The Department of Marine Biology

Annual Newsletter

Keeping In Touch With Our Marine Biology Community

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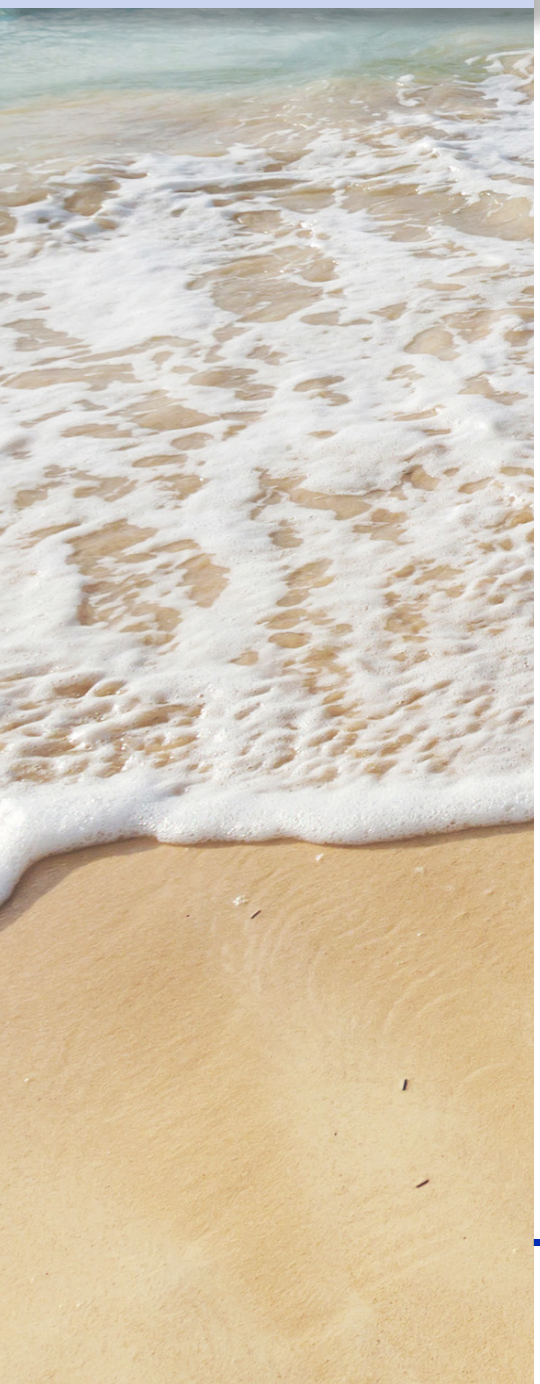
Leon H. Charney
School of
Marine
Sciences
UNIVERSITY
OF HAIFA

September 2024

Prof. Smadar Ben-Tabou de-Leon
Head of the Department of Marine Biology



Dear students, colleagues, and alumni,

Oh, what a year we've had. October 7th has changed our lives in every possible way. People have lost their loved ones, and 101 hostages are still waiting to be returned to us. In addition, we wish for all those protecting us to come home safe. As the Tikva-6 song says, "We are a nation of superheroes". You, our students and faculty, are superheroes, not only for making progress in your studies and research during this difficult year but also for excelling and making major contributions to the community and to science.

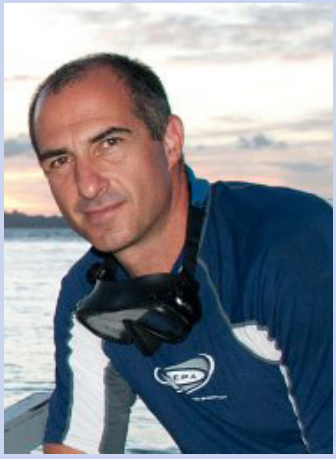
Congratulations to our **nine MSc and four PhD graduates** for their outstanding research that demonstrates the diverse scope of our department – from marine microbes in the oceans, sea anemones, corals, and sea urchins to top marine predators (see full list below); to **Prof. Ilana Berman-Frank**, for winning the Rector Excellency Prize for a senior researcher (see details below); to **Prof. Tali Mass** for her promotion to full professor and for winning the VATAT grant to establish a new MicroCT and RAMAN spectroscopy center; to **Prof. Dani Tchernov** for winning the VATAT grant to establish a marine applied science and technology center and lastly, to **Dr. Tal Luzzatto-Knaan** on her new lab that is finally up and running!

Welcome to **Dr. Maxim Rubin Blum**, the head of the Deep-Sea Biology and Microbial Ecophysiology (MicRoBiology) Lab in IOLR, Shikmona, who joined our department this year, and to **Dr. Dar Golomb,** the new caretaker of our aquaria. More on the MicRoBiology Lab and Dar Golomb in the newsletter below.

