



The depositional environments of the Lower Cretaceous Coyhaique Group,
Aysén Basin, southern Chile (45°-46° S)

C.M. Bell*, M.J. Townsend*, M. Suárez+ and R. de la Cruz+

The Coyhaique Group is a Lower Cretaceous sedimentary sequence which was deposited in the Aysén Basin of southern Chile (45°-46° S) (1). This sedimentary basin was formed in a back-arc environment to the east of the Patagonian Batholith. The predominantly marine sediments, which crop out over an area of approximately 150 km from north to south and 75 km from west to east, have a thickness in excess of 1200 m. The Mesozoic stratigraphy of the area has been presented somewhere else (1,2). The Coyhaique Group (1,2) is underlain by a thick sequence of Middle to Upper Jurassic volcanic rocks of the Ibañez Formation. The group is subdivided, from the base upwards, into the Toqui Formation (volcanic rocks and marine limestones), the Katterfeld Formation (black marine shales) and the Apeleg Formation (marine sandstones and shales). Unconformably overlying the group are the uppermost Lower Cretaceous volcanic rocks of the Divisadero Formation. The Coyhaique Group provides an important stratigraphic marker between the volcanic successions of the Ibañez and the Divisadero Formations.

Toqui Formation.

The Toqui Formation comprises a succession of calcareous and clastic sediments, together with pyroclastic rocks, up to 80 m thick (1,2). The strata represent a marine transgression over the

subaerial volcanic succession of the Ibañez Formation. Limestones include laterally restricted shoreline reefs, carbonate buildups and carbonate sands. The clastic sediments include sandstones and shales with marine fossils and calcareous intercalations. The clastic component is volcanic in origin and the sediments are interbedded with tuffs and reworked volcanic debris.

At a location 8 km south of Coyhaique the original topographic relief was provided by rounded volcanic boulders. These became colonised by corals and encrusted by oysters and serpulids. An onlapping sequence of parallel-bedded sandstones overlies the carbonate reef. The sediments consist of well-sorted shell fragments in a volcanoclastic matrix, interbedded with volcanic sands. The sedimentary succession indicates that the rocky shoreline of an active silicic volcano, washed by the waves and currents of a clean, warm sea of normal salinity, was overlain by the beach deposits of a high-energy shoreface.

At several locations, including El Toqui mine and 6 km west of Ñireguao, the calcareous beds of the Toqui Formation comprise oyster bioherms up to 12 m thick and over 100 hundred metres in length. These mound-shaped structures are composed almost entirely of encrusted masses of large, flat, articulated oysters. Many of the oysters are bored and encrusted with serpulids. These hardgrounds with restricted faunas suggest the possibility of reduced salinity.

* Cheltenham and Gloucester College of Higher Education, Cheltenham GL50 2QF, U.K.

+ Servicio Nacional de Geología y Minería, Av. Sta. María 0104, Santiago, Chile.

Katterfeld Formation

The regionally extensive black shales of the Katterfeld Formation conformably overlie the Toqui Formation. A thickness of up to 600 m has been recorded, but in most localities the succession does not exceed several hundred metres. The shales are homogeneous, with laterally extensive, parallel bedding. Beds near the base of the formation, 20 km south of Coyhaique, contain belemnites, ammonites, bivalves (including Gryphaea), the trace fossil Chondrites, fish teeth and scales and plant fragments. This fauna represents a typical community of a soft sediment silty clay substrate. Beds higher in the formation, with a higher clay content, are only sparsely fossiliferous. A highly fossiliferous bed in the succession, 7 km NW of Coyhaique, contains a mixed fauna of large bivalves, some typical of shallow water, together with gastropods and plant fragments. The shells are articulated and in life position.

The biologically-favourable depositional environment of the Katterfeld Formation consisted of still, shallow seas of normal salinity. Sedimentation was from suspension with no evidence of current or wave activity. These features are suggestive of a sheltered, partly enclosed marine embayment.

Apeleg Formation

The sandstones and shales of the Apeleg Formation conformably overlie the Katterfeld Formation with an abrupt transition. The estimated maximum thickness of the formation is about 1000 m. It comprises well-sorted marine sandstones and shales with minor conglomerates and limestones. Much of the succession comprises a heterolithic facies of rippled sandstones and shales. Invertebrate body fossils are very rare but plant material and a wide variety of trace fossils are common.

The Apeleg Formation was deposited under marine conditions of normal salinity. Sediment was transported by storm and tide generated currents in water depths of less than 200 m.

Tectonic development of the Aysen Basin

The sediments of the Aysen Basin were deposited during Lower Cretaceous times in the period between two major episodes of subduction-related volcanic activity. The clastic debris was derived from a magmatic arc, probably situated to the west of the basin. The broad regional extent of the epicontinental depositional basin, together with a lack of evidence for active tectonism, suggests development as a back-arc thermal sag. As the basin subsided a marine transgression was followed by the formation of a shallow, and initially restricted, sea. Renewed volcanic activity in uppermost Lower Cretaceous times was preceded by an episode of deformation, uplift and erosion.

Acknowledgements

This work was funded by the Servicio Nacional de Geología y Minería in collaboration with the Regional Government of the XI Region (Chile), the Cheltenham and Gloucester College of Higher Education (U.K.) and FONDECYT N° 1930246 project.

References

- 1.- Suárez, M. and De la Cruz, R. En prensa. Estratigrafía y Paleogeografía Mesozoica de Aysén Nororiental. Actas 7° Congreso Geológico Chileno, Octubre 1994, Concepción, Chile.
- 2.- Suárez, M. and De la Cruz, R. 1994. Estratigrafía del Jurásico-Cretácico Inferior de la Cordillera Patagónica Oriental (45°-46° Lat. S), Chile: facies y paleogeografía. Unpublished report, Gobierno Regional XI Región-SERNAGEOMIN.