

# **Scyphomedusae along the southeastern coasts of the Mediterranean and the organisms associated with them**

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## **Abstract**

A long time has passed since the birth of the earth, approximately 4,550 million years ago, till the Cambrian period, 570 million years ago, where the first evidences of the appearance of more complex organisms were found- the multicellular organisms including the *Cnidaria* and the ancestors of the jellyfish. Fossil finds of the jellyfish from the period of 510 million years ago indicate their similarity to the jellyfish existing today, they being large predators dominant in the seas of those days.

The jellyfish as predator/prey are found higher in the food web than was estimated in the past and they successfully compete with other marine predators for food resources. Just like their relatives the *Anthozoa*, they are involved in different forms of biotic interactions, from parasitism to full mutual collaboration between the jellyfish and the organisms associated with them.

The jellyfish present a nuisance to man-kind, but alongside the disadvantages one should consider also the potential benefit of these marine organisms as they constitute a considerable and important biomass. This biomass could be put to use as an important energy source for renewed biological development in areas stricken by anthropogenic activities

Research objectives:

Reviewing the history of the jellyfish's appearance and the history of research on the jellyfish and their associates.

A presentation of the jellyfish's biological, physiological and ecological structure.

Clarification of the possible relationships between environmental conditions and the appearance of Scyphomedusae and their related biota.

Examination of the possible mutual relationships between the Scyphomedusae along the Mediterranean coasts of Israel, particularly those of the nomadic jellyfish, *Rhopilema nomadica*, and the organisms associated with them, in their natural environment.

The present research started in January 2006. It included a continuous and regular surveillance, by sailing and diving, along the Mediterranean coast of Israel, which continued for 540 days and included 68 sailing trips. It concentrated mostly on the northern part of the Israeli shore, in between the Bay of Akko (Acre) - Nahariya. The research was carried out in the natural environment of the jellyfish and it presents an ongoing representation of the presence of Scyphomedusae, their density, behavior and the organisms associated with them.

During the research young specimens of the Shiff arms jellyfish, *Rhizostoma pulmo*, were identified and the relationship between the appearance of the juvenile jellyfish and the temperature graph preceding their appearance was established. It is suggested that the factor causing their appearance is not the absolute temperature but rather a continuous decline in the seawater temperature followed by an increase in temperature of several degrees. The research also indicates similar behaviors concerning the appearance of the populations of *R. pulmo* and *R. nomadica*, in spite of the quantitative differences between them. The sparse appearance of *R. pulmo* compared to the manifestation of swarms of *R. nomadica* is apparently affected by the competition between these two species and by the differences in exploitation of the environment by each species.

The nomadic jellyfish, *R. nomadica* is the dominant jellyfish in its presence in the coastal waters of Israel. It is a Lessepsian migrant originated in the Indo-Pacific region which is capable of exploiting various niches in the Levant basin. The massive appearance of swarms of the *R. nomadica* is explained by the exponential rate of growth in the summer season from local strobilation which is made possible by the vegetative reproduction cycles by way of podocysts.

The presence of swarms of jellyfish terminates with their almost complete disappearance over a short period of time. The suggested explanation for this phenomenon is a combination of factors including a high population density which overburdens the environment, sea and other environmental conditions which do not move and disperse the swarms of jellyfish, which are dependent on external sources for their transport to new and un-depleted areas. As a result the jellyfish weaken and their susceptibility to pathogens, which may be harmful to the population, increases. The research presents different aspects of the relationship of the jellyfish to their environment and to obstructing elements while indicating that the jellyfish possess

certain abilities to detect obstructing elements depending on the environmental conditions.

The accompanying fish were observed mainly on the jellyfish of the species *R. nomadica* and were mostly of the carangid species, the Shrimp scad, *Alepes djedaba*, a Lessepsian migrant by itself, which appeared in the Mediterranean before the jellyfish (first identified in 1929). During the present study different periods were observed in which fish of different lengths were present as associates. A linear relationship was found between the jellyfish diameter and the number of the accompanying fish. Their considerable presence and location on the jellyfish point to the existence of interrelationship between jellyfish-fish and the jellyfish serves as a floating surface for the growth of juvenile fish which possibly find a wide range of advantages in the associations with the jellyfish.

Amphipods of the species *Brachyscelus rapax* are reported for the first time in the present study. They were discovered riding on the *R. nomadica*. These amphipods were observed in the early winter of 2007. The amphipods are also migrants. They are known from the Indo-Pacific region which is also the origin of the *R. nomadica* and consequently it is likely that they are Lessepsian migrants as *R. nomadica* and *A. djedaba*. The amphipods are organisms known for living in interrelationships (usually parasitic) with different gelatinous organisms and for their ability to exploit decaying organic matter. The amphipods add another piece to the ecological, biological and environmental puzzle of the southeastern Mediterranean and may increase the energetic value of the marine environment for the organisms feeding off this living floating platform, including the jellyfish and their associates.