

- **Jellyfish blooms in the Mediterranean and Black Sea: a brief review (by Nastasi A.)**
Blooms of autotrophic algae and some heterotrophic protists are increasingly frequent in coastal waters around the world. Algal blooms are natural events that occur seasonally due to the renewed availability of nutrients in the ocean waters; nevertheless, it has been demonstrated that these events are occurring more frequently where human activities are highly concentrated. Phenomena such as pollution and human-related nutrient enrichment can favour the expansion of algal bloom events. The Mediterranean and Black Sea basins have been experiencing several algal blooms events during the last 50 years mostly in areas such as bays, lagoons, ports beaches and estuaries. Algal blooms, frequently grouped as harmful algal blooms (HABs), not only lead to a deterioration in water quality but they also cause fish kills and high risks to human health due to specific toxins that may enter the food chain. Thus, national and regional water quality assessment efforts and routine coastal monitoring programmes to detect species, toxins, and toxicities are increasing worldwide.
- **Jellyfish bloom in the Lebanese seawaters: is it a sequence of the “Tropicalization” of the Levantine Basin? (by Lakkis S. and Zeidane R.)**
Among six species of Scyphomedusae present in the Lebanese coastal waters, *Rhizostoma pulmo* and *Rhopilema nomadica* are the most important. This latter is a recent migrant from the Red Sea into the Levantine basin where it appeared in the plankton community during the seventies and overcame later *R. pulmo* in importance and abundance. The stinging and venomous *R. nomadica* became invader in early nineties, showing pronounced multi-annual fluctuations and clear seasonal variations. The released “ephyrae” larvae became young individuals starting to appear by mid-June when seawater temperature rise suddenly to 24-25°C, reaching a bloom in early July, coinciding with a high phytoplankton standing crop followed with heavy zooplankton abundance community. Heavy populations with high density (1-5/m²) generate fearing to the tourist swimmers and creating damage in the nets of fishermen; lasting during July and August to disappear completely afterwards. During a long-term survey (1970-2008) on Scyphomedusae, we conclude that the bloom of *R. nomadica* occurring between mid-June and mid-August is not regular every year with regard to the density of the aggregations. It is related to hydrological factors, especially the rise of temperature during early spring and summer and ecological and trophic factors such as the phytoplankton bloom and the abundance of zooplankton. It was clear that the changes in the hydrology of the Levantine Basin due to the increase of seawater temperature and salinity ($\Delta T = 0.40^{\circ}\text{C}$, $S \sim 0.35\text{‰}$) following the functioning of Aswan High Dam, has induced ecological changes in the whole ecosystem, enhancing biological invasion of Indo-Pacific species. On the other hand, certain “Tropicalization” of the Levantine Basin due to Global warming and Climate change, may also enhance the migration process from the Red sea into the Mediterranean and the occurring of the jellyfish bloom.
- **The price of change: jellyfish outbreaks along the Mediterranean coast of Israel (by Galil B.)**
Some recent changes in biodiversity patterns in the Mediterranean littoral may be linked to direct drivers such as climate change and invasive species. The invasive alien jellyfish along the Mediterranean coast of Israel are reviewed and their impact the already teetering fisheries, coastal installations, and tourism discussed. The Erythrean invasion swept ashore the scyphozoan jellyfish, *Rhopilema nomadica* Galil, 1990. Each summer since the mid 1980s huge swarms of the Erythrean jellyfish have appeared along the Levantine coast. These planktotrophic swarms, some stretching 100 km long, must play havoc with the limited resources of this oligotrophic sea, and when the shoals draw nearer shore, they adversely affect tourism, fisheries and coastal installations. As early

as the summer of 1987 severe jellyfish envenomations requiring hospitalization had been reported in the medical literature. The annual swarming brings each year reports of envenomation victims suffering burning sensation, eurythema, papulovesicular and urticaria-like eruptions that may last weeks and even months after the event. Local municipalities report a decrease in holiday makers frequenting the beaches because of the public's concern over the painful stings inflicted by the jellyfish. The local newspapers and TV news report during the summer months the presence of jellyfish along the beaches. Coastal trawling and purse-seine fishing are disrupted for the duration of the swarming due to net clogging and inability to sort yield -it is not uncommon that fishermen, especially purse seines, discard entire hauls due to the overwhelming presence of poisonous medusae in their nets. Jellyfish-blocked water intake pipes pose a threat to cooling systems of port-bound vessels, coastal power plants and desalination plants.

- **Jellyfish outbreaks: do we know enough? (by Piraino S.)**

The understanding of complex ecological phenomena, such as the recurrent occurrence of jellyfish outbreaks, require large-scale integrative approaches to couple ecophysiological optima of key outbreaking-forming species (OFS) with their environmental envelopes. Mechanisms boosting jellyfish proliferations can be overlooked without a comprehensive knowledge of their biology and ecology. This is the case not only for rare or alien species, but also for most popular taxa, like *Aurelia* spp. or *Pelagia noctiluca*. The developmental plasticity of cnidarian jellyfish is proverbial and the ecological potential of their diverse life cycle adaptations grants their ecological success and persistence in worldwide ecosystems. Resting stages, high regeneration potential, reverse development are all shared features within Medusozoa, leading to rapid jellyfish population growth in narrow time windows. A combination of traditional methodologies, innovative technologies and multidisciplinary approaches (from natural history observation to video-acoustic behavioural records from biochemical investigations of trophic relationships to molecular taxonomy and phylogeography) will be required to a) understand the roles of jellyfish in the health of our seas, b) analyse causes and consequences of outbreaks, c) foresee environmental envelopes and hot spots of jellyfish occurrences, and d) eventually developing mitigation countermeasures against OFS negative impacts. Besides the common negative perception of outbreak events, jellyfish can be a resource for humans, as they have a number of properties that may be of benefit to society as a source of healthy molecules in cosmetics (e.g. collagen), pharmacology (e.g. free radicals scavengers and antioxidant proteins, anti-cancer drugs), nutraceuticals (food for humans, feed for animal farming and aquaculture). In my talk, I briefly summarized some of the potential outcomes that might be achieved by a recently established network of 15 Mediterranean laboratories from 10 different countries dedicated to the study of jellyfish biology (the JELLYMED consortium).

- **The effect of jellyfish on the small scale fishery in the Black Sea (by Özdemir S., Erdem E. and Birinci Özdemir Z.)**

By-catch in fisheries has been considered a serious problem. Horse mackerel is a most of the economic fish in the Turkey small scale pelagic trawl fishery. Jellyfish are important by-catch pelagic trawl fisheries in the Black Sea coast of Turkey such as inedible, damage to target species, decreasing catch amount and mean length of fish. The experiments were carried out Black Sea coast (Sinop-Samsun) in October 2008; total 11 night and 11 daytime pelagic trawls were towed. Horse mackerel (*Trachurus mediterraneus*) and moon jellyfish (*Aurelia aurita*) were caught by pelagic trawl in the study 19540 kg and 8220 kg respectively. In the present study the effect of moon jellyfish (*Aurelia aurita*) on the catch efficiency and length composition of horse mackerel caught by the midwater trawl were established. The results showed that moon