What is your vision for the field of the marine sciences in Israel in the coming decade?

Greater interdisciplinary cooperation between the various marine scientific/academic institutions as well as between them and the marine industries and governmental ministries and agencies

Development of Interdisciplinary University Center of Marine Studies with new staff positions and necessary financing

An emphasis on process-level, quantitative understanding of the controls on the coupled evolution of biogeochemical cycling and climate in our region and globally. Such an understanding will arise from excellent field studies and sampling campaigns, alongside an insistence on understanding the data obtained in such studies at a mechanistic level through integration of theory and models of appropriate complexity. Dissemination of the insights gained not only in the professional literature, but also to the public and to decision makers, with the aim of influencing economic, environmental and social policy.

There are five major pillars that could uphold a more sustainable future of the region:

1. Water: Desalination is increasingly becoming the main freshwater source in Israel, approx. 80% of consumption by 2020). Water desalination can be further developed to minimize environmental impact and become more efficient.

2. Food – Mariculture may be the foremost answer to fostering food security in this region. Israel can become a leader in the clean technology of mariculture (aka blue-tech) and thereby creating solutions that will reduce environmental impact.

3. Energy – Gas, petrol, and alternative energy sources from the sea (both wind & wave) are required to sustain the desalination plants and the local economies under climate change.

4. A sustainable marine environment is defined as ecologically balanced, with clean water & long-term resource management).

5. Marine Technology (engineering)

here is just a taste of a roadmap:

It is an opportunity to ensure both safe potable water and support a viable mariculture industry. In addition, a clean and healthy sea will also help in developing other economically valuable avenues, such as drug discovery from the sea.

We propose to establish the first faculty of aquaculture in Israel and as far as we know worldwide. The faculty will be able to provide the necessary infrastructure (Scientific, HR, and physical) for development of state of the art technologies and innovations propelling Israel’s mariculture industry to the highest tiers. We aim to lead in Mariculture, marine biotechnology, aquaculture engineering, environmental impact assessment & control, and more. Israel will be able to export knowledge and impact regional economy and hopefully beyond.

Key Goals:

Water
It will address the water desalination issue in three main paths:
1. Improving the existing technology through novel engineering solutions that will lower the impact on the environment and lower production cost.

There are five main operational elements of a desalination treatment systems: Feedwater intakes, Pretreatment, Membrane-based desalination, Post-treatment and Concentrate management. We will
focus on Feedwater intakes.
Feedwater intakes

There are three main types of intakes: Open intakes, subsurface intakes, and co-location with existing intake. Most plants in Israel use an open-intake sometime they are co-located with a power plant intake. The main problem is Impingement and Entrainment (I&E) of aquatic species. Impingement – relatively larger organisms are trapped against the intake screens and disrupt the influx of water to the plant. Entrainment occurs when small organisms are passing through the screens and continue through the whole system into the treatment facility.

In Israel and throughout the eastern Mediterranean we have a growing problem with year-round outbreaks of gelatinous organisms (jellyfish (medusa), ctenophores, salps, and haetognatha) mostly in the summer months. We plan to combine forces of our marine biology department and marine engineering, to mitigate this problem (causing major reoccurring disruptions) by creating a feasible solution based on the biology of jellyfish (the main intruder) and a special design intake that will prevent the jellyfish to enter. Based on our preliminary research we noted that jellyfishes are acoustically vulnerable and that we may be able to manipulate their autonomous movement. The novel intake will be designed to deflect the Jellyfish prior to the entrance, while not affecting the rate of intake using a close circuit pumping system.

2. The Israeli shoreline is undergoing major shifts from a marine geophysical aspect that needs to be studied and assess the threats that these changes pose on desalination plants. We will deploy much-needed measuring equipment to follow subtle changes that may affect the plants (sediment, water chemistry currents) and create a full risk assessment plan that will lead to a long-term management plan.

3. Assess the impact the desalination plants have on the ecology and biology in its vicinity while creating an effective long term study that can also monitor potential biological changes that can serve as early warning signs for a decline in seawater quality.

Food
The Center will become a hub for creating clean marine biotechnologies (blue-tech) beyond the state of the art.

1. In this fast-growing field, there are a few key issues that hider the safe and sustainable future of mariculture: Marine pathogens that raise havoc in early as well as late stages of fish and fry development and risking the natural environment due to potential infection of wild populations. Our cutting edge contribution will be in creating both general and specific kits that will be able to identify the key pathogens found in the Mediterranean Sea. We will use advance molecular methods for early and cost effective detection of these marine pathogens.

