Distribution, species composition and status of the intertidal blue-green algal mats

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Abstract: Before the 1991 Gulf War extensive blue-green algal mats covered the intertidal zone, most of which were severely affected by the subsequent oil spill. By mid-1992, areas where the tar layer had been covered by sediment were recolonised. Different types of mats with a marked zonation were observed.

Extensive blue-green algal mats covered the intertidal zones in the study area before the oil spill as can be seen from pre-oil-spill satellite images (ALTHUKAIR & AL-HINAI 1993). Different mat morphologies could be distinguished, the most widespread can be described as either folded mats, pinnacle mats, flat mats or polygonal mats (HOFFMANN in prep.). The morphology of these different mat types is related to their species composition and to the environmental factors in which they grow (e.g. tidal regime, drainage, sedimentation rates, degree of exposure to wave action, etc.). The most common taxa in these mats are filamentous blue-green algae belonging to the genera Lyngbya, Microcoleus, Phormidium and Schizothrix. In some salt-marshes, the heterocystous genus Scytonema is also of importance.

Following the oil spill, most of the intertidal mats were severely affected; living mats survived only in the upper intertidal (supralittoral) zone and in some areas protected by physical barriers. In the affected places, the algal mats were either soaked with oil or covered with an oil layer which subsequently solidified to form a more or less thick tar layer. Two years after the oil spill, no sign of blue-green algal growth is observed in the areas where the tar layer is still on the surface and not covered by sediments. Sediment cover seems to be a prerequisite for the recolonisation by blue-green algae. In those parts of the intertidal zone where the tar is covered by a sediment layer, extensive growth of blue-green algal mats occurred in a short time. A marked zonation of mat types was observed, the most important being flat, polygonal, black and orange pinnacle mats. The most common blue-green algal species in these newly established mats are Microcoleus chthonoplastes and Lyngbya aestuarii. The pinnacle mats (Plate 1) represent a complex laminated microbial
ecosystem in which blue-green algae are associated with purple sulphur bacteria. The polygonal mats (Plate 2) play an important role in the cleaning of the polluted coasts. When dry for a long period, these mats curl up at the edges, breaking away from the substrate below and lifting off the tar layer with them, leaving exposed sediment or fresh oil/tar below. This is then open for further weathering, sedimentation and colonisation by the next layer of algal mat and for the recruitment of opportunistic animal species.

Plate 1: Orange pinnacle mats occur towards the lower edge of the oiled intertidal zone.

Plate 2: Polygonal mats form a continuous belt seaward of the salt-marshes on oiled shores.

REFERENCES


HOFFMANN, L. in prep. Microbial mats of the northwestern Arabian Gulf.

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