



## **Annual Report**

### **Academic year 2017/2018**

#### **The George S. Wise Faculty of Life Sciences**

- School of Zoology
- School of Plant Sciences and Food Security

#### **Sackler Faculty of Medicine**

- Department of Anatomy and Anthropology
- The Maurice and Gabriela Goldschleger School of Dental Medicine

#### **The Lester and Sally Entin Faculty of Humanities**

- The Sonia and Marco Nadler Institute of Archaeology
- Department of Archaeology and Ancient Near Eastern Cultures

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## FOREWORD

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The museum is now completing its first full year of operations. It has been a long and mostly gratifying endeavor. When I look back on the 22 or so years that I have been engaged with the museum, I feel proud of our achievements, of our innovation, and our desire to make this one of the great institutions of the State of Israel. The overwhelming credit for much that has gone on belongs to Tamar Dayan, who not only has worked tirelessly, but with remarkable creativity as well. The museum is filled with new elements, innovative displays, and has the ability to attract both young and old. This is truly a remarkable achievement! Can you imagine how many decisions have been made over these many years, and how many are yet to be made?

Where do we go from here? Even now, there remain a number of odds and ends to complete in the present structure, but we can't help thinking a little bit about the future and that future is to include public programs also in both the Botanical and Zoological Gardens.

For all of our 250 or so employees, and all our partners in numerous organizations who helped to construct this edifice, and for the donors who have been so generous, we thank you all. We hope that the future is at least as bright as the present and we will endeavor to make it so.

Very truly yours,  
Michael Steinhardt



## HONORARY PRESIDENT

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Michael Steinhardt

## SCIENTIFIC AND PUBLIC COUNCIL

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The Steinhardt Museum of Natural History is a national research infrastructure. The Scientific and Public Council comprises leaders, who represent the public interest in their diverse fields. Itamar Borowitz (Chair), Ruth Arnon, Gedalia Gal, Ariel David, Yael Dayan, Ariel Weiss, Samuel Hayek, Ilan Chet, Yaakov Turkel, Ami Federman, Aharon Ciechanover, Shony Rivnay, Shimshon Shoshani, Michael Steinhardt, Brian Sherman, Meir Shalev, Martin Weyl.

## BOARD OF DIRECTORS

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Tamar Dayan (Chair), Aharon Fogel, Itamar Borowitz, Ami Federman, Izhar Kanne, Doron Sapir, Gady Frank, Dudu Zaken, Motti Kohn, Neri Azogui.

## INTERNATIONAL SCIENTIFIC ADVISORY BOARD

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**Gretchen C. Daily**, Department of Biology, Stanford University, Stanford, CA, USA; **Jared Diamond**, Department of Physiology, University of California, Los Angeles Medical School, Los Angeles, CA, USA; **Paul Ehrlich**, Department of Biological Sciences, Stanford University, Stanford, CA, USA; **Daphne G. Fautin**, Ecology and Evolutionary Biology, Invertebrate Zoology University of Kansas, USA; **Marcus W. Feldman**, Department of Biology, Stanford University, Stanford, CA, USA; **Lord Robert May** of Oxford OM AC Kt FRS, Department of Zoology, Oxford University, Oxford, UK; **Harold A. Mooney**, Department of Biological Sciences, Stanford University, Stanford, CA, USA; **Peter Raven**, Missouri Botanical Garden, St. Louis, MO, USA; **Daniel Simberloff**, Department of Ecology and Evolutionary Biology, University of Tennessee, Knoxville, TN, USA; **Edward O. Wilson**, Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA; **Nancy Knowlton**, Marine Science, US National Museum of Natural History, Washington, DC, USA.

## MUSEUM STAFF

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- Prof. Tamar Dayan – Chair
- Dr Menachem Goren – Deputy-Chair
- Alon Sapan – Director
- Dana Silvera-Sharir – Administrative Manager
- Tamar Zadok – Head of Marketing & Strategy
- Galit Benshahar-Abadi – Sales, Events and Visitor Front Desk Manager
- Liat Lev – Sales, Group Visits Manager
- Aviva Kimchy – Sales, School Groups Visits Manager
- Maya Ruth Katorza – Head of Operation
- Doron Ninio – Museum maintenance
- Andrei Lapicov – Museum maintenance
- Lyn Geffen Cohen – Museum operations
- Galit Shenhav – IT Coordinator

## EDUCATION AND SCIENCE COMMUNICATION DEPARTMENT

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- Dr Yael Gavrieli – Head of Education and Science Communication
- Dr Ilil Pratt – Coordinator of Public Programs
- Dafna Lev – Coordinator of Educational Projects
- Irit Sidis – Coordinator of Public Programs
- ~30 graduate students as guides

### Exhibition Constructors

- Gev Weil – Project Manager
- Eli Gdulin – Project Manager
- Adi Malol – Technical support, Project Manager
- Dr Naama Berg – Scientific Curator of Exhibitions
- Hadas Zemer – Curator of Exhibitions
- Eran Yuval – Multimedia Manager
- Gaudeamus Productions – Multimedia Productions
- Exhibition Designers: Nitzan Studio, Studio Amir Zehavi, Design Mill Studio, Tucan Design Studio, Ori Glazer

## COLLECTIONS AND RESEARCH DIVISION

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**Museum Committee:** Tamar Dayan (Chair), Menachem Goren, Alon Sapan, Revital Ben-David-Zaslow (Chief Collections Manager), Shai Meiri, Roi Dor, Eli Geffen, Yossi Yovel, Eran Levin, Jonathan Belmaker, Roi Holtzman, Noa Shenkar, Frida Ben-Ami, Micha Ilan, Netta Dorchin, Amnon Freidberg, Moshe Guershon, Gal Ribak, Inon Scharf, Dorothée Huchon, Yuval Sapir, Israel HersHKovitz, Hilla May, Rachel Sarig, Dafna Langgut, Lidar Sapir-Hen, Yael Gavrieli.

Tirza Stern – IT Coordinator

### The Entomology Group

- Dr Netta Dorchin – Chief Curator (flies)
- Dr Gal Ribak – Curator (beetles)
- Prof. Vladimir Chikatunov – Curator (beetles)
- Prof. Vasily Kravchenko – Curator (moths)
- Dr Sergey Zonstein – Curator (spiders)
- Dr Mike Mostovski – Curator (flies)
- Dr Elizabeth (Liz) Morgulis – Curator (flies)
- Dr Amnon Freidberg – Curator Emeritus (flies)
- Dr Inon Scharf – Associate Curator
- Dr David Furth – Associate Curator (Smithsonian Institution and TAU) (beetles)
- Dr Dany Simon – Associate Curator (Neuroptera)
- Prof. Yael Mandelik – Associate Curator (Hebrew University of Jerusalem) (bees)
- Dr Moshe Guershon – Collections Manager (bees) and Staff Director for Entomology
- Ariel-Leib-Leonid Friedman – Collections Manager (beetles)
- Dr Armin Ionescu – Collections Manager (ants)
- Dr Tatyana Novoselsky – Collections Manager (bugs)
- Dr Zoya Yefremova – Collections Manager (parasitic wasps)
- Dr Wolf Kuslitzky – Collections Manager (parasitic wasps)
- Dr Malkie Spodek – Collections Manager (Sternorrhyncha and Auchenorrhyncha)

- Dr Miriam Kishinevsky – Technical Assistant (parasitic wasps)
- Dr Avi Keysary – Volunteer (Palmoni Collection)
- Binyamin Shalmon – Volunteer
- Dr Phyllis Weintraub – Volunteer
- Amir Weinstein – Volunteer

## **The Marine & Freshwater Group**

### **Invertebrates**

- Prof. Noa Shenkar – Curator (ascidians)
- Prof. Micha Ilan – Curator (sponges)
- Prof. Frida Ben-Ami – Curator (mollusks)
- Dr Stanislav Pen-Mouratov – Curator (nematodes)
- Prof. Yehuda Benayahu – Curator Emeritus (soft corals)
- Dr Bella Galil – Curator Emeritus (crustaceans)
- Henk K. Mienis – Collections Manager (mollusks)
- Oz Rittner – Collections Manager (mollusks, beetles and butterflies)
- Dr Rony Izhar – Collections Manager (mollusks)
- Dr Sigal Shefer – Collections Manager (sponges)
- Alex Shlagman – Collections Manager (soft corals)
- Ya'arit Levitt-Barmatz – Technical Assistant (crustaceans)

### **Fishes**

- Dr Menachem Goren – Curator Emeritus
- Prof. Jonathan (Yoni) Belmaker – Curator
- Prof. Roi Holzman – Curator
- Dr Nir Stern – Associate Curator (IOLR)
- Dr Bat-Sheva (Shevy) Rothman – Technical support

## **The Terrestrial Vertebrates Group**

- Prof. Shai Meiri – Curator (reptiles, mammals and birds)
- Dr Roi Dor – Curator (birds)
- Prof. Eli Geffen – Curator (mammals and amphibians)
- Prof. Tamar Dayan – Curator (mammals)
- Dr Eran Levin – Curator (mammals)
- Prof. Yoram Yom-Tov – Curator Emeritus (mammals)
- Prof. Yossi Yovel – Curator (bats)
- Dr Amos Belmaker – Collections Manager (birds)
- Erez Maza – Collections Manager (reptiles)
- Kesem Kazes – Collections Manager (mammals)
- Avigail Ben-Dov Segal – Technical assistance (birds and feathers)
- Arie Landsman – Volunteer technical assistant
- Moshe Geizler – Volunteer technical assistant
- Nir Weil – Volunteer technical assistant
- Igor Gavrilov – Chief Taxidermist
- Dr Stanislav Volynchik – Taxidermist
- Hamutal Friedman – Technical Assistant in taxidermy
- Yiftach Ramot – Technical Assistant in taxidermy

## **The Herbarium**

- Dr Yuval Sapir - Curator
- Dr Yotam Zipser-Berger – Collections Manager (plants)
- Bruria Gal – Collections Manager (fungi)
- Yonatan Gur – Collections Manager (fungi)
- Prof. Jacob Garty – Curator Emeritus (lichens)
- Dr Ya'akov Lipkin – Curator Emeritus (algae)
- Dr Razy Hoffman – Collections Manager (water plants, cyanobacteria and water fungi)

## **The Paleosciences Group**

### **Paleontology**

- Dr Yuri Katz – Curator
- Dr Olga Orlov-Labkovsky – Curator (micropaleontology)
- Prof. Sigal Abramovich – Associate Curator (Ben Gurion University of the Negev)
- Dr Daniella E. Bar-Yosef Mayer – Collections Manager

### **Biological archeology**

- Dr Dafna Langgut – Curator (palynology and archeobotany)
- Dr Lidar Sapir-Hen – Curator (archeozoology)
- Dr Meirav Meiri – Ancient DNA Lab Manager

## **Dan David Center for Human Evolution and Bio-History Research**

### **Physical Anthropology**

- Prof. Israel Hershkovitz – Curator
- Dr Hilla May – Curator
- Dr Rachel Sarig – Curator
- Prof. Yoel Rak – Curator Emeritus
- Prof. Baruch Arensburg – Curator Emeritus
- Julia Abramov – Collections Manager
- Shirly Cohen – Technical Assistant
- Linoy Namdar – Technical Assistant
- Elisia Vanzety – Technical Assistant

## **Molecular Systematics and Tissue Collection**

- Prof. Dorothée Huchon – Curator
- Dr Tamar Feldstein-Farkash – Collections Manager

## **ISRAEL TAXONOMY INITIATIVE**

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National Project of the Higher Education and Research Systems; Ministries of Environmental Protection, Agriculture, Energy and Water, Science and Technology, and Health; KKL-JNF, Israel Nature and Parks Authority, Society for the Protection of Nature in Israel.

### **Directors:**

- Dr Menachem Goren and Dr Frida Ben-Ami – Directors
- Dr Daniella E. Bar-Yosef Mayer – Coordinator

### **Steering Committee:**

- Professor Leon Blaustein
- Professor Bella Galil
- Professor Yael Lubin
- Professor Alan Matthews
- Professor Yosef Steinberger

## **APPLIED RESEARCH DIVISION**

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Applied research institutes/laboratories/programs operating in the Division have each their own steering committees or boards of directors and academic/professional oversight.

