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YOU ARE HERE Eilat: A Marine World in the Desert

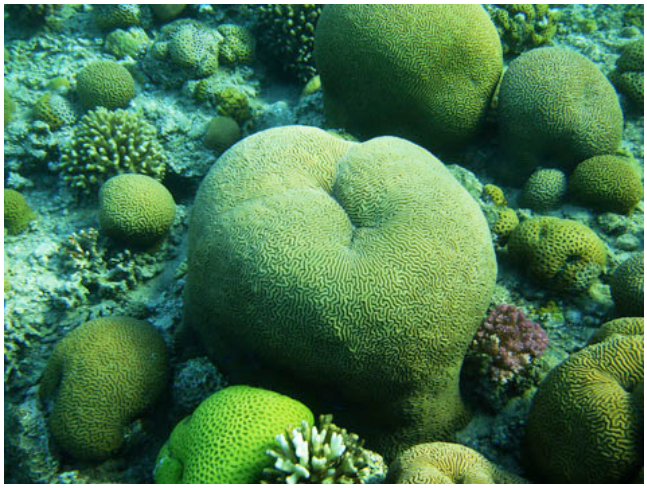
Eilat: A Marine World in the Desert

By ***CORAL Editors*** *- Posted on* ***23 February 2010***

Stylophora pistillata **in a shallow-water captive pool, displaying vivid pigmentation.**

By Tim Wijgerde, M.Sc.

Although largely unknown to North Americans, a small city in the south of Israel is earning itself the reputation as a must-see "Coral City." For Eilat, a seaside town at the northernmost tip of the Red Sea, the local coral reef is of great importance, luring ecotourists and marine scientists alike. With its reefs, stunning public aquarium, and marine research stations, Eilat truly is a very alluring destination.



The coral reef of Eilat, Gulf of Aqaba. The reef flat is dominated by *Platygyra sinensis, Stylophora pistillata* and *Favia* spp. Photograph: Tim Wijgerde.

For stony coral enthusiasts, Eilat is a mecca, with some of the most spectacular large colonies of *Playgyra, Stylophora, Favia,* and other genera seen in captive systems. Public displays allow casual tourists intimate views of corals in look-down reef pools, where shallow water and blinding desert sunlight conspire to produce exceptionally vivid pigmentation. Behind the scenes, fascinating research delves into coral reproduction and the effects of changes in ocean conditions on coral

growth and survival.

Sitting in the arid Negev Desert, Eilat faces out onto the beautiful blue waters of the Gulf of Eilat, also known as the Gulf of Aqaba. The city lies close to the Egyptian village of Taba to the south, and the Jordanian port city of Aqaba to the east. Home to 65,000 people, Eilat draws divers and ecotourists from Europe and the Middle East, and coral scientists from many countries.

Marine biologists study the local coral reef and its fauna at several academic institutions such as the National Center for Mariculture (NCM) and the Interuniversity Institute for Marine Sciences.

The Underwater Observatory Marine Park provides an amazing view of the coral reef, which is protected by a long wire running along the coast (out of view). Tourists are not allowed to cross it. Photograph: Tim Wijgerde.

The NCM

The National Center for Mariculture is located close to the border with Jordan, in the east of Eilat. This institute develops technologies for rearing marine fish and other marine species having high economic value, including corals. Studies carried out here stimulate the development of mariculture, a practice which is seen all over the world due to declining (fish) stocks.

The NCM entrance, protected by a metal gate and barbed wire. In Israel, government institutions are well-protected. Photograph: Tim Wijgerde.

The NCM is made up of nine research groups working together to domesticate marine species as sustainable products. Major research areas include fish reproduction, larval rearing, genetic improvement of fish, development of feeds for fish and fingerlings, and development of integrated systems for rearing fish, mollusks and algae.