The marine pathogen transmission working group’s (WG) goal is to determine the main pathogenic threat to the mariculture industry for both the Mediterranean and the North Sea regions. We aim to create protocols and kits for the evaluation of fish health status in the both cage and wild fisheries, which will be aimed at specific pathogens and include: Photobacterium damselae ssp. Damselae, Photobacterium damselae ssp. Piscicida, Vibrio harveyi, Vibrio parahaemolyticus, Vibrio vulnificus, Streptococcus iniae). Diagnostic kits will be designed for these targeted pathogens, and the various consortium members will tailor their kit towards their regional species. Using the eastern Mediterranean region as an example, kits have already begun to be developed for Mycobacterium spp., Piscirickettsia salmonis. Myxozoa spp., Red sea bream irido virus (RSIV), Lymphocystivirus, Nervous necrosis virus (NNV).

Different diagnostic methods will be in continuous development and evaluated as possible candidates for the final, commercial kits. For this, known and novel systems will be developed using DNA array-based diagnostics, specific monoclonal antibodies, real-time quantitative reverse transcriptase (qRT-PCR), and
What is your vision for the field of the marine sciences in Israel in the coming decade?

2. Another key challenge in mariculture is the source of the protein and fatty acids that are fed to the cultured fish. The market price of feed, in fact, is constantly increasing as a result of the progressive restriction in the availability of fish meal (FM) and fish oil (FO) - which represent the basic ingredient and that is almost entirely imported from South America - due to overexploitation of fishery resource ocean. We will develop new technologies and innovative protocols to create new products able to respond effectively to the needs of aquaculture innovation, formulating eco-friendly feed, using raw materials from algae, fungi, yeasts, and insects. The integration of conventional feed, with the materials that we propose, will lead to the formulation of feed that will improve the welfare of farmed fish, the quality of fish products, reducing the environmental impact and finally the production of fodder with a lower price.

**Energy**

Most of the natural gas is planned to be transported to land via underwater pipes. One of the big risks is that the pipes will be affected by seafloor instabilities and that we will have no warning. Scientists (at the Helmsley Charitable Trust Mediterranean Sea Research Center) have documented more than 400 landslides located at depths between 130 to 1000 m all across the Israeli continental slope and into deeper waters. These have all been deemed to be “recent” in geological terms, i.e. less than 50,000 years old. What triggered these landslides in the past is still unknown. However, the conditions for creating instabilities in the subsurface are present and abundant in this area. Hence, it can be assumed that these features are still potentially active. One result of such landslides can be the formation of deadly tsunami waves, which can wash the coastal cities of Tel Aviv, Gaza or Haifa. Submarine landslides and underwater gas seeps pose a threat to the stability of the seafloor and thus to coastal development and a major threat to the natural gas infrastructure.

To better understand these two interconnected and dangerous processes, we propose to set up an integrated seafloor monitoring system. The aim is to place an array of seismometers on the continental shelf to “listen” for minor earthquakes that can lead to potential landslides. The project will further strengthen our academic and scientific ties with our neighbors in the eastern Mediterranean Basin. To understand the two interconnected and dangerous processes of submarine landslides and seafloor gas release, we propose to set up an integrated seafloor monitoring system. The idea is to place an array of seismometers on the continental shelf to “listen” for minor earthquakes that can lead to potential landslides. A second array of seafloor seismometers will be placed in an area of active methane seeps to look for simultaneous changes in gas release to see if these two processes are in fact connected. In addition, a monitoring system will be constructed to record continuous measurements in the water column in the vicinity of the active seepage area. To accomplish this task, we plan to deploy a CTD monitoring device attached to a glider that moves up and down in the water column continuously transmitting conductivity, temperature and depth measurements every 100 m. The CTD device will include a methane sensor to detect the amount of greenhouse gases escaping into the atmosphere. Existing monitoring stations will be connected to form a network throughout the Mediterranean. These include the two joint University of Haifa – Texas A&M stations (in water depths of 120 m and 1500 m), as well as numerous ocean observatories throughout the eastern Mediterranean (for example, the four stations in the eastern Mediterranean that are part of the European FixO3 initiative). In addition, the vast networks of ocean gliders in the Mediterranean will provide additional, real-time information on parameter such as temperature, conductivity (to calculate salinity), currents, chlorophyll fluorescence and optical backscatter.