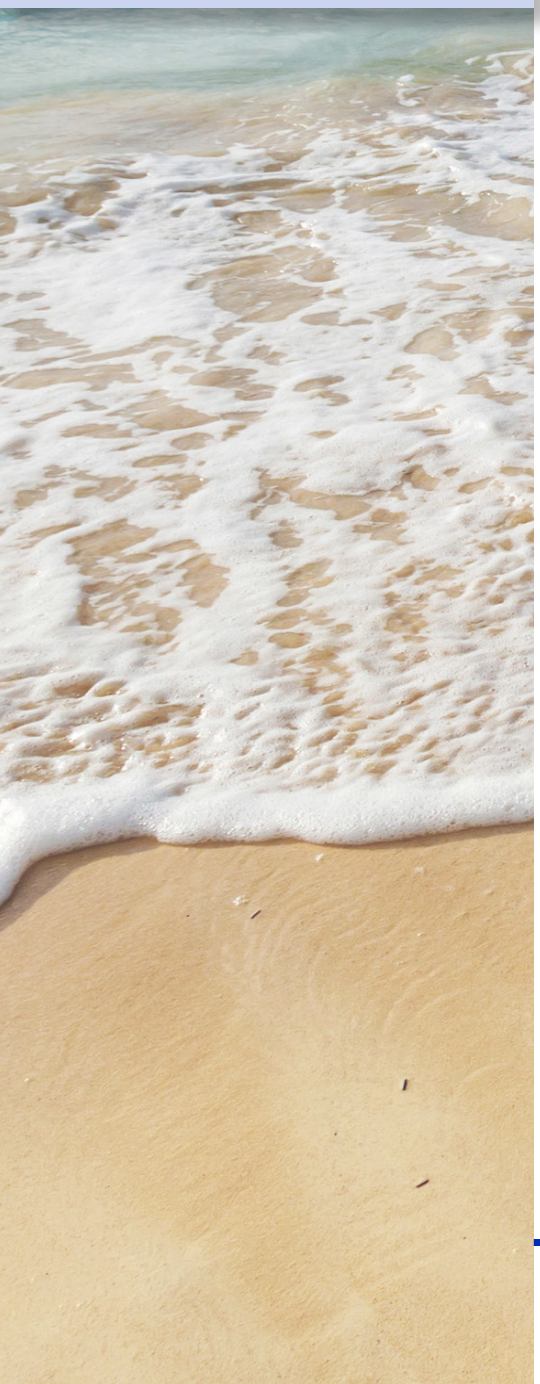
Newsletter content: In this newsletter, you can find articles about the heated debate in the course "**Challenges in the Mediterranean**", on the **Helmholtz Research Cruise** led by groups of Israeli and German scientists, and on the beloved **Annual Retreat** of our department. The **winners of the best talks and posters** introduce themselves and their research. Finally, our alumni, **Sofia Sizikov**, tells us about her scientific journey, from an MSc in Prof. Laura Steindler's lab to a career in industry and back to a PhD with us!

Dear friends, this has been one of the most challenging years I can remember, and I highly appreciate your resilience and thriving despite the hardship. The major challenge that we face as a department is to attract more excellent students to our labs, and all of you can help with that. I wish us all a good and productive break and for all the hostages to return home.

Smadar



Dan Tchernov, Head of the Leon H. Charney School of Marine Sciences



Dear staff, researchers, and students,

As we step into the new academic year, I want to reflect on our community's incredible resilience and achievements. Despite the challenges posed by the ongoing war, all school departments continue to thrive, pushing the boundaries of marine science and making significant contributions to our understanding of marine ecosystems. Our work on sustainable mariculture and the protection of vital habitats, such as the nursery grounds for the blackchin guitarfish, has gained national and international recognition, reinforcing our leadership in marine conservation.

At the Leon H. Charney School of Marine Sciences, we have maintained our commitment to excellence in research and education and found new ways to innovate and adapt. Within the Morris Kahn Marine Research Station, we have successfully opened a new department for sustainable aquaculture and continue to progress with our ongoing development of our BlueTech Hub. This is a testament to our ability to turn challenges into opportunities and foster collaboration between academia, industry, and government. These upcoming plans are poised to catalyze marine research products to market, showcasing our unique role in bridging the gap between science and practical solutions.

I know these times are tough, and many of us are personally affected by the conflict. Yet, it is in these moments that our dedication to science, each other, and the sea around us becomes even more crucial. Let us continue to support one another, carry on our vital research, and look toward the future with hope and determination.

Wishing you all strength and success in the coming year.

Warm regards,

Dan Tchernov

Congratulations to our graduates:

