

Field Trip to Centerville Beach

Sedimentary rocks of the Miocene to Pleistocene Wildcat Group are exposed in seacliffs extending approximately 6 km southward from Centerville Beach, located due west of the town of Ferndale, California (Fig. 1). The Wildcat Group is an approximately 2.5-km-thick succession of strata that accumulated in the Eel River (or Humboldt) forearc basin atop the Franciscan accretionary complex and to the east of the Cascadia subduction zone. Only about 10% of the basin is exposed on land—the remainder lies submerged offshore from northern California and southern Oregon (Fig. 2; Gulick et al., 2002).

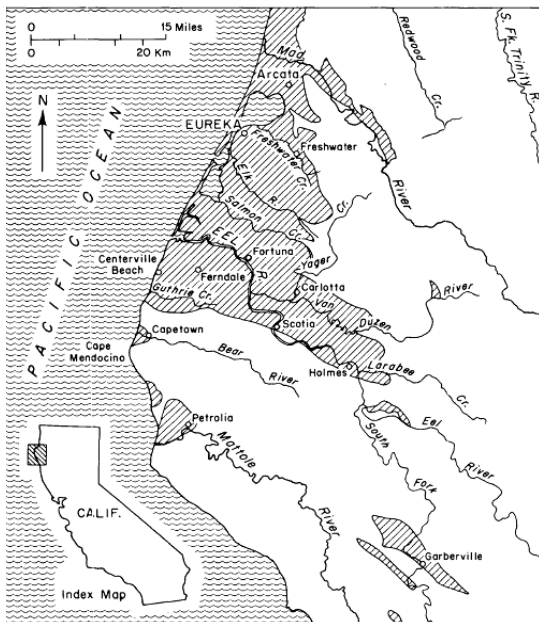


Figure 1. Onshore portion of the Eel River (Humboldt) basin. From Dodd et al., 1984.

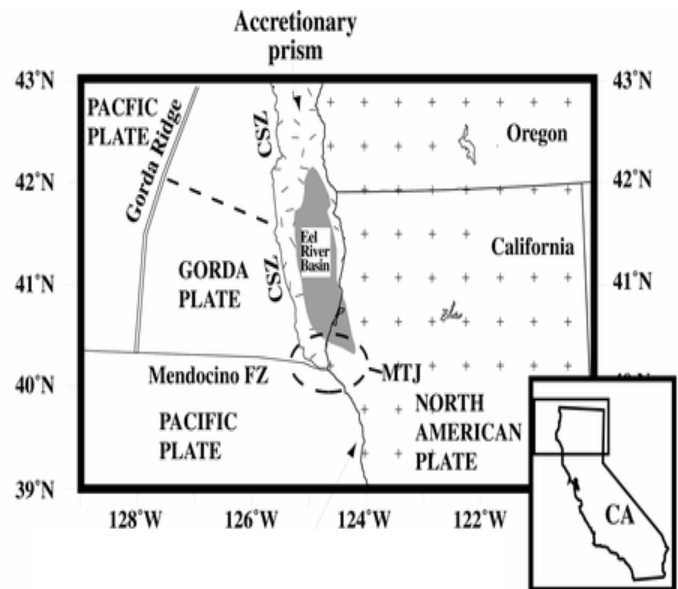


Figure 2. Map view of northern California showing the Eel River basin over the southern Cascadia accretionary prism. The CSZ marks the deformation front of the southern Cascadia subduction zone, and the dashed oval shows the general location of the Mendocino triple junction (MTJ). From Gulick et al. 2002.

The dominantly marine sedimentary rocks of the Wildcat Group have been subdivided into five units, which are in ascending order: the Pullen, Eel River, and Rio Dell Formations, the Scotia Bluffs Sandstone, and the Carlotta Formation (Figure 3). These strata record an overall shallowing of the present onshore basin from abyssal (~ 3000 m) water depths in the late Miocene to nearshore/non-marine conditions in the middle Pleistocene. At Centerville Beach, an angular unconformity dated at about 1.0 Ma separates shelf mudstones of the Rio Dell Formation from shallow marine, estuarine, and fluvial sandstones and pebbly sandstones of the interfingering Scotia Bluffs Sandstone/ Carlotta Formation (McCrorry, 2000; Leithold, unpublished facies interpretation).