2. We will embark on research focusing on harvesting alternative energy form the sea mainly.
What is your vision for the field of the marine sciences in Israel in the coming decade?

Concentrate our efforts on hydrokinetic energy (wave action) and ocean thermal energy conversion (OTEC).

Alternative energy form the stems from six main sources, ocean thermal energy conversion (OTEC), surface waves, tidal range, tidal currents, ocean currents and salinity gradients (osmotic power). Since we have relatively insignificant tide range or currents, we can leave them out as a viable option. Unfortunately, our rivers are few and their flow rate is low, thus not sufficient to support salinity gradients (osmotic power). Therefore, we chose to focus on two promising directions that a country like Israel with such a (relative to its size) long coastline should pursue. We have now established a marine engineering department that can combine efforts with other institutes in Israel and beyond to become a leader in this important field.

The OTEC may be especially useful most of the year (8 months – where sea surface temperatures are above 24°C while the deep water keeps at least 5°C lower.

OTEC working principle:
Hydrokinetic energy (wave action) is another potentially efficient alternative energy source that can be implemented given the local sea conditions. Wave action (both offshore or coastal) is the most productive hydrokinetic energy. Here in Israel we have both offshore and coastal wave action year-round with massive winter storms. During summers, coastal wave action is almost constant and effective. There are a few prototypes that are working in several locations worldwide (Oscillating water column device: Oceanlinx in California, Overtopping device: Wave Dragon and Pelamis Wave Energy Converter from Scotland).

This research will require a working knowledge of spatial and temporal patterns in nearshore waves. A model output for swell wave height over the shelf and along the shoreline of Israel – we hope to get this from the new buoy system we are installing in both deep water and on the continental shelf with Texas A&M University (THEMO).

We strive to develop with commercial partners a cost-effective method to harness this untapped resource into usable energy. It will be custom built for our specific conditions in the Israeli coast and offshore.

Marine strategy
Israel will need to look far into the future and plan a long-term strategy to implement policy that will enable harnessing the states natural resources to the maximum without creating regional turmoil. This will become increasingly difficult considering the geopolitics of this troubled region. We propose that massive research will be performed to lay a solid foundation to such a plan. This will include the following:
1. The projected geopolitical situation under different scenarios
2. Investigating the security issues that may change due to the new energy discoveries in recent years.
3. A detailed economic research on the different paths the Israeli and regional economy may be heading into.
4. What will be out statutory position regarding international law, especially following disputes about the EEZ boundaries.
5. A Sustainable Marine Environment

We now know that we need a much more robust knowledge of our food web and our physical and chemical environment to comprehend this unique ecosystem. We also noted that we need to enhance our knowledge of marine microbiology and the impact of key pollutants on marine life (such as heavy
What is your vision for the field of the marine sciences in Israel in the coming decade?

2. How is the eastern Mediterranean food web affected by the global change and local disturbances? The Eastern Mediterranean is undergoing major environmental changes that accelerated dramatically over the last 40 years. It has also been affected directly by the turn off on the Nile River in 1965. It is also the location of the largest importation of exotic species anywhere in the world that pass through the Suez Canal into the Mediterranean. These changes and others specified in the above section combined with long term environmental and climate change pose a clear and demonstrable threat to the remaining flora & fauna as well as to the water quality of the sea. The research will include the entire mesophotic depth range (0-200m) and therefore we plan to develop novel deep-sea sensing and monitoring technologies including the deployment of new gliders (see above, paragraph 1). Furthermore, we plan to launch a large research program that will focus on large marine predators that have a major role in every ecosystem. We intend to research 25 species of sharks present at our Coastal and deep waters, Blue fin Tuna and marine mammals. This will mark the largest effort of its kind in the EMSB ever. Many of these species are close to extinction from the Mediterranean Sea and are only found here near the Israeli shoreline. Why focus on top predators? They are the best markers to assess the entire food web. We are going to harness state of the art analytical methods to establish the condition (number of trophic levels, and the trophic efficiency- how well is the energy transferred through the food web) of the food web. This will be achieved using compound-specific stable isotope analysis (SIA) method. The advantage of using compound specific SIA is not limited only to δ13C (stable carbon isotope ratio) but had expended also to Stable nitrogen isotopic composition (δ15N stable nitrogen isotopes ratio) both will allow to determine the number of trophic levels, and the trophic efficiency and the food source. The method is based on observations of elevation in δ15N values of organisms as they belong to higher trophic levels. The latter will allow us to compare present day top predators with preserved samples we obtained from over 50 years ago, thus we will be able to tell what exactly happed to our local food web. The sharks are also tagged with special barcodes and with both acoustic and satellite tags.
What is your vision for the field of the marine sciences in Israel in the coming decade?

