Action Plan for Protecting the Biodiversity of the Rocky Habitats in the Mediterranean Sea and Along the Coast of Israel

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Photography: Adam Konstantinovsky

Foreword

For the first time in Israel, we present here an action plan for the protection of the biodiversity in the rocky, coastal and marine habitats.
The work extensively explores the current status of the rocky habitat in Israel, with emphasis on information gaps, problems and threats. It relates to all the entities that have responsibility for and a connection to protection of the habitat, and proposes a comprehensive action plan for conservation of the biodiversity in this habitat.

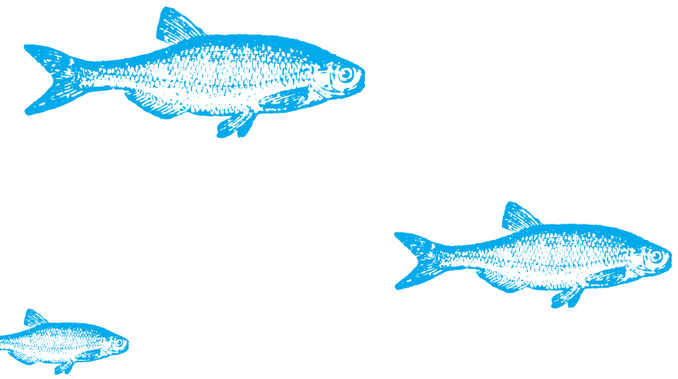
One cannot underestimate the ecological importance of the rocky habitat for marine biodiversity and its contribution to marine biomass. The stable infrastructure and the protection it provides create ideal conditions for the development of very rich communities of organisms, from invertebrates, including Mollusks, Echinoderms, and crabs, to many different species of fish. In addition, the protective rocky habitat serves as the spawning ground for many species that live as adult fish in the open sea.

The intensive human activity in our country along the seashore and the accelerated activity at sea, create significant threats on the rocky habitat, and we are in a situation requiring that urgent and immediate steps be taken. Only focused and coordinated activity of all the agencies – governmental, municipal and public, with the full cooperation of the wider public, can bring about the required change.

In its approach, the plan adopts the most advanced methods of action prevailing in the world today. We hope this action plan will be speedily realized and serve as a beacon to additional action plans of its type.

Sincerely,

Amotz Degani
CEO EcoOcean



Photography: Dr. Gil Rilov

Photography: Hagai Netiv

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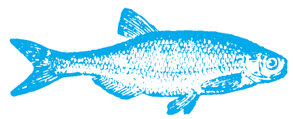


Executive Summary

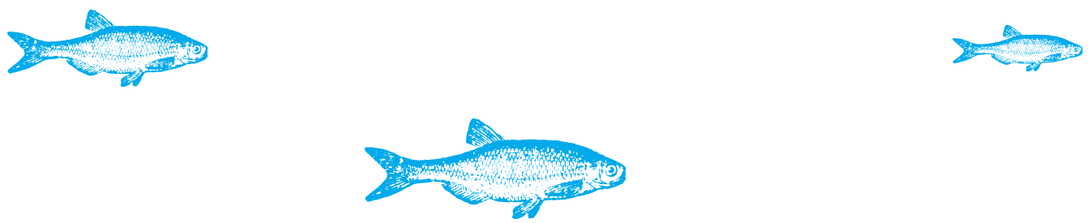
The rocky habitat is inhabited by a wide range of marine organisms and is the richest and most complex habitat along the Israeli Mediterranean coastline.
This habitat comprises submerged rocky reefs and intertidal vermetid reefs, which together constitute an oasis in the biomass-poor eastern Mediterranean. The reefs provide shelter and breeding zones vital to the revival of marine populations, including many species of commercial value. Their ecological value is therefore immense. Because of its beauty and richness of life, the rocky habitat attracts large numbers of visitors by boat and on foot, as well as scuba divers.
Rocky intertidal reefs also provide the shore essential protection against erosion.
However, despite its importance, this habitat has been damaged by intensive human activity.
This damage can be attributed to intensive and uncontrolled fishing - some of it using destructive fishing methods and equipment; the invasion of non-native species; accelerated water desalination and energy infrastructure development along the shore; and various types of debris and pollution. In addition, the physical break-up of the rock, which damages organisms attached to it, and the rise in sea level and water temperature further impact on the rocky habitats and the species they nurture.
Biodiversity Action Plans (BAPs) are used in many countries to protect rocky habitats. In Israel, however, rocky habitats do not have adequate protection and as a result both they and their inhabitants are being decimated.
The conservation of this unique and significant marine ecosystem requires an action plan to protect its biodiversity and enable it to be of benefit to man now and in the future.
The BAP we propose focuses on six of the main factors impacting on the rocky habitat: fishing, solid waste pollution, coastal infrastructure development, physical damage, invading species, and industrial and municipal sewage effluents.

The key targets of the BAP are to:

- Increase the percentage of effective protection of rocky habitats within marine reserve areas;
- Rehabilitate and protect biodiversity; and
- Establish a statutory and administrative system for effective and sustainable management.

The BAP incorporates the outline of a policy for rocky habitat protection as well as suggestions on how to disseminate this information among decision makers.

It also includes ideas for research, education and campaigning activities. The BAP calls for increased monitoring and enforcement, as well as regional and international measures to promote protection of biodiversity in the rocky habitat.



Introduction

Photography: Dr. Gil Rilov

Introduction

1.1 The Objective of the Proposed Action Plan

The objective of the Action Plan for the protection of biodiversity of the rocky habitats in the Mediterranean Sea and along the Israeli coast is to serve as a roadmap for activities that must be carried out to bring about an improvement in the ecological situation of the rocky habitats. This roadmap outlines recommended policy for protecting the marine rocky habitats and rehabilitating them, while setting out clear objectives, courses of action, potential partners for implementation, and schedules.

1.2 About the Action Plan Model

This Biodiversity Action Plan (BAP) is based on the Convention on Biological Diversity (2013, 1992)[1]. As an outcome of Israel's ratification of the Convention and the decision of the government to prepare a strategic plan for sustainable development[2], the Ministry of Environmental Protection, together with the Israel Nature and Parks Authority (INPA), and representatives from the academic world, prepared a national plan to protect biodiversity. This plan provides a framework for drafting detailed BAPs for protecting habitats and diverse species of flora and fauna.

These BAPs deal with rehabilitation of animal and plant species and habitats at risk and their conservation. They include ecological data on the species and the habitats, and information on the status of legal protection of species and habitats, and set goals for rehabilitation and conservation.

They include six steps:

1. Identification of a habitat or species of ecological importance and their classification;
2. Assessment of the ecological status of specific species or habitats;
3. Identification and definition of barriers, solutions and goals to rehabilitate and conserve and their definition;

Photography: Hagai Netiv

[1] The Convention was adopted at the 1992 Rio Earth Summit in Rio de Janeiro, and took effect in 1993. The objective of the Convention is to preserve global biodiversity, sustainable use of its elements, and fair and equal distribution of the benefit arising from exploitation of the biological resources of the planet. Israel signed the Convention in 1992 and ratified it in 1995.

[2] Decision number 246 of the Government of Israel on 14.05.2003 on the issue of a strategic plan for sustainable development in Israel.

4. Identification of stakeholders and potential partners and their enlistment to action;
5. Setting a budget, allocating tasks and timetables; and
6. Implementation and evaluation.

Maintaining biodiversity requires that actions be taken across different domains. It is therefore necessary to pool governmental and non-governmental resources to create cooperation, coordination and synergetic activity among the relevant entities.

1.3 Some examples from around the world of BAPs for the protection of rocky habitats

A number of countries have extensive regional plans to protect rocky habitats. They tend to combine a variety of methods of operation and diverse partnerships.

In Britain, which is a signatory to the Convention on Biological Diversity (CBD), rocky habitats are defined as preferred habitats for conservation (JNCC, 2007; JNCC, 2013). In this framework, local plans incorporate activities for promoting legislation and environmental management, research, education and advocacy (DBAP, 2013).

The National Park of the North York Moors is an example of a BAP to conserve biodiversity. (http://www.northyorkmoors.org.uk/caring/biodiversity).

The tidal zone in this area is typified by tidal pools, crevices and caves, and a wealth of flora and fauna species.

