

## Forensic Evaluation of Phytoplankton Diversity of Sukhna and Rewalsar Lakes

TINA SHARMA\* AND RUCHIKA DHIMAN

Department of Forensic Science, Chandigarh University, Gharuan-140 413 (Chandigarh), India

\*(e-mail : sharmatina1989@gmail.com; Mobile : 85668 42214)

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### ABSTRACT

Phytoplankton bodies have the potential to help in estimating drowning cases with respect to ante mortem and post mortem death. In the present study, a total of 38 different species of phytoplankton were comparatively analyzed in water samples from Rewalsar and Sukhna Lakes which concluded species specific variation with respect to geographical changes.

**Key words :** Forensic sciences, drowning cases, phytoplankton, microscopic techniques, forensic botany

### INTRODUCTION

Phytoplanktons are the microscopic plant algae which are similar to land plant and contain chlorophyll. Because of their size and shape and inherent buoyancy, the phytoplanktons are found on the superficial surface of water bodies (Pereira *et al.*, 2018; Matheiw *et al.*, 2021).

In forensic science, when a dead body is found the main aim of the forensic experts is to find out the real cause of the death. In cases where the dead body is recovered from the water bodies, the presence of plankton in drowned human bodies can help to estimate whether the individual died due to drowning or not (Caeiro, 2021). Samples taken from the dead bodies can be examined and compared to the phytoplankton of the water body in which it was found which can help in establishing the geographical link as well as the cause of death. So, in this manner by comparing the species of the phytoplankton, a link can be established (Zhao *et al.*, 2018). In the present study, two altitude variations were studied to find out geographically significant species which can help in establishing a link between the dead body and primary location in which it was drowned.

### MATERIALS AND METHODS

Water samples were collected from the water bodies in the months of February to April from various sites in the sterilized bottle of 1 l capacity and preserved with 40% formalin

solution. Samples were collected from two different sites as follows : The Sukhna Lake, manmade water body and national wetland Chandigarh, India (Lat. 30°44'14" N, Long. 76°47'14" E). Rewalsar Lake, the mid altitude water body, Mandi district of Himachal Pradesh, India (Lat. 31.63389° N, Long. 76.83333°E). Two altitude variations were considered that Chandigarh with altitude 350 m and Himachal Pradesh district Mandi with altitude 750 m.

The collected water samples from Sukhna and Rewalsar lakes were processed for extraction and isolation of phytoplankton. Fifty ml of water sample was used for digestion of the sample by adding 10 ml of 5% HCl for 24 h. Next day, after the complete mixing of water sample and HCl, 10 ml of water sample was taken in the centrifuge tube and centrifuged at 3000 rpm for 10 min and supernatant was collected out, remaining with the residual at the bottom of the tube. The remains were again centrifuged with the excess of water as above and this was repeated twice. After discarding the supernatant, pellet was taken and slides were prepared. The mounting of slides was done with DPX for the study of diatoms and with glycerin jelly for the study of phytoplankton. All the slides prepared from the different water samples were examined with the help of phase contrast microscope under different magnification powers, low (10x) and high (40x). Photomicrographs were taken with the camera attached to phase contrast microscope (1.3 MP). These photomicrographs were used for the