The NCM focuses on developing an environmentally friendly land-based system for rearing fish in seawater ponds. This technology includes biological purification of the system effluent, the polluted water which emanates from the ponds. For this purpose, scientists at the NCM utilize *Ulva lactuca*, a common seaweed (Sea Lettuce, right). By means of air flow, large quantities of *Ulva* are constantly rotated in basins. This is

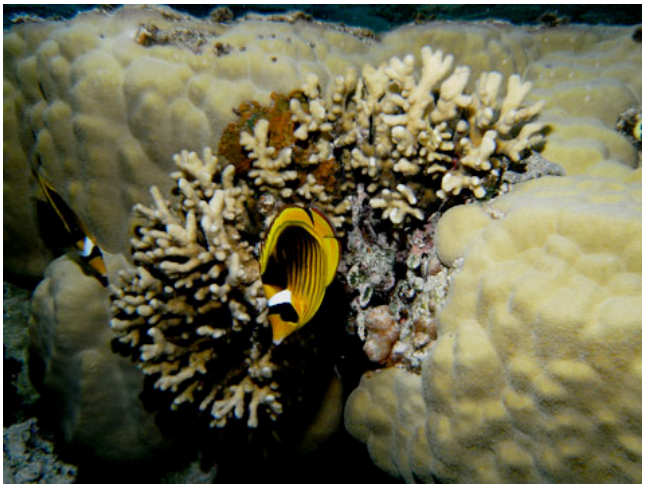
reminiscent of *Chaetomorpha refugia* used for home aquarium filtration. The idea is to upscale this technology, allowing the country to grow large quantities of fish on land without affecting local wildlife. This technology is highly important as new regulations demand that waste-waters are low in nutrients, protecting the surrounding waters and its underwater life. About 50 scientists, research assistants and technicians are employed at the NCM.

Corals are also studied here, with the stony coral *Stylophora pistillata* being a major species of interest. Currently, NCM scientists are testing the effects of elevated ammonium concentrations on the growth of this species. Natural ammonium levels in the Gulf of Aqaba fluctuate around 1 µM (micromole). This equals to 0.02 mg/l (ppm), which is quite low. The effects of 25 - 50 µM (0.5 - 1 mg/l) on *S. pistillata* are now being investigated, and the results will be published soon. This research is very relevant for the aquaculture industry in Eilat, as several fish farms had to move out of the bay area after political decisions.

Small *Stylophora pistillata, Pavona cactus* and *Favia favites* fragments are exposed to various ammonium concentrations, ranging from 0.02 to 1 mg/l. Research will show whether coral growth rates and survival are affected by these elevated levels. Photograph: Tim Wijgerde

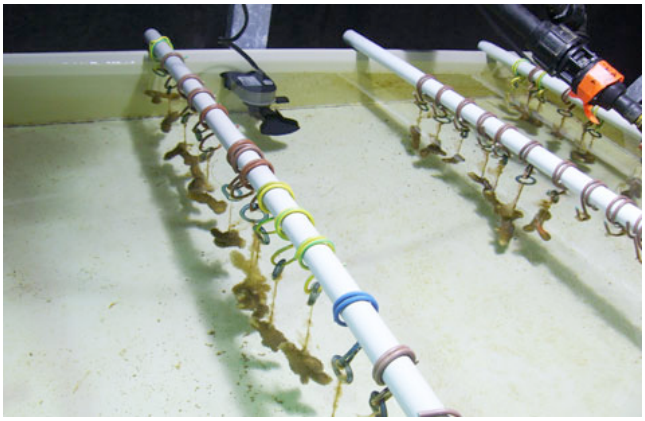
The IUI

The Interuniversity Institute for Marine Sciences is an institute shared by several Israeli universities. It has its own section of the coral reef, which allows marine biologists to study marine life without too much disturbance. Although this part of the reef does not display very high biodiversity, there is still lots to be seen. Several *Favia, Acropora* and *Pocillopora* spp. can be found here, as well as lots of *Stylophora pistillata* colonies. The reef is also inhabited by several butterflyfish, such as *Chaetodon fasciatus*, parrotfish and lots of surgeonfish, including the Purple Tang, *Zebrasoma xanthurum*. Urchins such as *Diadema setosum* also scavenge the reef in large numbers.



A pair of Red Sea Raccoon butterflyfish, *Chaetodon fasciatus*. This species is common in the Red Sea and the Gulf of Aqaba. Photograph: Tim Wijgerde.

On the IUI beach, several aquaria are installed as experimental setups. Here, corals are subjected to low pH levels, mimicking future ocean acidification scenarios. A decline in oceanic pH is already noticeable, which has been about 0.1 units over the last century. A low pH level is highly threatening to the world's coral reefs, as this decreases coral calcification (growth) significantly. A pH of about 7.4 is sufficient to dissolve corals entirely within a matter of months (1). This is because the carbonate ion concentration (CO_3^{2-}) drops as a result, stimulating calcium carbonate dissolution. All that remains are solitary polyps, which resemble Zoanthids. The coral reef may transform into a giant calcium reactor in the next 100 - 150 years if current CO_2 emissions persist (1,2). With new gas and oil explorations around the Earth's poles, this situation is not unimaginable.