### **The Israel National Center for Aquatic Ecology**

#### **Steering Committee:**

- Alon Zask – Ministry of Environmental Protection
- Dr Amir Erez – Ministry of Environmental Protection
- Nissim Keshet – Israel Nature and Parks Authority
- Dr Dana Milstein – Israel Nature and Parks Authority
- Dr Menachem Goren – TAU
- Prof. Tamar Dayan – TAU

#### **Staff**

- Dr Yaron HersHKovitz – Director
- Tuvia Eshcoly – Biologist
- Adi Weiss – MSc student
- Lior Bentor – MSc student
- Etai Kahana – Lab technician
- Avital Katz – Lab technician
- Dafi Lavi – Lab technician

### **The Entomological Laboratory for Applied Ecology**

#### **Academic Committee:**

- Dr Menachem Goren – TAU
- Dr Inon Scharf – TAU

#### **Staff**

- Ittai Renan – Director
- Shifra Briga – Technician
- Ahikam Gera – Technician
- Dr Enav Vidan – Technician
- Itai Namir – Technician
- Dafi Lavi – Technician
- Carmel Herold – Student

## **HaMaarag – Israel's Nature Assessment Program**

### **HaMaarag Board of Directors:**

- Gady Levin, Chair – Israel Academy of Sciences and Humanities
- Dr Yehoshua Shkedy – Israel Nature and Parks Authority
- Dr David Brand – KKL-JNF
- Dr Avi Perevolotsky – Agricultural Research Organization and Hebrew University of Jerusalem
- Hanoch Ilssar – the Rothschild Foundation
- Prof. Tamar Dayan – TAU

### **Steering Committee of the State of Nature Report:**

- Dr David Brand – KKL-JNF
- Dr Anna Trajtenbrot – Ministry of Environmental Protection
- Dr Yehoshua Shkedy – Israel Nature and Parks Authority
- Dotan Rotem – Israel Nature and Parks Authority
- Dr Avi Perevolotsky – Agricultural Research Institute and Hebrew University of Jerusalem

### **Staff**

- Dr Irina Levinsky – Director
- Noa Zanzuri – Administrative Manager
- Dr Idan Shapira – Terrestrial Biodiversity Monitoring Program Coordinator
- Dr Alon Lotan – Israel National Ecosystem Assessment Coordinator
- Dr Michal Sorek – State of Nature Report Coordinator
- Ron Drori – Remote Sensing and Databases Manager
- Harel Dan – GIS and Cartography Coordinator
- Dr Hila Shamoon – Quantitative Ecologist
- Shira Grossbard – Israel National Ecosystem Assessment Program Assistant

## **The Open Landscapes Institute**

### **Council (Board):**

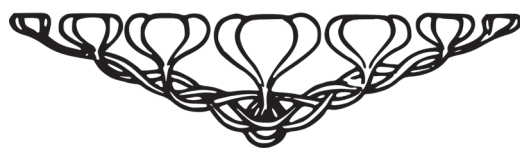
- Yoav Sagui, Chair – SPNI (ret.)
- Amir Ritov, Co-Chair – Chair of the Regional Councils Organization
- Hanoch Ilssar – the Rothschild Foundation
- Yaron Ohayon – KKL-JNF
- Dr David Brand – KKL-JNF
- Dr Yehoshua Shkedy – Israel Nature and Parks Authority
- Dr Yuval Peled – Israel Nature and Parks Authority
- Alon Zask – Ministry of Environmental Protection
- Dr Anna Trajtenbrot – Ministry of Environmental Protection
- Uriel Ben-Haim – Regional Councils' Organization
- Prof. Eran Feitelson – the Hebrew University of Jerusalem
- Prof. Yael Mandelik – the Hebrew University of Jerusalem
- Prof. Tali Mozes – Technion
- Dr Hana Sweid – the Arab Center for Alternative Planning
- Prof. Tamar Dayan – TAU
- Alon Sapan – TAU

### **Staff**

- Uri Ramon – Director
- Aviv Avisar – Head of the Research Unit



- Dr Liron Amdur – researcher
- Noa Zanzuri – Administrative Manager
- Gal Kagan – GIS Coordinator
- Dr Amir Perelberg – Head of survey unit
- Eitan Romem – Survey Manager
- Merav Lebel – Survey Manager
- Bar Shemesh – Survey Manager
- Miryam Ron – Head of Botanical Research
- Amit Mendelson – Survey Manager
- Idan Talmon – Survey Manager
- Omri Shalev – Survey Manager
- Hila Gil – Hotspots Research Coordinator
- Uri Shapira – Survey Manager
- Liraz Cabra-Leykin – Survey Manager
- Nadav Sade – Assimilation and Social visibility





## PROGRESS AT THE STEINHARDT MUSEUM OF NATURAL HISTORY

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### **Tamar Dayan and Alon Sapan**

The past year was a historical milestone in the Steinhardt Museum development, with the beginning of the move into the new building and opening our galleries to the general public. This process began decades ago, most formally with a science policy decision made by the Israel Academy of Sciences and Humanities in 1986, to consider our collections as National Collections, a National Museum of Natural History in the making.

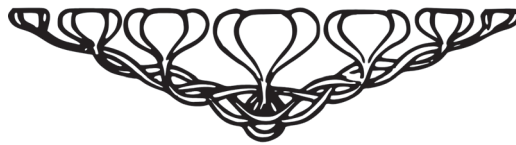
We have finalized Phase I of the Steinhardt Museum development and now face challenges of Phase II – the continuing development of our public programs and scientific and professional capabilities, while strategically advancing the organizational and financial structure of the Steinhardt Museum.

The Steinhardt Museum comprises three major divisions. The Public Division was very active with finishing the exhibitions, developing an application and educational materials for museum visitors, and training guides, ushers and cashiers to work with the public. July and August saw a trial run with limited numbers of visitors and in September we opened the museum for all who purchased tickets on-line. The interest in the museum was gratifying, exceeding our most optimistic expectations, with the tickets sold out weeks ahead. Very positive responses were received from the public representing all sectors of the Israeli society; we feel privileged to share our treasures and knowledge with all.

The Collections & Research Division has developed dramatically over the past few years – now comprising ca. 5.5 million specimens, over 40 expert collections managers, taxidermists and technical assistants, 24 curators, 5 associate curators and a number of active curators emeriti. The Israel Taxonomy Initiative and the Aliya from the former USSR have contributed highly qualified museum professionals, in particular expert taxonomists, to this division, and the relevant academic units have hired excellent young faculty members who serve as curators and develop collections-based research programs. Consequently, the rate of our collecting and the numbers of graduate students and international colleagues who use the collections for research have increased substantially. The staff members were entrusted with an arduous task of transferring the collections to the new museum building and reorganizing the collections in the storage facilities; they have been dealing with this admirably. Two special projects in the Collections & Research Division – the Israel Taxonomy Initiative and the Ancient DNA Program – continued to perform well, and the joint molecular systematics laboratory moved from cramped quarters to a spacious lab in the new museum building that would allow its development and use by all collections-based researchers.

The Applied Policy-Relevant Research Division comprises three centers supported and co-managed by the Ministry of Environmental Protection, the Israel Nature and Parks Authority and KKL-JNF: The Israel National Center for Aquatic Ecology, the Open Landscape Institute (with partnership also of the Society for the Protection of Nature in Israel) and HaMaarag - Israel National Nature Assessment Program. The experts working in these centers have added a new dimension to the research carried out in the museum, and we trust that the synergy between them and the Collections & Research Division of the museum will continue to add depth to the museum's mission and activities. The Applied Policy-Relevant Research Division also comprises special projects and services provided by the museum to governmental and other agencies: The Entomology Lab for Applied Ecology, the Feather Identification Lab, Agricultural Biodiversity and Marine Biodiversity, which produce knowledge required to support important activities of the Plant Protection and Inspection Services of the Ministry of Agriculture, monitor and survey arthropods, monitor bird-strikes for the Airports Authority and the Israeli Air-Force, and do forensic work and monitor marine nature reserves for the Israel Nature and Parks Authority.

It was a very intensive, uneasy yet rewarding year, and we are privileged to have a dedicated hard-working team that meets challenges successfully and good-humoredly. We are also fortunate to have excellent colleagues in all relevant agencies and organizations who work with us, to attain the common goal of recording Israel's biodiversity, studying it and sharing our knowledge and treasures with decision-makers and with the general public.



## COLLECTIONS NEWS

The staff members of the Steinhardt Museum of Natural History (SMNH) continued curation and promotion of our collections. The major efforts focussed on the preparation of all the collections for their relocation into the new Museum building. We continued to collect and preserve new scientific material, rescue and incorporate important private and institutional collections, maintain the existing holdings, send scientific material and data abroad, and assist graduate students, academic courses, and educational activities.

During the academic year 2017–2018 we received and/or incorporated over 50,000 specimens of various taxonomic groups collected worldwide by the collection curators and staff, students, rangers from the Israel Nature and Parks Authority, and others.

### THE ENTOMOLOGY GROUP (INCLUDING ARACHNIDS)

Netta Dorchin, Amnon Freidberg, Inon Scharf, Gal Ribak, Moshe Guershon, Vladimir Chikatinov, Vasiliy Kravchenko, Sergei Zonstein, Mike Mostovski, Zoya Yefremova, Tanya Novoselsky, Wolf Kuslitzky, Armin Ionescu, Dany Simon, Tirza Stern, Arie-Leib-Leonid Friedman, Alex Shlagman, Malkie Spodek, Oz Rittner, Elizabeth (Liz) Morgulis, Miriam Kishinevsky, Avi Keysary, David Furth, Binyamin Shalmon, Amir Weinstein, Itzhak Nusbaum.

#### Research and curation

The entomological collections were fully prepared for transfer to the new museum building, and completely and successfully moved to their new home at the Steinhardt Museum of Natural History during April–May, 2018. During the transfer, the collections were consolidated and optimized. The preparation and the actual relocation were planned and supervised by David Furth, and were facilitated by all curators and collection managers led by Moshe Guershon.

#### Arachnida

S. Zonstein continued his research into the systematics of Mygalomorphae (trapdoor spiders) and described 15 new species and previously unknown males of four species in the families Cyrtacheeniidae, Filistatidae and Nemesiidae from the Palearctic and Afrotropical regions.

#### Hemiptera

T. Novoselsky sorted and databased material of the family Notonectidae. In our collection, the family is represented by two genera, *Anisops* (500 specimens) and *Notonecta* (114 specimens). The following species of backswimmers were identified: *Anisops debilis perplexus* (new record for Israel), *A. sardeus sardeus* (new record for Nigeria), *A. varius* (new record for Nigeria), *Notonecta glauca glauca*, *N. maculata*, *N. meridionalis* (new record for Israel), and *N. viridis*. A richly illustrated manuscript on the Israeli fauna of the family Belostomatidae was prepared and submitted, with descriptions and an identification key, including information on distribution and life history attributes, where known. The giant water bug *Belostoma bifoveolatum* was recorded in the Old World for the first time.

