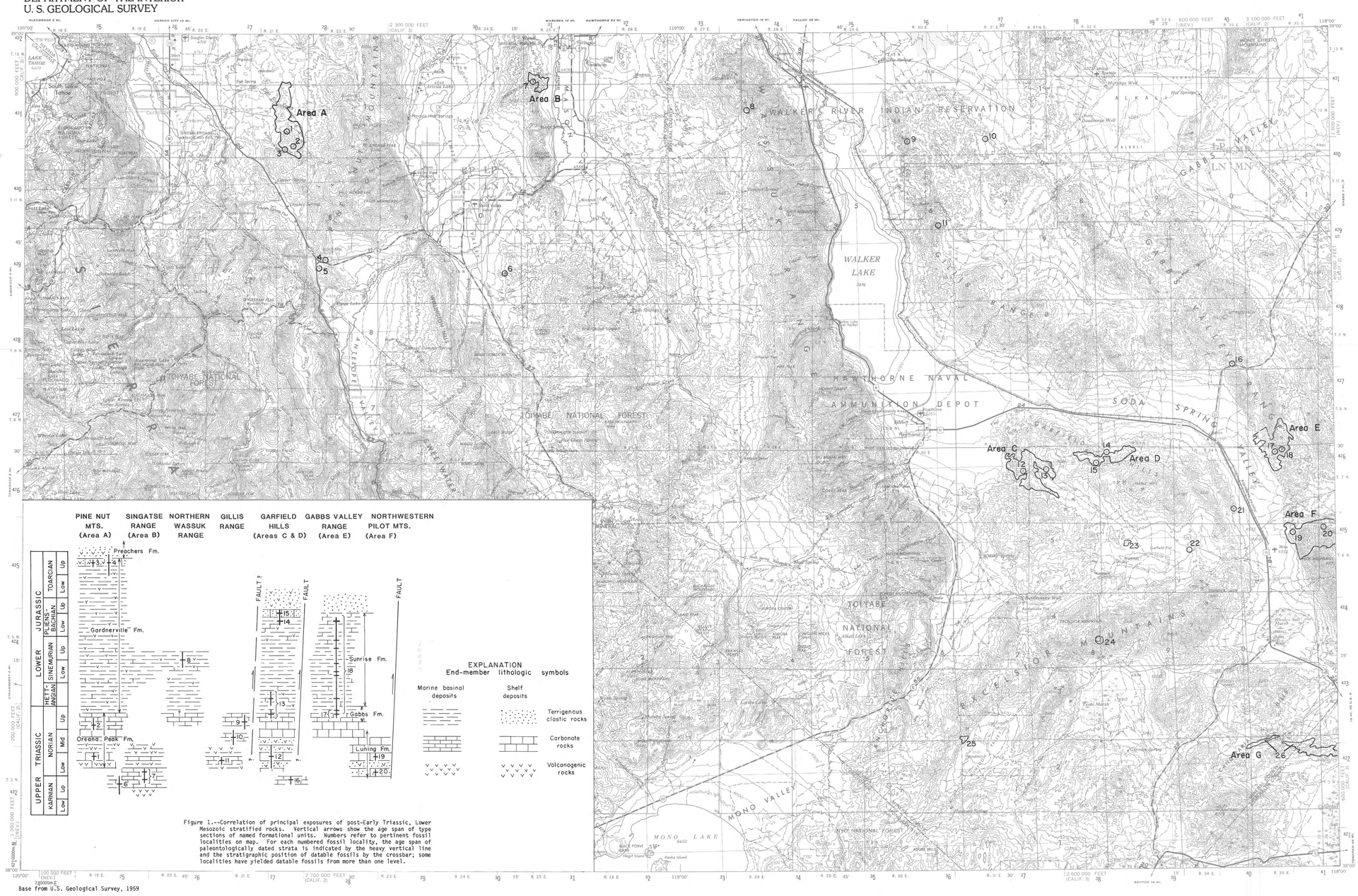
DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1382-O



Base from U.S. Geological Survey, 1959

Figure 1.--Correlation of principal exposures of post-Early Triassic, Lower Mesozoic stratified rocks. Vertical arrows show the age span of type sections of named formational units. Numbers refer to pertinent fossil localities on map. For each numbered fossil locality, the age span of paleontologically dated strata is indicated by the heavy vertical line and the stratigraphic position of datable fossils by the crossbar; some localities have yielded datable fossils from more than one level.