Frags of *Stylophora pistillata* are suspended from metal wires and exposed to different pH levels. Previous research has shown that a pH of 7.4 is sufficiently low to completely dissolve a coral's skeleton. Scientists are now investigating how coral calcification is inhibited on a molecular level. Photograph: Tim Wijgerde.

On the reef, experiments are carried out as well, such as determining the reproductive season of *S. pistillata*. This species is known to reproduce from January to July, however climate change may have already affected the coral's reproductive season. To determine whether and when these corals actually reproduce, researchers place plankton nets with collection cups over adult colonies. *S. pistillata* is a so-called brooder, which releases its larvae at night. If the coral has spawned, larvae can be found the following morning. The plankton nets allow for sufficient water exchange, thereby minimizing the negative effects on the coral.

The larvae are also used for all kinds of experiments such as competition studies, where primary polyps are challenged with their siblings. This has led to new insights into coral immunology, and how these young polyps compete with other organisms on the reef. Young colonies may also be returned to the reef as part of reef restoration programmes.

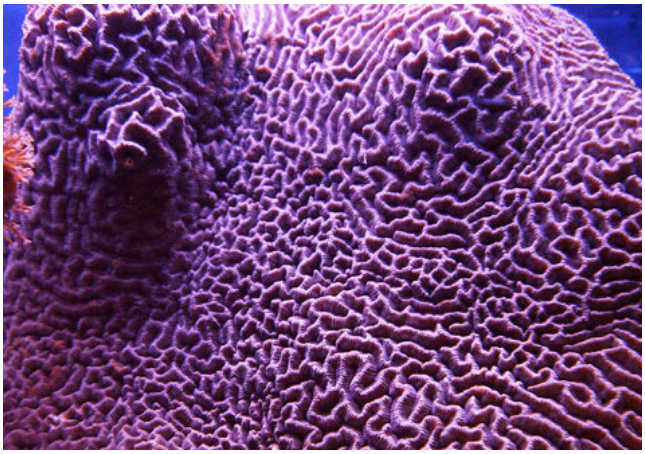
Plankton nets with collection cups are placed over adult *S. pistillata* colonies, after which larvae are harvested the following morning. Photograph courtesy of Dr. Keren-Or Amar.

Next to all the scientific research conducted around Eilat, much remains to be seen for the average visitor. For the aquarists out there, the Underwater Observatory Marine Park probably is Eilat's main attraction.

The Underwater Observatory Marine Park

The Underwater Observatory Marine Park is a public aquarium which houses several stunning aquaria. Tanks are on display indoors as well as outdoors, as the Israeli climate is ideal for coral growth. The aquarium is also flanked by a coral reef, which can be observed from an underwater observatory.

The indoor aquaria house a large variety of species. The keen observer will notice that some species here do not actually occur in the Gulf of Aqaba, or in the Red Sea for that matter. That doesn't mean these aquaria do not serve an educational purpose of course. The choice in fish species is somewhat different from the average home aquarium; many corallivore fish inhabit these tanks, such as angelfish and butterflyfish. The aquaria are also constantly supplied with fresh seawater by means of turbine pumps. These carry individual capacities of around 26,000 USG per hour!



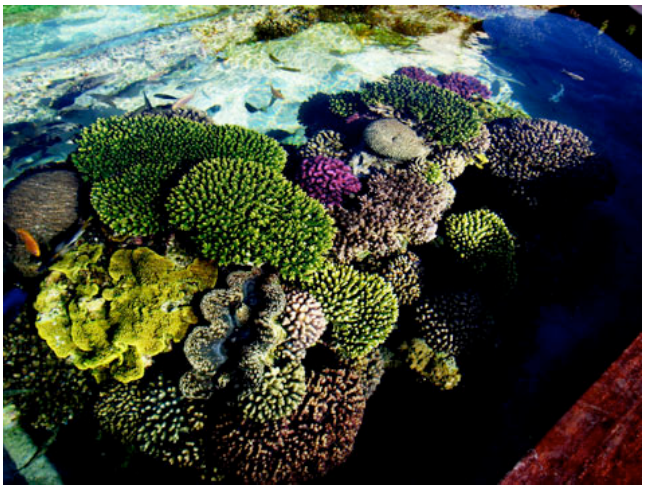
Startling purple unidentified *Platygyra sp.* The indoor aquaria are stocked with exceptionally stunning corals, mostly LPS. *Echinopora,*