MSc

Michal Tamir Avital – *cum laude*

Yara Soussan – *cum laude*

Alhan Abu Hamoud – Dean of Graduate Studies Honor

Prashant Tewari – Dean of Graduate Studies Honor

Cláudia Ferreira – Dean of Graduate Studies Honor

Daniel Goloe – *cum laude*

Shlomi Zrihan – *cum laude*

Itamar Avidor – Dean of Graduate Studies Honor

Tamar Shemesh – Dean of Graduate Studies Honor

PhD

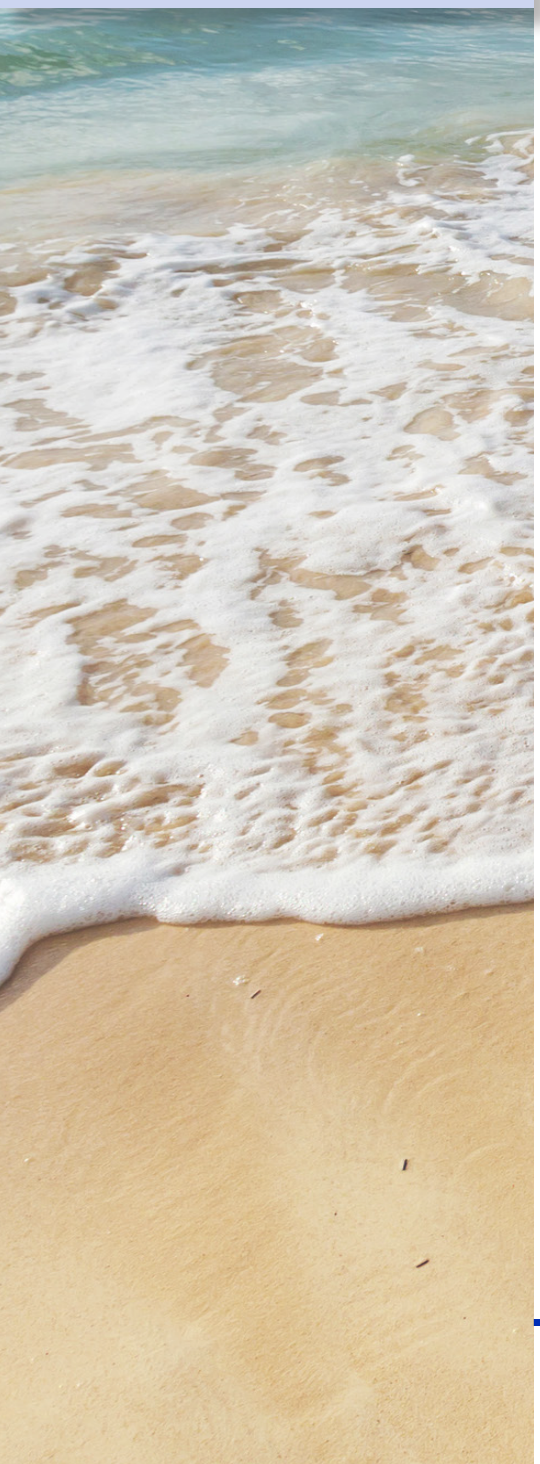
Yosef Chyams

Ynon Deutsch

Adi Barash

Orna Natan Schweizer

Prof. Ilana Berman-Frank
Head of the Charney School of Marine Sciences



Congratulations to Prof. Ilana Berman-Frank for winning the Rector Excellency Prize

We want to congratulate Prof. Berman-Frank for receiving the Rector Excellency Prize for a senior researcher in recognition of her significant contributions to the field of Marine Sciences. Ilana made groundbreaking discoveries in the fields of phytoplankton ecophysiology and carbon and nitrogen fixation and cycling. Her work illuminates the mechanisms underlying and controlling marine nitrogen fixation, the organisms involved, and the impacts of climate change on these organisms. A demonstration of her leadership in these fields is her high ranking in the 2023 edition of Ranking.com, placing her as #15 in Israel in the field of Environmental Sciences. Furthermore, Prof. Berman-Frank led national and international collaborative projects between marine research institutions, industry, and governmental offices. As the head of the School of Marine Sciences, she contributed significantly to the school's success and independence. Her scientific contributions, which focus on the environmental sustainability of aquatic systems from local to global scales, and her leadership in the field of marine sciences, as well as her contributions to our school, led to her receiving the Rector Prize for a senior researcher. Ilana, you make us proud!

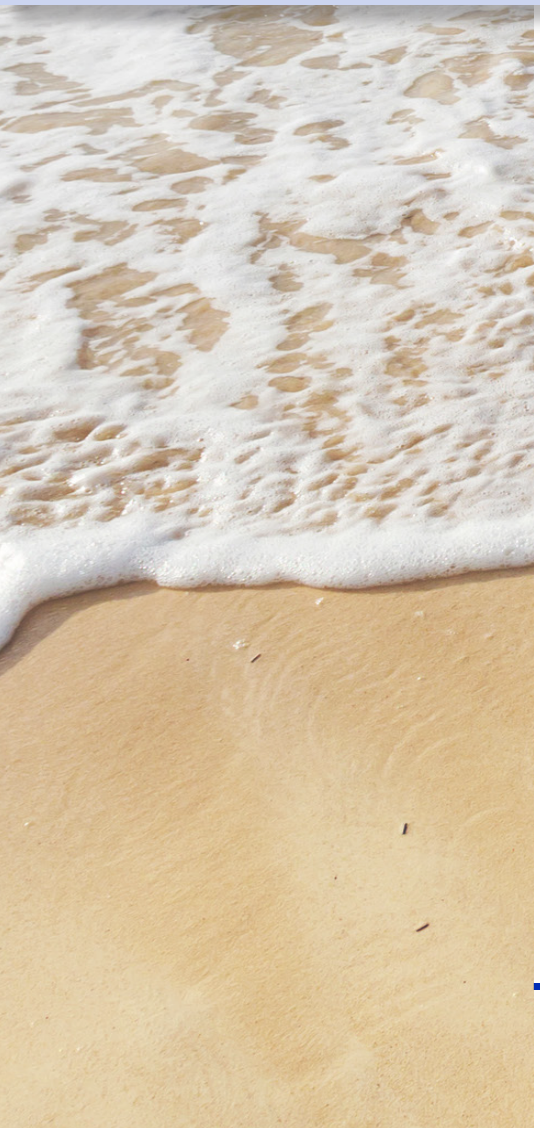
Deep-Sea Biology and Microbial Ecophysiology Lab (MicRoBiology)

By Dr. Maxim Rubin Blum https://www.mrblab.org

Diverse, understudied biota maintain the vast deep-sea ecosystems, playing a key role in Earth's geochemical cycles and facilitating the vital ecosystem services of the oceans. The MicRoBiology (MRB, Fig. 1) Lab explores the incredible world of these organisms, focusing on the main actors in this scene: the enigmatic marine microbes. The MRB Lab asks burning questions in the fields of deep-sea biology and aquatic microbial ecophysiology: How do microorganisms adapt to their environment, especially the harsh, light-deprived, extreme deep-sea habitats? What is the molecular basis for this adaptation? How do microbial communities interact with each other, other biota, and their physical environment to fuel productivity and nutrient cycling? To answer these questions, the MRB Lab employs deep-sea robotics in combination with advanced molecular techniques, such as omics. Bioinformatics is a key tool in the MRB Lab to process the big data produced by omics.

