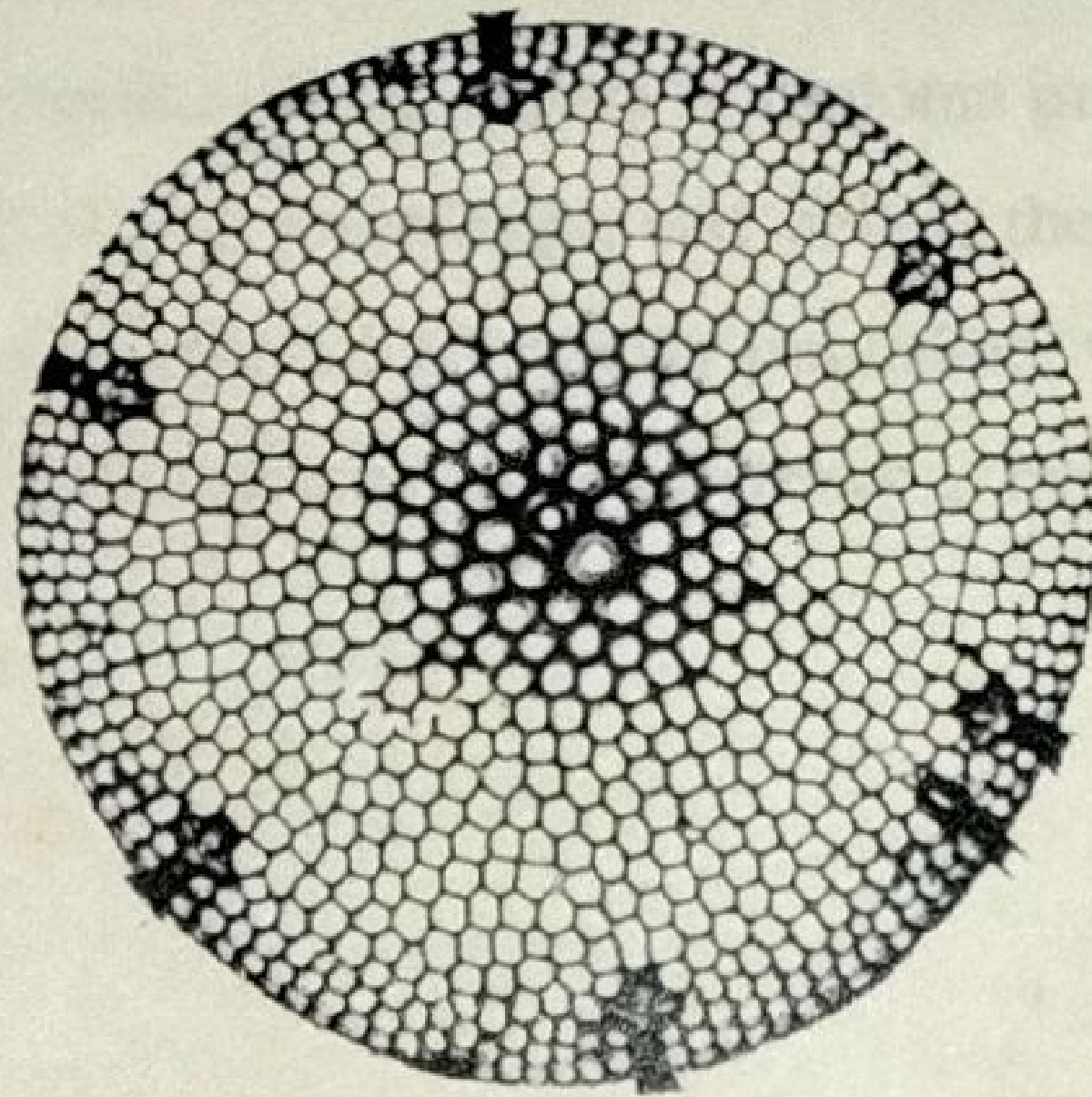




Seasonal Succession of Phytoplankton
Communities in Lombok Indonesian Coastal
Waters, with Emphasis on Species of the Diatom
Genera *Pseudo-nitzschia* and *Thalassiosira*



by

Lalu Japa

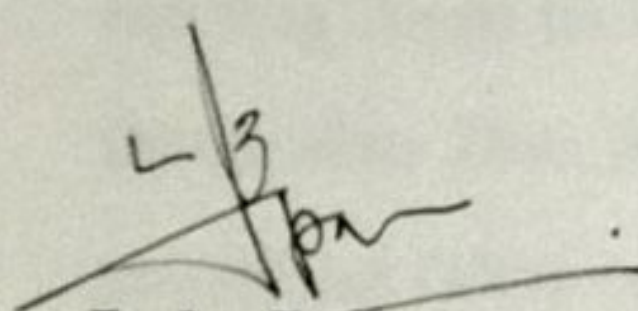
**SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF**

**Master of Science Studies
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Statement and Declaration

I hereby declare that this thesis contains no material which has been accepted for the award of any degree or diploma in any University and that, to the best of my knowledge and belief, the thesis contains no copy or paraphrase material previously published, written, or provided by another person except where due reference is made in the text.


Lalu Japa

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This, the first study of the phytoplankton communities of Lombok and the completing of the extensive and time consuming research reported here would never have been possible without a lot of help and support from the numerous people to whom my grateful appreciation goes.

