Lithostratigraphy and palaeoenvironment

Overlapping with the Aldiss and Edwards survey was field work by N S Meadows, who published independently (Meadows 1999) but acknowledged the assistance provided by Don Aldiss. Nevertheless, Meadows based his account on the Greenway (1972) geological map in which the northern part of East Falkland is shown as being underlain by the Port Stanley Formation. He used the lithostratigraphical divisions Gran Malvina Group (following Marshall (1994) and the Argentine literature) and Lafonia Supergroup (following Greenway). Aldiss and Edwards (1998, 1999) erected the replacement lithostratigraphical units West Falkland Group and Lafonia Group, and identified the Port Stephens Formation as underlying the northern part of East Falkland. Meadows described the two units in terms of transgressive-regressive sedimentary cycles. Within the West Falkland Group, the lowest formation, Port Stephens, was interpreted as the result of a marine transgression across an erosion surface in the Cape Meredith Complex basement with deposition mostly in an upper shoreface environment. Meadows proposed that shallow marine conditions then pertained during deposition of the Fox Bay Formation (shallow marine shelf) and Port Philomel Formation (delta front mass-flow). The overlying Port Stanley Formation was described as the deposits of a fluvial channel system which prograded across the Falklands during marine regression. The Lafonia Group was also referred to a transgressive-regressive cycle, commencing with glacigenic deposits, then passing upwards through lacustrine, shallow marine and deeper marine strata before culminating in fluvial channel deposits. Meadows supported the close association of the West Falkland Group with coeval lithostratigraphical units in South Africa, but regarded the Lafonia Group as less correlative with South Africa than had been previously supposed.

A detailed study of the Port Stephens Formation by Hunter and Lomas (2003) led to the recognition of a more complex interplay of sub-environments than had been recognised by either Meadows or by Aldiss and Edwards. Thirty five distinct lithofacies were identified which, together with their associated ichnofauna, were related to deposition on an extensive, gently-shelving alluvial to coastal plain. Within an overall transgress-regressive-transgressive sedimentary pattern the bulk of the sediment accumulated during the regressive phase. Hunter and Lomas stressed the correlation of the Port Stephens Formation with the Nardouw Subgroup of South Africa and considered that sediment distribution patterns were most compatible with a palaeogeography in which the Falklands were rotated to the south-east of South Africa, i.e. the Adie (1952) model. Eustatic sea level changes were thought to be a significant influence on the sedimentary pattern.

Biostratigraphy and palaeontology

The Mid-Devonian (Emsian–Pragian) fauna of the Fox Bay Formation has a wide distribution in both East and West Falkland and has been much collected and described since its discovery by Charles Darwin in 1833. Substantial collections are held by museums in UK, USA and Sweden (Stone and Rushton 2012) and by the British Geological Survey (Stone 2012). A summary faunal list was given by Aldiss and Edwards (1999, Table 2), but several new discoveries can now be added.
In February 2000, a fossil collecting expedition from the American Museum of Natural History, New York, visited a number of sites in both East and West Falkland and made several new discoveries. Maisey and others (2002) described sparse fish remains: spines and a tooth whorl from the Fox Bay Formation at Roy Cove, and part of a cranial plate from the overlying Port Philomel Formation (Givetian?) at Dunnose Head, both West Falkland. Maisey and others noted that the fish remains were the first documented Devonian vertebrates found in the Falklands as the previous reports of rare and fragmentary fish material, in collections of the early 20th century Swedish expeditions and listed by Clarke (1913), refer to material that was never determined and may now be lost. Two specimens collected by W Croft in 1947 and now held by the Natural History Museum, London, are probably a fish plate and spine, but are too poorly preserved to allow definitive identification.

The trilobites collected by the American Museum of Natural History expedition, from a number of sites in both East and West Falkland, were described by Carvalho (2006). In addition to the relatively abundant Homalonotid and Calmoniid trilobites, Carvalho noted the first definitive record of a Proetid trilobite, found at Pebble Island (West Falkland). Clarke (1913) had listed a possible Proetus sp. from Port Louis (East Falkland), identified from “two half pygidia, preserved on a single block of sandstone” that had been collected by Halle during the Swedish Magellanic Expedition, but the current whereabouts of this specimen is unknown and it may be lost. As an additional complication, Proetid trilobite nomenclature has been revised and expanded considerably since Clarke wrote. Amongst the Calmoniids, Carvalho described examples of Metacyrphaeus cf. M. caffer from localities in both East and West Falkland; this is a new record for the Falkland Islands. Carvalho assigned a Pragian age to the trilobite fauna. The historical background to the discovery and nomenclature of the rare trilobite species Metacyrphaeus allardyceae (Clarke 1913) was clarified by Stone (2009).

Bryozoa had not been previously recorded, but Stone and Rushton (2003) noted an encrustation of Trepostome Bryozoa on a fossil snail shell collected at Pebble Island (Figure 3a). The shell and its coating were contained in a carbonate concretion within Fox Bay Formation mudstone. The specimen is now held by The Natural History Museum, London. Another unusual addition to the Fox Bay Formation’s fossil fauna, a starfish-like ophiuroid, was described by Rushton and Stone (2011) but had been collected some years earlier at Fish Creek, 2.5 km north-east of Port Louis on the north side of Berkeley Sound, East Falkland. It is only the partial impression of the underside of the animal (Figure 3b) but seems likely to be from a previously undescribed species. The specimen is held at the Falkland Islands Museum in Stanley, with the Falkland Island Museum and National Trust inventory number 2589.

The brachiopod fauna from the Fox Bay Formation was utilised and figured by Cocks (2011) in a wide-ranging review of Palaeozoic faunal provinciality.

References


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- Contributions
- Log in
- Request account