Life in the deep sea is often scarce due to the limited food supply produced by photosynthesis in the upper photic layers. The discharge of energy-rich compounds, such as methane and hydrogen sulfide gases from the seabed, can fuel extremely productive chemosynthetic ecosystems at the deep-sea hydrothermal vents and hydrocarbon seeps. Many animals in these ecosystems engage in nutritional, often obligate, symbioses with chemosynthetic microbes. These unique associations are among the key research themes in the MRB Lab. Beyond hosting a large biomass of unique lifeforms, these flourishing

Fig. 1. Deep-Sea Biology and Microbial Ecophysiology (MicRoBiology) Lab on land and at sea.



ecosystems are biological filters for methane emissions from the seabed, limiting the marine fluxes of this greenhouse gas into the atmosphere.

The main research site of the MRB Lab consists of a series of natural seeps of gas-rich brines situated 1150m below the surface, 60km off the coast of Tel Aviv. These seeps are located within the geological feature known as the Palmahim Disturbance. Together with the Applied Marine Exploration Lab at the Charney School of Marine Sciences (CSMS), the MRB Lab led the expedition that resulted in the discovery of this fascinating, intricate ecosystem in 2021 (Fig. 2). Palmahim brines are warm (~20^{o}C), carry 1.5 times more salt than marine water, and are saturated with methane, sulfide, and ammonium. These gases fuel dark productivity by dense microbial populations and chemosynthetic fauna, including tubeworms, clams, and mussels (Fig. 3). Exploration of this habitat resulted in another fascinating discovery, as Palmahim seeps are nurseries for deep-sea oviparous sharks, which lay a large number of eggs throughout the year. The MRB Lab team is engaged in a multidisciplinary collaborative effort to better understand the functions and services of these communities. For example, MSc student Lina Ratinskaia is looking into the biotechnological potential of Palmahim microbes, exploring the diversity of secondary metabolites, in collaboration with the Functional Metabolomics Lab led by Dr. Tal Luzzatto-Knaan in the Marine Biology Department.

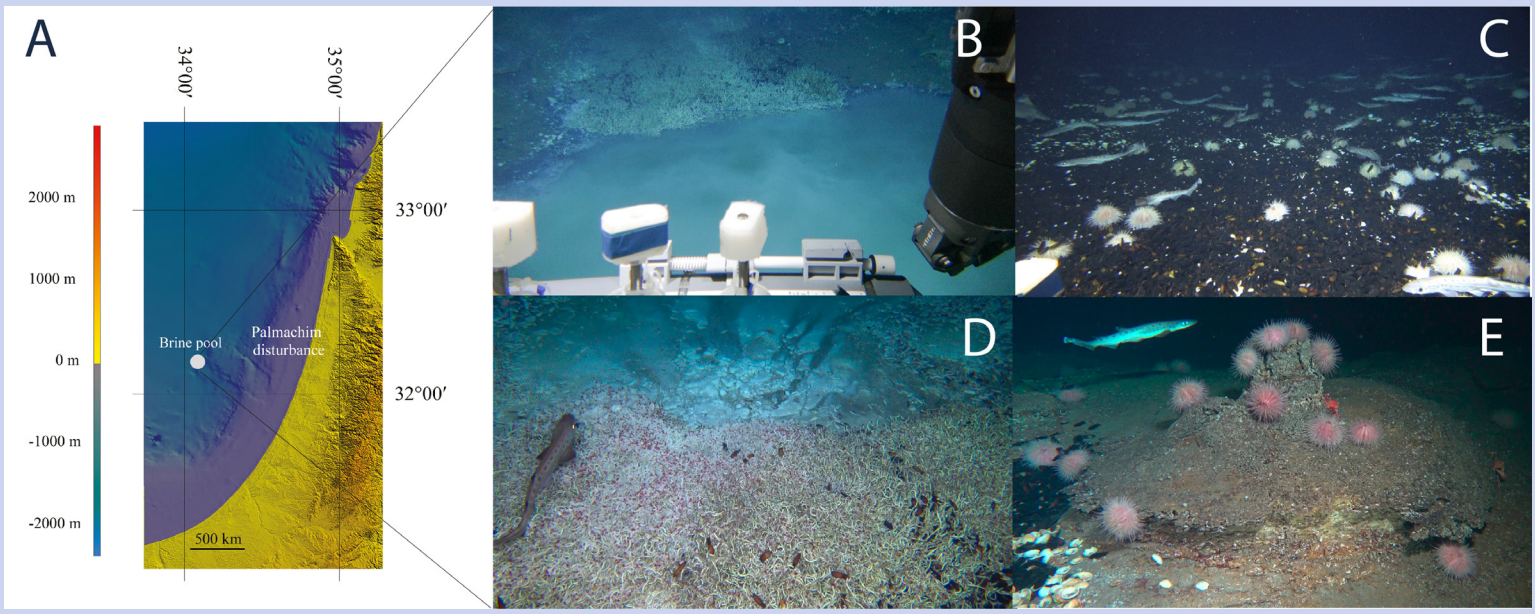
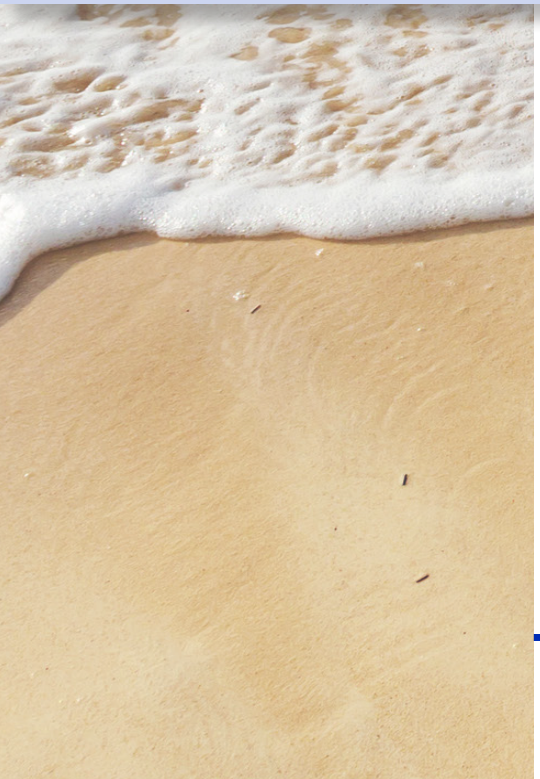