Its action zones are demarcated according to geological features, ecological status, and key species according to their level of importance and the dangers threatening them. Actions to be taken – and the bodies responsible for their implementation - are designated for each of the habitats.

This BAP includes a number of actions, such as: formulating ideas to reduce pollution resulting from the agricultural activity of landowners on the coastal cliffs, management of a fund of donations for conservation activity in the Park, activities to raise public awareness and for educational purposes, implementation of an "Adopt a Beach" program to remove solid waste from the beaches, and observation of seawater pollution, habitat monitoring by activists and volunteers, and the creation of a common database.

Durham, England also has a BAP in operation (http://www.durhambiodiversity.org.uk/pdfs/habitats/Rockyshores.pdf).

To enshrine the protection of its rocky habitat, actions have been taken in Durham to prevent pollution and conduct monitoring surveys. They also operate educational and advocacy measures in the local community.

San Francisco Bay is another example.

As of 2010, a program for protecting habitats is in place, which also incorporates the protection of rocky habitats (http://www.sfbaysubtidal.org/report.html). A number of government agencies jointly contributed to its establishment, such as: the San Francisco Bay Conservation and Development Commission (BCDC), California Ocean Protection Council (OPS), California State Coastal Conservancy (SCC), the National Oceanic and Atmospheric Administration (NOAA), and the San Francisco Estuary Partnership (SFEP).

The joint body is tasked with research studies to check the benefits produced by the natural and rehabilitated ecosystem of the rocky habitat. Actions are also carried out to prevent physical damage from coastal development, the cleaning and recycling of fisheries waste, and the fencing and paving of access routes for visitors.

The umbrella organization **MARINe – the Multi-Agency Rocky Intertidal Network**, operates in the U.S. in collaboration with universities and private and environmental organizations, whose goal is to promote research into the rocky coast. It conducts monitoring programs at approximately 135 sites along the western and eastern coasts of the U.S. and stores the collected information in a database open to all.

The organization is responsible for:

- Creating protocols for the standard sampling of biodiversity across all the monitoring sites;
- Promoting research studies and their publication in journals;
- Organizing conferences and workshops for

stakeholders and other interested parties;
- Allocating grants to researchers in postgraduate and doctoral frameworks;
- Developing a study program for students;
- Creating a biological health index for rocky habitats;
- Ensuring the accessibility of information to the public; and
- Running an information campaign entitled “What you can do to save the rocky shore”.

Table 1: presents the range of tools that have served rocky habitat protection plans around the world.

	Sub-tidal Goals Project (San Francisco, USA)	MARINe (USA)	North York Moors National Park (UK)	Rocky Shores in the Durham area (UK)
Monitoring and research	x	x	x	x
Setting up a database		x		
Transmitting information to targeted audiences		x	x	x
Policy promotion and legislation				x
Public information campaign		x		x
Educational programs and advocacy	x	x	x	x
Reducing pollution from various sources	x		x	x
Managing a fund to finance conservation activities	x		x	
Creating cooperation with local authorities and communities	x		x	x

Background

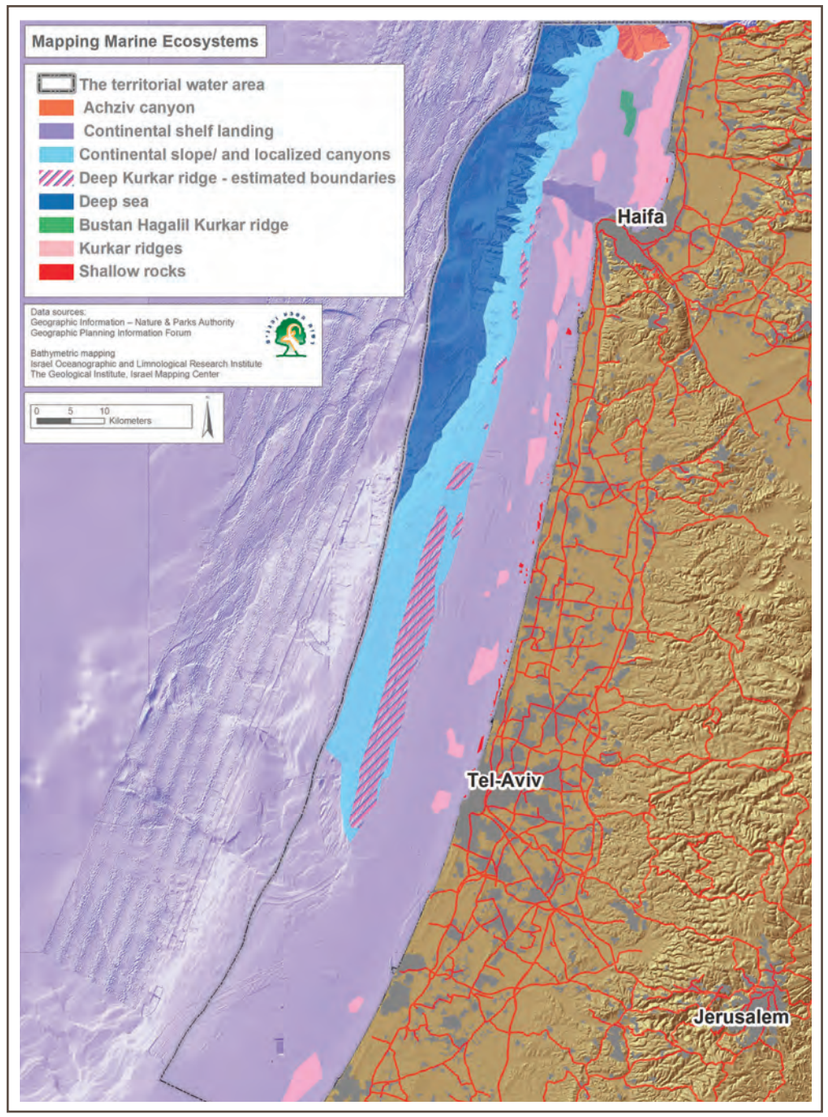
Photography: Hagai Netiv

Background

2.1 The importance of the rocky habitats along Israel's Mediterranean shore

The rocky habitat occupies about 12% of the Mediterranean seabed within the territorial waters of the State of Israel. The Israeli Mediterranean coastal region is typified by Kurkar stone (Calcareous sandstone) - i.e., fossilized sea sand dunes with a mix of limestone in the sand, created at the meeting point of sea and land. There are a number of Kurkar coastal ridges along the length of the Israeli Mediterranean coastline, some of which are on land and some in the sea, testimony to the rise and retreat of the coastline in different geologic periods.

Fig. 1: Rocky habitats in the Israeli Mediterranean Sea
(Analysis and mapping: Gilad Weil, the Geographic Information Unit, Israel Nature and Parks Authority)



Three or four marine ridges are to be found in parallel at depths of between 10 and 130 meters, at sections all along the coast (Fig. 1).
The coastal ridges have undergone a process of abrasion and leveling by the waves, and created the unique structure of the **abrasion platforms** or **Vermetid Reefs**.
In the Haifa and Rosh Hanikra area, limestone can also be found in the marine rock infrastructure – the continuation of the land of the Carmel and the Ladder of Tyre cliffs.
South of Dor, at Wingate Beach, and again south of Ashdod, one can find hard, flat rock slabs in the area where the waves wash up against the beach. The slabs, which are made up of a mixture of sediment and with shell fragment cementation, are known as **beachrock**.
In temperate seas, rocky reefs are considered to be the richest habitats. In terms of their complexity and ecological importance, they are frequently compared with coral reefs, mangrove forests and seagrass meadows (Keesing & Irvine, 2005; Rilov and Guy-Haim, 2013).
On the Israeli Mediterranean coast, which is relatively poor in biomass, the flats, ridges and rocky reefs are 'oases' in which marine creature populations live, which are far more complex and considerably richer than those to be found in soft habitats. The rocky habitats provide a stable infrastructure and shelter, creating safe breeding grounds essential to the renewal of communities of various marine organisms. These communities include algae of various species, sponges, sea anemones and corals, Ascidians (sea squirts) sea urchins, crabs and many other invertebrates as well as many species of fish, including many species of edible fish (Sahyoun et al, 2012; Galil et al, 2013; Rilov and Guy-Haim, 2013; Scheinin and others, 2013).
The **Vermetid Reefs** are a unique and rare habitat, complex and rich, found only in very few areas of the world. The platforms are coated in biogenic matter, which is created by two marine gastropod species: *Dendropoma petraeum*, which is found on the rims of the table, and *Vermetus triquetrus* in the basins of the platform. The calcareous, coil-shaped shells of the snails are embedded in the reef by calcareous seaweed. They stabilize the reefs of the shallow table, characteristic of the Israeli Mediterranean beach, and give them protection against abrasion (Safriel, 1974; Safriel 1975). Because the abrasion platforms provide the shoreline with protection against the waves, the defense that the biogenic material provides the platforms against erosion is essential to the protection of the shoreline against erosion and abrasion.
The abrasion platforms are of diverse configurations, such as a lagoon area, pools and low-tide chasms, flat platform surfaces and edges (half-pipe rock formations) facing the open sea, which serve as microhabitats for creatures that have adapted to life under the variable conditions of the intertidal zone. (Galil and others, 2001; Goren & Galil, 2001; Consoli et al., 2008; Rilov and Guy-Haim, 2013).
The beauty and abundance of flora and fauna on the abrasion platforms and in the rocky underwater habitats along Israel's coastline attract numerous visitors and divers.