My vision includes an increased interest in diverse aspects, not just in the ‘popular’ ones, basic knowledge incorporated with modern methods, and science-based management decisions.

First we need to have an account of the marine species (from bacteria, protists, invertebrates, vertebrates). Invasive and non-invasive

Then we need to better understand the different pressure (pollution from plastic, water pollutant, invasive species, salt pollution from desalination plants, over-fishing)

We need to have more marine reserves, especially along the Mediterranean coast.

We need to have monitoring for pathogens and pollution.

ишפרתعط הздравות שלchers

מתקרי מופתים עם המדינות השכנות בים סוף, מתקני מחקר איכותיים מהמובילים בעולם - מערכות שאיבה מהים, מערכות חישב ובקרה מרחוק, שהיא יותר פיזיקה מאשר ביולוגיה.
What is your vision for the field of the marine sciences in Israel in the coming decade?

Vision:
1. A central institute responsible of operating and maintaining (in operational state) the marine research facilitates (Ship, AU, ROV, Streamer, gliders, etc). IOLR is the probably the right institute for the job. As long as the use is open to everyone in the community to use (Academic and Governmental) with no preconditions (see below in the Current status).

2. A dedicated annual funding for ship-days (and other marine research-facilities time, e.g. ROV) based on submitting of personal-proposals (review of proposal similar to ISF or even as an ISF special marine program). If granted, the central institute will be responsible for executing the research-program under the direct leading of the granted researchers (PIs) as a service (i.e. all acquired data belong to PIs).

Current status:
Researches/labs and institutes ‘own’ the facilities recently purchased by governmental dedicated funding. They are not entirely open to the use of the entire community. Use in many cases is on the base of personal collaboration or other. Means, e.g. that for the use of Bat Galim and on board facility, I am forced to take an IOLR personnel as an academic collaboration. Their contribution is technical in its nature (on board) and is behind research-schedule ( in the post-excursion data analysis stage). This is because these personnel are working year round for other researchers and do not have time to conduct real academic research. In addition in other cases I need to double pay, to IOLR for the ship time and to a different lab for the use of a research tool, e.g. streamer.

I envisage marine sciences in Israel, and especially studies of the Mediterranean, becoming highly collaborative and inter-disciplinary. A national program of moored instruments (based on THEMO and DeepLev), lab instruments and routine cruises, operated by a highly experienced set of professional scientists, provides the necessary data to answer scientific and societal questions. The data from this program and from individual researchers is organized, maintained and analyzed by professionals in data sciences and oceanography, and is made freely available. The same program also supports access to sea-days (e.g. berths on routine cruises) and high-quality analytical measurements. Funding is available for innovative projects, especially collaborative ones (both within Israel and internationally).

I anticipate also a stronger collaboration in teaching marine sciences, by combining resources between the universities, Michmoret and the IUI. Specialist courses are made available freely and widely. Marine sciences also become a mainstay of the Israeli education system, including the development of "BAGRUT" tests in marine biology and the strengthening of similar programs in oceanography.

Finally, I hope to see a strong connection between academia, the Israeli government, NGOs and companies, utilizing scientific data and insights to support societal decisions.

Our cadre of researchers and our innovation must lead to novel integrative studies of the marine environment.

I returned to Israel 5 years ago having left in 1990. In the interim our knowledge of the Eastern Mediterranean stagnated (and sometimes even worse). My vision is to educate my academic colleagues and the next generation about the unique properties of the EMS which makes it a globally important
What is your vision for the field of the marine sciences in Israel in the coming decade?

Our conditions in the eastern Mediterranean and red sea put us in the best position to lead in Research and problem solving for the world on the issue of global warming and climate change. Our vision, as a world leader, is to develop strategic plans for sustainable marine environments, whereby needed activities (fishing, food, fuel) are in place that have little compromise on the natural environment and protection of biodiversity. Finding solutions that are practical but also can be win-win for both biodiversity and industry.