Fig. 2. Brine pool system at the toe of the Palmahim Disturbance. A) Palmahim seeps are located 60km offshore of Tel Aviv at a depth of ~1000m. C) Galeus melastomus catsharks lay eggs (brown) on the beds of lucinid clams. D) Sharp redox transitions result in hotspots of extreme productivity. E) Authigenic carbonates host seep biota and microbial biofilms.

Fig. 3 Microbes are vital players in Palmahim Disturbance brine pools and gas seeps. Specialist bacteria are found in chemosynthetic fauna and main habitats, such as brines and brine-infused sediments. Apart from chemosynthetic specialists, different niches are occupied by a changing diversity of generalist microbes that serve as recycling factories.

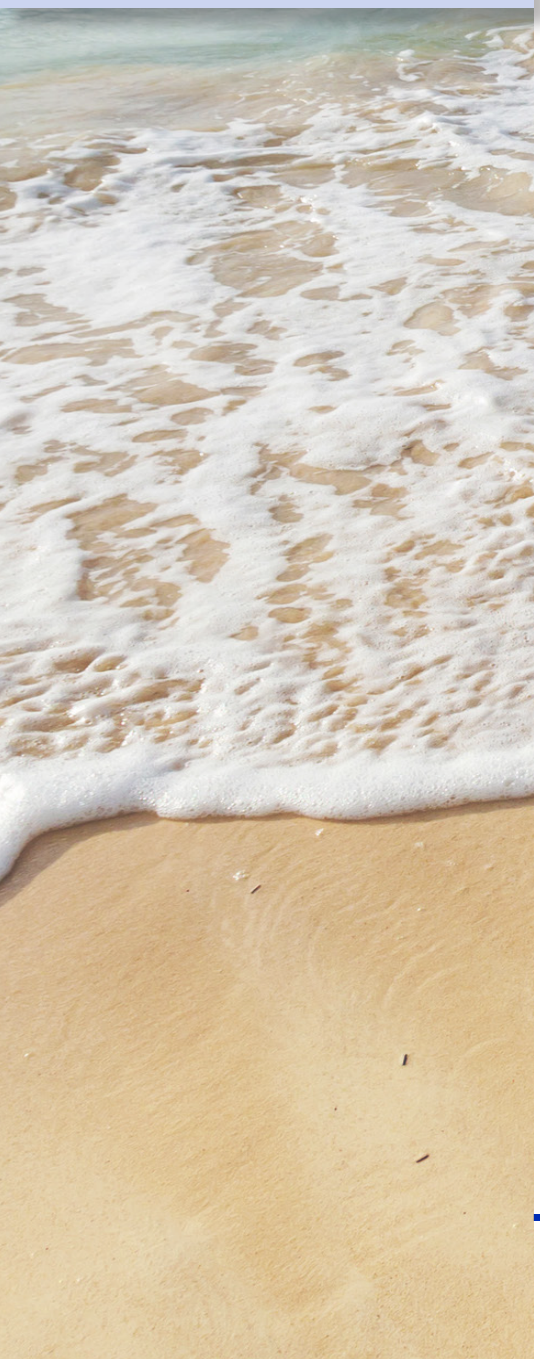


The MRB Lab is located at the National Oceanographic Institute (IOLR) in Tel Shikmona, overlooking the beautiful Mediterranean Sea coastline. Using IOLR's facility, such as the Bat Galim research vessel, the lab has frequent access to the sea. This allows us to participate in the National Monitoring Program of the Israeli Mediterranean Waters and various other projects aimed at environmental assessment and management, sustainability, and restoration of marine habitats. Based on these recent discoveries in the deep sea, the deep Palmahim Disturbance became the first Israeli "Hope Spot" designated by Mission Blue. It was declared an Important Shark and Ray Area (ISRA) and, most importantly, was declared the first marine protected area in the deep exclusive economy zone of Israel, extending marine conservation beyond its territorial waters.

