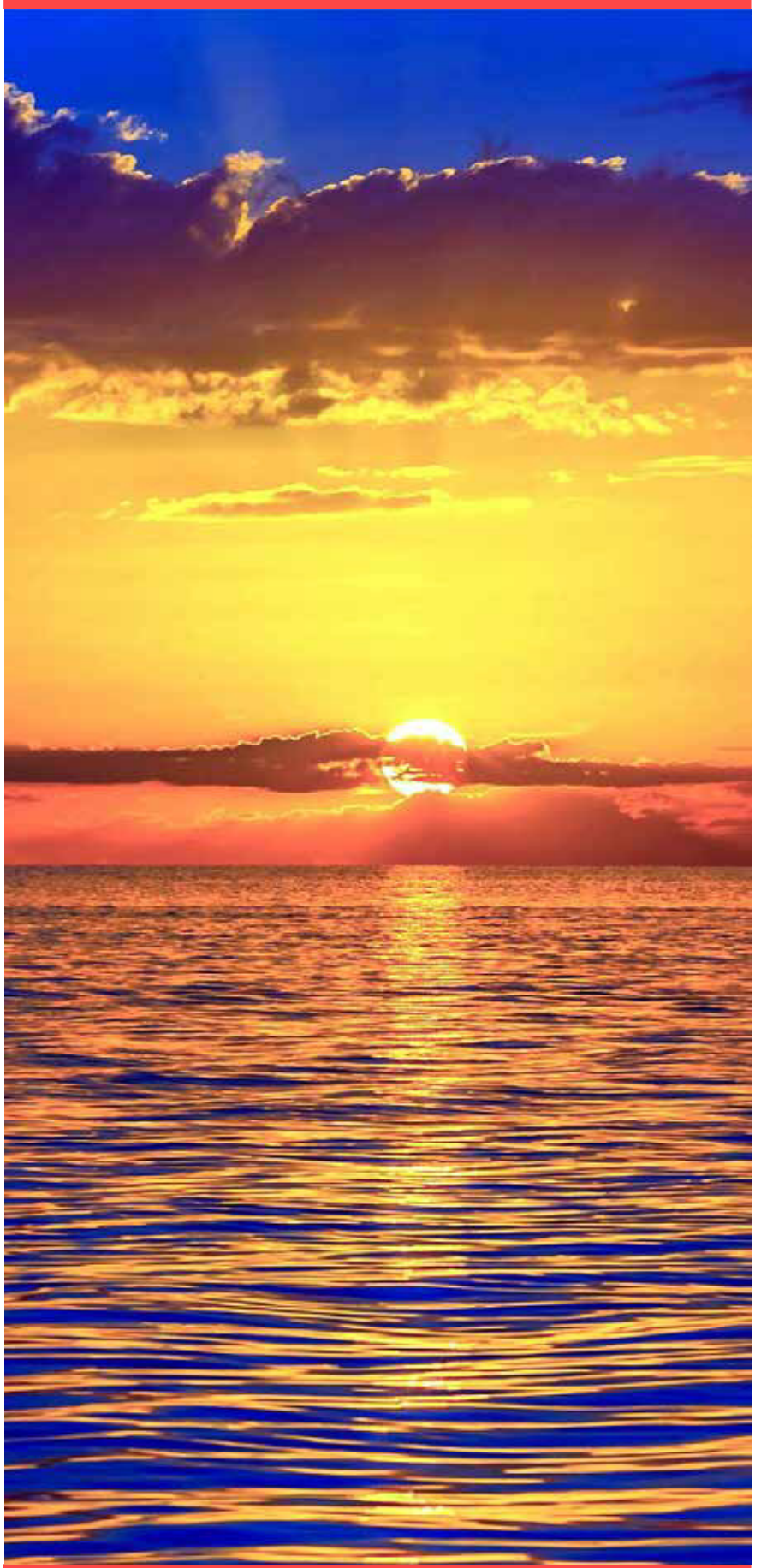
SQU Addresses Key Issues in Marine and Fisheries Sector