M. Spodek reviewed the Auchenorrhyncha collection during its preparation for moving to the new building. The collection comprises of about 30,000 pinned specimens in unit trays and, some are identified or partially sorted. Identifications will all require verification. The Cicadidae and Dictyopharidae have both been subject to recent publications relating to Israel and have been curated accordingly. The separate Palmoni collection (4 drawers; some specimens have Linnavuori determination labels) require proper labels with collection data to allow integration into the main collection. The curatorial work resulted in several important discoveries. In the family Achilidae, only 1 species was known in Israel (Linnavuori 1962). A second species was recovered from Malaise trap material collected in Bet Dagan and Zoological Gardens; further specimens were also noted from A. Freidberg's Hertzliya Hill material. The species was identified as *Cixidia mersinica* Dlabola,



Several species of Giant Water Bugs (Hemiptera: Belostomatidae) are newly recorded from Israel.

described from Turkey (Anatolia); this is a new record of both the genus and species for Israel. The suspected vector of *Xylella* plant pathogen in Italy, *Philaenus spumarius*, is widespread in Western Europe but was unknown in Israel. However, two specimens in our collection are labeled as this species, leading M. Spodek to wonder what the status of the species in Israel really is. A guide for the disease vectors including *Xylella* bacterium and phytoplasma/spiroplasma is unavailable and information about the presence or absence of potential vectors in the country should be investigated. There new records of agricultural significance. *Penthimiola bella* Stål (Cicadellidae) is a South African citrus pest that extended its range in the past forty years. It was not included in Linnavuori's review (1962) but was later recorded in Israel (Raccah 1975). One specimen of presumed *P. bella* was noticed on a sticky trap (PPIS, Ministry of Agriculture) and the status of this species should be further investigated. A single female specimen of *Hishimonus* sp. (Cicadellidae) was detected on a sticky trap in a citrus grove in the Southern Arava R&D station (Yotvata), and a second specimen was found in the Coastal Plain area. The existing network of yellow sticky traps distributed in citrus orchards should be utilised for survey and detection of potential vector species such as *Hishimonus* sp. However, the Plant Protection Services, Ministry of Agriculture and The Citrus Board were formally informed. M. Spodek also collaborated with Serkan Kaptan, MSc student from the Olive Research Station, Izmir, Turkey, on an olive psyllid (Hemiptera: *Euphyllura* spp.) identification project. About 500 specimens were identified and a joint publication would result from this project. Dr Phyllis Weintraub (Agricultural Research Organization, Gilat) volunteered in our Hemipteran collection from October 2017 – February 2018, and helped prepare the Auchenorrhyncha collection for the move to the new Museum building, and also assisted with preparing specimens for the *Taxonomy of Auchenorrhyncha* course.

### Coleoptera

A.L.L. Friedman added to the collection, databased and partly sorted and identified ca 3000 beetles (mainly weevils) from Israel, Germany (Bavaria) and Russia (St Petersburg environs). A collection of 150 identified species of weevils from the European part of the former USSR, Middle Asia and Far East (291 specimens, including several paratypes) was donated by the Zoological Institute, St Petersburg, Russia. This material was identified by the most prominent Russian weevil specialists (e.g. B. Korotyaev, late M. Ter-Minassian, late V. Zherikhin etc.) and, therefore, is of high importance as a comparative collection. A collection of Central European weevils (ca 230 specimens), part of them identified, was donated by Dr Michael Hiermeier, Zoologische Staatssammlung München.

V. Chikatunov identified beetles from pitfall traps for Prof. Elli Groner and Dr Michal Segoli (Ben-Gurion University), and water and riparian beetles for the Israel National Center for Aquatic Ecology (Dr Yaron HersHKovitch, SMNH). He also curated and rearranged the collection of Pselaphidae (Coleoptera).



## Lepidoptera

V. Kravchenko prepared the Lepidoptera collection for transfer to the new Museum building and arranged the collection in the new place. In this regard, the following families were treated at the genus/species level: Israeli and Palearctic Noctuidae (>1500 specimens), world collection of Saturniidae (ca 300 specimens), Israeli Crambidae (ca 1000 specimens), Pyralidae (ca 1000 specimens) and Gelechiidae (ca 500 specimens). He actively collaborated with foreign colleagues on national and international projects: *Density regulation of malaria vectors (mainly Anopheles gambiae complex: Anophelinae) in West Africa* (in cooperation with the Univ. of Sciences, Techniques and Technologies of Bamako, Mali); *Biodiversity in the Congo Basin. Part I – Lepidoptera: Noctuidae* (Max-Planck Inst., Germany); *Gelechiidae fauna of Israel* (Inst. for Evolutionary Ecology, National Acad. of Sciences of Ukraine); *Biodiversity of Lepidoptera of highland Ethiopia* (Witt Museum, München, Germany); *Crambidae and Pyralidae of Israel* (Academy of Biology and Biotechnology, Southern Federal Univ., Rostov-Don, Russia); *Gelechiidae of Israel* (Inst. for Evolutionary Ecology, National Acad. of Sciences of Ukraine); *Himalayan winter Lepidoptera fauna of highland South East Asia* (Hungarian Natural History Museum in Budapest); and *Lepidoptera pests and their parasitoids of pearl millet in West Africa* (with Zoya Yefremova, SMNH). He also accommodated Dr Alexey Bidzilia (Inst. for Evolutionary Ecology, National Acad. of Sciences of Ukraine), who assisted with organizing of our Gelechiidae collection and participated in field trips around Israel.

## Diptera

A. Freidberg continued working on final drafts of several chapters for the Manual of Afrotropical Diptera.

N. Dorchin continued various studies on the taxonomy and systematics of gall midges, wild bees, galling wasps, and mayflies of Israel, which contributed hundreds of specimens to the SMNH collection and numerous descriptions of new species. Ongoing study on the biological control of *Acacia saligna* (an invasive alien plant) in Israel continued with the collaboration of Prof. Zvi Mendel from the Volcani Center, funded by research grants from KKL-JNF and the NPA. Numerous fieldtrips in Israel as well as a 2-month research visit in the South Africa National Biodiversity Institute in Cape Town have yielded dozens of undescribed species and a substantial addition to the Cecidomyiidae collection in the SMNH. She continued collaborative studies with several colleagues in Israel (Roi Dor, Zvi Mendel, Moshe Inbar), the USA, UK and South Africa. She was also a member of the organizing committee for the 54<sup>th</sup> annual conference of the Zoological Society of Israel at Tel Aviv University in December 2017, and gave two lectures in public events on campus, and several interviews for the media.

E. Morgulis continued working on the primary-type catalogue of the insect collection, recording label data of the primary types, taking pictures and putting together essential references.

M. Mostovski continued working on the shoot-flies (genus *Atherigona*, Muscidae) from the Afrotropics and Israel in collaboration with Burgert Muller of the National Museum, Bloemfontein, South Africa. As a result, the number of species of these pests of cereal crops and grasses increased two-fold for Mali (from 14 to 30; Muller & Mostovski (2018)) and three-fold for Israel (from 3 to 10). He also continued to sort alcohol-preserved samples for phorids and other Diptera.

I. Scharf's research focused on a comparison between urban and natural sites populated with a pit-building predator, the wormlion. Wormlions (Diptera: Vermileonidae) are fly larvae that construct conical pits in loose soil and ambush other small arthropods that fall into their trap. They require cover from direct sunlight and rain. They are highly abundant in cities all over Israel probably owing to the man-made constructions providing such a cover or shelter. Their natural habitat is caves or cliff overhangs. He compared the important environmental characteristics, such as plant cover, soil composition, temperature and arthropod abundance among our urban and natural studied sites. He later also compared wormlion density, their body mass and pit size among sites. In short, it was found that wormlions in the city were much more abundant than in natural sites, they were larger and construct larger pits. It was explained by the higher abundance of available covers/shelters and by the higher abundance of small ant species in the city that provide suitable prey for wormlions. This research was facilitated by the museum entomology team (especially A. Ionescu) through identification of collected arthropods.

## Hymenoptera

**Ants:** A. Ionescu collaborated with Inon Scharf and trained his student Michael Bar-Ziv to identify the collected ants (Bar-Ziv *et al.* 2018). He also worked on morphological characterization of ants of the *Messor semiruber* species group in order to align their taxonomy to the DNA findings by Maya Saar, who started a study on the molecular phylogeny of these ants. After the transfer of the collections to the new location, he worked on re-mapping of the entomological wet collection, so the database can be updated. A. Ionescu collaborated with Sándor Csősz from the Hungarian Natural History Museum Budapest, Hungary, in conducting a revisionary work of *Temnothorax rottenbergi* species group, and with Carmel Herold, a student in Ittai Renan's *Entomology Lab for Applied Ecology*, on sorting the collected ants and their morphological characterization to align their taxonomy to the DNA findings.

**Parasitic Hymenoptera:** W. Kuslitzky sorted the newly collected material to families and sub-families, and specimens of Parasitica (80%) reared from various hosts on *Ricinus communis* and *Eucalyptus camaldulensis* were identified to the species level. Together with D. Kasparyan (St Petersburg) and G. Broad (London) he revised three genera of Ichneumonidae, and discovered three species new to science. The Ichneumonoidea collection was moved and arranged in the new Museum storerooms.

**Parasitic Hymenoptera:** Z. Yefremova prepared the Chalcidoidea collection for transferring to the new Museum building and arranged the material in the new place. The Argaman Collection was arranged in the taxonomic order and the material was sorted into the families Bethyridae, Perilampidae, Proctotrupidae, Scelionidae and others. The Chalcidoidea material in alcohol donated from the Agricultural Research Organization (Bet Dagan, Israel) was sorted to the family level and most specimens of the family Eulophidae were pinned for incorporation into the collection. She accommodated Dr Ekaterina Yegorenkova of the Ulyanovsk State Pedagogical University, Russia, who visited the SMNH in August 2018 and sorted and arranged specimens of Tetrastichinae (Chalcidoidea) to the genus and/or species level.

**Bees:** A. Dorchin devoted much time to research: (1) A first illustrated pocket guide to the bees of Israel was prepared with support from the Society for Protection of Nature in Israel (SPNI) and submitted for pre-publication editing. The guide includes descriptions and 50 scientific color drawings by Tuvia Kurtz of representatives of the Israeli bee fauna, and also presents illustrations and information on natural history and the conservation of bees. The main purposes of the guide are to raise public awareness to the outstanding bee diversity of Israel and its ecological importance, and assist naturalists in the identification of main groups of bees in the field. (2) A dataset of the spectrum of pollen collected by bees of the genus *Eucera* (Apidae) was prepared using pollen analyses with the help of Dafna Langgut, the Laboratory of Archaeobotany and Ancient Environments, and other palynologists. This was done as part of an ongoing research on the evolution of floral preference in the cosmopolitan genus *Eucera*. The pollen analyses would be based on 325 pollen samples taken from different female specimens and 72 bee species, about half of which are native to Israel. (3) A first taxonomic revision of the western Palearctic genus *Megachile*, subgenus *Pseudomegachile*, based on research performed in the museum, was completed. The revision, which included 20 species, five described as new, 57 pages, and 117 figures, resolved the taxonomy, and proposed a phylogenetic hypothesis for this systematically complex group. Israel is situated within the centre of distribution of this group, where morphologically divergent species, some which were last recorded in the 1980s are found; one of the newly described species is morphologically impressive and endemic to the Arava valley. This study was made possible by two research travels to museums in Europe with the support of the the Israeli Taxonomy Initiative (ITI). (4) The study on the nesting biology of snail shell nesting bees from the Palearctic genus *Wainia*, subgenus *Caposmia* performed in collaboration with specialists for the group from Switzerland was based on collection of nests constructed in shells in the central Negev and resulted in a paper. (5) A new genus of eucerine bees, *Protohalonia* (Hymenoptera: Apidae: Eucerini), was described based on phylogenetic analyses and a species revision. Although endemic to southwestern North America, delimitation of the new genus became possible only via morphological and molecular analyses of related bee lineages from both the New and the Old World, including many species collected in Israel. This paper resulted from a postdoc study supported by the ITI.



### Professional work abroad

N. Dorchin went on a two-month research visit to the South Africa National Biodiversity Institute in Cape Town, which yielded dozens of undescribed species and a substantial addition to the Cecidomyiidae collection in the SMNH.

A.L.L. Friedman went on a research and collecting trip to Munich, Germany, and dedicated two days for studying the weevils' collection at the Zoologische Staatssammlung München. He also spent several days in the Insect Collection of the Zoological Institute (ZIN) in St Petersburg, Russia. During collecting excursions around St Petersburg, he discovered a new host plant (*Salix* sp.) for a jumping weevil of a genus *Isochnus*. The trip to ZIN was funded by the Systematic Entomology Fellowship, School of Zoology, TAU.

M. Mostovski went in August 2018 on a private trip to South Africa and spent two weeks sorting and identifying Phoridae (Diptera) at the KwaZulu-Natal Museum.

T. Novoselsky during a private visit to Kiev, Ukraine, dedicated a week for collaborative work on the Reduviidae bugs with Dr P.V. Putshkov at the I.I. Schmalhausen Institute of Zoology of National Academy of Sciences. Identifications of over 500 specimens representing 25 species were checked.