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Summary

Seasonal succession of the phytoplankton community with emphasis on species of the diatom genera *Pseudo-nitzschia* and *Thalassiosira* was investigated in Lombok-Indonesian coastal waters. During the first investigation of diatom species of some western Indonesian waters by Allen and Cupp (1935), species of the genus *Pseudo-nitzschia* were recorded as *Nitzschia seriata* and species of *Thalassiosira* were not reported.

This pilot study represents the first opportunity of studying phytoplankton in Lombok-Indonesian coastal waters by using a combination of light and modern transmission electron microscopy. The analysis and observations of each species of the genera *Pseudo-nitzschia* and *Thalassiosira* includes a description of the variation of their fine structure characteristics which were clearly observed with the transmission electron microscope, but not light microscopy.

Thirty-one quantitative coastal water samples were obtained weekly by using a 20 μm mesh free fall nylon plankton net, during a period of seven months from November 1998 to May 1999. The samples were preserved with formalin in the final concentration of 2 %. Samplings were undertaken at one station in the Lembar ferry harbour located on the south west coast of Lombok, one of the two larger islands of the West Nusa Tenggara Province, which extends from 115°45' to 119°10' East and from 8°5' to 9°5' South. Water column temperature, salinity and alkalinity (pH) were also recorded using an alcohol thermometer, a hand refractometer, and a pH-meter 1118014 Hanna Instruments.

Salinity gradients fluctuated irregularly from 9 to 38 ‰, with an average of 28.3 ‰. Water temperature ranged from 24 to 29 °C, with an average of 26.7 °C. The average pH was 6.8, with the values ranging from 6.2 to 7.6.

Laboratory observations were done on fresh and cleaned samples. All samples were acid cleaned with hydrogen peroxide (H_2O_2) and observed under a Zeiss

Axioplan light microscope (LM) and under a Phillips 410 transmission electron microscope (TEM) at 100 kV.

Both fresh and water mounts of preserved samples and cleaned coumarone mount samples of the light microscopic observations revealed more diatom taxa than dinoflagellate taxa. From a total of 178 phytoplankton taxa recorded in the present work, 153 species were diatoms, 18 species dinoflagellates and 7 species were freshwater diatoms and green algae. The most abundant diatom taxa were *Skeletonema* and *Chaetoceros*, while the most common dinoflagellate taxa were *Ceratium* and *Peridinium*. *Chaetoceros* species were also the most common group in terms of the number of species. The occurrence of diatom taxa fluctuated more than that of dinoflagellates, and this is more likely related to salinity than pH and temperature fluctuations. The lowest number of diatom taxa occurred at the lowest salinity during the highest rainfall event (527 mm) in April. Some potentially toxic species of diatoms and dinoflagellates were also identified such as: *Pseudo-nitzschia pungens*, *P. pseudodelicatissima* and *Dinophysis* spp. (i.e. *D. caudata*, *D. acuminata*). The presence of some freshwater diatom taxa (i.e. *Thalassiosira weissflogii* and *Asterionella formosa*), dinoflagellate taxa (i.e. *Peridinium* spp.) and green algae species such as *Pediastrum* sp., *Scenedesmus* sp., *Micractinium* sp., *Actinastrum* sp., *Synedra* sp., and *Phacus* sp. may be because of freshwater input during the rainy season.

Species occurrence of phytoplankton taxa was subjected to cluster analysis based on weekly or monthly occurrences. The Bray Curtis Cluster Analysis results represented very similar patterns of monthly grouping of physical characteristics (i.e. salinity) of the water column and phytoplankton species occurrences. The physical parameters and the phytoplankton species compositions in March is similar to that in February and different from other months. The grouping of both physical parameters and species occurrences is also likely determined by freshwater input to the study site.

Five species of the marine pennate planktonic diatom genus *Pseudo-nitzschia* were identified: *P. fraudulenta*, *P. granii*, *P. pseudodelicatissima*, *P. pungens* and *P. turgidula*. The most abundant species of *Pseudo-nitzschia* was *P. pungens*. This

diatom was abundant every month, except in the first month of sampling. *P. pungens* occurred more frequently when *Skeletonema* species were abundant. *P. granii* was recorded for the first time in the Southern Hemisphere, and for the first time in warm water. *Nitzschia americana*, which is morphologically very similar in valve cell outline to the genus *Pseudo-nitzschia*, was also recorded in the present work. The occurrence of *Pseudo-nitzschia* species was lower during low salinity in April.

Six species of the centric diatom genus *Thalassiosira* were conclusively identified, namely: *Thalassiosira eccentrica*, *T. leptopus*, *T. minima*, *T. minuscula*, *T. oceanica*, and *T. weissflogii*. Three other unidentified species, *Thalassiosira* sp1, *T. sp2* and *T. sp3*, require further study. *T. minima* and *T. sp2*, were the most frequent and varied considerably in size. The presence of the freshwater *Thalassiosira* species, *T. weissflogii*, related to freshwater input during the months of higher rainfall. Other diatom species related to *Thalassiosira* which were also recorded in the present work were *Cyclotella* spp., *Minidiscus trioculatus*, *Lauderia annulata*, and *Skeletonema costatum*. All fifteen species, except *Lauderia* and *Skeletonema* are first-time records for Lombok-Indonesian waters.

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