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The Marine Science and Fisheries (MSF) Department of the College of Agricultural and Marine Sciences (CAMS) is a leader in the marine science research and teaching dealing with the marine environment and fisheries in the Sultanate of Oman and among GCC countries. The MSF has on campus and off campus facilities for marine (Al Hail) and freshwater (SQU Agricultural Experimental Station) research. Additionally, the Department runs a 17.5m research vessel 'Al Jamiah' and a 10m boat 'Hamour' for both fisheries and oceanographic investigations and sampling. These vessels are used for student training as well. At the Department, four laboratories designed for the chemical analysis of marine samples, microscopic observations, histology, molecular and microbiological work, and accessible to faculty, technicians, students and private enterprise. The MSF focuses research mainly on fisheries, aquaculture, oceanography, ecology of marine species and marine biotechnology. The Department offers a B.Sc. in Marine Science and Fisheries and a M.Sc. in Marine Science and Fisheries. In 2008, the Department started offering Ph.D. program in Marine Science and Fisheries.

The first MSF student Khalid Abdullah Al-Hashmi received the degree of Doctor of Philosophy in Marine Science and Fisheries in October 2015. His thesis is entitled "Seasonal and interannual changes of phytoplankton community and dynamics of potentially harmful phytoplankton in coastal waters of Muscat, Sea of Oman". Khalid's work was supervised by Dr. Sergey Piontkovski (MSF). The thesis was examined by the external examiners Prof. Joaquim Goes (Columbia University, USA) and Dr. Sardar Farooq (Science, SQU).

Harmful Algal Blooms (HABs) is a common phenomenon in Oman waters usually detectable by the presence of green or red color of sea water. In the Sultanate HABs lead to economic losses due to high fish mortality and disruption of desalination plant's work because of membrane clogging. Some of the microscopic algae can produce toxins that can be harmful to humans. There has been only limited information about of the composition and abundances of diatoms and dinoflagellates in Oman waters.

Khalid Al-Hashmi's work resulted in identification of 278 microscopic algae (belonging to dinoflagellate and diatom taxa) present in Bandar Al Khayran area. During his Ph.D., he produced an atlas of marine phytoplankton species of Oman waters that enable identification of species of microalgae. His data suggested that the monsoon has a strong influence on composition of phytoplankton; the highest number of microalgae was present during the Southwest monsoon and the lowest one was detected during the spring intermonsoon. Usually, algal blooms in Oman waters are dominated by the dinoflagellate Noctiluca scintillans, which produces light (bioluminescent) at night. Blooms of this microalga develop twice per year in winter and summer. In total, 24 potentially harmful algal species of diatoms and dinoflagellates were identified by Al-Hashmi. A dense bloom of Cochlodinium polykrykoides that had a devastating impact on marine ecosystems was observed for the first time in the Sea of Oman during 2008-2009. Research conducted by Al-Hashmi facilitates our understanding and prediction of algal blooms and the distribution and abundance of potential HAB species.

The second Ph.D. student of the Department, Thirumahal Muthukrishnan defended her Ph.D. work in January 2016. Her thesis is entitled "Quantitative and qualitative study of microbial biofilms on marine antifouling coatings". Dr. Sergey Dobretsov, Head of the Department of Marine Science and Fisheries, supervised Thirumahal's work. Her thesis was examined by the external examiners Prof. Claire Hellio (Brest University, France) and Dr. Abdullah Al-Saadi (Crop Science, SQU).

Biofouling is undesirable growth of organisms on submerged installations. Annually, countries are spending billions of US dollars to prevent marine biofouling and control the problems caused by it. In the Sultanate, biofouling is responsible for clogging pipes and membranes of desalination plants, decreasing speed and increasing corrosion and fuel consumption in the vessels sailing in the Sea of Oman, damaging fishing nets and cages and decreasing their fishing efficiency. The most common strategy to prevent biofouling includes the use of antifouling coatings. While these coatings prevent accumulation of large fouling organisms, limited information is known about microbes associated with them.

During her Ph.D. work, Muthukrishnan demonstrated that abundances of microbes on antifouling coatings varied over the time and location. The type of antifouling coating, paint composition and experimental location significantly influenced fouling bacteria and diatoms. Muthukrishnan evaluated a microbial counting technique and developed a new method for counting of bacteria that can help to obtain a reliable estimation of the bacterial densities on solid substrata. Using the next generation sequencing technique, she was able to identify unique bacteria associated antifouling coatings for the first time. By light and electron scanning microscopy 29 species of fouling diatoms were identified. This information will be used in the future research in order to develop a novel antifouling defense.