2.2 Factors affecting the rocky habitats

The coastal plain in Israel is densely populated. Human activity in the area is vast and intensive, and its impact on the natural environment of the beach and sea is enormous. There is extensive evidence of heavy damage in the marine rocky habitats and changes arising from human activity in this unique

Photography: Hagai Netiv

habitat (Scheinin and others, 2013). One of the ways to examine this violation is through comparison of the rocky habitat in an area where fishing and development are banned, vs. similar rocky habitats which are not protected. In surveys comparing the two, as noted, the protected habitat was found to be richer in terms of algal cover, abundance of species, the number of specimens and their size (Rilov, 2011; Yahel and Engert, 2012; Rilov, data not published). In a survey conducted in Atlit in 2007-2008, the number of species in the closed area was found to be 2.67 times greater compared with the open control site (Spanier and Sonin, 2008). In the protected islets of the Rosh Hanikra-Achziv reserve, the prevalence of a number of common fish species was higher by several orders of magnitude in the shallow water compared to more southerly islets, outside the reserve, and the number of specimens was also significantly larger in the former (Rilov, 2013).
The human factors affecting the rocky habitat are many and varied; some of them are of local character and others are of a regional or global nature. However, there is insufficient data on their impact.
There are many factors behind violation of the rocky habitat: fishing, invasive species, the gas and oil industries being developed at sea, waste effluent, desalination plants, power stations, beach development, pollution from the air, noise pollution, illumination pollution and global physical and chemical changes in the sea.

Fishing
There is extensive evidence of the decline in local fisheries and 'fishing down the food chain' in marine habitats in general and in the rocky habitats in particular, as a result of over-fishing (Aronov, 2002; Edelist, 2012). Fishing takes place everywhere, in all seasons of the year, including during the reproduction period, without any limitation on the size of the catch (The Society for the Protection of Nature, 2014). Much of the fishing is conducted using non-selective, destructive means, such as driftnets and bottom trawling nets, at times augmented by air pressure to frighten the fish out into the nets, as well as the use of a special device, known as a Rocky Hopper, designed for use on a rocky substrate. Another destructive method of fishing, which causes a fatal blow to the marine food web, is spear hunting by divers using scuba gear. The latter method most often results in large predator species being caught. In recent years, use has also been made of special vertical jigging fishing rods to fish in relatively deep rocky areas (Edelist, 2012; Sahyoun et al, 2012; Aronov & Goren, 2008).
Marine animals are also collected for research purposes and to produce materials for the pharmaceutical industry.


Photography: Hagai Netiv


Photography: Hagai Netiv

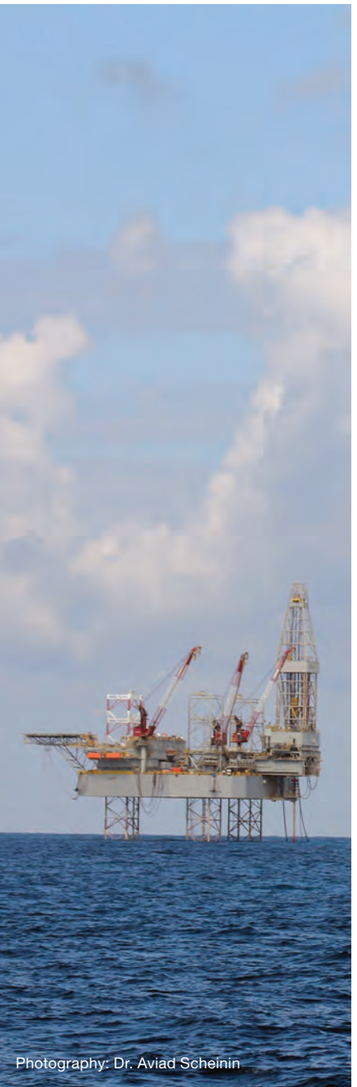
Invasive Species
Studies clearly show that many marine animal species are invading from the Red Sea via the Suez Canal, and are impacting on marine biodiversity in all the Israeli Mediterranean habitats (Golani et al, 2007; Rilov et al, 2004; Goren & Galil, 2001; Spanier & Galil, 1990).

The Gas and Oil Industry
This industry, which is fast developing at sea, will have considerable impact on rocky habitats, particularly in cases of breakdown of their infrastructure and polluting incidents. Contaminated mud and drilling water, chemicals used in the production process, methane and oil could all be discharged into the marine environment and cause pollution and severe environmental damage (Becker and others, 2011). As if all this were not enough, even the very fact of laying the transmission infrastructure through the habitats will cause injury. Under National Outline Plan 37 (NOP.37), the areas marked out for laying of the pipeline for gas transmission to land passes through the Gador marine reserve area, the Dor area, as well as through other areas containing sensitive rocky habitats.

Sewage Effluents
The damage from the sewage effluent is twofold: firstly, in the sewage pollution itself and, secondly, because of the presence of the sewage infrastructure cutting across the rocky habitats. The outtake pipe of the Shafdan, (the wastewater treatment facility serving metropolitan Tel Aviv), is one of the largest sources of pollution in the Mediterranean. It traverses the rocky habitat in the Palmahim area and damages habitat and flora. The sludge discharged by the Shafdan into the sea contains large amounts of organic matter, oils, heavy metals and pharmaceutical drug residues, which cause considerable damage to the habitats and their marine organisms.

Desalination Plants
By 2020 the volume of desalination along the Mediterranean coast in Israel is expected to increase from its current level of 505 million cubic meters at the four desalination plants now active, to approximately 704 million cubic meters at 6-7 plants (the Water Authority, 2013). About half the brine discharge into the sea will be carried out at a 40km long section of the coast between Ashkelon and Palmahim (Kress & Galil, 2012).

Photography: Hagai Netiv



Photography: Dr. Aviad Scheinin

The desalination plants damage the habitats in their vicinity, mainly because of the emissions of concentrated salt water and the filtering of a tremendous quantity of seawater (Kress and Shoham-Frieder, 2013; Roberts et al, 2010, Lattemann & Hopner, 2008). Following the desalination process, the concentration of salt in the extruded water is double that of the sea, and contains chemicals used in the desalination process. These chemicals mostly harm organisms close to the discharge point. Seawater filtering could impact on the regenerative processes of the populations of organisms in rocky habitats in the coastal area as a result of diminution of the larvae populations of fish and invertebrates.

Power Stations

Power stations, using seawater for turbine cooling, discharge water that is ~10°C warmer than seawater, and create thermal pollution that impacts on the organisms in rocky habitats close to each station (Nylor, 1965).

Coastal Zone Development

The construction of breakwaters and the expansion of ports affect the accumulation and dispersal patterns of sediments (Nir, 1987), and thus impact on the coastal and rocky habitats.

Air Pollution Emissions

The emissions into the air from vehicles as well as from the cement, metals and energy-producing industries cause pollution of the sea, particularly with heavy metals (UNEP/MAP, 2012).

Global Environmental Changes

Marine habitats are all being affected by global processes of ocean warming, increased water salinity and acidity, and the rising sea level. These changes are also occurring in the Mediterranean and along the Israeli coast[3] and have evidently already made a significant impact on the marine rocky habitats (Rilov and Treves, 2010).