S. Zonstein spent several weeks in August 2018 at the Turku University, Finland, working on collaborative projects on the systematics of the trapdoor spiders.

Z. Yefremova collaborated with her Chinese colleagues, in particular with Prof. Xue-Ping Zhou, Director General of the Institute of Plant Protection, Chinese Academy of Agricultural Sciences (Beijing), on the project *Identification and genetic divergence of parasitoids of leafminers in Chinese Eulophidae (Hymenoptera: Chalcidoidea)*. She paid two research visits to China in November 2017 and September 2018; both trips were financially covered by her Chinese counterparts.

### Integration of "Orphan collections" into the SMNH

Avi Keysary curated the Palmoni collection. All specimens in the collection were moved to standard new drawers. In total, 1700 specimens were recorded in the database, belonging to Coleoptera (Meloidae, Carabidae, Scarabaeidae, Oedemeridae, Anthicidae, Aderidae, Cicindelidae, Dytiscidae), Orthoptera (Acrididae, Gryllidae, Gryllacrididae), Odonata (Libellulidae), Ephemeroptera (Baetidae), Hymenoptera (Cephidae, Cynipidae, Braconidae, Bethyidae, Evanidae, Chalcididae, Scelionidae, Scoliidae, Vespiidae).

### Identification Services

A total of 887 specimens were identified by the SMNH staff for government, academic and private organizations:

- Coleoptera (A.-L.-L. Friedman): 70 identifications were made for Plant Protection and Identification Services, Ministry of Agriculture of Israel, and ca 20 identifications for various institutions and members of general public.
- Hemiptera Heteroptera (T. Novoselsky): 74 specimens were identified the Plant Protection and Identification Services, Ministry of Agriculture of Israel, Israel National Center for Aquatic Ecology, and Jacob Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev.
- Hemiptera Sternorrhyncha (M. Spodek): About 20 psyllids and scale insects were identified for various individuals and government bodies.
- Diptera: N. Dorchin consulted staff of the Ministry of Agriculture regarding two agricultural pests: an undescribed species of gall midge damaging the cut-flower industry and a serious pest of olives. These consultations included visits on site (in the field) to assess the damage and collect the insects. Other services included identification of cecidomyiid material sent from Kenya and from South Africa.
- Hymenoptera (Ants, A. Ionescu): 14 identifications were done for the Ministry of Agriculture (PPIS) and 157 ants were identified for Noam Gonen, student of A. Freidberg.
- Hymenoptera (Bees, A. Dorchin): Several hundreds of specimens from the bee genera *Eucera*, *Anthophora* (both Apidae), *Panurgus*, *Panurginus*, *Clavipanurgus* (all Andrenidae), *Osmia*, and *Megachile* (both Megachilidae) were identified to species as service to the Mandelik group, Faculty

of Agriculture, Food and Environment The Hebrew University of Jerusalem, and the Sapir group, School of Plant Sciences and Food Security, Tel Aviv University. In addition, several hundreds of live bees, mainly from the genus *Andrena*, were assigned to morphospecies in the field as part of a study on virus infestation among wild bee communities of the Judea foothills region, carried out by the Mandelik group, Faculty of Agriculture, Food and Environment, The Hebrew University of Jerusalem, and the Agroecology Lab, the Institute of Plant Sciences, Volcani Center.

- Hymenoptera (Parasitica): Z. Yefremova identified Eulophidae specimens collected during ecological project in pomegranate gardens at University of Haifa-Oranim (Israel). Identification of parasitoids specimens (Hymenoptera: Encyrtidae) reared from Psyllidae (Hemiptera: Psylloidea) fig pests was done for the Department of Plant Production & Protection, Faculty of Agriculture & Veterinary Medicine, An-Najah National University Nablus of Palestinian Autonomy.

### Collecting trips and expeditions

A dynamic archive, our Natural History Collections grow annually through donations, research projects, and collecting trips and expeditions. Many research projects have added numerous specimens to our collections, while other collections have benefited from focused collecting trips. Here we report on some of the new collecting activities of our scientists. According to our database, the entomology staff added 8,183 insect specimens during the reporting period.

L. Friedman undertook 25 collecting trips, one of them 2 days long expedition to the Arava and Central Negev (with N. Dorchin), six trips 1 day long and the rest were short trips, lasting a few hours to half a day. The collecting efforts were directed for sampling in the previously unvisited or undersampled localities. Particular efforts were directed for collecting in East Samaria ('Eli, Shilo, Jebel Trudja, along the Alon Road: Har Qida, Duma, Kokhav haShahar, Har Kokhav, Rimonim, Ma'ale Mikhmas) (13 short visits, mainly on Fridays), which resulted in discovery of a few rare species and an undescribed species of a weevil (*Thamiocolus* sp., Ceutorhynchinae), developing on the Lamiaceae. Six trips were made to the Jordan Valley, with an emphasize on its middle, less visited part, revealing a few species of weevils new to this region or being extremely rarely collected. One of these trips was interrupted by a car brake near Yitzhar (Central Samaria); while waiting for towing, a few occasional sweepings revealed a population of a weevil species still not recorded from Israel (widespread in Europe) and its host plant. Special attention was paid to



wet biotopes, in order to complete the study on the hygrophilous weevils in Israel ('En Afeq, 'En Nimfit, Berekhat Ya'ar, Levinsky Pool in Tel Aviv, Robert's Pool in Nizzanim Dunes, 'Enot Peza'el, 'Enot Bidan): two specimens of *Baris analis* was collected after 40 years of absence (only two specimens had been kept in the SMNH), and a few species of weevils expanded dramatically their distribution (Friedman 2018). A visit to the avocado plantation in Gan Shelomo yielded an avocado stone weevil *Pseudomimus avocadi*, described from Israel and known only from the type series. It appears to be a rather common species; adults, larvae and pupae were collected. When on a private visit to Munich, Germany, L. Friedman collected (under an official permit) about 1,800 insects, mostly weevils and leaf beetles, along Isar River (meadow and riverbank), Leutstettener Moos (swamp and riverbank), Aschau (riverbank),

Lush vegetation at 'Enot Bidan and other wet biotopes in Israel harbour an amazing diversity of hygrophilous weevils, including *Baris analis*, which was found again after a 40-year break. (Photo by A.L.L. Friedman)



around Tatzelwurm Waterfall (600–1020 m, riverbank, meadow and mixed forest), Kreuzeck (1650 m) and Kampenwand (1400–1650 m) (alpine meadows and mixed forest). During his research trip to the Zoological Institute, St. Petersburg, Russia, two collecting trips were undertaken to the Sosnovka Park at the northern edge of the city (mixed forest, swamp and a bank of a small lake) and to the banks of Strelka River, SW St. Petersburg (meadows). About 1100 insects, mainly weevils, were collected during these trips.

M. Mostovski went in August 2018 on a private trip to South Africa and collected around 1000 insects with a Malaise trap set on a forest edge near Pietermaritzburg.

W. Kuslitzky collected over 3,000 Hymenoptera (Ichneumonidae, Braconidae and Parasitica) by sweeping and rearing from various hosts on *Ricinus communis* and *Eucalyptus camaldulensis*.

V. Kravchenko went on several partly externally funded field trips to the Solonga National Park (Democratic Republic of the Congo, April 2018), Upper Golan Heights and Hermon (Israel, May 2018), Phonsavane Region (Laos, June 2018), and Bamako, Kéniéroba, Ouronina, Narena, and Sikasso (Mali, September–October 2018), and brought a great wealth of material to the SMNH collection, mainly Lepidoptera, Coleoptera and Hemiptera.

THE INSECTARIUM

Elizabeth (Liz) Morgulis

The collection of live arthropods (also know as Charakirium in Hebrew, חרקיריום) became a part of the Entomology Group at the Tel Aviv University owing to Alex Shlagman, an expert in rearing various organisms, over 30 years ago. Over the years, Alex collected and received from others different arthropods, which he managed to keep and breed. Thus, at present nearly all arthropods in the isectarium are born there, rather than collected from nature. Nevertheless, some additional individuals are being brought from time to time from the field, which enables revitalizing the “stock colonies”. All our arthropods require particular diets and different environmental conditions (such

as temperature, humidity, and the terrarium setting), which resemble the natural and preferred habitat of each species.

At the moment, the live collection consists of more than 40 species—the flower chafers, cave crickets, lubber grasshoppers, Madagascar hissing cockroaches, Medi-



The praying mantis *Sphodromantis viridis* (above) and Madagascar hissing cockroaches *Gromphadorhina portentosa* attract visitors’ attention at the live insects display. (Photos by A.L.L. Friedman)

terranean black widow spiders, black tarantulas, and Megarian centipedes, to name a few. Some of our arthropods are used in the live arthropod exhibition at the SMNH (underlined in the list below), whereas others are extensively used for teaching several courses at the Tel Aviv University. During the last year, I was rearing arthropods for the museum exhibition, including *Poecilotheria ferox*, *Gryllotalpa gryllotalpa*, *Hersilia* sp., and *Latrodectus revivensis*, which had not been reared in the “live collection” of the SMNH. We also designed and constructed the scenery of different terrariums for the museum exhibition, and our work was featured in the popular media – in *Maslul* (Yediot Ahronot) and on channel 10 (*Shishi im Ayala Hason*).

#### List of arthropods currently kept in the insectarium

- Australian leaf insect (*Extatosoma tiaratum*)
- Stick insects (*Bacillus atticus*)
- Israeli black gaudy grasshopper (*Poecilotheria ferox*)
- Desert locust (*Schistocerca gregaria*)
- Lubber grasshoppers (*Romalea* sp.)
- House cricket (*Acheta domesticus*)
- Mediterranean field cricket (*Gryllus bimaculatus*)
- Cave crickets (*Phaeophilacris bredoides*)
- Bush cricket (*Tylopsis* sp.)
- Mole cricket (*Gryllotalpa* sp.)
- Praying mantis (*Sphodromantis viridis*)
- American cockroach (*Periplaneta americana*)
- Madagascar hissing cockroach (*Gromphadorhina portentosa*)
- Surinam cockroach (*Pycnoscelus surinamensis*)
- Dubia roach (*Blattella dubia*)
- Giant cockroach (*Blaberus giganteus*)
- Cuban cockroach (*Panchlora nivea*)
- Desert roach (*Polyphaga aegyptica* and *Arenivaga hebaica*)
- Field cockroach (*Loboptera decipiens*)
- Termite colonies (*Reticulitermes clypeatus* and *Kaloterms sinaicus*)
- Two spotted assassin bug (*Platymeris biguttatus*)
- Spoonwings (*Dielis croce hebraea*)
- Rose-chaffer beetle (*Potosia cuprea*)
- Egyptian beetles (*Blaps* spp.)
- Fireflies (*Lampyris* sp.)
- Water-beetle (*Cybister* sp.)
- Spider beetle (Ptinidae)
- Flour beetle (*Tribolium molitor*)
- Superworms (*Zophobas morio*)
- Carpenter ant colonies (two species: *Camponotus phellah* and *C. sanctus*)
- Smith's redknee Tarantula (*Brachypelma smithi*)
- Black tarantula (*Chaetopelma olivaceum*)
- Brown recluse spider (*Loxosceles recluse*)
- Mediterranean black widow spider (*Latrodectus tredecimguttatus*)
- Two tailed spider (*Hersilia caudata*)
- Common black scorpion (*Nebo hierichonticus*)
- Arabian scorpion (*Androctonus* sp.)
- Megarian banded centipede (*Scolopendra cingulata*)
- Terrestrial hermit crab (*Coenobita* sp.)
- Rough woodlouse (*Porcellio scaber*)
- Black millipede (*Archispirostreptus syriacus*)
- Silverfish (*Lepisma* spp.)

## THE MARINE & FRESHWATER GROUP

### THE PORIFERA COLLECTION

**Sigal Shefer**

Collection and field survey of Porifera communities along the Mediterranean coast of Israel, and other locations:

This year 81 specimens were added to the collection, 28 of them collected during excursions to the mesophotic sponge grounds at the depth of 80–100 m off Herzliya and from the depth of 5–30 m in Sedot Yam. These specimens were collected as part of studies conducted at Prof. Ilan's lab. The rest of the specimens originated from Bioblitz (51 samples) and 2 samples from CSA Ocean Sciences Inc. (2 samples).

