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PEDIASTRUM AS A GUIDE FOSSIL IN SEQUENCE STRATIGRAPHY

Patrice Brenac and Keith Richards

Abstract

Pediastrum are easily transported freshwater algae which are often found in abundance in marine sediments in some tropical areas. Several species of *Pediastrum* are illustrated and their distribution in a typical marine sedimentary record is shown. In marine sediments, high numbers of *Pediastrum* often coincide with reduced numbers of marine microfossils and are associated with periods of low relative sea level. Reduced numbers of *Pediastrum* are usually recorded during periods of high relative sea level. The record of *Pediastrum* in marine sediments can be useful for sequence stratigraphic interpretation, with maximum abundances usually associated with late highstand and lowstand systems tracts.

PEDIASTRUM AS A GUIDE FOSSIL

Pediastrum are colonial green algae which occur naturally in freshwater environments, in particular, in standing bodies of water such as ponds and lakes. There are many living species of *Pediastrum*, though all are morphologically similar and vary only in shape, wall structure and the number of cells in the colony. The cell walls of *Pediastrum* are highly resistant to decay. Several species occur commonly in the fossil record and are frequently observed in palynological preparations (Plate 1). Palynological studies from offshore wells in the low latitude tropics, for example in west Africa and south east Asia, have shown that *Pediastrum* also occur, often in significant numbers, in sediments deposited on or beyond the marine continental shelf. In the marine sedimentary record, *Pediastrum* occur as part of an allochthonous association brought by rivers and streams from the freshwater catchment areas. There is often a direct relationship between the presence of high numbers of *Pediastrum* and reduced numbers or, in some cases, total absence of planktonic foraminifera and marine microplankton as a result of freshwater rafting into the marine environment. Text-Figure 1 is a generalized illustration showing the total numbers of *Pediastrum*, marine microplankton, mangrove pollen and inland (hinterland) derived palynomorphs found in part of a well section from offshore west Africa, in which the sediments were deposited at water depths ranging from middle shelf to bathyal. Part of each depositional cycle, or "sequence," coincides with generally high proportions of marine and/or brackish water microfossils in response to high relative sea level (transgressive systems tract). The major transgressive events are also marked by increased representation of planktonic and/or benthonic foraminifera (data not shown). The uppermost (and sometimes lowermost) part of each cycle is characterized by increasing numbers of *Pediastrum*, and often with increased representation of hinterland derived palynomorphs, reflecting deposition in response to a low-

ering of relative sea level. These intervals relate to the late highstand and/or lowstand phases of deposition (i.e. highstand and lowstand systems tracts). Further study will determine if the relationships observed between *Pediastrum* and other palynomorph groups in some tropical areas are also applicable outside tropical latitudes.

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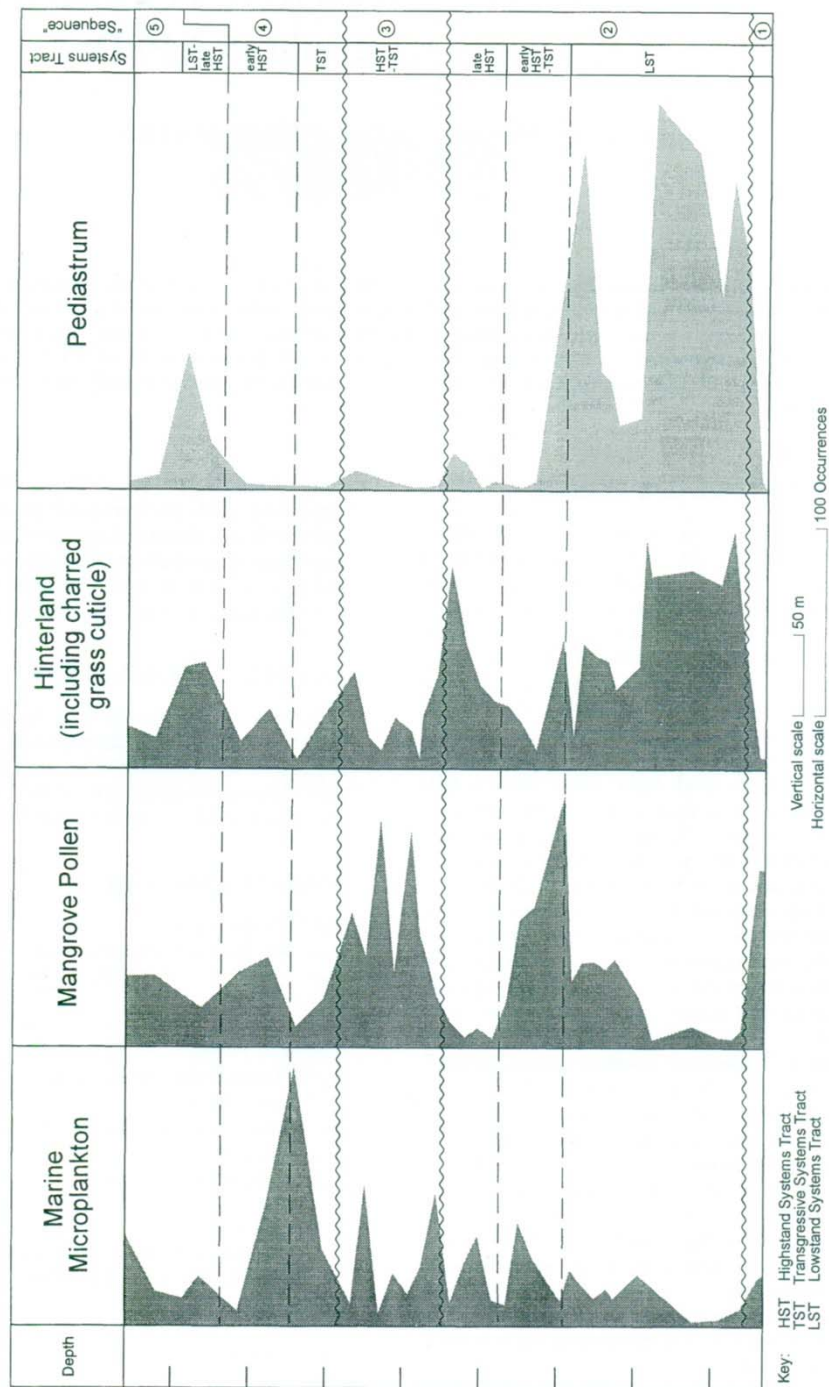
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Text-Figure 1. Generalized figure to show the abundances and relative proportions of *Pediastrum*, marine microplankton, mangrove pollen and inland (hinterland) derived palynomorphs (mostly grass pollen and cuticle) in part of a well section from offshore west Africa. The section illustrated represents approximately 400 m vertical thickness of marine sediment.

PLATE 1

Examples of the freshwater algae *Pediastrum* obtained from marine sediments.

- | | | | |
|---|--|---|--------------------------------------|
| 1 | <i>Pediastrum delicatites</i> (x1,000) | 5 | <i>Pediastrum delicatites</i> (x400) |
| 2 | <i>Pediastrum kajaites</i> (x1,000) | 6 | <i>Pediastrum kajaites</i> (x1,000) |
| 3 | <i>Pediastrum</i> sp. (x1,000) | 7 | <i>Pediastrum kajaites</i> (x1,000) |
| 4 | <i>Pediastrum bifidites</i> (x1,000) | | |

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