Noise Pollution

Loud noise could harm marine creatures, especially marine mammals (ACCOBAMS[4], 2012; JNCC, 2010; Ketten, 2010). Seismic surveys conducted along the coast in an attempt to discover gas and oil deposits could cause serious harm to populations of dolphins that come into the area and stay. The risk of harming marine animals is further impacted by greater noise pollution from the increased scope of naval activity, which also includes the use of sonar by submarines.

Light Pollution

The widespread use of artificial lighting near the coast as well as on marine facilities disrupts the life cycles, reproductive cycles and navigation abilities of many marine species. The main casualties of light pollution are: birds, which often smash into facilities shining lights; sea turtles, which are naturally attracted to the reflection of moonlight on the sea and, becoming disoriented, move instead to the sources of urban lighting adjoining the beach; and fish and invertebrates of various species, whose reproductive and migratory

[3] Long-term monitoring conducted by the Israel Oceanographic & Limnological Research Institute shows a rise of about 8.5 cm in the sea level at the Israeli Mediterranean coast in 1992-1998. (Rilov and Treves, 2010).

[4] Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area.

cycles malfunction (Deda et al, 2007).

2.3 Human Impact on the Different Types of Rocky Habitat

Here we address the human factors causing damage to different areas in the rocky habitat, according to their distance from the shore and their depth (See).

2.3.1 The Abrasion Platforms

Sightseers walking on abrasion platforms cause damage to the creatures living in and on them.

Many visitors and fishermen leave food scraps and packaging, as well as fishing waste, such as fishing lines, hooks, bait and weights.

Divers and small boats operate and/or moor close to the platforms and often cause physical damage to their edges.

Thousands of amateur anglers cast their rods near the edge of the platforms and in the vicinity of the reefs, spread nets and dive to fish using fishing guns. The sport fishing catch, mostly concentrated in this area, is estimated at about 18% of the total annual fisheries catch (the Society for the Protection of Nature, 2014). Although there is a lack of quantitative data on the changes that have occurred in the fish population in this area, it is reasonable to assume that the pressure of fishing has caused a reduction in the number of fish.

Collection of live creatures living on or near the platform (for example, different species of snail) by fishermen for use as bait affects the composition of the communities on the abrasion platforms.

Pollution by industrial waste and municipal sewage, discharged into the sea via rivers or coastal sewage pipes and air pollution are likely to impact more on the abrasion platforms than on areas further from the shoreline.

The location of the abrasion platforms in the intertidal zone close to the waterline exposes them to the influence of the sea level rise and changes in ocean acidity caused by increased concentrations of carbon dioxide in the atmosphere. These factors, which derive from activities at the global

Table 2: Human Impact Factors on Rocky Habitats (Known and Anticipated)

Influencing factor/area	Abrasion Platforms	Shallow Rocky Habitats (up to 30 m)	Deep Rocky Habitats (up to 125 m)
Fishing	X	X	X
Pollution – solid waste	X	X	X
Invasive species	X	X	X
Infrastructure and development	X	X	X
Physical damage – anchors, walking, sea vessel damage, divers	X	X	X
Pollution – dissolved matter	X	X	X
Thermal pollution (power stations)	X		
Light pollution	X	?	?
Rise in sea level	X		
Rise in salinity	?	?	?
Rise in acidity	?	?	?
Noise pollution	?	?	?
Air pollution	?	?	?
Military activity – firing, ammunition and more	?	?	?

Key:	Impact in all areas	Impact close to shore	mpact unknown & global factors


Photography: Hagai Netiv

level, could damage the biogenic crust coating the abrasion platforms and lead to their erosion. The communities of organisms on the platforms are also sensitive to the rise in the sea's temperature and the frequency of extreme climatic and oceanographic events (heat waves and storms) linked to global climate change (Rilov and Treves, 2010).

2.3.2 The Shallow Rocky Habitats

This area is less accessible to visitors, but is affected by fishing and mooring, military activity, the presence of pipelines and other infrastructure, solid waste that accumulates on the seabed, and industrial wastewater. The ecosystems of the shallow reefs have undergone great changes in recent decades. The changes result from widespread invasion of alien species - a number of which are dominant (for example, algae grazing by Rabbitfish (Siganus spp.), fishing, and the disappearance of many native species for reasons that are not yet known, but which may in part be due to climate change (Rilov, unpublished data).

2.3.3 The Deep Rocky Habitats

Fisheries pressure in the deep area is relatively low, and so their animal populations have in all likelihood been less harmed. However, the growing sophistication of fishing equipment and the ability to reach deeper rocky areas in recent years, are now starting to create heavy pressure on these habitats. The mooring of small craft and military activity, as well as the laying of damage-inducing infrastructure also take their toll on the deep areas. There are reports and evidence of accumulation of solid waste, especially 'ghost nets' even in these areas, but there is almost no quantitative data on the scale of the problem.

2.4 Maintaining and protecting rocky habitats - the situation in Israel

The protection of marine habitats in the coastal water area (within the limits of the territorial waters) of the State of Israel is implemented through legislation. **The National Parks, Nature Reserves, National Sites and Memorial Sites Law (1998)**, allows the Israel Nature and National Parks Protection Authority (abbreviated to INPA) to declare the establishment of a nature reserve or national park, subject to the approval of the Minister of the Interior, after approval of the plan by the Planning and Building Committees of the relevant local authority.

INPA, in recognition of the scenic and ecological importance of the abrasion platforms, gave serious representation to the rocky habitats in the coastal reserves and in the Marine Protected Areas. However, all the reserves total less than 1% of the maritime territory of Israel, so that only about 0.5% of the rocky habitat area is awarded protection under the law. INPA's goal is to reach protection of 20% of Israel's maritime territory, while protecting about 32% of the rocky habitat area (Yahel and Engert, 2012; Weil, 2013).

INPA acts to protect natural assets as defined in the **Declaration of National Parks, Nature Reserves, Historic Sites and Memorial Sites (Protected Natural Assets) 2005.**
The Declaration allows the protection of organisms and non-living natural assets, and in fact is allowed in principle to declare the abrasion tables and Kurkar coastal ridges as protected natural assets[5].
The Fisheries Ordinance, 1937, is the legal means for the prohibition of fishing in particular areas or habitats. The Fisheries Division of the Ministry of Agriculture and Rural Development is responsible for its enforcement.

The Prevention of Sea Pollution from Land-Based Sources Law (1988), the **Prevention of Marine Pollution (Dumping of Waste) Law (1983)**, the **Prevention of Marine Pollution by Oil Ordinance (1980)**, and the **Abatement of Environmental Nuisances (Civil Action) Law (1992)** provide, indirectly, protection over the rocky habitats too.

Other laws affording **protection to the rocky habitats are the Protection of the Coastal Environment Law (2004)**, which defines a ban on the violation of abrasion tables and sea rockeries in caves and on natural ridges in the coastal environment without a permit, and through the Mining Ordinance (1925), it is possible to prevent mining of sea rockeries without a permit[6].

The Planning and Building Law 1965 also provides decision makers and the public a variety of tools through which it is possible to protect the rocky habitats or to reduce the damage to them, starting with an environmental impact assessment and procedures for submitting objections to the planning committees.