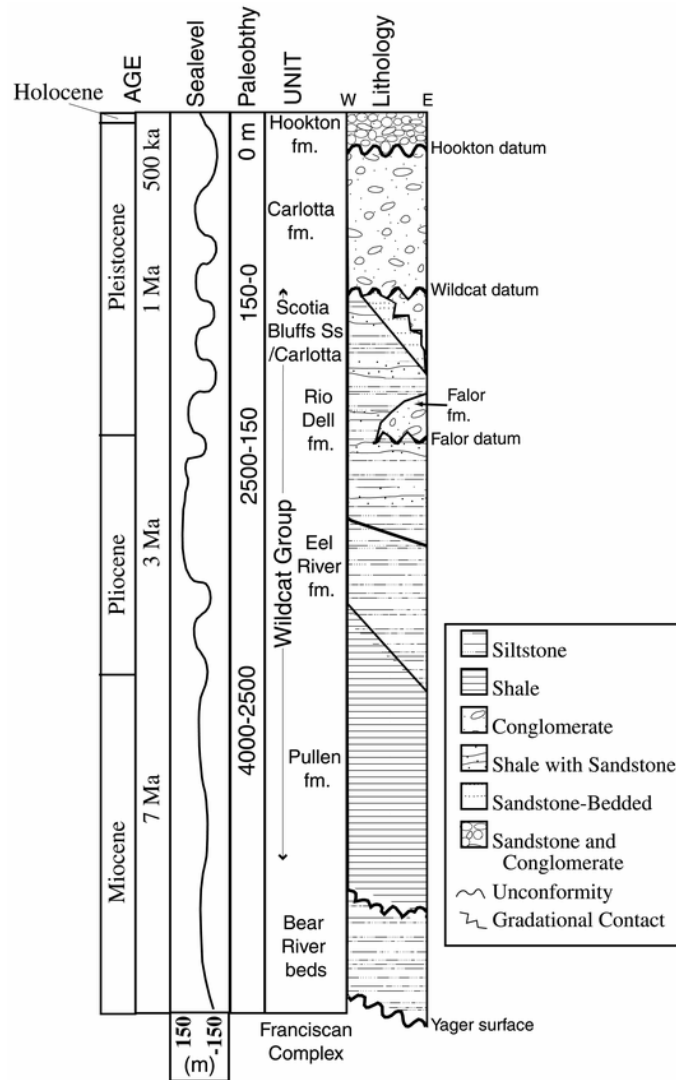


Figure 3: A composite onshore stratigraphic section for the Eel River basin showing unit ages, names, paleobathymetry, and lithology. The Bear River beds are an informal unit. Unconformity names and ages are from McCrorry (2000). From Gulick et al., 2002.

At Centerville Beach, access to the outcrops is strongly dependent on the tides. In recent years, severe beach erosion has made access to the lower parts of the section particularly tenuous. In today's trip we will be able to view the upper Rio Dell and Scotia Bluffs/Carlotta Formation only (Figure 4). Gray mudstone of the Rio Dell Formation accumulated at upper continental slope to shelf depths. Leithold (1989) recognized 4 shallowing-upward packages within the shelf facies, separated by lag surfaces rich in reworked concretions and shell debris (Figure 5). Leithold also recognized storm and river flood event layers within the Rio Dell deposits, and interpreted them to have accumulated under conditions similar to those operative on the modern Eel shelf. Other notable features of the rocks we will be viewing are large *Pecten* shells and *Teichichnus* burrows, thought to have been made by crustaceans.

The Carlotta/Scotia Bluffs Formation comprises red-brown sandstones and conglomeratic sandstones exposed at the northern end of the cliffs at Centerville Beach. These rocks have been exposed relatively recently and have not received detailed investigation. They are correlative to similar facies exposed along the Eel River near Scotia. Preliminary study suggests that these rocks accumulated in shallow marine, estuarine, and fluvial environments. Notable features are apparent hummocky stratification (a sedimentary structure attributed to storm scouring and deposition in shoreface environments), *Teichichnus* burrows, mud-draped ripples, and trough cross-stratification.