#### Taxonomic identification service:

- Two samples were identified for CSA Ocean Sciences Inc. Company (Elad Mills).
- 28 samples were accepted and identified as part of the Bioblitz (15/10/2017, Habonim, 18/10/2017, Akziv; 19/10/2017, Shiqmona; 7/11/2017, Gedor).
- 23 samples were accepted for identification on 16/1/2018 (Palmachim) and are being processed.

#### Physical organization:

The sponge collection has been undergoing a massive archiving process. This process was enabled thanks to the work done by Kesem Kazes. We were updating scientific names at various taxonomic levels, adding new specimens to the collection, printing new labels, replacing fixative solutions and arranging the samples on the shelves according to their systematic affiliation.

Since the collection was relocated to the new museum building in June 2018, we have been organizing it according to sponge taxonomy for identified specimens, and according to geographical origin or expeditions for the unidentified ones.

#### Courses, Training and Conferences:

I took the course on *Biology and Systematics of Marine Invertebrates* at the Inter-University Institute for Marine Sciences in Eilat (April 2018), and the course The Plant World (Botany 2) in Tel Aviv University.

I participated in the 4<sup>th</sup> International Workshop on the Taxonomy of Atlanto-Mediterranean Deep-Sea and Cave Sponges, 10–15 Sep. 2018, Station Marine d'Endoume, Marseille, France. During this workshop, we identified sponges collected along the Mediterranean coast of Israel with the assistance of leading sponge taxonomists (Christine Morrow, Paco Cardenas, Jean Vacelet, Thierry Perez).

### THE MOLLUSCA COLLECTION

**Henk K. Mienis, Oz Rittner and Revital Ben-David-Zaslow**

#### Research and curation

During the academic year 2017–2018 we continued to carry out research in the fields of taxonomy, systematics, nomenclature, Lessepsian migration, exotic and invasive species among the mollusc fauna of Israel and various aspects of archaeomalacology.

#### New records from Israel

The following marine species have been found for the first time off the Israeli part of the Eastern Mediterranean, i.e. the Levant Sea.

##### Gastropods

*Copulabbyssia corrugata* (Jeffreys, 1883): this tiny cap-like gastropod was found commonly in empty bore holes caused by shipworms in wooden pellets brought up from a depth of 600 m during deep water fishery carried out by Profs. Menachem Goren and Bella Galil in the summer of 2018.



*Varicopeza pauxilla* (A. Adams, 1855): large numbers of this tiny species were collected from bottom samples by Prof. Albano and its crew (see below under “Cooperation with visiting scientists”). It was already known to occur along the Turkish coast (Öztürk *et al.* 2017).

*Viriola* cf. *bayana* Jousseaume, 1884: was collected near Palmahim by Prof. Albano (Steger *et al.* 2018).

*Doto paulinae* Trinchese, 1881: this tiny nudibranch was photographed crawling on *Schizoporella errata* at a depth of 7 m off the Gordon beach in Tel Aviv (Halevy *et al.* 2018).

#### Bivalves

*Anadara transversa* (Say, 1822): this invasive species from the New World, long known from the Mediterranean Sea near Turkey and Greece and in the Adriatic Sea seems to have reached the coast of Israel. It was found adhered to plastic brought up from a depth of 200 m during fishery research carried out by Profs. Menachem Goren & Bella Galil. The presence of it off Ashdod was confirmed by material collected later on by Dr Aharon Dotan.

*Gregariella* cf. *ehrenbergi* (Issel, 1869): it was found on a buoy from Egyptian waters which drifted ashore near Shefayim (Steger *et al.* 2018).

*Pillucina vietnamica* Zorina, 1978: see Steger *et al.* (2018).

*Alveinus miliaceus* (Issel, 1869): see Steger *et al.* (2018).

#### Cephalopods

During the fishery investigations carried out by Profs. Menachem Goren and Bella Galil three species were recorded for the first time from off the coast of Israel, all at depths of about 600 m: *Loligo forbesi* Steenstrup, 1856, *Pyroteuthis margaritifera* (Rüppell, 1844) and *Histoteuthis bonnellii* (Férussac, 1835).

#### Other faunistic records

A terrestrial snail *Monacha* cf. *claustralis* was recognized among material collected long ago in the Botanical Garden of the Hebrew University at Givat Ram, Jerusalem (Mienis, 2018). True *Monacha claustralis* (Menke, 1828) is known from SE Europe and Asiatic Turkey. Shells of it are rather similar to those of *Monacha cartusiana* (Müller, 1774), a Western Palearctic species. Only additional living specimens may solve the true identity of the Givat Ram material.

The distribution of *Xerocrassa pseudojacosta* (Forcart, 1976) has been revised and a first sinistral shell of it has been reported (Mienis *et al.* 2017).

The distribution of *Turanena benjamitica* (Benson, 1859), a rarely collected land snail has been revised (Mienis & Rittner 2018).

#### **Support with identifications**

Various ecological studies on the presence of molluscs in Israel are currently being carried out by a number professionals like Dr Aharon Dotan, Dr Eldad Elron, and various institutes (see below). They received our expertise by the identification of their material. The major part of the identified material is being kept permanently at the Steinhardt Museum of Natural History.

#### *Cooperation with the Israel National Center for Aquatic Ecology*

On a regular base samples are received for identification or verification which have been collected by Dr Yaron Hershkovitz or other people associated with the Center.

#### *Cooperation with the Plant Protection & Inspection Services of the Ministry of Agriculture*

Mrs Svetlana Vaisman of the mollusc unit of the Plant Protection and Inspection Services (PPIS) at Bet Dagan continued to work 4–5 hours a week in our mollusc collection. Most of the time she is picking and identifying micro-molluscs from leaf litter and soil samples collected at various anthropogenic sites in Israel.

This academic year Mrs S. Vaisman brought us for verification or identification 67 samples of land and freshwater snails intercepted by inspectors from the PPIS from either agricultural shipments from abroad or found on local material grown in nurseries. During the second half of the reporting period, a noteworthy change occurred in the number of snail samples intercepted on vegetables regularly arriving in Israel from the Gaza Strip via the Kerem Shalom check point. Only samples that could not be identified by the inspector(s) working on the site were submitted for identification.

**Cooperation with the Israel Nature and National Parks Protection Authority**

Like in previous years we received some mollusc material which had been collected during the BioBlitz-project carried out in several Marine Nature Reserves along the Mediterranean coast of Israel. Like in previous years the results were rather disappointing from both a quantitative and qualitative points of view.

**Cooperation with local and foreign archaeologists**

During the past academic year we continued to work on the archaeomalacological material from the following sites:

- Jewish Quarter in the Old City of Jerusalem excavated by the late Prof. Nahman Avigad and more recently by Dr Hillel Geva;
- Horbat Bet Loya excavated by Dr Oren Gutfeld;
- Ramla via Dr Ravit Nenner-Soriano;
- Tiberias excavated by the late Prof. Izhar Hirschfeld;
- Tell es-Safi/Gath excavated by Prof. Aren M. Maeir;
- Gilat excavated by Prof. Thomas E. Levy;
- Horbat Rosh Zayit excavated by Dr Zvi Gal;
- Tel Dalit excavated by Prof. Ram Gophna.

**Cooperation with visiting scientists**

Dr Paolo G. Albano of the Department of Paleontology of the University of Vienna, Austria, continued his study of the historical ecology of ecosystems affected by alien species introductions. During his presence in Israel information was discussed and exchanged dealing specifically with Lessepsian migration. Samples of *Corbula* (*Varicorbula*) *gibba* collected alive during the period 1960–2000 were sent on loan for further palaeo-dating projects.

The first year of cooperation between Dr Albano and his crew and the Steinhardt Museum of Natural History yielded five new records of alien species (see above) and probably one entirely new lucinid species, of which it is not clear whether it is a native Mediterranean species or a Lessepsian migrant (Steger *et al.* 2018).

**Cooperation with malacologists abroad**

The Dutch-German team consisting of Jordy G. van der Beek, Frans de Jong, Dr Bernd Sahlmann and Dr Vollrath Wiese continues to revise the Scaphopoda from the Red Sea.

**New acquisitions in the Mollusc Collection (2017–2018)**

New material, not only from colleagues at various institutes but also from private collectors was arriving regularly during the past academic year. The identifications of this new material were immediately checked and the samples are prepared for permanent storage in the collection.

<u>Name</u>	<u>Brief description of the material</u>
U.J. Bar-Zeev	Land and freshwater molluscs from Israel
T. Eshcoly	Freshwater snails Israel
Bet Gordon	Land and freshwater molluscs from Israel
B.S. Galil	Land snails from Israel and marine molluscs from eastern Mediterranean
A. Gasith	Freshwater snails from Israel
Y. HersHKovitz	Freshwater snails from Israel
M. Keppens	Fossil molluscs from the Pliocene of Belgium and the Eocene of France
S. Machlof	Molluscs world wide
S. Malamud	Marine molluscs from the Mediterranean coast of Israel
H.K. Mienis	Land- and freshwater molluscs from Israel and the Netherlands
S. Ohayon	Various molluscs
O. Rittner	Land snails from Israel
B.S. Singer	Molluscs from the Mediterranean and Red Sea
S. Vaisman	Exotic land snails confiscated in Bat Yam, land snails from Israel
M. Zaitzove-Raz	Land snails from Israel

### Computerization of the collection

The computerization of the mollusc collection is carried out by Oz Rittner (collection of recent molluscs and occasional arrivals of fossil material) and Dr Daniella E. Bar-Yosef Mayer (fossil molluscs in the paleontological collection of Hanan (Hans) Bytinski-Salz).

A total of 285 samples were digitized during the reporting period, and at the moment 63,286 samples (not including fossil ones) representing 11,015 taxa (including fossil ones) in the mollusc collection have been computerized. The majority of the new species and subspecies, which we added this year to the collection were again mainly from the Paleontological collection of the late Prof. Hanan (Hans) Bytinski-Salz.

Due to the transfer of the mollusc collection to the new facilities at the SMNH considerably less attention has been given to the computerization of new samples.

### The Malacological library

The library is a most important tool for taxonomic and systematic studies in the Mollusc Collection and has been expanded through recent donations.

Books donated by Mr Benjamin Solom (Solly) Singer of Rehovot:

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- Anon. 1982. *The Macdonald encyclopedia of shells*. MacDonald & Co., London & Sydney. 512 pp.
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- Clayton, J.M. 1989. *All color book of seashells*. Chartwell Books Inc., Secaucus. 72 pp.
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- Cox, J.A. 1979. *Shells – treasures from the sea*. Windward, Leicester. 255 pp.
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- Kensley, B. 1973. *Sea-shells of Southern Africa – Gastropods*. Maskew Miller Ltd, Cape Town. 236 pp.
- Lamprell, K.L. & Healy, J.M. 1998. A revision of the Scaphopoda from Australian waters (Mollusca). *Records of the Australian Museum, Supplement*, 24: 1–189.
- McMillan, N.F. 1977. *The Observer's book of seashells of the British Isles*. Frederick Warne, London. 158 pp.
- Orr, J. 2001. *Seashells of Cyprus*. Efstathiadis Group S.A., Athens. 229 pp.
- Pinn, F. 1977. *Seashells of East Africa – Spider and Wing shells*. Rex Collings, London. 40 pp.
- Rehder, H.A. 1992. *The Audubon Society field guide to North American seashells*. 6<sup>th</sup> Ed. Chanticleer Press, New York. 893 pp.
- Walls, J.G. [1979]. *Cone shells – a synopsis of the living Conidae*. T.F.H. publications, Neptune City. 1011 pp.
- Wye, K.R. 1989. *The Mitchell Beazley pocket guide to shells of the world*. Mitchell Beazley International Ltd., London. 192 pp.



Books donated by Henk K. Mienis:

- Anonymous 1998. *Shells*. Chartwell Books, New Jersey. 64 pp.
- Aston, O. 1975. *Snails*. Basil Blackwell, Oxford. 31 pp.
- Braley, R.D. (Ed.) 1992. *The Giant clam: hatchery and nursery culture manual*. Australian Centre for International Agricultural Research, Canberra. 144 pp.
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- In addition we have received many reprints and again numerous journals from Zoological Institutes or Malacological Societies in exchange of *Triton*, an independent malacological journal published in Israel.