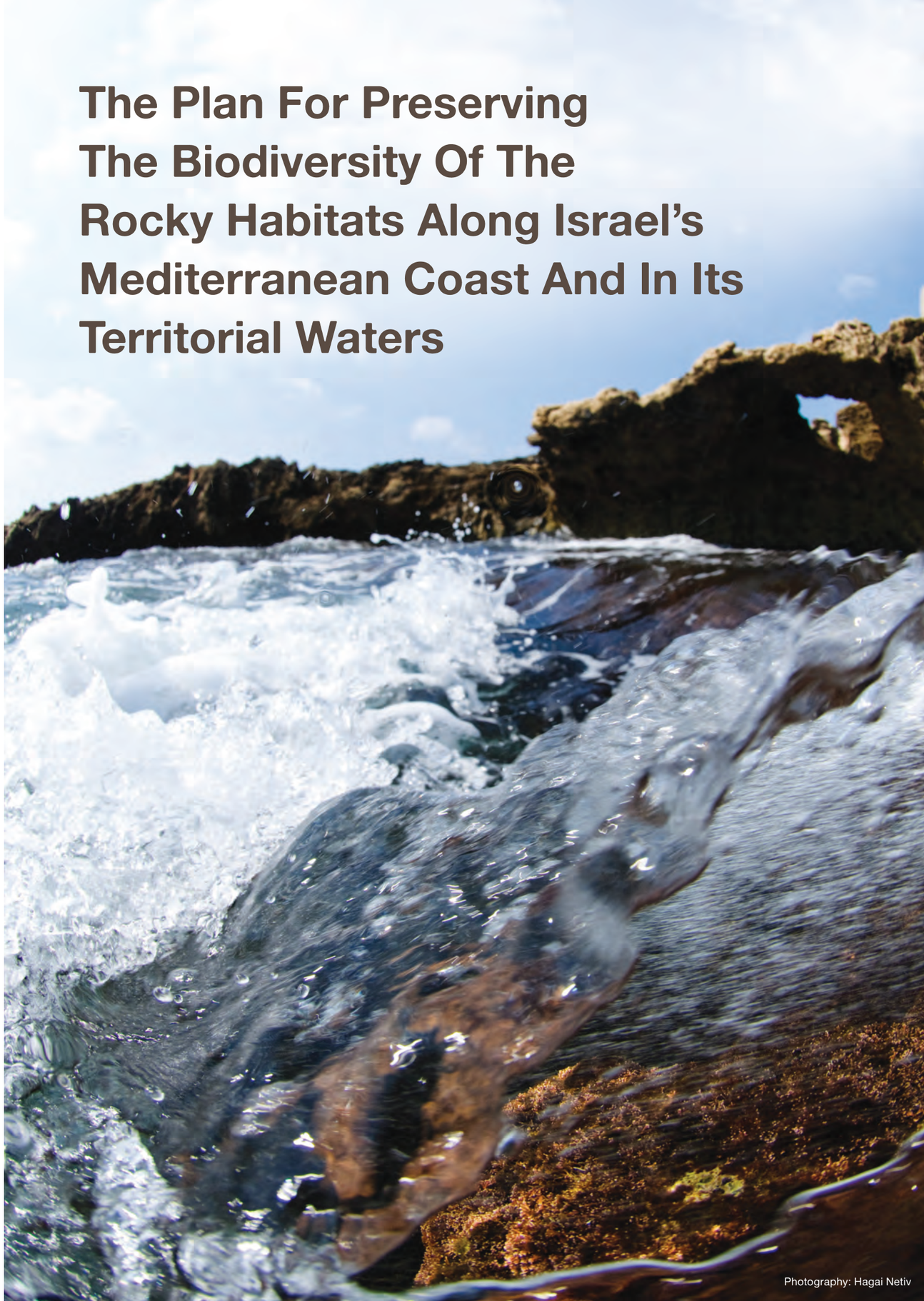
Israel has signed and ratified the Biodiversity Convention. Among the Convention's objectives it was determined that by 2020 Member States would protect at least 10% of the sea and shore areas in their territory, with priority to areas of great ecological importance and would operate a sustainable interface between fisheries and biodiversity issues. In addition, by 2015, Member States must act to reduce to a minimum the human pressures on rocky habitats that are sensitive to the increasing acidity of seawater, such as abrasion tables.

The rocky habitats in Israel do not receive sufficient protection despite the many benefits they provide mankind. The underwater rockery is not considered a protected natural asset, and only a very small section of rocky habitat is included in nature reserves and Protected Marine Areas (MPAs). Outside of the MPAs there is no specific restriction on fishing in rocky areas or targeted protection of the species living there, and in any event, enforcement is poor.
From everything said above, a picture emerges of the State's lack of recognition of the rocky habitats as vital natural assets. There is an extensive mix of legal tools to prevent damage to the rocky habitats, but, in practice, the necessary actions are not taken to carry out such prevention.

[5] Protection of natural assets in the 'Mediterranean Rosh Hanikra-Achziv Marine Reserve' was made under the Declaration

[6] The Ordinance defines "quarries" for which mining requires a permit as "all materials having economic value that are part of the crust of the earth or that their natural origin is from the crust of the earth, including mineral oil, bitumen, asphalt and natural gas, and excluding ore solution or peat, trees, wood for construction and all the produce of the forest and such like, or materials defined in the term "quarry" in section 108.

The Plan For Preserving The Biodiversity Of The Rocky Habitats Along Israel's Mediterranean Coast And In Its Territorial Waters



Photography: Hagai Netiv

The Plan for Preserving the Biodiversity of the Rocky Habitats along Israel's Mediterranean coast and in its territorial waters

3.1 Objectives of the Plan

The key objectives of the Plan are to:

a) Improve the ecological situation of the rocky habitats and see this reflected in an improvement in the relevant indices.
b) Increase the percentage of rocky habitat area included in the areas designated as marine reserves.
c) Establish a statutory and administrative system for the effective and sustainable management of the rocky habitat.

3.2 Outline of the Plan

An effective Plan requires identification of:

- Influencing factors - focused on those having relevancy as well as some ability to mitigate their impact in practice;
- The most effective practices likely to affect the identified factors;
- The target audiences for actions to be implemented; and
- Partners for implementing the Plan.

The factors that impact on rocky habitats are diverse and have varying degrees of strength, subject to their distance from the shore. The degree of impact of certain factors is unknown - or their source is linked to global processes - and our ability to have an effect on them is therefore minimal.

Some factors are of a local nature and their impact is vast across all areas. It is also important to note that by reducing the pressure of these local factors, a more stable ecosystem could be created – one that is more resistant to external influences, such as invasive species or climate change.
The domestic factors are therefore the ones of most value to the Action Plan, and in order to influence the ecological status of rocky habitats, we must first exert influence on these.
The most significant and relevant local factors for the Plan are:

- Fishing
- Solid waste/debris pollution
- Development and infrastructure
- Physical injury (as a result of mooring, damage caused by boats hitting into the habitat, walking across abrasion platforms)
- Invasive species
- Dissolved pollution (different types of waste water and brine).

Proposed methods of action under the Plan include:

- Collecting data
- Formulating proposals for recommended policies and legislation
- Promoting policies and legislation among the decision makers
- Promoting marine spatial planning and marine reserves
- Increasing enforcement
- Focusing information at user groups
- Educating and informing the wider public.

Target audiences for action are to be found among:

- The professional level in public administration - e.g. the Department of Fisheries at the Ministry of Agriculture and Rural Development, planning committees, local government;
- The political level (decision makers) - the social environmental lobby and Members of Parliament who have an interest in environmental issues;

- User groups, such as anglers; and
- The general public.

Potential partners for activities could be drawn from local and global environmental organizations, as well as from academia and government agencies.
Details of influencing factors (the hazards), methods of operation, target audiences and the partners for the types of action are listed in Table 3.

3.3 Actions for incorporation in the Action Plan

The Action Plan incorporates five key tools:

1. Recommendations for policy, planning, legislation and interface
2. Advocating the recommendations among decision makers
3. Advocacy and educational activities
4. Research and monitoring
5. Regional and international operations

3.3.1 Policies, planning, legislation and interface

The first part of the Action Plan includes formulating a policy for the protection of the marine rocky habitats. The policy will include planning processes, spatial marine plans, and strategic plans for sea management and for the protection of natural assets. It will also cover the updating of legislation and regulations that are applicable to the protection of rocky habitats.
The following steps are required in this field:

3.3.1.1 Updating the list of protected natural assets
The possibility should be considered of inclusion of the Kurkar coastal ridges and the abrasion platforms in the list of protected natural assets.

3.3.1.2 Updating the Fisheries Ordinance and the Fishing Regulations
We recommend the amendment of the Fisheries Ordinance and the Fishing Regulations so that they would give protection to the rocky area and the sensitive species inhabiting them. Emphasis should be placed on banning the use of destructive fishing methods, prohibiting the fishing of specific species during reproductive periods, and setting quotas for all types of fishing, including sport fishing.

3.3.1.3 Integrating policies for the protection of rocky habitats into spatial planning
Principles for the protection of rocky habitats should also be included in the National Outline Plans (NOPs) for Coastal and Marine Spatial Planning relating to infrastructure and transportation.