I don't see a change. A southern institution will close if only it is allowed and its contribution (the meager) will significantly decrease. A global vision is needed, understanding how the ocean affects and is affected by climate change. Moreover, we must make a great effort to understand how to bury carbon dioxide in the ocean, one of the most critical questions of our generation.

Strengthening study programs at all levels; training of masters and doctoral students in critical areas; developing comprehensive research capabilities for "infrastructure" collection, processing and analysis in order to understand the effects of the sea on the Levant and the impact of man on the shores and seas of the Levant.

Our vision is a natural laboratory. An important local resource and a place where, once we understand the basics, world class research can be carried out. We need however to understand Israel is a small country and fighting each other is a very bad way to make scientific progress.

The focus, therefore, should be on developing a national research institution in the field of oceanography, with broad capabilities in the areas of critical importance:

1. Establishing a national oceanographic research center, funded by the government and other institutions, to conduct research and develop infrastructure for research in the field of marine sciences.
2. Establishing a national marine research network, linking research institutions and academic institutions, to facilitate collaboration and exchange of knowledge.
3. Establishing a national marine research fund, to support research projects and encourage innovation in the field of marine sciences.

In conclusion, our vision is a world leader in planning a sustainable marine environment, whereby needed activities (fishing, food, fuel) are in place that have little compromise on the natural environment and protection of biodiversity. Finding solutions that are practical but also can be win-win for both biodiversity and industry.
What is your vision for the field of the marine sciences in Israel in the coming decade?

Strong scientific community capable of leading careful, responsible, sustainable and rational use of the marine environment. Rational use of the marine environment rather than political manipulations in favor of strong financial groups and private interests.

Funding and opportunity to allow students to participate in field or lab research, identification and financing of centres of excellence to carry out state-of-the-art research, engagement with the public (citizen’s science and other outreach) to communicate the progress that is being made, that can be made and the fascination researchers have for their subject.

Straight forward, more students, more research budgets and in my field, better understanding the deep sea bottom and sub-bottom ecology.

establishment of an independent faculty of marine sciences, research institutes, international cooperation with neighboring countries.
What is your vision for the field of the marine sciences in Israel in the coming decade?

Significant and internationally leading community which will generate innovative graduates capable of generating an industry and export in the field.

Education starting from schools for mariculture and smart sustainable farm/factories. Leading the world with innovations and solutions for the next advantages (food, fresh water and healthier communities)

Establishment of a new body ("one shop") that provides all the resources needed to conduct marine research. It will concentrate on providing marine services for the marine communities in Israel. Creation of a panel/route (under ISF?) aimed to distribute dedicated funds for marine research. Purchasing of working AUV/ROV and maybe (a dream!) formation of second marine research vessel for ocean studies.

Mainly, the return of Israel to the international marine research family through partnership with IODP will provide a podium for Israeli scientists to excel and to enhance our participation in interdisciplinary marine research.

Faculty, monitoring, academic studies

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What is your vision for the field of the marine sciences in Israel in the coming decade?
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I would like to see marine sciences (with its multidisciplinary and applied aspects) become an essential and integrated component of all governmental policy and regulation agendas regards the marine resources of Israel. This would mean that long term funding and planning on a national level will facilitate and promote training in programs of marine sciences and related disciplines. These would then provide the personell (technical, administrative, and academic) needed to: run and develop future blue-tech or marine-product industries, to maintain marine protected areas; to advise government agencies and industries on the environmental aspects (e.g. how desalination plants can reduce their footprint on the marine environment, where to place offshore drilling operations, how to monitor them etc?); to be employed in research institutes such as IOLR responsible for monitoring programs on national levels; to operate and analyze the necessary infrastructures and big-data platforms used to comprehensively investigate the system; and to teach and convey the importance of our marine environment at all levels of education systems.

Leader in the world, and strong collaboration with all neighbors.

An inter-disciplinary instructional and research approach crossing life-sciences, exact sciences (physics, mathematics, chemistry, engineering, geology) dedicated to marine research.

A collaborative effort by academy and dedicated institutes (IUI/IOLR), based on advanced infrastructure, with profressional personnel.

More collaborations, hosting international conferences, acknowledgment in the uniqueness of our systems

more funding that will draw more students and researchers into the field, enabling enhanced understanding of the system and better management of our marine resources

The question of plastic recycling should be solved first in order to free the sea from the major pollutants.

Many long-term research ships in the whole Mediterranean region for fundamental research. Sea and deep-sea exploration programs. Israeli projects and collaborative projects outside of Israel — in the Pacific and Atlantic oceans.