**Malacological fieldwork in Israel**

Oz Rittner and Henk K. Mienis

During the academic year 2017–2018 fieldwork was carried out only on two days. One day was sponsored by the Plant Protection and Inspection Services of the Ministry of Agriculture (PPIS) in Bet Dagan.

**16 January 2018: Park Ariel Sharon, Hiriya**

Participants: Svetlana Vaisman and Yo'av Motro (both PPIS) and Henk K. Mienis (SMNH).

The purpose of this fieldwork was to check the wetland established on the former waste dump of Hiriya for the presence of the invasive, exotic Apple snail *Pomacea maculata*. Apple snail species are outlawed in Israel by the Ministry of Agriculture, because of similar restrictions taken by the European Union.

It appeared that *P. maculata* was still living in the ponds and especially in the large water filters. Fourteen specimens were found alive and 122 dead. In spite of cold weather few egg clusters were seen attached to emerging aquatic weeds. Other species observed were *Melanooides tuberculata* and *Physella acuta*.



The egg mass of the exotic Apple snail *Pomacea maculata* (above) and the pre-historic site of Gilgal (right) that was surveyed for molluscs. (Photos by O. Rittner)



**25 January 2018: Gilgal**

Participants: Oz Rittner and Henk K. Mienis (both SMNH) and Uri J. Bar-Zeev.

The purpose of the fieldwork was to survey the prehistoric site of Gilgal and its surroundings for the presence of living land snails and freshwater molluscs and to compare them with the terrestrial and aquatic molluscs recovered during excavations of the site carried out by Dr Tamar Noy (Noy *et al.* 1980) and several follow up studies of the site after her death by various other prehistorians (Bar-Yosef *et al.* 2010).

No living freshwater molluscs could be traced in or near the site of Gilgal, but old empty shells were found here and there on the slopes of Gilgal I and Gilgal II. They represented *Theodoxus jordani*, *Melanopsis buccinoidea*, *Melanopsis cerithiopsis* and *Corbicula fluminalis*. Some of the *Melanopsis* specimens showed a damaged lip of the aperture. They were most probably predated upon by *Potamon potamios*, a freshwater crab, which pincers were found on the same slopes.

Empty land snails found on the slopes of Gilgal I and Gilgal II included *Buliminus therinus*, *Sphincterochila fimbriata*, *Xerocrassa mienisi*, *Xerocrassa seetzenii seetzenii*, *Helix engaddensis engaddensis* and *Levantina spiriplana transjordanica*.

Due to high humidity numerous living terrestrial snails were seen crawling around among the patches of vegetation on the same slopes. They included tiny but fully grown up specimens of *Buliminus therinus* and numerous *Sphincterochila fimbriata*, *Xerocrassa mienisi*, *Xerocrassa seetzenii seetzenii* and *Helix engaddensis engaddensis*. No living *Levantina* specimens were seen because of the complete absence of protruding rocks, their preferred habitat.

In order to check the possible source of the empty shells of *Levantina* found at Gilgal I and II, we checked some rock formations about 500 m south of the site on the steep slope towards the complete dry Wadi Salebiya. There we registered *Turanena benjamitica* (one dead juvenile), *Buliminus therinus*, *Sphincterochila fimbriata*, *Xerocrassa langloisiana*, *Xerocrassa mienisi*, *Xerocrassa seetzenii seetzenii*, *Helix engaddensis engaddensis* and *Levantina spiriplana transjordanica* (all remaining seven species alive). A real surprise was the finding of an empty shell of the rare *Turanena benjamitica* (Mienis & Rittner 2018).

A more intensive survey of rocky outcrops in the surroundings of Gilgal is planned in the spring of 2019.

**Malacological fieldwork in Friesland, the Netherlands**

Henk K. Mienis

It has become a tradition that from about half September until the middle of October I am visiting my native Holland. While the mollusc fauna of North Holland is well known, this is certainly not the case in Friesland. There are numerous white spots on the distribution maps of many species.

In 2017 and 2018 I was therefore rather active investigating the mollusc fauna of a number of Nature Reserves in the municipality of the 'Fryske Marren' (Frisian Lakes) in the neighbourhood of Joure and visited seven sites:

- The Famberhorst, a private nature reserve in Joure. I recorded the presence of 29 terrestrial and 36 aquatic mollusc species including the critically endangered Glutinous snail *Myxas glutinosa*. The inlet of extraneous water into the reserve led into the establishment of several exotic species in some of the ditches: *Potamopyrgus antipodarum*, *Ferrissia californica*, *Dreissena bugensis* and *Dreissena polymorpha*.
- A short visit to the unique Elm-arboretum in Joure, a unique project of 41 different species and/or varieties of Elm trees in a single field, so far resulted in the registration of ten terrestrial species and 21 aquatic species including the critically endangered *Myxas glutinosa*.
- The Twigen, a Nature Reserve belonging to 'It Fryske Gea', situated next to the Elm-arboretum in Joure so far yielded 20 terrestrial and 22 aquatic mollusc species including again the critically endangered *Myxas glutinosa*.
- The "Put van Nederhorst", an artificial lake west of Joure, yielded only ten aquatic species, among others the exotic *Potamopyrgus antipodarum* and *Dreissena polymorpha*.
- Wilhelmina-Oard, a Nature Reserve of 'It Fryske Gea' near Sint Nicolaasga, yielded 15 terrestrial molluscs despite the fact that this is a forest growing on rather acid soil.





The endangered Glutinous snail *Myxas glutinosa*. (Photos by H. Mienis)

- Another Nature Reserve, the Eaterskar of 'It Fryske Gea' near Sintjohannesga, has yielded a disappointing number of 18 aquatic species: 13 gastropods and five mussels. Just before I carried out the fieldwork, the canals and ditches traversing the reserve were cleaned from mud and excess aquatic weeds.
- A first survey of several ditches in the Nature Reserve 'Kop Bloksleat' revealed at least 20 species of freshwater molluscs. Noteworthy were several very large colonies of *Myxas glutinosa*.

The water quality in the studied part of the Frisian Lakes is of a very high standard and that allows the Glutinous snail to maintain remarkably large populations in that part of the Netherlands.

Two weeks were also spent on the Frisian Wadden Sea island Terschelling. Much attention was given to land snails and slugs in the graveyard around the Dutch Reformed Church in Hoorn. The latter is the oldest building on the island and dates back to the 13<sup>th</sup> century. At least 27 species were living in the churchyard. The most important find turned out to be a living specimen of the Blind snail *Ceciloides acicula*, a tiny subterranean land snail. It constituted the first find of that species on Terschelling. Less fortunate was the fact that also five exotic species dwelt in the church yard: the snails *Hygromia cinctella*, *Cepaea nemoralis* and *Cornu aspersum*, and the slugs *Limacus flavus* and *Deroceras invadens*. At least some of them reached the graveyard most probably with potted plants, which were placed on the tombstones. Other newcomers to the malacofauna of Terschelling are the Mediterranean land snails *Theba pisana* and *Cochlicella acuta*. Both were encountered on the "Grootduin" (the "Large dune") near West-Terschelling.

Numerous samples of the material collected in Friesland were deposited to the Mollusc Collection of the Steinhardt Museum of Natural History. They will serve as comparative material for samples of land snails intercepted by inspectors of the Plant Pest and Inspection Services of the Ministry of Agriculture on imports from the Netherlands and other countries in northwestern Europe.

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## THE BRYOZOA COLLECTION

Noga Sokolover

### Collection

Two specimens were collected from a mesophotic reef in Eilat, at 90 m depth, and another two from the Mediterranean at -100 m, off Herzliya. The collecting was done as part of studies conducted at Prof. Ilan's lab. One sample of freshwater Bryozoa was collected in the Hula Reserve.

### Taxonomic identification service

One sample was identified for Marine Ventures International.

### Databasing

The old collection was digitized and 259 records were entered into the Museum database.

## TERRESTRIAL, FRESHWATER AND MARINE FREE-LIVING NEMATODES

Stanislav Pen-Mouratov

Roundworms are most abundant metazoans on the planet; with over 25,000 described species, the total number of nematode species can be scores as great as that. The free-living nematodes are among the best biological tools for environmental assessment, and are widely used as indicators for terrestrial and aquatic ecosystem monitoring.

### Research goals

- To study the species diversity, abundance, and distribution of roundworms inhabiting the Israeli terrestrial and aquatic ecosystems;
- To determine impact of different natural and anthropogenic disturbances on the free-living nematode communities in terrestrial and aquatic environments.

### Infrastructure

At the beginning of 2018, a computer, an up-to-date Nikon microscope providing the most adequate resolution ( $\times 2200$ ), a drawing attachment and a camera were purchased. This equipment is crucial to study soil free-living roundworms of our region.

### Main research directions

(1) Impact of epigeal animal activity on habitat, abundance, trophic structure, sex ratio and taxonomic diversity of soil free-living nematode communities.

The effect of epigeal vertebrate activity on soil biota have generated increasing interest among of scientists in the last decades. Twice a year Israel becomes a preferred rest area for a huge number of migrating birds, with the vast amount of bird feces in nesting and breeding areas significantly impacting the habitat. However, information about the effect of the birds' activity on soil ecosystems is grossly inadequate in our region. During the last year we dedicated our effort to determine the impact of bird nesting and roosting activity on soil free-living roundworm abundance and diversity in Israel. Nematodes from each sample were extracted, counted and identified to order, family and genus using a compound microscope, with 62 taxa identified so far.

The collected nematode samples were prepared for the long term storage. The data of soil properties, soil microorganisms and nematodes have been recorded for scientific publications. Results of our study were presented at the 33<sup>rd</sup> Symposium of the European Society of Nematologists (Pen-Mouratov & Dayan 2018). Following the conference presentation, a manuscript on the birds' activity effect on the soil biota was prepared and submitted for publication.

(2) The seasonal effect of plant species diversity on soil free-living nematode communities in shifting sands of the coastal plains of Israel.

Numerous studies over the last decades demonstrated an increased negative impact of alien invasive plants on epi- and hypogean biota. During recent years, Israel has also been facing the issue of invasive vegetation. The *Eucalyptus camaldulensis* is one of the invasive species introduced in the local ecosystems in the 1880s, whose impact on local species and ecosystems has been widely discussed in the society. The aim of this project was to evaluate the *E. camaldulensis*

A free living soil nematode *Acrobeloides* sp. from a pine forest at Tzomet Re'em, under a compound microscope at a high magnification. (Photo by S. Pen-Mouratov)



effect on the soil free-living roundworm abundance, trophic structure, sex ratio and generic diversity. Soil samples were collected under *E. camaldulensis* and the native tree *Ceratonia siliqua*. The study revealed that the bacteria-feeders and juvenile nematodes were the most sensitive nematode groups to the effect of the invasive *E. camaldulensis*. However, other nematode groups as well as most of the observed species were found to be resistant or adapted to the invasion impact (Pen-Mouratov *et al.* 2016). Roundworms assemblages can significantly change during other seasons, especially during the most unfavorable dry period. The present study was extended into the dry season to understand better the invasive impact of *Eucalyptus* on soil nematode community.

The nematodes from each sample were extracted, counted and identified to the order, family, and genus levels, and fixed samples were prepared for long term storage. The obtained data are used for scientific publications.

(3) Species diversity of marine nematodes in shallow water coastal sediments of the Mediterranean Sea, Israel. To evaluate the species diversity of free-living roundworm community, sediment samples have been collected in the study area. Nematodes from each sample were extracted, fixed and prepared for long term storage.

### Collaborations

During the reporting year, I continued active collaboration with overseas colleagues, who work on free-living roundworms. Furthermore, I participated in the 33<sup>rd</sup> Symposium of the European Society of Nematologists (ESN) Symposium (Belgium, 2018).

## THE CRUSTACEA COLLECTION

### Ya'arit Levitt-Barmats

The Crustacea is the only large group in the phylum of Arthropoda that is primarily aquatic, with over 50,000 described species. Most crustaceans occupy marine, freshwater, and terrestrial environments all over the world, and some species are even found in extreme—in terms of temperature, pressure, and salinity—environmental conditions. Crustaceans have significance economic and ecological importance, and they constitute an important food source for marine animals and humans.