This map is part of a folio of maps of the Walker Lake 1° X 2° quadrangle, California and Nevada, prepared under the Conterminous United States Mineral Assessment Program.

DISCUSSION

Lower Mesozoic strata underlie a significant part of the Walker Lake quadrangle (Stewart and others, 1982). However, owing to a combination of different factors, age diagnostic marine invertebrate shelly fossils, such as ammonites and halobiid and monotid bivalves, are found in these rocks only at widely scattered localities in the part of the quadrangle within Nevada. Contributing to the sporadic character of the fossil record are the discontinuous nature of potentially fossiliferous pre-Tertiary exposures, the prevalence among the lower Mesozoic strata of primarily unfossiliferous volcanic rocks, or peritidal and even nonmarine sedimentary rocks, and the obliteration of primary features by metamorphism associated with deformation and plutonism.

The localities of all known, adequately located, age-diagnostic lower Mesozoic fossils from the Walker Lake quadrangle are plotted on this map. In addition to figure 1, which shows the correlation of some of the fossil localities, their general lithologic settings, and their correspondence to the type sections of formational units within the map area, more detailed data on the fossil localities and documentation of their age assignments are provided on the correlation diagrams in figure 2.

The 26 fossil localities under consideration are plotted herein on correlation diagrams because no single formational sequence is applicable to the lower Mesozoic rocks throughout the region. Changes in facies between isolated lower Mesozoic exposures are pronounced, and in places different facies have been juxtaposed by nappe-like thrust sheets having major displacements (Speed, 1977; Oldow, 1978). Most of the localities of age-diagnostic fossils are geologically isolated. Some, however, are found together within outcrop areas as much as a few square kilometers in size, in which a coherent stratigraphic succession has been established. These areas, lettered A through G, are shown on the map along with those numbered fossil localities that are included within them.

With the exception of the localities in area G (representing fossil occurrences in the basal part of the Candelaria Formation of earliest Triassic age), the localities in the correlation diagrams represent rocks of Late Triassic and Early Jurassic age and can be plotted against a time scale for these two epochs (table 1). The basic units of this time scale are intervals of time corresponding to ammonite zones, which are arbitrarily designated by the zone numbers 1-34 for cross reference with the correlation diagrams.

The zonal scheme incorporated in table 1 is composite. The zones of Early Jurassic age, and their groupings in terms of ages and subages, are the same as those for northwestern Europe as summarized by Dean and others (1961), and previously applied in the western United States by Hallam (1965). The late Norian zonation, for the youngest part of Triassic time, is that recently proposed by Tozer (1979) on the basis of ammonoid faunas in western Canada. In this zonal scheme the late Norian subage includes the Rhaetian Age, which, as represented in terms of ammonite zones by the Alpine Marshi Zone, corresponds to the Crickmayi Zone of the present scheme. The zones of the middle Norian, early Norian, and late Karnian subages are adapted from the classification of Silberling and Tozer (1968). For the early Karnian, a time not well represented by the faunal succession in North America, the zones used herein are those redefined in the Alpine-Mediterranean province by Krystyn (1978). The North American Desatoyense Zone of Silberling and Tozer (1968) corresponds approximately to the Aonoides Zone, the oldest zone of the Late Triassic in the present zonal scheme.