Connecting Ocean sciences in Israel to burning questions of climate change

will be able to link theoretical studies with field observations much more, students should get a stronger basic education (math, physics)
What is your vision for the field of the marine sciences in Israel in the coming decade?

Closer collaboration with the regional and global academic community

An inter-university Mediterranean research station with easy access to shared equipment, courses, training and scientific exchange. The identification of 3-4 well funded centers of excellence that will include researchers from multiple institutions. Together they will move marine sciences in Israel into the next level.

Continued cooperation between researchers in Israel and abroad, policy makers, fishers and other non-academic marine users. Research about sustainability and restoration that work hand in hand with educators and outreach programs.

Shared data, cooperation among researchers and academic institutes, and the improvement of platforms for field studies would promote our understanding of marine ecosystems. Specifically, there would be an increase of studies concerning conservation and sustainable use of marine resources.

I would like to see a more modern and knowledge-based management of the marine environment, educated by state-of-the-art scientific research

Real cooperation between IOLR and the Universities in Israel. Research vessel in the Red Sea, Physical chemical oceanography, marine geology and geophysics. Much less marine biology and more biological oceanography.

saving coral reefs

The few dedicated Israeli institutions and researchers in coral reef sciences are really paving the way for future research. I think that coral reef sciences and ocean/sea ecosystem health will be a huge topic in the coming decade. The focus will also fall on how climate change and human induced impact will affect ocean/sea health and especially how that impact will increase on coral ecosystems.

Governor Akpataobi is a strong voice and an advocate for the marine environment. The partnership between IOLR and the Universities in Israel is essential. The Governor's leadership and commitment to marine science and ocean conservation is commendable.

Accelerating ocean science to better understand current and future ocean conditions and functioning, forecast their change and impact on human wellbeing and livelihoods, and on healthy, productive, safe and accessible ocean.
What is your vision for the field of the marine sciences in Israel in the coming decade?

1. Development of a world class body of researchers in the array of oceanographic sciences, with proper infrastructure and a first-class leadership.

2. Development of the aquaculture sector, to parity with the agriculture sector, in R&D, positions, leadership and budgets.

Being realistic, I would very much like to see a proper graduate program in Physical Oceanography.

Coral reef research (but not marine research in general) in Israel is a nepotistic system. Only students of certain faculty get jobs back in Israel. Searching for faculty should be genuine, fair, and international. It is not enough to send students to post-docs and then hire them. You need different perspectives and these you can get if you accept Israeli students that have done Ph.D.s in other countries and/or researchers that are not originally from Israel.

my vision is to see marine science in Israel grow significantly in number of people involved, facilities at the national level and much bigger budget for basic research.

The marine sciences should propose a perspective where engineering, marine biology and geomorphology take into account the human element. It should emphasize the evolution of the relationship between people and the maritime context where they live. An important place must be provided to the issues regarding the sea level changes and the connection of the territory to the rest of the world (trade, geostrategy, migrations, etc.).

Improved facility and data sharing culture, establishment of observatories and/or LTER-type programs where data and facilities are made accessible to the research community. Israel has many talented and able researchers but direct access to advanced facilities (vessels, in-situ instrumentation and observation platforms) and existing data gathered over the past decades is hard to attain. Addressing these shortcomings will help follow and understand trends and changes of practical significance, as well as address basic-science questions.

Extensive mapping of the marine environment, promoting sustainable fishing, preparing coastal defenses from rising sea levels, promoting areas designated for conservation through marine nature reserves, expanding knowledge and exposing the public to the importance of the sea and contributing to the quality of life.

We must have a proper support for fisheries in order to preserve their sustainability and prevent overfishing. We have to invest in marine research and development of technologies for a wide variety of fields. This includes developing marine technology that is cutting edge, including work in different parts of the sea, especially in the open sea, and performing significant marine experiments, when they are integrated with new analytics and technological developments.
**What is your vision for the field of the marine sciences in Israel in the coming decade?**

I would like to understand the biogeochemical cycles in the EMS. To answer questions that are related to the biological response and understand the system's ability to fix carbon.