The past year was mainly dedicated to rearranging the collection in preparation for the move to the new museum building. In addition, new material was incorporated into the collection:

- Beit Gordon museum, Kibbutz Degania, donated specimens from their collections.
- New material was obtained during a deep-sea survey by Prof. Bella S. Galil and Dr Menachem Goren, curators emeriti of invertebrates and fish, respectively. The work on the material is still in progress.
- Prof. Yair Achituv from Bar-Ilan University donated barnacles, which represent species new to science.

Within the framework of the Aquatic Ecology Center surveys, four juvenile specimens of the alien crayfish *Cherax quadricarinatus* (von Martens, 1868) were collected from the 'Amal River. This find added a new location to this alien species in Israel, which had been known only from the Yarqon River. Two specimens of a new Erythraean crab species *Arcania brevifrons* Chen, 1989 were collected in Ashdod during a survey of the National Institute of Oceanography, Israel Oceanographic & Limnological Research, Haifa. This is the first record of the species in the Mediterranean Sea.



## THE POLYCHAETA COLLECTION

Liron Goren

### Collection and field survey of the Polychaeta community along the Mediterranean coast of Israel

This year we added 101 individuals to the collection: about half of them were collected during Achziv mini-bioblitz and others during excursions to the sponge grounds at depth of 80–100 m, off Herzliya, and from SCUBA excursions to Sedot Yam (30 m deep). These specimens were collected as part of studies conducted at Prof. Ilan's lab.

More Polychaete samples are being processed from the tunics of Tunicata collected as part of a research conducted by Noa Shenkar's lab (TAU) in 2017.

### Courses, training and conferences

In July–September 2018 I attended the course *Ecology and Systematics of Caribbean Polychaetes* at the Smithsonian Tropical Research Institute in Bocas del Toro, Panama. The lecturers were presented by world renowned polychaete experts from the Natural History Museum in Los Angeles (Leslie Harris) and El Colegio de la Frontera Sur, México (Prof. Sergio I. Salazar-Vallejo). The purpose of the course was to train young researchers in taxonomy, photography, collection, and museum preservation standards of polychaetes.

### Checklist

In 2018 I undertook a task of compiling a list of all polychaete species found along the Mediterranean coast of Israel. The list will include approximately 350 species that are either present in the SMNH collection or were reported in scientific papers about polychaetes that were found in Israel.

### Taxonomic identification service

Three samples were identified for the Aquatic Ecology Center at the SMNH, 40 samples were received for identification as part of the Palmachim Bioblitz (4/2018).

### Future plans

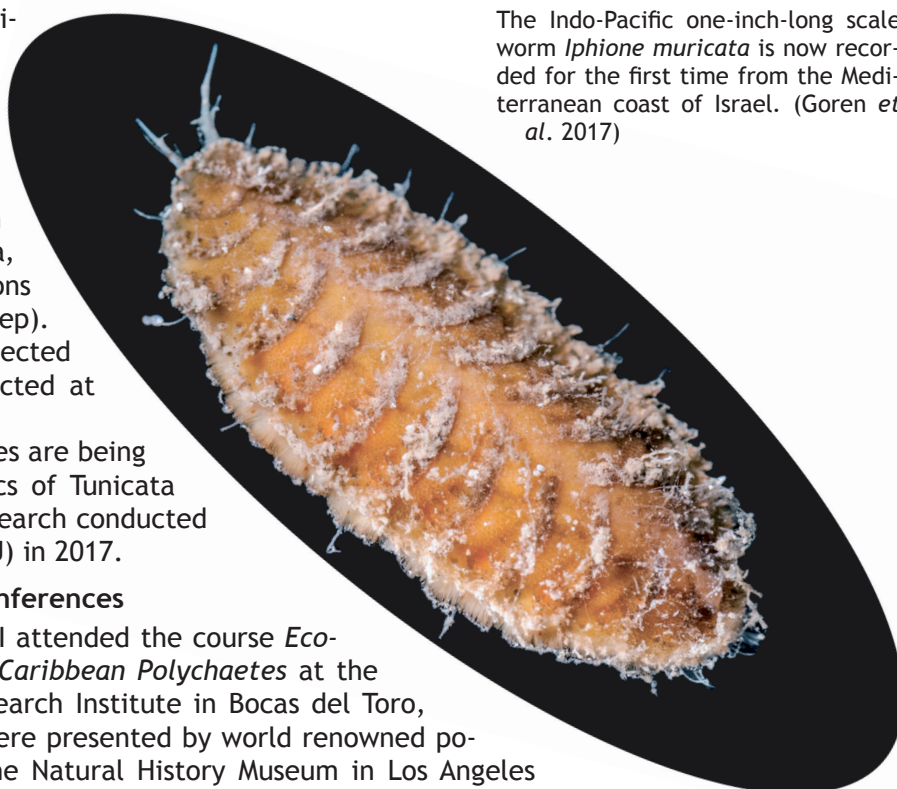
- Finalize and publish the Checklist of Polychaeta along the Israeli Mediterranean coast.
- Complete identification and description of two *Parasabella* spp. that have been found in sponges in the mesophotic sponge grounds.
- Collaborate with the Israel Institute of Oceanography and Limnology with regards to hundreds of unidentified polychaete samples in their possession, which will be deposited in the SMNH collection.

## THE ECHINODERMATA COLLECTION

Omri Bronstein and Noga Sokolover

### Collection

36 new specimens were added to the collection and databased. Also spines of the alien *Diadema setosum* dealt with in Bronstein & Kroh (2018) were registered. Eight DNA samples of live specimens



The Indo-Pacific one-inch-long scale worm *Lphione muricata* is now recorded for the first time from the Mediterranean coast of Israel. (Goren *et al.* 2017)

were registered in the molecular lab. The corresponding specimens are kept in the underwater observatory in Eilat and are marked to match the DNA vouchers.

#### Museum sample loans and visits

In April 2018, we had a visitor from the California Academy of Sciences. Tissue samples of 22 crinoids specimens were taken and dispatched to California. During the visit our guest identified 11 of our specimens.

#### Ongoing project

Dr Omri Bronstein continues working on an illustrated guide for the Israeli echinoderms.

## THE ASCIDIACEA COLLECTION

Noa Shenkar

Ascidians (Phylum Chordata, Class Ascidiacea), or sea squirts, are the largest and most diverse class of the sub-phylum Tunicata (also known as Urochordata). They comprise approximately 3000 described species, both solitary and colonial, found in all marine habitats from shallow water to the deep sea. The class Ascidiacea presents fundamental opportunities for research in the fields of development, evolution, ecology, regenerative biology, natural products and more.

During 2017–2018 the Ascidiacea collection at the Steinhardt Museum of Natural History grew significantly due to the addition of samples from the Mediterranean coasts of Israel and reflected growing concern regarding the arrival and spread of non-indigenous species. During 2018 we conducted numerous field trips along the Mediterranean coast of Israel, including both natural and disturbed habitats such as the fish cages in Michmoret, marinas and ports. The increased sampling effort resulted in over 30 new specimens in the collection, preserved in both formaldehyde for morphological identification and ethanol for molecular studies. Dr Zafir Kuplik is heading toward the completion of the second year of his post-doctoral research in our laboratory and is in charge of the production of an updated list of colonial ascidians along the Mediterranean coasts of Israel, with particular reference to non-indigenous species. We continued to provide professional taxonomic identifications of ascidians to several researchers and organizations in Israel and abroad. International collaborations include material exchange with Prof. Aibin Zhan (China; Chen *et al.* 2018), Prof. Rosana Moreria de Rocha (Universidade Federal do Paraná, Curitiba, Brazil), Prof. Lucia Manni (University of Padova, Italy) and Prof. Pupa Gilbert (University of Wisconsin, USA). Dr Noa Shenkar actively participated in the work of the Editorial Board of the *European Aliens Species Information System* (EASIN) and the *Horizon 2020* scanning team, and served as an Editor of the Ascidiacea World Database. Our research is also supported by the Israel Scientific Foundation, Regular Research Program (PI: Dr N. Shenkar) “Ascidians (Chordata, Ascidiacea) as bio-indicators of the marine environment – from ecological, physiological, and cellular perspectives”, with 250,000 NIS per year (2015–2019).



Colonial tunicates *Didemnum* (left) and *Botrylloides* (above). (Photo: N. Shenkar)

## MEDITERRANEAN AND RED SEA FISHES

Jonathan (Yoni) Belmaker

Nowhere is the native biota faced with changes that are more rapid than in the Eastern Mediterranean, where the continual influx of invasive Red Sea species, warming water temperature, over-fishing and pollution affect fish diversity. The Mediterranean natural history fish collection provides a globally unique resource that is being used to identify how these immense changes influence fish diversity, biogeography and, more generally, marine ecosystem services and function. Such understanding can be used to identify the consequences of these major changes to the integrity of the marine ecosystem and, perhaps more importantly, to mitigate future adverse influences of human activity.

### Research

This year we analyzed museum data on the morphology of Mediterranean and Red Sea fish to test for biotic and abiotic constraints on traits diversity associated with fish invasion.

We continued fish sampling based on trawl catch as part of Hezi Buba's PhD project. Sampled fish is used to quantify fish functional response which will be inserted into models that estimate how fishes respond to both invasion and warming. Representative samples of unique species are deposited in the collections.

We continued fish sampling based on recreational fisher catch as part of Ori Frid's PhD project. The goal of the study is to understand temporal dynamics of catch and by-catch. Representative samples of unique species are deposited in the collections.

We led an intensive fish survey effort in collaboration with the Israeli Nature and Parks Authority along the Gulf of Aqaba (Eilat) coast. The goal was to establish an ecological baseline that can be used to assess the effectiveness of protection efforts. Surveys were conducted in fall of 2018 and included all lab members. Roi Holzman collected about 20 details of reef fish, mainly from specimens that died underwater or were intercepted by inspectors during illegal fishing.

In collaboration in with Sebastien Villeger (CNRS, France) we conducted an intensive sampling campaign to understand what processes facilitate rabbitfish invasion (project EXOFISHMED: *Exotic herbivorous fish in Mediterranean ecosystems: biological causes and ecological consequences of an ongoing invasion*). Surveys were conducted in the spring and fall of 2018.

In collaboration in with Paolo Albano (University of Vienna, Austria), we conducted an intensive sampling campaign to document the diversity and invasion impact in small Mollusca assemblages. Surveys were conducted in the spring and fall of 2018.

We started a large-scale fish larvae sampling project funded by the Israel Ministry of Science and Technology. The study aims to advance next-generation sequencing methods to understand the spatiotemporal dynamics of fish larvae and their response to warming. Representative samples of unique species are deposited in the collections.

### Postgraduate students who utilize the fish collection

- Or Givan (PhD/Post-doc) – traits of Mediterranean fishes.
- Ori Frid (PhD) – Understanding Marine Protected areas, recreational fisheries catch and by-catch.
- Itai Granot (PhD) – fouling communities along Mediterranean and Red sea coasts.
- Hezi Buba (PhD) – functional response in Mediterranean fishes.