From current estimates of how radiometric ages relate to the geologic time scale for the early Mesozoic, the Late Triassic and Early Jurassic Epochs together span about 40-45 m.y. Thus the numbered zonal units of this time scale average a little more than 1 m.y. apiece in duration. In unusual circumstances particular faunas among those considered here can be placed within part of a single zone; in most cases, however, the possible age limits of the fossils from a given locality subtend more than the duration of one zone, and this is indicated by brackets on the correlation diagrams.

Few of the faunas listed on the correlation charts have been described or illustrated. Consequently, documentation of the taxonomic identifications rests with the collections themselves, all of which are part of the reference collections held by the U.S. Geological Survey. Although all of these collections are housed together (currently in Denver, Colo.), their reference collection numbers are of several different kinds. U.S. Geological Survey (USGS) collection numbers prefixed by the letters U or M denote Mesozoic localities recorded respectively in registers at the Denver and Menlo Park laboratories of the U.S. Geological Survey. USGS collection numbers not having a letter prefix are Mesozoic localities recorded in the U.S. National Museum, Washington, D.C. Collection numbers designated by the letters SU denote Stanford localities, the Triassic collections from which have been incorporated into the reference collections of the U.S. Geological Survey.

Many of the collections bearing Stanford University locality numbers were made in the 1930's by the late S. W. Muller of Stanford University, who, with H. G. Ferguson of the U.S. Geological Survey, pioneered geologic study in the Walker Lake region of Nevada. In more recent years, others who have provided collections and locality data of age-diagnostic significance include E. C. Bingler, Anthony Hallam, R. F. Hardyman, R. L. Nielsen, D. C. Noble, J. S. Oldow, and R. C. Speed.

Collaboration both in the field and in the preparation of this report with J. S. Oldow is gratefully acknowledged.

SUMMARY

From this overview of biostratigraphic age control, sparse as it is, some generalizations can be made about the lower Mesozoic stratigraphy of the part of the Walker Lake quadrangle within Nevada.

Despite their obvious, large-scale tectonic shortening, fossiliferous lower Mesozoic rocks north of the Luning thrust (as drawn by Speed, 1977, fig. 1) generally represent the same age span from latest Karnian (mid-late Triassic) through the Sinemurian (mid-Early Jurassic). Faunal evidence for the age of still younger strata is weak, but diagnostic Pliensbachian fossils are known from the Garfield Hills (loc. 14) and Gabbs Valley Range (loc. 18), and ammonites of definite Toarcian Age occur in and near the Pine Nut Mountains (locs. 3 and 4). Much of the Dunlap Formation in the east-central part of the quadrangle may also be of Toarcian Age, but the rocks to which this name is applicable generally have not yielded age-diagnostic fossils.

Within this tectonically disrupted and telescoped package of Upper Triassic and Lower Jurassic strata, an increase in the abundance of volcanic rocks, as compared with terrigenous clastic and carbonate rocks, is pronounced at all levels in structurally higher, southeast-verging nappes and generally to the north and west. Nonetheless, the age, character, and lithologic association of the various faunas is permissive of several through-going stratigraphic characteristics common to the entire region. For example, platform carbonate rocks and their basinal equivalents are restricted to mid-late Norian and older parts of the various sections. Younger strata are commonly calcareous, but pure carbonate rocks are poorly represented among them. Uppermost upper Norian, Hettangian, and Sinemurian strata (for example, in the Sunrise and Gardnerville Formations) tend to be lithologically uniform, monotonous, fine-grained terrigenous clastic and(or) tuffaceous sedimentary rocks.

Among the Upper Triassic strata, the uppermost Karnian is represented by basinal limestone containing planktic or pseudoplanktic ammonite and halobiid bivalve faunas at widespread localities in the Walker Lake quadrangle (locs. 7, 16, and possibly 6) as well as just north of the quadrangle in the Mason Valley area. Shelly faunas of late early or middle Norian age are characterized by the same genera and species of bivalves (especially Lopha, Septocardia, and trigonitids) at localities in and near the Pine Nut Mountains (Area A and loc. 5) as well as at many places in the Pamlico and Luning Formations of the Garfield Hills, Gabbs Valley Range, and Pilot Mountains. Another possibly through-going Upper Triassic depositional environment is manifested by basinal carbonate rocks of about mid-late Norian age which are recognized at localities 2, 9, and 17 across the area.

