

## Dear Friends,

The turbulent period in our area has taken its toll on our work. Changes in study tour routes are just minor signs of it all. The cuts in the budget have hurt us, but we are weathering the situation better than some. Our reputation in the field of maritime studies, both in Israel and abroad, assists us in obtaining competitive grants. This, together with the never-failing, ongoing financial support from our friends around the world, makes it possible for us to continue and in some cases, expand, our research undertakings. As a result of the increase in the number of students studying towards both the M.A. and the Ph.D. degrees in the Department of Maritime Civilizations, research activity in the Institute has been augmented.

Work on the refurbishment of the wing (0 floor, as it is commonly known), which will house laboratories, special classrooms and the offices of the Department of Maritime Civilizations, is nearing completion. With more of our facilities housed under one roof, life for the faculty and the researchers will be much easier.

In June Pinhas Peled (Pini), our conservator, who worked with us since the establishment of our institute, officially retired. Pini was involved in nearly all of our research undertakings, from the Tel Akko project through to the conservation of the Ma'agan Mikhael Ship. Whenever a problem arose Pini was called in. With his creative thinking and experience it was never long before a solution was reached. We parted from Pini and his family at a farewell party (Fig. 1). We hope to be seeing Pini on a regular basis in the future. We need his expertise.

A new conservator has been chosen, Jonathan Gottlieb (J.J.), who in the past was one of our students. J.J. worked at a number of our excavations, following which he found



Fig. 1. Institute members wishing Pini well for his retirement (Photo: I. Peled)

himself working at the Hecht Museum before re-joining us in his new capacity (Fig. 2).

We have been continuing many of our projects, some of which are: the use of artificial reefs and open sea bio-filters to reduce the environmental impact of mariculture, bio-struc-



Fig. 2. J.J. working in the conservation Lab. (Photo: M. Artzy)

tural indicators for paleo sea level changes, the complex tectonics of Cyprus, the paleogeography of the Taninim river mouth and the Kebara swamps in the Holocene, ecological aspects of, and anthropogenic impacts on, coastal dolphin populations, Caesarea Maritima, the Dor (Tantura) lagoon, metals of Early Iron Age Palestine: production and utilization in an ethno-political diversity, Tell Abu Hawam and our project in Liman Tepe in Turkey, with Ankara University's Hayat Erkanal and the Izmir Regional Project, among others. We have undertaken some new projects such as the one in Apeh-Kurdane, in which archaeological and geomorphological work is carried out concurrently. Work on previous projects for publication continues as well, Akko Gate project and Area H, the Ma'agan Mikhael Ship Project, Jews and the History of Shipowning and Ship Operation, Caesarea publications, Nami publications, and more. We have been involved with some salvage projects, which aid in training and financing some of the students. We also hosted several workshops and conferences.

This year, as previously, we purchased a number of essential instruments which will aid us in our research. Most of the financing for these instruments originated from grants, and we hope to be able to continue in this vein in the future. Plans for laboratories to house geological and mammal research, as well as the new wood preservation section, have already passed the planning stage and we hope, that in time, hopefully a short space of time, they will move from the drawing board to reality.

We were proud to attend the ceremony where the annual Ettie and Dusty Miller Fellowship for a distinguished young scholar was awarded to our own Ezra Marcus (Fig. 3). The Hatter Research Fellowships, which are awarded to outstanding students, and the Recanati Fellowships, for excellent first-year graduate students, were ceremoniously awarded to deserving students. We cannot but be thankful and proud of our good friends and supporters (Fig. 4-5).

**Michal Artzy**

*Fig. 3. Ezra Marcus being congratulated by Yehuda Hayuth, President, after receiving the Dusty and Ettie Miller Fellowship (Photo: A. Baltinester)*



### 2002 RECIPIENTS OF THE MAURICE HATTER FELLOWSHIPS IN MARITIME STUDIES

Ofra Barkai ♦ Adina Ben-Zeev  
 Ehud Edelman ♦ Arad Haggi  
 Simona Rodan ♦ Noa Sheizaf  
 Edna Stern ♦ Anat Tsemel  
 Gregory Votruba ♦ Idit Yovel  
 Noga Yoselevich

*Fig. 4. Sir Maurice and Lady Irene Hatter presenting a Maurice Hatter Fellowship to Adina Ben-Zeev (Photo: A. Baltinester)*



### 2002 RECIPIENTS OF THE JACOB RECANATI FELLOWSHIPS IN MARITIME STUDIES



Amani Abu Hamid ♦ Sharon Ayal  
 Ofer Babluky ♦ Deborah Cvikel  
 Eitan Kravchik ♦ Anat Shmueli  
 Anat Tsemel ♦ Idit Yovel

*Fig. 5. Mrs. Eliane Recanati (middle) presenting a Jacob Recanati Fellowship to Amani Abu Hamid (Photo: A. Baltinester)*