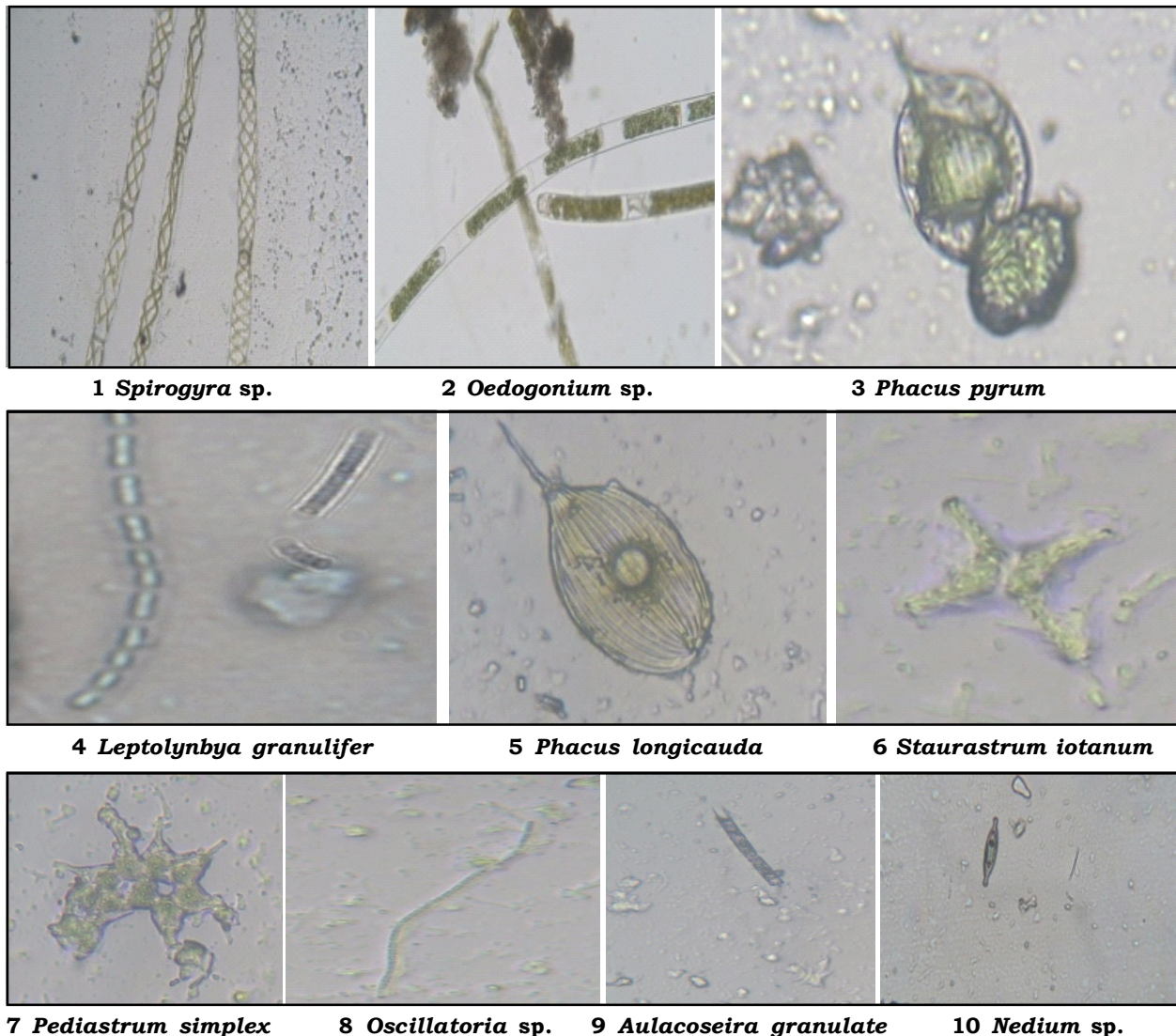


Fig. 1. Microscopic view of the species at 40x magnification.

identification of the phytoplankton species (Thakar *et al.*, 2018; Li *et al.*, 2021).

## RESULTS AND DISCUSSION

In this comparative study, the water samples were collected from the Sukhna Lake, Chandigarh and Rewalsar Lake, Mandi (H. P.) during the months of February to April to conclude the geographical variations. The different types of species of phytoplanktons (algae and diatoms) were identified from the water sample collected from these locations (Fig. 1). In Sukhna Lake, water samples observed for phytoplankton were : *Spirogyra* sp., *Phacus pyrum*, *Phacus longicauda*, *Oscillatoria* sp., *Oedogonium* sp., *Leptolynbya granulifer*,

*Staurastrum iotantum*, *Pediastrum simplex*, *Aulacoseira granulata*, *Pseudo nitzschia* and *Euglena* sp. These were found in abundance as compared to Rewalsar Lake which showed the presence of *Oscillatoria limosa*, *Oscillatoria*, *Euglena* sp., *Pseudo- nitzschia*, *Aulacoseira granulata*, *Aulacoseira* sp., *Nodularia spermigenia* species only. The difference in species observed might be due to the different geographical condition like temperature and altitude. In addition, Sukhna Lake showed cases of diatoms species like *Navicula* sp., *Synedra ulna*, *Cyclotella* sp., *Navicula menisculus*, *Nedium* sp., *Mastogloia* sp., *Cymbella* sp., *Naviculoid*, *Gomphonema* sp., *Cymbella tumida*, *Enautia minor*, *Nedium affine*, *Navicula microspora*, *Nitzschia acicularis* and *Navicula*

*pennata*. Further, Rewalsar Lake showcased species like *Melosira* sp., *Navicula cryptocephala*, *Synedra ulna*, *Cymbella cuspidata*, *Cymbella cymbiformes*, *Nitzschia* sp., *Pinnularia* sp and *Navicula radiosa*.

Few species were found common at both places e. g. *Oscillatoria*, *Euglena* sp., *Pseudo-nitzschia*, *Aulacoseira granulate* and *Synedra ulna*. The numbers of species were different like *Spirogyra* sp. *Phacus longicauda*, etc. only which were observed in Sukhna Lake and species like *Navicula cryptocephala*, *Navicula radiosa*, etc. only in Rewalsar Lake. So, these observations concluded the geographical variations of the phytoplanktons species.

### CONCLUSION

A preliminary study was conducted in order to establish a geographical site specific species of phytoplankton with respect to altitude variations. It was observed that few species like *Spirogyra* sp. and *Phacus longicauda* were only found in Sukhna Lake and *Navicula cryptocephala*, *Navicula radiosa* were available only with Rewalsar Lake. The site-specific species determined in this preliminary study can be helpful to determine site of drowning and is establishing a future scope of detailed research in this area.

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