My personal vision is too idealist. I dream of a day that we will be able to share our knowledge and data with the neighbor countries and we will be able to see the big word outside of the borders of Israel. It is always better to be able to research the source of the problem than the results of the problem and a lot of problems in the Israeli waters are coming from the south or the north usually with the sea currents, even if these are polluted water masses with plastics, or jellyfish masses. On the good side not only problems are traveling with the currents but also sediments, which are actually building the continental self of Israel and it would be more than amazing to be able to have access on actual data and research in deep the ways and routes of transport and so many other issues.

I would like to see better education for Israel's public about the harmful effects of micro plastics, as well as chemical pollution; research into historical human adaption to sea-level change utilized to inform decisions about future adaption to sea-level rise along Israel's coast.

A centralised major facility on the mediterranean that provides field support, laboratory, instructional, research, industrial (aquaculture, desalination development, high tech start ups), and public outreach. Major governmental increases in spending for new hires start up packages, mid-career 'booster' packages, and fully funded ship-days within grants to guarantee the maximisation of field equipment and facilities. Open access datasets from regular monitoring and measurements (e.g. currents/tides/temps, etc.). Legal requirements for offshore development projects to have scientific monitoring and 'chaperones' within academic sciences (non-profit) as well as giving access to the facilities. For example, drill rigs having sensors and monitors on them that are planned and accessible to researchers. Specialty laboratories that receive funding contingent on a plan for accessibility and affordability for local researchers. Encouragement of offshore observation buoys and construction of a submerged observation station for multi-week underwater experiments and training.

Better conservation biology and research ethics tuition, to better round out the scientists we produce.
What is your vision for the field of the marine sciences in Israel in the coming decade?

The State of Marine Sciences in Israel: Thoughts and Vision

Yossi Loya

For the record: I am a Marine Ecology Professor (emeritus) at Tel Aviv University and a member of the Marine Sciences Steering Committee, nominated by the Israel Academy of Sciences. The thoughts, opinion, and vision stated below are solely my own. They stem from many years of scientific activity, mainly in coral-reef ecology (>50 years), and from my close acquaintance with many fields of Marine Sciences and International Marine Institutions. In view of the preliminary discussions we have held and the ongoing debate on some of the issues discussed below, I present here my personal views for an open discussion among members of the Committee.

What are the marine fields of research we should encourage for future support?

"A jack of all trades is a master of none!"

In a nutshell, I believe that we need to strengthen those established fields in marine research that currently demonstrate a proven international excellence, rather than recommend the establishment of fields that are at present lacking or the expansion of those that are poorly represented in Israel, both of which are also extremely costly.

Although identifying the wide array of marine research fields that are missing in Israel or need strengthening – and consequently encouraging their support – is obviously a logical direction, recommending this could lead to channeling the majority of the future budget for Marine Sciences in Israel towards this direction.

I believe and recommend that our focus should be on enhancing both those Israeli marine science fields with proven scientific excellence and those new and potentially promising fields that are affordable by Israeli standards, rather than exploring extremely costly directions. Thus, deep-sea research (discussed in our Committee), although undoubtedly an important field, would require an inflated budget that Israel simply cannot afford! Moreover, we have a limited scientific advantage in this field and the associated huge cost may not translate into cutting-edge research. The obvious consequences of such a recommendation would be dire! I am convinced that such an approach would competitively exclude the existing highly diverse and successful scientific fields in Israel, as well as endanger the training of new generations of marine scientists.

Being a small country with obvious limited financial resources, we cannot compete scientifically in deep-sea research with huge institutions such as the Woods-Hole Oceanographic Institute, Scripps Research Institute, or the like, which receive ongoing support from large and affluent countries (e.g. the G7 countries and China). The infrastructure for deep-sea research (e.g. vessels, ship time, large ROVs and other extremely expensive equipment/items) should come from international collaborations of the Israeli researchers, rather than constituting a specific ("colored") Israeli budget.

To reiterate: A jack of all trades is a master of none! Deep-sea research is indeed important and should continue, but since the budget is limited, it should not come at the expense of those established marine fields with recognized international excellence, and which require relatively modest budgets. I strongly believe that we should encourage and financially strengthen those specific research areas (to be identified by the Committee) in which the Israeli Marine Sciences can function and successfully compete on a global scale.