## THE USE OF ARTIFICIAL REEFS AND OPEN SEA BIO-FILTERS TO REDUCE THE ENVIRONMENTAL IMPACT OF MARICULTURE

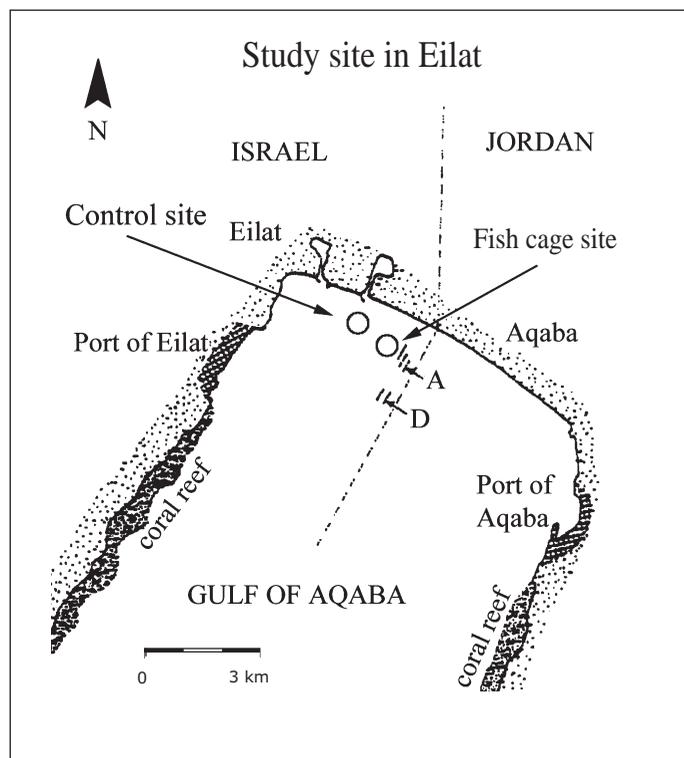


Fig. 1. Map of the study area

The seas were once considered a limitless source of food, yet recent studies have shown that the marine fisheries catch has decreased and is failing to meet the steadily increasing demand for seafood. In recent years, a growing proportion of this demand ( $\geq 30\%$ ) is supplied by the aquaculture industry, and especially by mariculture (marine aquaculture). However, many see the intense expansion of mariculture as a mixed blessing. Mariculture offers a viable alternative to many of the fishing traditions that have destroyed a variety of aquatic and marine habitats (through bottom trawling, dynamite fishing, overfishing, etc.) as well as to unemployed fishing fleets. Fish farms inevitably cause other environmental impacts. Indeed, one of the main factors that prevents the growth and expansion of the mariculture industry in many countries is the concern that it will lead to pollution and destruction of fragile aquatic environments.

Net pen fin fish mariculture, which is the main branch of mariculture, has grown and developed immensely over recent years. This open sea farming technique has several advantages over land-based aquaculture (there is no need to pump or aerate sea water, or use expensive coastal land). However, the main drawback of this open water technique is

the environmental problem caused by its organic effluents released into the natural environment. This problem is worsening due to the fact that most net pen fish farms are located within protected bays and semi-enclosed coastal areas where the sea is relatively calm, therefore enabling smooth operation. However, such calm conditions also tend to reduce the exchange of water with the open sea, the result of which is the reduction of the dilution of the organic effluents.

An example of such a problem in Israel is the intensive pen fish aquaculture (map, Fig. 1) being carried out in two large fish farms by two commercial companies, Ardag (A) and Dag-Suf (D). The farms are situated several hundred meters off the northern coast of the Gulf of Eilat (Fig. 2) along the marine border with Jordan. The two fish farms produce about 2,500 metric tons annually of high quality fish, mainly gilthead sea-bream, *Sparus aurata*, and the European sea bass, *Dicentrarchus labrax*. The remains of the fish food and the fish secretions are released into the otherwise naturally oligotrophic (clear water which contains low levels of nutrients and organic matter) marine environment, as dissolved and particulate organic matter. These loadings can cause a variety of environmental problems such as sediment anoxia (low oxygen content), algal blooms and a reduced benthic (bottom) biodiversity.

The city of Eilat attracts many tourists from Israel and abroad due to its coral reef and clear water. However, the Eilat coral reserve (the only one in Israel) has severely deteriorated in recent years, and the variety and amount of marine organisms has decreased significantly. There are disputed claims that the deterioration of the coral reserve, which is situated approximately 7 km south-west of the farms, should be blamed on the organic loading from the fish farms (although other factors, such as damage inflicted by divers and glass-bottomed boats, sewage spills, spills from the



Fig. 2. Aerial view of a fish farm off the northern coast of Eilat