The general impression given by these lower Mesozoic strata is that of a laterally variable, but genetically interrelated complex of volcanic, terrigenous clastic, and carbonate rocks which has undergone severe tectonic shuffling and telescoping. Facies contrasts from one structural block to another are not so great as to mask all original stratigraphic interrelations. This conclusion agrees with the assertion by Stewart (1980, p. 66) that major units within the lower Mesozoic section from the Pine Nut Mountains on the northwest to the Gabbs Valley Range and Pilot Mountains on the southeast can be grossly correlated on the basis of their lithologic characteristics.

EXPLANATION OF MAP SYMBOLS

Area B — AREA HAVING A COHERENT STRATIGRAPHIC SECTION AND CONTAINING ONE OR MORE FOSSIL LOCALITIES

2 — FOSSIL LOCALITY--Fossil locality 24 is approximately located

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TABLE 1.--Biostratigraphic time scale for the Late Triassic and Early Jurassic

EPOCH	AGE	SUBAGE	ZONES	ZONE NUMBER
JURASSIC			Levesquei	34
		Late Toarcian	Thouarsense	33
	TOARCIAN		Variabilis	32
		Early Toarcian	Bifrons	31
			Falcifer	30
			Tenuicostatum	29
EARLY		Late Pliensbachian	Spinatum	28
			Margaritatus	27
	PLIENSBACHIAN	Early Pliensbachian	Davoei	26
			Ibex	25
			Jamesoni	24
	SINEMURIAN	Late Sinemurian	Raricostatum	23
			Oxynotum	22
			Obtusum	21
		Early Sinemurian	Turneri	20
			Semicostatumm	19
			Bucklandi	18
	HETTANGIAN		Angulata	17
			Liasicus	16
			Planorbis	15
TRIASSIC	NORIAN	Late Norian	Crickmayi	14
			Amoenum	13
			Cordilleranus	12
		Middle Norian	upper Columbianus	11
			lower	10
			Rutherfordi	9
		Early Norian	Mangus	8
			Dawsoni	7
			Kerri	6
	KARNIAN	Late Karnian	Macrolobatus	5
			Welleri	4
		Early Karnian	Dilleri	3
			Austriacum	2
			Aonoides	1

Localities 1, 2, and 3 (Area A).--Buffalo Canyon area, west side Pine Nut Mountains (D. C. Noble in Moore, 1969; Stewart and Noble, 1979).

Zone number 34 33 32 31 ?

Preachers Formation (well sorted cross-bedded sandstone)
--- ? ---? --- ? --- ? --- ? --- ? ---

Locality 3.--USGS M1194: Grammoceras sp. Phymatoceras sp. (Stratigraphically equivalent to SU 3539 with Grammoceras sp.)

Gardnerville Formation (mainly thin-bedded, partly tuffaceous or calcareous siltstone and argillite; volcanic conglomerate and sandstone interbedded at top)

15 14 13 12 11 10 9 8 7

--- ? ---? --- ? --- ? --- ? --- ? ---

Locality 2.--USGS M528 (= USGS M1193): Rhabdoceras suessi Hauer, Lissonites sp., Gnomohalorites sp., Monotis subcircularis Gabb, Heterastridium sp., etc.

Oreana Peak Formation (limestone interstratified with thick units of mafic to intermediate volcaniclastic breccia, tuff, and lava)

Locality 1.--SU 3735: Indojuvavites angulatus (Diener) (Also from the Oreana Peak Formation at SU 3534 is Lopha montiscaprilis of about this same age)

Base not exposed

Localities 4 and 5.--Holbrook Junction area, southern Pine Nut Mountains.

Zone number ? 34 33 32 31 ?