Vision:

Israel is a small country with limited financial abilities that can be directed towards higher education and scientific research. Nevertheless, Israeli science, as a whole, has significantly contributed to many scientific breakthroughs on a global scale (e.g., the relatively high number of Israeli Nobel Prize winners). Unfortunately, the Marine Sciences in Israel have not developed to what might be expected from this important field, due to both historical reasons and the attitude of the present-day decision-makers to the

What is your vision for the field of the marine sciences in Israel in the coming decade?
Environmental Sciences as a whole. Unfortunately, the Ministry for Environmental Protection is among the government’s lowest-key offices. Despite the disadvantages we face, there is clear evidence of our international reputation for excellence in our field. This is largely due to the vision of those pioneers among the Israeli Marine Sciences community who established in the early 1960s the Interuniversity Institute for Marine Sciences in Eilat (IUI-Eilat). I consider the IUI-Eilat to be the finest example of Israel’s international front-line scientific standing in Red Sea research; and, in short, as the “jewel-in-the-crown” of Marine Institutes in Israel. In contrast, the Mediterranean Sea along the Israeli coastline has been relatively poorly studied by the Israeli community of marine scientists.

The Mediterranean’s biological uniqueness, strategic and economic importance to Israel, as well as the recent environmental issues echoed in the media (e.g. oil, gas, desalination plants, power plants, artificial islands, marinas, marine biotechnology – a source for new biologically active materials, marine agriculture, and marine trade increasing pollution hazards), are well recognized. Notably, the Mediterranean Sea is considered as a “European Sea” and throughout the FP5-7 programs, as well as HORIZON 2020, the Israeli East Mediterranean coast has played an increasing role in collaborative projects. This is also clearly demonstrated in the EU’s future multi-billion funding agendas. Establishing the long-overdue Mediterranean Inter-University Institute for Marine Sciences (MIUI), similar to the IUI-Eilat, is both timely and imperative. It has solid scientific benefits, on both the national and international levels, as well as political ones.

Based on my close association and knowledge of the IUI-activity since its establishment in 1968, I recommend that the administrative organization and all academic procedures of the MIUI will follow, in the main, those of the IUI-Eilat (details to be discussed in the Committee). One significant difference, however, to the protocol at the IUI-Eilat, is that the Scientific Director of MIUI will be elected/nominated on a rotation basis from among the universities in Israel (unlike the problematic situation in IUI-Eilat, in which the Director is exclusively from the Hebrew University, Jerusalem). Such an Institute should include tenured academic personnel from established institutes of higher education in Israel and graduate students who will receive their formal degrees from these institutes.

An appropriate and steady annual budget is required in order to materialize this vision. The MIUI should be equipped with state-of-the-art equipment that will be available to all marine scientists in Israel (e.g. wet laboratories with running seawater tables and aquaria; isotopic and geochemical analysis lab, molecular lab, ROV, AUV, EM, Histology lab, etc.) to be identified and recommended by the Committee.

On a national scale, such a central facility will be economically efficient as the expensive marine instruments and facilities will be shared among all universities and will not need to be purchased separately by individual scientists or schools (in contrast to the situation today). Furthermore, together with the IUI-Eilat, such an infrastructure will provide a solid platform for the training and education of future generations of Israeli marine scientists, and highlight the field of Marine Sciences in Israel in a significant, broader, and more influential way than its present status.

For obvious reasons an ideal location for the MIUI is in Michmoret (i.e. a geographic location close to most of the universities and research institutes in Israel; an existing, newly-built modern marine research building and new laboratories; proximity to the sea, harbor, running sea-water facilities, etc.) I do not see this proposal as impeding the development of the IUI-Eilat. On the contrary: I believe that establishing the MIUI will highlight the Israeli Marine Sciences worldwide within a wider and more influential context.

However, this proposal is conditional upon the continuation of Vatat’s financial support to IUI-Eilat, which, in view of the IUI-Eilat’s proven excellence, should be increased!

What is your vision for the field of the marine sciences in Israel in the coming decade?
What is your vision for the field of the marine sciences in Israel in the coming decade?

1. Increase of international cooperation
2. Increase of research in open sea and shallow water (+ Lake Kinneret, Dead Sea)

Israel will become an exporter of trained technical personnel in the field of seabed surveying.

More long term measurements, central site for process studies, leading instrumentation development, regional center for education

The following answer is given:

What is your vision for the field of the marine sciences in Israel in the coming decade?

1. Increase of international cooperation
2. Increase of research in open sea and shallow water (+ Lake Kinneret, Dead Sea)

I believe international cooperation will continue to raise and the already excellent quality of marine Israeli Scientist will also improve, but please do not forget the students! It is not possible to conduct serious research with a 4KNIS grant another half-job time!