3.3.1.4 Integrating the policies in relevant strategic plans
Principles for the protection of rocky habitats should also be included in reviews and strategic plans for the management of the coastal and marine environments.

3.3.1.5 Promoting the approval and designation of marine reserves


Photography: Hagai Netiv

Photography: Hagai Netiv

Rocky habitats should also be incorporated into designated and protected marine reserve areas.

3.3.1.6 Strengthening enforcement in reserves

To facilitate more vigorous supervision, we aim for more personnel and higher budgets, as well as an increase in the fines imposed on offenders.

3.3.1.7 Strengthening the ties between INPA, the community and environmental organizations

To strengthen wider involvement, the marine reserves should be introduced to the public and the community. Environmental organizations, activists and interest groups in the community could be invited to participate in the operation of the reserves.

3.3.1.8 Strengthening enforcement in the fisheries interface

Enforcement in the rocky habitats should be a central element of a sustainable fisheries interface.

3.3.2 Promoting the recommendations among decision makers

Decision-making occurs at two levels. The political echelons make the decision at the legislative and policy level, whereas the professional tier makes the field-level decisions. This is reflected in guidance and interface procedures and in the implementation (or non-implementation) of policies.

Promoting and lobbying a project starts with persuasion. Persuasion should lead the political echelon to formulate desirable policy, and the professional echelon to act to realize it. To illustrate, in lobbying the professional echelon, the goal might be to draft an official and operative policy paper for them to champion through to approval by the political entities. Another goal could be to encourage the political entities to place pressure on the professional level to draft a document of this type and disseminate it in relevant circles of activity (internal meetings at relevant government offices, debates in Parliament, at forums and conferences and so on).

In this process it is important for the decision-making echelon to receive professional information and base the required legislation and policy on it. Experience shows that focused lobbying activity capable of influencing decision makers is a lengthy process requiring ongoing professional accompaniment and support throughout the entire process through to implementation of the policy.

The three key steps for promoting and assimilating policy

Persuasion tactics > engagement with the process > support and assistance

3.3.2.1 Recommended Key Steps to Promote Policy and its Assimilation include:

3.3.2.2 Creating a reliable and up-to-date database

The database would include professional reports, position papers and background documents to provide to decision makers for their use as the basis for their recommendations.

3.3.2.3 Mapping out ‘activity intersections’

Meeting with decision makers is possible mainly during parliamentary debates, in professional committees, at conferences and professional forums, and in closed meetings. These intersections must be mapped and we must become a part of their activities.

3.3.2.4 Focused activity with decision makers (lobbying)

To promote formation of the desired policy, we must take advantage of the ‘activity intersections’ to meet key people, provide them with information, and present the positions and vital arguments for promoting the desired policy.

3.3.2.5 Cultivating personal relationships with decision makers

We envisage building direct contact with those responsible for legislation and policy are essential to develop the ability to mobilize decision makers to act in favor of the processes. We must create and develop communication channels of these kinds.

3.3.3 Information and education

Success in promoting a policy for maintaining the marine rocky habitats requires raising public awareness of their importance and the need to protect them. Raising awareness will contribute to positioning the issue at the top of national priorities and create broad public consensus on the essential change. Therefore, the public information campaign must be handled as a parallel activity to political lobbying - so as to strengthen promotion of the desired policy.

Educational activities are an important element in strengthening public awareness in the short and long term, as participating students reach favorable views on the issue as a result.

Building an effective information campaign to raise awareness on a specific topic requires action on two key axes: the first is about content management, which includes selection of the appropriate subjects and messages.

The second is about process management, building an outline of activities, and coordinating between the two.

We recommend working to the following outline:

3.3.3.1 Mobilizing a broad coalition of stakeholders

In the first stages, it’s important to harness a wide circle of interested parties and experts in their field to promote the issue and disseminate it in wide circles.

3.3.3.2 Building the strategy for the advocacy campaign

To best formulate strategy, we must choose a permanent working group to discuss appropriate methods for action for all entities as a whole and for each of them individually (advertising, PR, collecting relevant material and lobbying activity), and formulate a set of messages that appeal to the widest common denominator of all the partners.

3.3.3.3 Activity on the Internet

In the Internet environment it is possible with a relatively low budget to create considerable impact and divert public opinion to the issues on the agenda. We therefore need to add a dedicated website, a Facebook page, etc., in addition to recruiting partners and building a suitable strategy.

3.3.3.4 Focused activity with interested parties

As well as the broad public information campaign, we must operate focused information campaign directed at stakeholders, such as:

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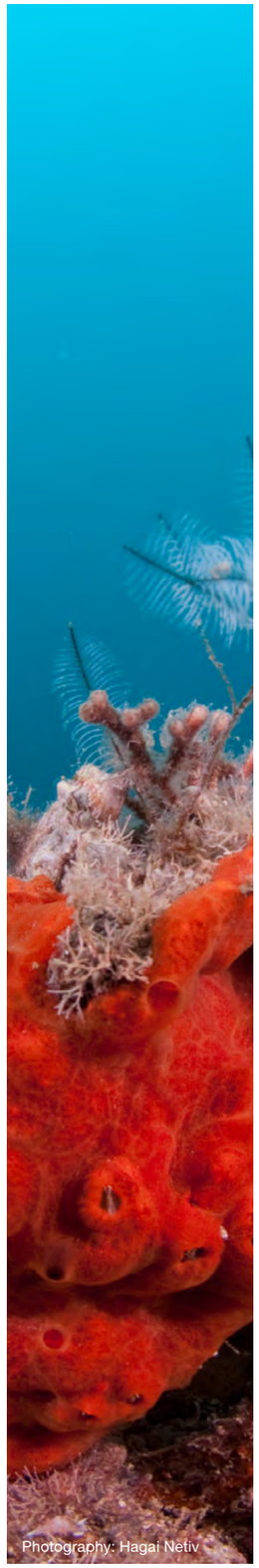
Photography: Hagai Netiv

scuba diving clubs, the Fishery Forum and other groups that have a direct connection to the topic, but lack expert information.

3.3.3.5 Educational activity

The educational actions we plan to undertake cover a wide range of activities such as: running educational programs on the question of the rocky habitat and how to protect it, talks and school trips for school children, producing and distributing educational materials.

3.3.4 Research and Monitoring

Promoting a policy for the sustainable management of the rocky habitat and the development of processes for effective decision-making, require a constant inflow of data and updates to keep information fresh. The information gives an indication on the ecological condition of the rocky habitat and the marine environment as a whole, as well as other information essential to effective environmental management and the development of new management tools. It is important to collect data, distribute it and assimilate it among relevant audiences in the following areas:

3.3.4.1 Ecological monitoring and research

The continuous gathering of fresh and concentrated information over an extended period, will give a broad current picture of the ecological changes taking place in the rocky habitat, and the damage being caused to it. The information will allow follow up of the effectiveness of the Action Plan and future plans, and will serve the process of preparing educational and advocacy materials, and in actions for promoting and assisting in the decision-making process in the marine management environment. In addition, ecological research must be conducted to gain an understanding of the factors intruding on - and the processes taking place in - the rocky habitat.

3.3.4.2 Making the information accessible to the public, the researchers and decision makers

It is vital to make the body of information from research and monitoring programs clear and accessible to the defined audiences so that it can be understood by the public at large and not only by the professionals.

3.3.4.3 Economic research

The intention here is to research aimed at providing economic estimates to assist in planning and management. Evaluation of ecosystem services[7] to the rocky habitat is an example of this type of research.

3.3.4.4 Feasibility studies and assessing public attitudes

Through the use of polls, the intention is to involve the public and learn what its needs are. For example, examining the willingness of residents of a particular area to have a marine reserve in their area.

3.3.4.5 Research into applicable management tools

There is a need to test and develop management tools that will facilitate the best and most effective management of marine

[7] Ecosystem system services are the full complement of processes and functions of ecological systems that areimportant to human life and wellbeing. They include physical outcomes (for example: food), cultural services (for example, beaches, heritage), and regulating services (for example: climate control).

reserves, a sustainable fishery interface, and protection of the rocky habitats with tools and other means. An example of this type of research would be examination of a management model that enables public participation in marine reserve management.