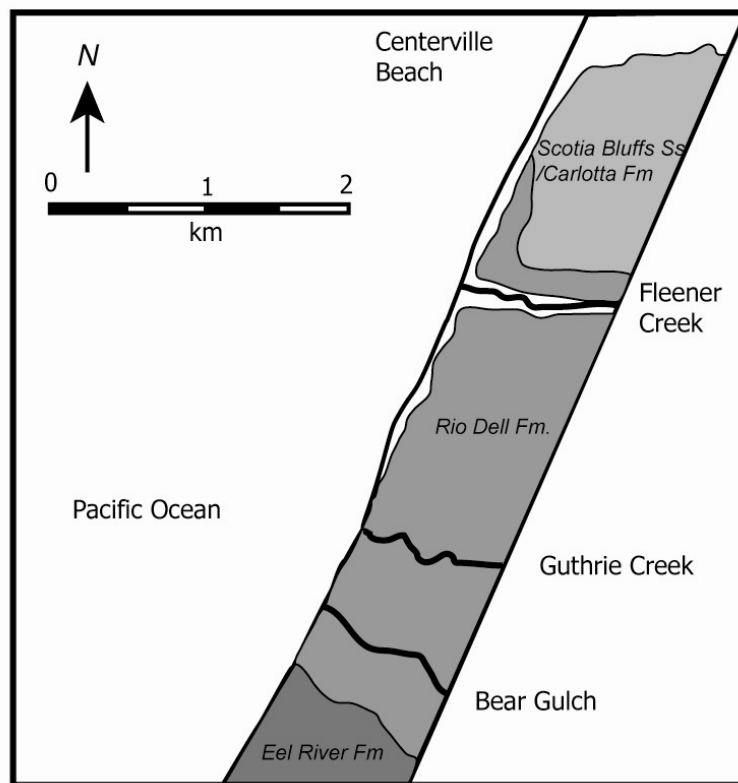


Figure 4: Schematic map of the Centerville Beach section

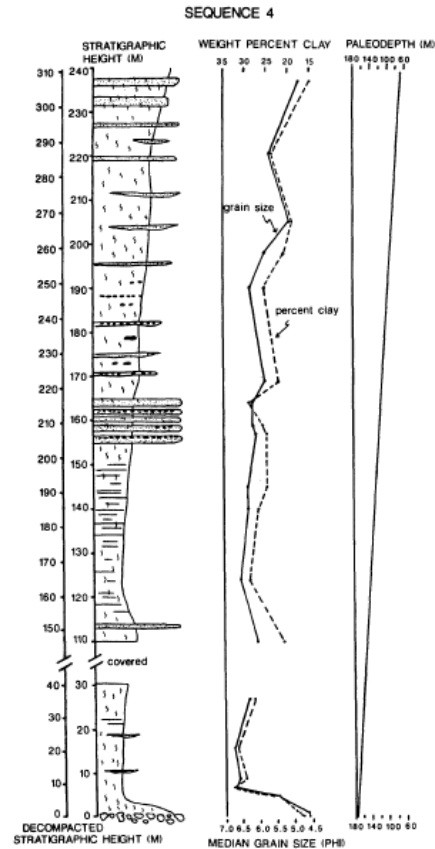


Figure 5: Stratigraphic column for the uppermost Rio Dell Fm. at Centerville Beach (from Leithold and Bourgeois, 1989)

References

Dodd, J.R., Stanton, R.J., Jr., and Johnson, M., 1984, Oxygen isotopic composition of Neogene molluscan fossils from the Eel River Basin of California: *Geological Society of America Bulletin*, v. 95, p.1253-1258.

Gulick, S.P.S., Meltzer, A.S., and Clarke, S.H., Jr., 2002, Effect of the northward-migrating Mendocino triple junction on the Eel River forearc basin, California: Stratigraphic development: *Geological Society of America Bulletin*, v. 114, p.178-191.

Leithold, E.L., 1989, Depositional processes on an ancient and modern muddy shelf, northern California: *Sedimentology*, v.36, p.179-202.

Leithold, E.L., and Bourgeois, J., 1989, Sedimentation, sea-level change, and tectonics on an early Pleistocene continental shelf, northern California: *Geological Society of America Bulletin*, v.101, p.1209-1224.

McCrary, P.A., 2000, Upper plate contraction north of the migrating Mendocino triple junction, northern California: Implications for partitioning of strain: *Tectonics*, v. 19, p.1144-1160.