Locality 4.--SU 3541: Harpoceras sp. or Polyplectus sp., Haugia sp. or Phymatoceras sp., Catulloceras sp. or Imetoceras sp., and ?Weyla sp. in fine-grained calcareous sandstone and sandy or silty limestone. Identifications by R. W. Imlay (written commun., June 21, 1978)

Locality 5.--USGS D11120: Septocardia? sp. indicative of only a Late Triassic age (Zones 4-13). From an isolated exposure, probably of the Oreana Peak Formation (D. C. Noble, oral commun., 1981). Matrix is a tuffaceous clastic rock.

(Localities 4 and 5 collected by D. C. Noble)

Locality 6.--Northwest edge of Pine Grove Hills.

Zone number ? 6 5 4 3 2

Locality 6.--Halobia superba Mojsisovics or H. ornatissima Smith in black, platy, crystalline limestone. (Collected by D. C. Noble)

Locality 7 (Area B).--McConnell Canyon area, Singatse Range.

Zone number 9 8 7 6 5 4

Dark, thin-bedded limestone and argillite interbedded with units of fine-grained volcaniclastic rocks. Halobia of early or middle Norian age about 130 m above USGS D11129

USGS D11129
USGS D11128
Locality 7 (= SU 1512)

Gray limestone, 25-75 m thick

----------(Disconformity)----------

Siliceous and intermediate volcanic rocks

(Stratigraphic information from J. M. Proffett, written commun., 1968)

Fossil lists: USGS D11129: Halobia alaskana Smith and H. cf. H. cordillerana Smith
USGS D11128: Anatropites sp. and Gonionotites sp.

Locality 8.--Northern Lights mine area, northwest Wassuk Range.

Zone number 22 21 ? 20 19 18

Locality 8.--USGS M6682: Asteroceratinid ammonites from near the fault-bounded top of a 200-m unit of fine-grained tuffaceous siltstone and interbedded limestone (Bingler, 1978)

Locality 9.--Gillis Canyon area, northwest Gillis Range.

Zone number 15 14 13 12 11

Locality 9.--USGS D11130: Monotis subcircularis Gabb and M. salinaria (Schlotheim) from about 15 m of black limestone bounded on one side by a thick section of conformable massive limestone and on the other side by tertiary volcanic rocks (R. C. Speed, written commun., 1970). Rocks shown as "Gabbs and Sunrise formations" by Ferguson and Muller (1949, pl. 1).

Locality 10.--Low hills at northeast end of Gillis Range.

Zone number 13 12 11 10 9 8

Locality 10.--USGS D11131: Halobia halorica Mojsisovics, H. cf. H. fallax Mojsisovics, ?Himavatites sp., and other ammonite impressions from isolated exposure of about 100 m of dark, laminated, partly sandy basinal limestone

Locality 11.--Wild Horse Canyon area, Gillis Range.

Zone number 8 7 6

Locality 11.--USGS D11132 (approx. = SU 837): Malayites sp. and other juvavitid ammonites from unit of black limestone a few tens of meters thick bounded by (intercalated with?) marine volcaniclastic rocks and volcanic tuff and breccia

Localities 12 and 13 (Area C). Pamlico area, western Garfield Hills.

Zone number 16 15 14 13 12 11 10 ? 9 8 7 ?

Locality 13.--USGS 11903: Psiloceratinid ammonites

Sunrise-Gabbs Formation of Oldow (1978)

Locality 13 --USGS 12231, 12312: Cycloceltites sp., Plicatula perimbricata Gabb

Pamlico Formation of Oldow (1978)

Locality 12.--USGS 11900, 12317, and 12318: Lopha cf. L. montiscaprilis (Klipstein) and other shelly and coralline bioclasts. L. cf. L. montiscaprilis observed in unit 12 of Oldow (1978)

Localities 14 and 15 (Area D).--North-central Garfield Hills.