***Favia, Favites, Acanthastrea, Platygyra, Symphyllia, Goniastrea, Oxypora, Blastomussa, Scolymia, Cynarina, Goniopora* spp. and of course *Stylophora pistillata* decorate the indoor aquaria. (See also image at top of this article.) Photographs: Tim Wijgerde.**

The outdoor aquaria may be the most spectacular of all. These actually resemble ponds, and completely depend on the Israeli climate. Besides regular feedings and a constant water flow from the nearby Gulf, nothing else is done to maintain the corals and fish. Sunlight and the tropical climate take care of the rest.

The corals in these ponds are battered by intense sunlight on a daily basis. The average irradiance around noon here is about 2,000 microEinsteins per square meter per second (µE/m2/s). Although this value may carry little meaning for most aquarists, compare this to an average value of around 300 µE/m2/s in the home aquarium! It must be noted however that such high irradiance levels are definitely not required for healthy coral growth. This level is even stressful for corals, which is why they produce such colorful pigments to protect themselves against this excess of light (and UV). This is an example of the many challenges corals have to face in nature.

The corals and fish in these ponds are exposed to the powerful sun on a daily basis. This is reflected in the intensity of the coral pigments, which is quite spectacular. Photographs: Tim Wijgerde.



The ponds mainly house *Acropora* corals, in various exquisite colors. *Platygyra sinensis* and *Turbinaria reniformis* can also be found here, accompanied by Picasso Triggerfish (*Rhinecanthus assasi*), *Anthias* basslets and several Orbiculate Batfish (*Platax orbicularis*).

An aquarist cleans one of the open coral reef ponds. Photograph: Tim Wijgerde.

The presence of a real coral reef in the immediate vicinity of a public aquarium is quite something, and allows the visitor to see many species in their natural environment. The biodiversity on the nearby reef is quite high with soft corals such as Heteroxenia sp., and colorful stony corals such as *Pocillopora verrucosa* and *Acropora* spp. up to 3 ft. in diameter. Large *Alveopora, Turbinaria, Platygyra* and *Favia* colonies can also be found here. According to its government, Israeli waters harbor over 270 species of coral – some of which are endemic to the Red Sea.

***Platygyra, Favia* and *Acropora* colonies are abundant on the Israeli reef. Most colonies are shades of green, brown, and yellow due to the presence of zooxanthellae in the coral tissue. Photograph: Tim Wijgerde.**

The reef here is populated by many fish species such as Purple Tangs (*Zebrasoma xanthurum)*, butterflyfish, Volitans Lionfish (*Pterois volitans*), Twoband Anemonefish *(Amphiprion bicinctus)*, together with Bubbletip Anemones (*Entacmaea quadricolor*), damsels (*Dascyllus* spp.), Emperor Angelfish (*Pomacanthus imperator*), and cornetfish (*Fistularia* sp.).

The observatory is the major attraction of the park, and provides an amazing 360-degree view of the reef. A short climb to the top of the observatory allows the visitor to oversee Israel, Jordan and Egypt. The reef around the observatory has been artificially constructed to spur the growth of corals, and the result is quite amazing.

Large *Turbinaria*, *Acropora*, *Siderastrea* and *Porites* colonies grow in very close proximity to the large windows. Fish are abundant, such as *Chromis viridis*, tangs and clownfish. Several small caves have also been constructed, which are ornamented with large *Dendronephthya* colonies and bivalve-covered gorgonians.

A Coral City

With its coral reef, interesting public aquarium and marine research stations, Eilat truly is a "coral city." Next to the fringing reef along the coast, there are several other diving sites worth visiting such as Joshua and Moses Rock. Divers may also visit several shipwrecks sunk by the Israeli navy, such as the Mosquito.

Next to Eilat's rich underwater life, many other attractions are worth visiting. Examples are the Negev Desert Botanical Garden and the historical town of Petra in Jordan. The way Israel maintains and promotes its coral reef sets a good example for neighboring countries such as Egypt, where tourism activity is allowed to wreak havoc on local wildlife.

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