	x	x	x
<i>Neptunia</i> cf. <i>neptunoides</i> (Howell)	x	x	x
<i>Whitbyella</i> cf. <i>alaska</i> (Howell) Turner	x	x	x

6 CHICHAGOF PEAK SECTION
(OLIGOCENE)

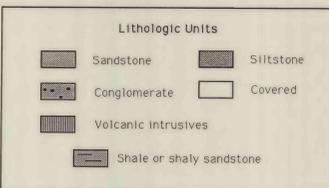
Locality numbers	M8057	M8058	M8059	M8349	M8350	M8351	M8353	M8354	M8355	M8356
Taxa:										
<i>Bivalvia:</i>										
<i>Actia</i> sp. indet.	x	x	x	x	x	x	x	x	x	x
<i>Mya</i> sp. indet.	x	x	x	x	x	x	x	x	x	x
<i>Ostrea gaskhanse</i> Krashkevich	x	x	x	x	x	x	x	x	x	x
<i>Pectinid</i> indet.	x	x	x	x	x	x	x	x	x	x
<i>Spisula callistiformis</i> Conrad	x	x	x	x	x	x	x	x	x	x
<i>Spisula</i> sp. indet.	x	x	x	x	x	x	x	x	x	x
<i>Uros</i> sp. indet.	x	x	x	x	x	x	x	x	x	x
<i>Yoldia</i> cf. <i>brewei</i> Dall	x	x	x	x	x	x	x	x	x	x
<i>Yoldia</i> cf. <i>paluchii</i> Dall	x	x	x	x	x	x	x	x	x	x
Gastropoda:										
<i>Crepidula</i> sp. indet.	x	x	x	x	x	x	x	x	x	x
<i>Neptunia</i> sp. indet.	x	x	x	x	x	x	x	x	x	x
<i>Trochidae</i> sp. indet.	x	x	x	x	x	x	x	x	x	x

STEPOVAK FORMATION SPOT SAMPLES
(OLIGOCENE)

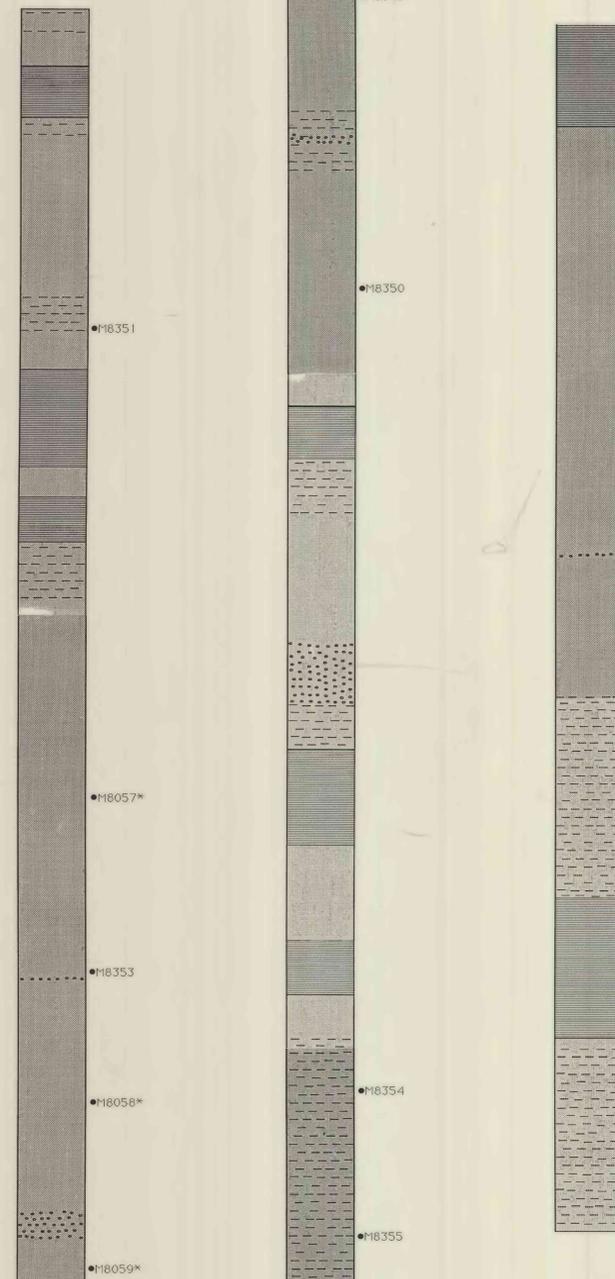
Locality numbers	M8391	M8376
Taxa:		
<i>Bivalvia:</i>		
<i>Mya</i> cf. <i>costaricensis</i> Nishio & Inoue	x	x
<i>Mya</i> sp. indet.	x	x
<i>Ostrea gaskhanse</i> Krashkevich	x	x
<i>Pectinid</i> indet.	x	x
<i>Spisula callistiformis</i> Conrad	x	x
<i>Uros</i> sp. indet.	x	x
<i>Yoldia</i> cf. <i>brewei</i> Dall	x	x



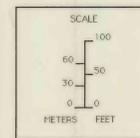
INDEX MAP SHOWING LOCATION OF MEASURED SECTIONS AND SPOT SAMPLES.



Chichagof Peak Section



Section continues at top of next column to right



Section continues at top of next column to right

PRELIMINARY TERTIARY MOLLUSCAN BIOSTRATIGRAPHY
OF THE ALASKA PENINSULA, SOUTHWESTERN ALASKA

by Louie Marinovich, Jr. and Charles L. Powell, II