Zone number 28 ? 27 26 ? 25 24 ? 23 16 15 14 13 12

Dunlap Formation: green-gray and red-gray volcanic sandstone and pebbly grit, minor silty primary dolomite
--- ? ---? --- ? --- ? --- ? --- ? ---

Locality 15.--SU882:
Locality 14.--Field no. 81S11 of Silberling: Described below

Assigned to Dunlap Formation by Ferguson and Muller (1949), but assignment to Sunrise Formation would be justifiable ?

Undifferentiated Gabbs and Sunrise Formations

Septocardia sp. like that from locality 18 in the middle member of the Gabbs Formation in the Gabbs Valley Range

Yellow-gray and gray dolomite, in part algal-laminated primary dolomite like that of the uppermost Luning Formation in the Gabbs Valley Range

SU 882: Plicatostylus cf. P. gregarius Lupher and Packard in massive, thick-bedded, sandy or coarsely bioclastic and conglomeratic limestone. In the Shoshone Mountains, about 70 km northeast of the Garfield Hills, this species occurs near the top of the Sunrise Formation and above the upper Pliensbachian (or possibly upper lower Pliensbachian) ammonites Protogrammoceras cf. P. varicostatum (Fucini) and Kadstockiceras fanninI (McLearn) (Identifications by P. L. Smith, written commun., 1981).

Field no. 81S11 of Silberling; evidently about the same stratigraphic level as SU 889: hildoceratid ammonites, probably Protogrammoceras sp., in yellow-brown and yellow-orange calcareous siltstone and turbiditic sandstone intercalated with impure limestone and mudstone. Ammonites from SU 889 erroneously reported as "Harpoceras" by Muller and Ferguson (1939, p. 1621) and regarded as stratigraphically higher than locality 15 (= SU 882).

Locality 16.--State Highway 23, Gabbs Valley Range.

Zone number 7 6 5 4

USGS D11133
USGS D11134
Locality 16

Structurally isolated, upright, east-dipping section of medium-bedded limestone several tens of meters thick

Fossil lists: USGS D11133 (approx. = SU 719): Anatropites sp., Tropites cf. T. subquadratus Silberling

USGS D11134 (about 30 m stratigraphically below USGS D11133): Tropites subquadratus Silberling

Localities 17 and 18 (Area E).--New York Canyon area, Gabbs Valley Range.

Zone number 28 27 26 25 24 ? 23 22 ? 21 ? 20 ? 19 18 17 16 15 14 13 12

Dunlap Formation

Observations on the succession of ammonite faunas from the Sunrise Formation by Anthony Hallam (oral commun., 1980)

--- ? ---? --- ? --- ? --- ? ---? --- ? ---

Bettoniceras mortilletti (Meneghini) (Hallam, 1981, p. 740)

Eoderoceratid ammonites

Oxynoticeras sp.

Euasteroceras sp.

Arnioceras sp.

Coroniceras sp.

Psiloceras-Waehneroceras faunas

Choristoceras crickmayi Tozer

SU 711:
Locality 17.--USGS M2471 and SU 752:

Units g and h of Hallam (1965). (The identification by S. W. Muller, in 1965, p. 1486, of a harpoceratid ammonite in unit h is incorrect)

Unit f

Sunrise Formation

Units e and d

Unit c

Units a and b

Locality 18

Upper and middle members of Gabbs Formation

See below

Lower member of Gabbs Formation

Top of upper member of the Luning Formation: dark gray dolomite, in part algal-laminated primary dolomite

Fossil lists--SU 711: Cycloceltites cf. C. ardunini Mojsisovics and the large molluscan fauna of the "Nuculoma, Lutcheria, and Plicatula associations" of Laws (1982)
USGS M2471: Cochloceras fisheri Hauer, Rhabdoceras suessi Hauer, and other ammonites

Localities 19 and 20 (Area F).--Northwestern Pilot Mountains.