Welcome to Dar Golomb, our new aquaria caretaker

My name is Dar Golomb. I hold a bachelor's degree in Marine Sciences and Marine Environment from Ruppin Academic Center and a master's degree in Coral Restoration from Ben Gurion University. Over the years, I have gained extensive technical knowledge and experience in managing water systems, developing a deep understanding of aquatic environments and their management.

Currently, I am responsible for operating the university aquarium room, where I use my expertise to maintain and optimize aquatic systems, ensuring the health and wellness of various marine species. In addition to this role, I assist both the Mass and the Berenshtein labs by contributing to various research projects and supporting ongoing scientific endeavors.

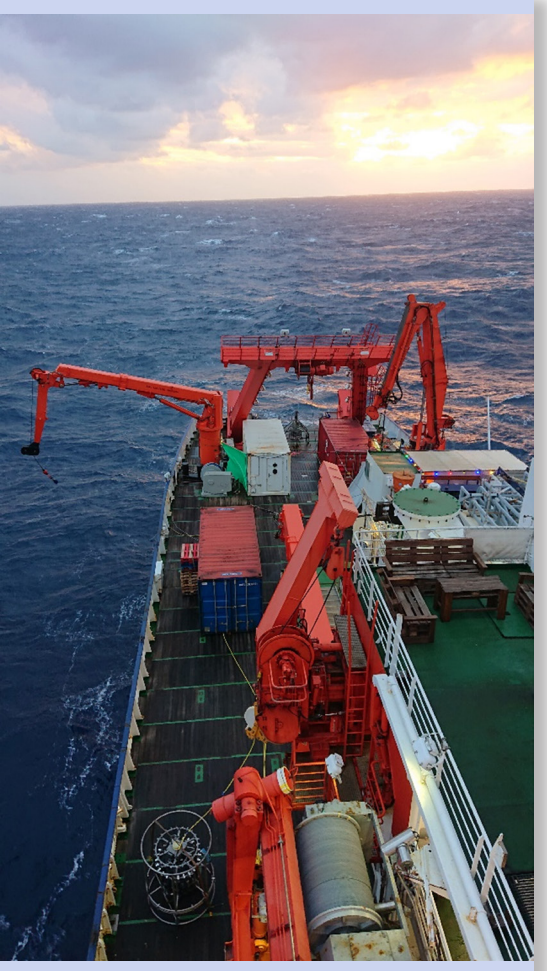


Exciting debate in the course "Challenges in the Mediterranean"

By Dr. Igal Berenshtein

The course "Challenges in the Mediterranean" was designed to provide students with a broad and interdisciplinary understanding of various aspects of the Mediterranean Sea. The course emphasizes the need to maintain the balance between the exploitation of natural resources and the preservation of the marine and coastal environment. This year, Dr. Igal Berenshtein from the Department of Marine Biology and Dr. Yoav Lehahn from the Department of Marine Geosciences led the course. Throughout the course, lectures were delivered by leading experts from academia, government agencies, and the energy sector, providing a holistic and comprehensive view of pressing issues in the Israeli Mediterranean.

To conclude the course, a debate was held in which groups had to support opposing positions on four issues: seawater desalination, deep-sea mining, fisheries reform, and wastewater discharge. Before the debate, the groups had to share their main arguments with the opposing group to facilitate meaningful and critical discussions, considering scientific quality and robustness. The students presented their views using data from the scientific literature, monitoring reports, and written media. The event was exciting and enriching and provoked further questions regarding these critical environmental issues.



Helmholtz Cruise of the Mediterranean Sea

by Tom Reich, PhD student in Prof. Ilana Berman Frank's lab

On January 1st, 2024, the RV Meteor left the island of Cyprus to carry out an oceanographic mission in the Levant Basin of the Mediterranean Sea. I had the privilege of being one of 35 scientists on board, taking part in a collaborative German-Israeli cruise for a month during a turbulent time.

I had done much of my past research out of boats in the Eastern Mediterranean Sea, but nothing compared to this. Firstly, our home away from home, the RV meteor, is not just a boat: The 98-meter research vessel is a fully equipped scientific tool for marine investigation. We were assigned to labs according to the dedicated disciplines of each group. The labs were packed with everything needed to accomplish our research, most of which we shipped from either Germany or Israel. The labs paired with larger gear, anything from two CTD/ Rosettes to a variety of on-deck incubators, were set on deck. This setting was as professional and comfortable as possible.

Additionally, the vessel is also a floating hotel with high standards: Rooms with room service, a dining hall serving three meals a day as well as two coffee and cake breaks, and a fully operational bar were all available to us so we could

concentrate on the job at hand. Couple all this with a dedicated crew, and you get an ideal environment for marine research!

On a personal level, this month at sea, filled with laborious work for many hours a day with no weekends, was fun! The reason for this gratifying feeling was merely the comfort the Meteor provided, and mainly due to the human aspect. We were joined by a mixture of researchers and students from the GEOMAR Institute in Kiel, Germany, all from various backgrounds. All like-minded, ocean-loving, and naturally curious people, who by the time we arrived at the endpoint of this intense expedition in Sicily, were considered friends and colleagues.