3.3.4.6 Operating a Citizen's Science Program

These programs expand the circle of data collectors, and additionally have a significant informational-educational dimension. An example of such a program is the Reef Check Program, which is run by an NGO, and is active in many countries in the world, including the US, Australia, Japan and Indonesia. In the Mediterranean, the Program runs in Italy and France. Reef Check relies on underwater surveys carried out by volunteer divers under the guidance of scientists and experts. (http:www.reefcheck.org). In Israel, a citizen's science program is in operation for underwater ecological monitoring, run by the Nature and Parks Protection Authority and the Israeli Diving Federation.

3.3.5 Regional and International Activity

Activity at the regional and international level will enable strengthening of existing knowledge and the reciprocal exchange of information, which will assist in promoting joint regional programs in accordance with the ecosystem-based management[8] approach. Such activities include:

3.3.5.1 The participation of stakeholders in international meetings

As valuable and extensive information is exchanged at international and regional forums and conferences on the management and protection of rocky habitats and on marine-environmental education, it is vital that we participate in such events. For example: workshops held by MEDPAN, an organization that acts to promote marine reserves in the Mediterranean Sea and to create a network for the exchange of information between managers of the reserves.

3.3.5.2 Protocols for sharing information from monitoring and research

The unification of research methods and data comparison at the international level will help to formulate the best policies and in optimal decision-making practices.

3.3.5.3 Promoting joint programs in research, monitoring and education

There are many advantages to be gained in collaborating in regional and international ventures, such as better access to financing, more economical use of resources, and enabling a wider range of activities geographically and in terms of the scope of influence.


Photography: Hagai Netiv

[8] This is an environmental management approach that takes into account the variety of factors in an ecosystem, including the human factors, and the interaction between them. This approach is contrary to the traditional sectorial approach of looking at individual sectors and focusing on the management of specific factors, activities or services, while not necessarily doing so across all factors and activities.

Table 3: The Action Plan – Summary Of Activities, Outcomes, Target Audiences And Partners

Fishing

Action	Research, monitoring, amassing and distributing information		Promoting policies & legislation for a sustainable fisheries interface		Spatial planning: promoting regulating of marine reserves		Increasing fishing- related enforcement		Education & information	
Outcomes	Ecological indicators of the status of the rocky habitat; basis of latest data on biodiversity in the rocky habitat; latest data on fishing pressure		Sustainable management of fishing in the rocky habitat		Increasing the percentage of rocky habitats being protected in marine reserves		Effective enforcement of fisheries interface; effective management and enforcement of existing marine reserves		Increased collaboration among fishermen; increased awareness among the public of the need for sustainable management of fishing in Israel and around the world	
	Target audiences	Potential partners	Target audiences	Potential partners	Target audiences	Potential partners	Target audiences	Potential partners	Target audiences	Potential partners
Ministry of Environmental Protection	V									
Ministry of Agriculture and Rural Development - Fisheries Dept	V		V	V				V		V
Authorities & Planning Committees					V					
Nature and Parks Authority	V	V	V	V		V	V	V		V
Local Authorities								V		
Members of Knesset (MKs)	V		V							
Stakeholder groups	V		V				V	V	V	V
Institute of Oceanographic & Limnological Research		V		V						
Universities		V								
Environmental organizations	V	V		V		V		V		V
International bodies & organizations	V			V		V				
Community & public	V							V	V	

Solid waste pollution in the sea and on the beach - marine debris

Action	Research, monitoring, amassing and distributng information		Formulating and promoting policies & legislation to reduce solid waste and debris on the beaches and in the sea		Enforcement & interface: increased enforcement and promotion of cleanup operations on undeclared beaches		Education & information	
Outcomes	Reliable information to manage the problem of coastal and marine debris in Israel and in the Mediterranean region; current indicators on the state of coastal and marine cleanliness		A policy document for managing the problem of coastal and marine debris; effective management of this problem		Decreasing the amount of waste dumped by the public at the beach; improving the cleanliness indicators of the beaches and the sea		Public awareness of the need for a solution to the problem of marine debris	
	Target audiences	Potential partners	Target audiences	Potential partners	Target audiences	Potential partners	Target audiences	Potential partners
Ministry of Environmental Protection	V	V						
Ministry of Agriculture and Rural Development - Fisheries Dept.	V		V	V			V	V
Nature and Parks Authority					V			
Local Authorities	V		V	V		V	V	V
MKs								V
Stakeholder groups	V		V				V	
Institute of Oceanographic & Limnological Research	V							V
Universities		V		V				
Environmental organizations		V						
International bodies & organizations	V	V		V		V		V
Community & public	V	V		V		V		

Invasive species

Action	Research, monitoring, amassing and distributing information		Promoting policies and legislation for a sustainable fisheries interface		Spatial planning: promoting regulating of marine reserves		Increasing enforcement in existing reserves		Education & information	
Outcomes	Reliable information for the control over and management of invasive species in Israel and in the Mediterranean; ecological indices of the status of the rocky habitat		Sustainable management of fishing in the rocky habitat with reference to the issue of invasive species		Increasing the percentage of protected rocky habitats as focal points for the regeneration of local species		An improvement in the functioning of marine reserves as the focal points for the regeneration of local species		Cooperation with the fishermen in the management of the interface for invasive species and sustainable fisheries; increased awareness among the public to the problem of and need for a sustainable fisheries interface	
	Target audiences	Potential partners	Target audiences	Potential partners	Target audiences	Potential partners	Target audiences	Potential partners	Target audiences	Potential partners
Ministry of Environmental Protection	V									
Ministry of Agriculture and Rural Development - Fisheries Dept	V		V	V				V		V
Authorities & Planning Committees					V					
Nature and Parks Authority	V	V	V	V		V	V	V		V
Local Authorities								V		
MKs	V		V							
Stakeholder groups	V		V				V	V	V	V
Institute of Oceanographic & Limnological Research		V		V						
Universities		V								
Environmental organizations	V	V		V		V		V		V
International organizations & bodies	V			V		V				
Community & public	V							V	V	

Development & infrastructure

Action	Formulating policies to protect and promote rocky habitats		Spatial planning: promoting the regulation of marine reserves		Education and Information	
Outcomes	A policy document for the protection of rocky habitats; incorporating principles of rocky habitat protection in development plans		Increasing the percentage of rocky habitats in marine reserves		Create public awareness of the importance ofprotecting rock habitats	
	Target audiences	Potential partners	Target audiences	Potential partners	Target audiences	Potential partners
Ministry of Environmental Protection	V					
Authorities & Planning Committees	V		V			
Nature and Parks Authority	V	V		V		V
Local Authorities			V	V		
MKs	V					
Institute of Oceanographic & Limnological Research		V				
Universities	V	V				
Environmental organizations	V	V		V		V
International bodies & organizations	V	V		V		V
Community & public					V	

Invasive species

Action	Increasing enforcement		Education & information	
Outcomes	Decrease in the physical damage to rocky reefs and abrasion platforms		Collaboration of "end users" in preventing damage to the rocky reefs and abrasion platforms	
	Target audiences	Potential partners	Target audiences	Potential partners
Ministry of Environmental Protection	V	V		V
Ministry of Transport - the Administration of Shipping and Ports (ASP)	V			V
Ministry of Agriculture and Rural Development - Fisheries Dept.				V
Nature and Parks Authority		V		V
Local Authorities	V	V		
MKs	V			
Stakeholders Groups	V	V	V	V
Institute for Oceanographic and Limnological Research				
Universitities				
Environmental organizations		V		V
Community & public	V		V	

Dissolved substance pollution

Action	Research, monitoring, amassing and distributing information		Promoting policies and reducing dissolved substance pollution		Education & Information	
Outcomes	Reliable information for the management of coastal and marine garbage in Israel and the Mediterranean area; current indicators of the status of cleanliness of the beach and the sea		Reducing pollution and preparedness for faults and polluting incidents		Public awareness of the need to prevent pollution	
	Target audiences	Potential partners	Target audiences	Potential partners	Target audiences	Potential partners
Ministry for Environmental Protection	V	V	V	V		V
Ministry of National Infrastructures,Energy & Water Resources			V			
Nature and Parks Authority	V					
Israel Electric Corporation & desalination plants		V				
Gas & oil companies		V				
Shafdan & other wastewater treatment plants		V				
MKs	V		V			
Stakeholder groups		V				
Institute of Oceanographic & Limnological Research		V				
Universities		V				
Environmental organizations	V	V		V		V
International bodies & organizations	V			V		V
Community & public	V				V	