Zone number 10 9 8 7 6 5

(Top not exposed but might project northward to underlie section of Area E)

Upper member
Middle member
Lower member

Luning Formation (of type area) Nappe 2 section of Oldow (1981)

(Base not exposed)

Locality 19.--SU 784
Locality 20.--SU 724

Fossil lists: SU 784: Metatibetites cf. M. cyclolobus Wang and He, Indojuvavites sp., from about 110 m above base of upper member in at least 12 m thick unit of argillite with interbeds of shelly limestone, some largely composed of Lopha montiscaprilis, others with abundant Septocardia sp.

SU 724: Nodotibetites cf. N. nodosus Chao and Wang, Mojsisovicsites sp., and diverse shelly fauna of scleractinian corals, spongiomorphs, sponges, brachiopods, bivalves, etc., described by Stanley (1979).

Locality 21.--Southeastern Garfield Hills.

Zone number 7 6 5

Locality 21.--SU 765 Mojsisovicsites cf. M. crassecostatus (Gemmellaro), Guembelites sp., in impure gray limestone matrix of Luning Formation; member assignment unclear. (Locality described by S. W. Muller on field label as near "Black and Gold mine")

Locality 22.--Hills at east end of Garfield Flat.

USGS 12147: Whorl fragment of an evolute, compressed ammonite having smoothly projected, or possibly falcoid, simple, regularly spaced ribs. Specimen resembles either a mid-Sinemurian arietitid or a hildoceratacid of late Pliensbachian through Toarcian age. Locality described by H. G. Ferguson on field label as "6.6 mi SW4W from Mina;" apparently from rocks mapped as Dunlap Formation by Ferguson and Muller (1949, fig. 4)

Locality 23.--Hills at northwest edge of Garfield Flat.

Zone number 22 21 20 19 ?

Locality 23.--USGS D11164: Arietitid ammonites and Weyla cf. W. alata von Buch from rocks mapped as Sunrise Formation by Ferguson and Muller (1949, pl. 2)

Locality 24.--Central part of Excelsior Mountains.

Zone number 22 21 20 19 ?

Locality 24.--USGS D11165: Weyla cf. W. acutiplicatus (Meek) from a "limey horizon above [a] volcanic breccia unit" (R. L. Nielsen, written commun., 1963) in rocks mapped as Dunlap Formation by Ferguson and Muller (1949, pl. 1)

Locality 25.--Southwest Excelsior Mountains.

Zone number 22 ? 21 20 19 ?

Locality 25.--USGS D11166: Arietitid(?) ammonite and Weyla sp. from rocks west of Huntoon Valley mapped as Dunlap Formation by Ferguson and Muller (1949, pl. 1). The ammonite is evolute with dense, gently projected, simple ribs; its venter is not preserved, but it resembles finely ribbed asteroceratinids from the Sunrise Formation elsewhere. The Weyla is a fragment of a large indeterminate species having V-shaped ribs.

Locality 26 (Area G).--Candelaria Hills.

SU 887, SU 1321, USGS 12325, USGS M675: Claraia and ammonites of early, but not earliest, Early Triassic age from various collecting sites in the Candelaria Formation a few tens of meters above its base which forms the southern boundary of Area G on the map. The ammonites include "Meekoceras" cf. "M." lilangense Krafft and Proptychites cf. P. ammonoides Waagen and represent the Candidus Zone of early Dienerian age (Silberling and Tozer, 1968). The Claraia beds are 15-20 m stratigraphically lower and may be of late Griesbachian age.

Figure 2.--Correlation of fossil localities and lithologic units with the ammonite zones of the Lower Jurassic and Upper Triassic. Zone numbers correspond to those listed in table 1. Question marks in dashed line between rock units indicate uncertainty in age of boundary.

MAP SHOWING LOCALITIES AND CORRELATION OF AGE-DIAGNOSTIC LOWER MESOZOIC MEGAFOSSILS, WALKER LAKE 1° X 2° QUADRANGLE, NEVADA AND CALIFORNIA

By
N. J. Silberling

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