The cruise was a challenging experience; the work was hard and was even harder for those who suffered from seasickness. This kind of research is not for everyone. Yet, for those who love the ocean and enjoy scientific exploration, I highly recommend finding the RV Meteor next to you and hoping onboard!

The 10th Annual Retreat of the Department of Marine Biology

By Prof. Smadar Ben-Tabou de-Leon

Our 10th Annual Retreat took place on March 7th, 2024, on our beautiful campus. It was attended by about 100 participants, including PhD and MSc students, post-doc scholars, principal investigators, lab managers, research associates, and representatives of four sponsoring companies.

During the retreat, students and researchers presented their scientific works through oral presentations and posters. They demonstrated the multidisciplinary research in the department that advances our understanding of life in the ocean and its conservation. In addition, one of our sponsors from Rhenium presented the advanced properties of Rhenium's new Digital PCR.

Special thanks to **Shanduo Chen**, who designed the beautiful logo that adorned the program and swag mugs; to **Prashant Tewari, Lior Shimoni, and Alhan Abu Hamoud** for organizing the fun social activity that helped to break the ice; to Hagai Nativ for the beautiful photographs of the event and to our generous sponsors: **Rhenium, Aquazone, Getter Group,** and **Tivan biotech**.

At the end of the meeting, prizes were awarded to the three best talks and posters, and the winners were:

Best Talks:

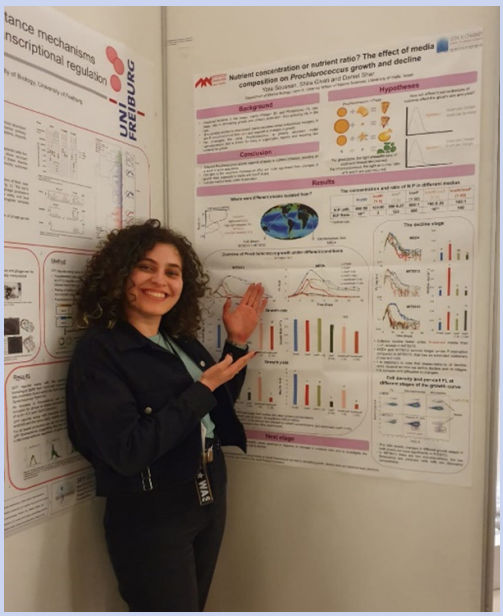
- First Place: **Yara Soussan**
- Second Place: **Elinor Nadir**
- Third Place: **Areen Qassem**

Best Posters:

- First Place: **Majed Layous**
- Second Place: **Tovah Nehrer**
- Third Place: **Debi Ramon**

Congratulations to all!

Link to photos



1st Place for Best Talk: Yara Soussan

I am a PhD student in the marine chemical ecology lab under the supervision of Prof. Daniel Sher. Our lab not only focuses on the chemically mediated communication and interactions between different marine organisms but also studies death at sea.

Nutrients at sea play a critical role in maintaining life, and different organisms are affected by the concentration of such nutrients. The focus of my research is to determine how the availability of nutrients affects the death of cyanobacteria while using Prochlorococcus, a globally abundant cyanobacterium, as a model.

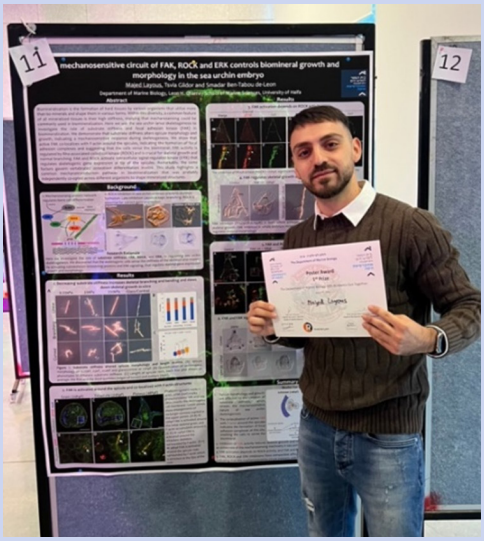
The work presented at the retreat showed results of the unique death phenotypes belonging to 15 strains of Prochlorococcus. So far, we know that the differences in death characteristics are not explained by the different isolation locations, nutrient acquisition genes, or environmental conditions. We are currently making further examinations to acquire a deeper understanding of death at sea.

2nd Place for Best Talk: Elinor Nadir

I am a PhD student under the supervision of Prof. Yehuda Benayahu and Prof. Tamar Lotan. In my research, I study the beautiful *Xenia umbellata*, a unique pulsating octocoral from the Red Sea. My research focuses on the regeneration abilities of this organism: we discovered that it can regenerate from pieces smaller than 1/3 of a millimeter! We are now trying to understand the mechanism of its pulsating motion. Repetitive motion in metazoans is ubiquitously controlled by small neural networks called 'central pattern generators' or pacemakers, but these have never been studied in corals before. During oral disc regeneration in *Xenia umbellata*, this pulsating motion develops gradually, allowing us to investigate gene expression correlated with behavior and morphology during regeneration. This approach has revealed a suite of transcription factors, neurotransmitters, and ion channels that are likely associated with the pacemakers in these organisms. We are now investigating the role of some of these proteins pharmacologically. We found that acetylcholine is associated with pulsation and are testing its effects on the polyp motion using video analysis. We are further investigating the development of the neuromuscular system throughout regeneration to isolate the morphology associated with pulsation capability.