Table 5: Action Plan phases (schedule)

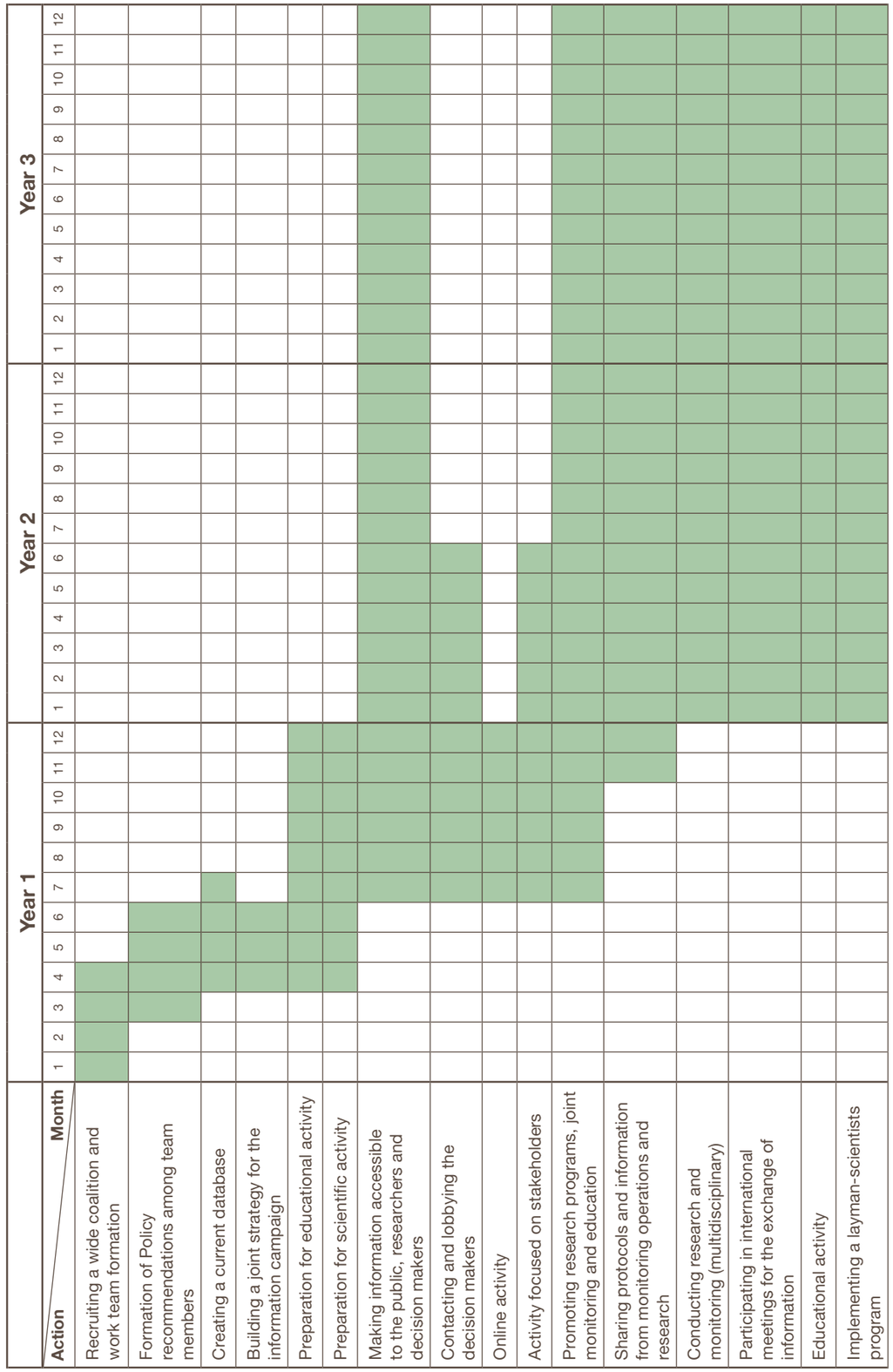

Table 4: Stages of the Action Plan (breakdown by field of activity)

Field	Action	Product
Preparations for operation of the Plan	Recruiting a broad coalition of stakeholders to operate the Plan	Setting agreed goals
	Formation of working teams	Allocating tasks; setting schedules
Formulating and implementing policy recommendations, planning and legislation	Formulating policy recommendations in the working teams	Position papers
	Creating a current database	Reviews and background documents
	Creating contacts and focused activity (lobbying) before decision makers	Promoting and amending legislation and planning
Information and education	Building a common strategy for the information campaign	A working plan for the information campaign
	Preparing educational activities	Educational programs; determining the location and target audience for their operation
	Internet activity	High public awareness of the issue
	Focused activity for stakeholders	Support and shareholder engagement
	Education activity	Increased awareness among children and youth
Research and monitoring	Preparations for research activity	Determining research areas and objectives; locating research institutes, and researchers and student partners
	Conducting research and (monitoring (multidisciplinary	Information and up-to-date statistics
	Accessibility of the information to the public, to researchers and decision makers	Knowledge-based decision making
	Operating Citizen-Science programs	Creating active volunteer groups
Regional and international activities	Participation in international information exchange meetings	Improved methods of operation and meaningful strategy
	Sharing protocols and information accumulated from monitoring and research	Comparison with international data
	Promoting joint projects of research, monitoring and education	A wide range of information, wide scope in raising awareness, access to additional sources of financing

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Photography: Hagai Netiv


Photography: Hagai Netiv

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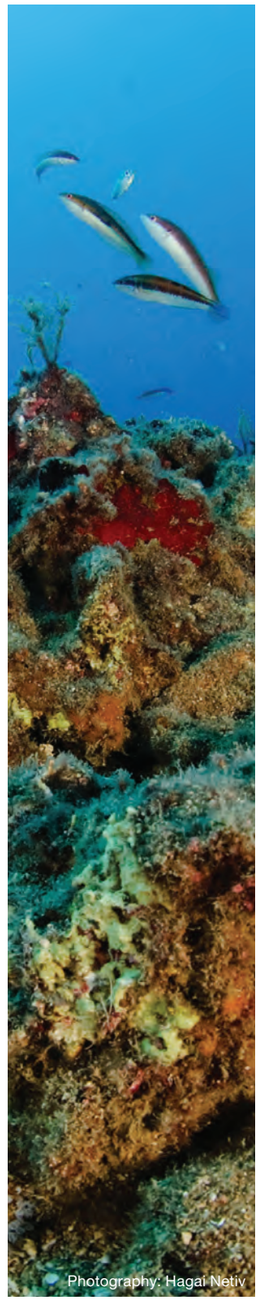
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About the EcoOcean Association

EcoOcean is Israel's leading association supporting marine research. It is also one of the leaders in the country in the field of education and preservation of marine and coastal nature.
The Association's goals include the promotion of coastal and marine environment protection in our region. It carries out these aims through research, education and advocacy, raising environmental issues onto the public agenda, and influencing decision makers on policy issues and legislation.
A group of Israeli scientists and environmentalists founded EcoOcean as a not-for-profit association in 2002. Through its research vessel, R/V Mediterranean Explorer, EcoOcean supports research that aims to expand knowledge and improve the state of the marine and coastal environment, while promoting cooperation between researchers from different countries.
In the field of education the Association operates 'Discovery Center' - an educational facility for teaching marine and environmental sciences at Kibbutz Sdot Yam. The Center holds a variety of educational programs on marine and environmental topics, designed for a wide range of audiences: lectures, field trips, research programs, study days and seminars, sea and beach activity, and more. The Association also works in schools and in the community in collaboration with the Ministry of Environmental Protection, the Green Network, and other bodies and organizations.
EcoOcean is the exclusive local representative of the global organization Foundation for Environmental Education (FEE) and currently operates the Blue Flag program, which awards an eco-label – a voluntary quality standard – to bathing beaches and marinas that meet strict criteria relating to seawater quality, services provided to the public, disabled access, and more.
'Young Reporters for the Environment' is another FEE program operated by EcoOcean to promote the involvement of youth in environmental issues through journalism.
Additional areas of activity of the Association include promoting programs and activities to maintain and protect rocky habitats and marine species and foster international cooperation in the field of education and research.


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