3rd Place for Best Talk: Areen Qassem

I am a master's student at the Regulation and Evolution of Development (RED) Lab under the supervision of Prof. Smadar Ben-Tabou de-Leon. I investigate the structure and function of the microtubule network during sea urchin larval skeletogenesis. Using pharmacological perturbations, I discovered that the microtubule network is essential for skeletal growth. Using immunofluorescence staining and confocal microscopy, I studied the microtubule structure and their co-localization with matrix proteins and focal adhesions. My studies suggest that matrix proteins are trafficked via the microtubules from the Golgi apparatus into the biomineralization compartment, where the matrix proteins control the physical properties of the biomineral. My studies shed light on the function of an essential component of the biomineralization toolkit. Currently, I am working at the marine unit of the Israeli National Parks Authority.



1st Place for Best Poster: Majed Layous

My curiosity about how a single cell develops into an organism led me to pursue research at Smadar Ben-Tabou de-Leon's lab, where we study embryo development using sea urchin embryos as a simple model system. I began my journey there during my BSc and continued through my MSc and PhD. In my research, I focused on how environmental factors, specifically hypoxia and mechanical forces, affect sea urchin skeletogenesis by examining their impact on the gene regulatory network. Currently, I am an embryologist in the IVF lab at Assuta Hospital. While I enjoy my current role, I already miss my time in the lab, research, and academia.

2nd Place for Best Poster: Tovah Nehrer

I am a master's student in the Regulation and Evolution of Development Lab under the supervision of Prof. Smadar Ben-tabou de-Leon. My research is focused on the regulation and role of ERK signaling during sea urchin skeletal elongation. The extracellular-signal regulated kinase, or ERK, pathway is an evolutionarily conserved signaling pathway that is activated by many different intercellular signals. Intercellular communication plays a vital role in developmental processes, especially during organ formation. Therefore, understanding how intercellular signals are integrated into organ growth and morphology is essential for unraveling the molecular control of organogenesis. I found that during sea urchin skeletal elongation, the ERK protein is activated within the skeletogenic cells by the ectoderm-secreted ligand VEGF (vascular endothelial growth factor). This activation of ERK during skeletal elongation is essential for proper skeletal formation and skeletogenic gene expression. Overall, I hope my findings will help elucidate molecular mechanisms that translate intercellular signals into organ growth and morphology during embryonic development.

3rd Place for Best Poster: Debi Ramon

I am a PhD student under the co-supervision of Prof. Danny Tchernov and Prof. Peter Croot and have recently submitted my PhD thesis. My research focuses on the accumulation of metals (arsenic, mercury, cadmium, and lead) in local marine biota and its implications for human health and the marine ecosystem. The research presented at the retreat forms the final chapter of my thesis, exploring metal accumulation in ecologically and economically important fish from Israeli coastal waters. In this study, we assess species-specific accumulation and contamination levels, providing a deeper ecological context by evaluating differences in accumulation behavior between local and migratory fish. These fish were caught in a marine protected area (MPA), highly industrial areas (Haifa Bay and Ashdod), and a relatively pristine area. Our findings shed light on the unique driving forces of each metal on accumulation, and this research contributes to our understanding of marine conservation strategies against chemical pollution and their implications for ecosystem health and human well-being.

News from our alumni: Welcome back, Sofia Sizikov!

My name is Sofia Sizakov, and I completed my MSc studies at the Marine Biology Department in the Marine Microbiology Lab under the supervision of Prof. Laura Steindler. My research focused on the molecular interactions between marine sponges and their bacterial symbionts. Specifically, my research aimed to analyze the role of bacterial cell-envelope composition in the ability of bacteria to evade digestion by the sponge. During my research, I used different techniques, such as molecular biology, confocal microscopy, and flow cytometry. I had the chance to work in a sterile environment as well as to participate in fieldwork for the collection of sponge specimens. In addition, I used metagenomics to look for unique genomic features of sponge symbiotic bacteria, which may help them adapt to life inside the sponge. My research has contributed to four peer-reviewed scientific papers in leading journals in microbiology.

After completing my MSc studies, I started working as a research and development scientist in a biotechnology startup company “Peel Therapeutics”. During my work in the company, I was involved in different stages of the development of anti-tumor and anti-inflammatory drugs. This position gave me the opportunity to learn new methods, such as protein purification and encapsulation in nanoparticles for efficient drug delivery, *in vitro* methods for drug efficacy evaluation, confocal microscopy, and flow cytometry for drug uptake evaluation. I also learned about the process and different challenges of developing a drug, from the stage of discovery to approval.

After five years of working in the industry, I decided to take the next step and do a PhD. Since the field of marine microbiology has remained my main interest and the Department of Marine Biology has always been a friendly and supportive environment, I decided to come back to the lab of Prof. Laura Steindler. During my PhD research, I hope to further advance our understanding of host-microbe interactions!

More about our alumni can be found here:

https://marsci.haifa.ac.il/en/alumni-new/

Updates and news on the Marine Biology Department can be found here: https://marsci.haifa.ac.il/en/news-archive/

Keep in touch!

Have a good new academic year!

שנה טובה ומתוקה והצלחה במחקר ובלימודים!