### Active external grants that utilize the fish collection

Year	Funder	Title	PIs	Sum, NIS
2015–2020	The Israel Science foundation (ISF)	Hierarchical delineations of ecological communities to enhance ecological predictions	J. Belmaker	1,250,000



Year	Funder	Title	PIs	Sum, NIS
2017–2020	Israeli Ministry of Science and Technology	Resolving the “black box” of larval-fish abundance and its sensitivity to climate change	J. Belmaker, R. Holzman, M. Kiflawi, R. Sorek	1,499,790
2017–2020	Israeli Ministry of Science and Technology	Using a novel acoustic broadband echo sounder for fish identification and biomass assessment to optimise fisheries management in Lake Kinneret	J. Belmaker, I. Ostrovsky, B. Katsnelson, A. Ostfeld	1,199,624

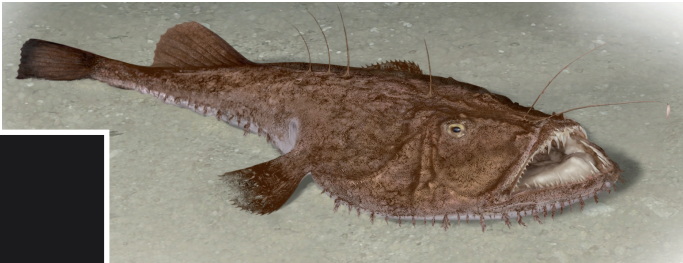
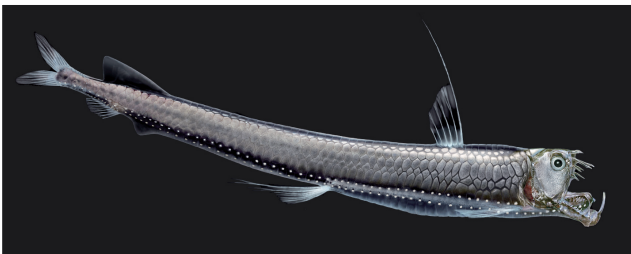
INTO THE DEEP:  
AN EMERGING ISSUE IN MARINE CONSERVATION AND MANAGEMENT

Menachem Goren and Bella Galil

The continental margin off the Mediterranean coast of Israel has been experiencing in recent decades rapid increase in human-induced pressure, such as changes in Nilotic outflow, sediment and nutrients supply, land-based pollution and eutrophication, coastal sprawl, overexploitation of living resources, offshore gas production, as well as rising temperature and salinity. The invasion of thermophilic species through the Suez Canal (Erythraean invasion) has markedly altered the shelf biota, resulting in changes to the structure and function of marine ecosystems. Yet, our ability to evaluate possible interactions between the highly impacted shelf environment and the continental slope is severely hampered by the lack of data as little is known about the biota of the transitional zone between the shelf break and the deep sea off the Mediterranean coast of Israel.

A series of research cruises conducted off southern Israel using 240 hp commercial bottom trawler, sampled shelf break sites (-100 and -120 m) in 2010, 2011 and 2012, and a -250 m site in 2011. Cognizant of the major increase in usage of the upper slope reflected in the preliminary policy document released by the Planning Administration of the Ministry of Finance, we conducted trawl research surveys in winter 2017 at depths between -200 and -600 m off the southern Israeli coast, partly financed by the EU DG-ENV project IDEM: Implementation of the MSFD to the Deep Mediterranean Sea (2017–2019). The main objectives of the research were to examine the spatial distribution of the assemblages and to determine how they relate to upper slope environments elsewhere in the Mediterranean Sea.

Over 100,000 individuals belonging to 120 species and 83 families were identified from the 32 trawl hauls. Preliminary analysis has indicated the presence of several distinct assemblages along the upper slope, rare species and new records to the Levantine Basin. The most significant result is the documentation at 200 m depth of individuals of three Erythraean species, the crocodile toothfish *Champsodon nudivittis*, Golani’s round herring *Etrumeus golanii*, and the burrowing goby, *Trypauchen vagina*.



*Chauliodus sloani*, collected at a depth of 450m (left) and *Lophius budegassa*, collected at -600m (above). (Drawings by Alberto Gennari)

### Why does it matter?

Soft corals, sponges and sea pens have been documented on the upper slope. These large arborescent species form patchy 'meadows' that attract highly diverse but vulnerable mesophotic assemblages. The occurrence of carnivorous and highly fecund Erythraean invasive species at these depths is ominous. They have already caused significant loss to native populations along the Israeli shelf (over 50% of commercially harvested fishes and ALL commercially obtained crustaceans are Erythraean species). Should a similar loss occur in deeper waters, the indigenous biodiversity and sustainability of the unique mesophotic assemblages may be placed under severe stress.

## THE TERRESTRIAL VERTEBRATES GROUP

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Shai Meiri, Roi Dor, Tamar Dayan, Yossi Yovel, Eran Levin, Eli Geffen, Erez Maza, Daniel Berkowic, Amos Belmaker, Kesem Kazes, Igor Gavrilov, Stanislav (Stas) Volynchik, Hamutal Friedman, Arie Landsman, Nir Weil

### Personnel

There have been few changes to the collection personnel. Igor and Stas are helped by Hamutal Friedman. Kesem, Amos and Erez carry on working in the collections, with some help from Daniel Berkowic. Arie Landsman and Moshe Giezler are now our only volunteers. Nir Weil did some important work georeferencing the database but has finished his project.

Postdocs: two museum postdocs worked in the collections this year. Orr Comay was studying the taxonomy of house and Macedonian mice of the genus *Mus*, and Yuval Itescu studies the taxonomy of vipers of the genus *Echis*. Yuval has finished working in the collections and went on for a postdoc abroad. A new postdoc, Marco Antonio Ribeiro Junior, has started working on reptile taxonomy recently.

### Move to the new collections facilities

Preparations for the move of the collections to the new building and the actual move took much of our time and effort during the reporting period. All wet collections were transferred, and the dry collections were being readied for either a whole or partial transfer scheduled for end November 2018. We have finished placing the bird, amphibian and reptile wet specimens on shelves in their new home, but much remains to be done (fixing shelves, placing labels etc.). The move of the wet mammal collection was halted because of the need to prepare the dry collection for the move. Conditions in the collection room seem far superior to those in the old wet collection building, and space, climate control etc. are far more adequate. We have been working hard to make sure that the new collection facilities are functioning well and all small problems are ironed out.

We continued incorporating the Beit Ussishkin and A. D. Gordon Museum holdings of hundreds of birds, reptiles, amphibians and mammals into our collection. The work has been progressing very slowly due to shortage of manpower and much effort dedicated to moving the collections to the new building.

### Research and Curation

#### The amphibian collection

Between 3 Dec. 2017 and 31 Oct. 2018 our amphibian collection grew by a mere 54 specimens, from 2690 to 2744, 34 of which were collected by Eli Geffen. The most abundant is the frog *Pelophylax bedriagae* with 23 individuals collected mostly by Eli Geffen and Tuvia Eshcoly. *Hyla savignyi* (10 specimens) and the much neglected *Bufotes variabilis* were relatively well collected this year (9 specimens), while other species were less well represented: 3 *Salamandra infraimmaculata*, 1 *Latonia nigriventer*, 2 *Ommatotriton vittatus* and 7 *Pelobates syriacus*.

Interestingly, some past errors in labeling display items made us to cooperate with Tamar Feldstein to molecularly identify toads in the collections. While, as expected, four Israeli specimens look most closely related to (and probably conspecific with) *Bufotes variabilis*, there seem to be

some deep divergence among them, which may have taxonomic implications – suggesting that further work should be dedicated to this issue.

### The mammal collection

Only 224 mammal specimens were added last year (from 15606 to 15830, compared to 296 in 2017, 463 in 2016 and 653 in 2015!). Our backlogs extended further during the reporting period, as they did in the last few years, because of a huge effort by our technical staff to prepare displays for the new building, and because Kesem spent much time preparing for the move. The 224 newly acquired mammals belong to 50 species, the commonest being Etruscan shrews (27 specimens) followed by mice (*Mus musculus* and *M. macedonicus*, 26 specimens combined). Among the rest, the ‘usual suspects’ predominate: the wolves (*Canis lupus*, 18), common hedgehog (*Erinaceus concolor*, 14 specimens), golden jackals (*Canis aureus*), least shrews (*Crocidura suaveolens*) and red foxes (*Vulpes vulpes*) (8 specimens each), and mountain gazelles (*Gazella gazelle*, 7 specimens). The Egyptian slit-faced bat (*Nycteris thebaica*) is somewhat rare and is represented by one specimen. This is a beautiful long eared bat, which previous specimen was collected in 2006.

Our major operation this year was moving to the new building. The wet collection was moved entirely and is currently under the process of unpacking according to a new order, which takes under consideration the latest taxonomy and the expected species-specific addition rate. The dry collection is in the process of preparation for moving. During these preparations, we have also improved and renewed a great proportion of the specimens’ packaging. Arie continues to be in charge of databasing incoming material. Nir Weil has worked on unifying the localities recorded in the database, in order to make this important information accessible and useful. Another volunteer, Shahar Dubiner, has been searching for mistakes in body measurements recorded in the database during his BSc project and helped correcting them.

Further progress was achieved in merging the teaching collection and several other “sub-collections”, which were historically separated from the main collection for various reasons. Such an arrangement made it hard to track the exact location of the specimens in the sub-collections, decreasing their availability and turning some specimens utterly forgotten. In this process we even discovered a specimen of a species new to the collection (the giant forest hog, *Hylochoerus meinertzhageni*), which was unrecorded, and returned it to the collection with honor.

### The reptile collection

The reptile collection growth also slowed down this year: it grew by 216 specimens only, from 18439 to 18655 specimens. This probably reflects both the cessation of the curator’s work in Greece (which used to bring hundreds of specimens, mostly tissue vouchers, each year), a cessation of the NPA’s attempts to control the invasive gecko *Tarentola annularis*. Shortage of staff and added chores related to the move to the new building further slowed us down. The list of newly added material is dominated by of the house gecko, *Hemidactylus turcicus* (34 specimens) followed by *Mediodactylus kotschy* (14 specimens, 12 still from Greece, the other two from Israel; see below notes for taxonomic considerations), then common fan-footed geckos (*Ptyodactylus guttatus*) and Palestine vipers (*Daboia palaestinae*) (12 specimens each), only six specimens of the invasive gecko *Tarentola annularis* were collected (compared with 255 last year). Altogether some reptile specimens catalogued this year belong to 47 species.

Overall the tetrapod collections grew by some 947 specimens, or 60% of the last year’s tally. We are still working against increasing backlogs in all collections, and our freezers are filled to the brim with specimens waiting to be processed. We hope that as we and the specimens settle in our new home we will find time needed to clear the backlogs, hopefully in the second half of 2019 at the latest. Two major changes occurred in reptile taxonomy through the use of our collections last year: Sinaiko et al. (2018) revised the thin racers of the *Platycephalus rhodorachis* in Israel, concluding the country is inhabited by a single species, *P. saharicus* Schätti & McCarthy 2004. Kotsakiozi et al. (2018) revised the East Mediterranean geckos of the *Mediodactylus kotschy* complex, arriving at the conclusion that they comprise five species. The Israeli populations were removed from *M. kotschy* and named *Mediodactylus orientalis* (Stepánek, 1937)

### The bird collection

Over the reporting period, the bird collection has grown by 453 specimens (from 21219 to 21672), about the same rate as last year and about 33–50% of what we got in previous years. Among the new acquisitions, about 100 birds were brought from Mali and still await preparation, about 40 are (mostly unidentified) eggs and mounted skins from the Schmitz collection, and for 70 only tissue samples were so far obtained. Twelve others are old specimens found in the collections and only now catalogued. Thus only some 230 birds that entered the collection this year represent specimens we got since 2013 (mostly 2016–2018). The following discussion concerns only these 230.

Altogether, the 230 specimens represent 101 species. The most common species we received is ring-necked parakeet (*Psittacula krameri*, 14 specimens) followed by the ubiquitous kestrel (*Falco tinnunculus*, 8 specimens), and slightly more surprisingly sparrowhawks (*Accipiter nisus*), little bitterns (*Ixobrychus minutus*) and corncrake (7 specimens each). We received one specimen of an Atlantic puffin (*Fratercula arctica*) that was found on the sea shore – the first record in Israel. We are accumulating bird specimens in our freezers: in total, 556 bird specimens were actually received this year, but less than half have entered the collections.

Most of the activity in the bird collection revolved around preparations for the opening of the exhibits, taking out specimens and helping with the construction of the exhibits. In addition, the work of putting skulls and skeletons in plastic boxes and round skins in plastic continued. Amos focused on preparing the collection for the move to the new building – packing drawers, eggs and nests. The wet collection moved entirely to its new home. Amos also checked the inventory on the shelves against the database records and fixed errors. Moshe Giezler was comparing the catalogs with the database for errors, and quite a few were found.

### Collection management: equipment, infrastructure, storage and curation

We made little progress in absorbing the Beit Ussishkin and A.D. Gordon Museum collections into our holdings. We will be reviewing our storage needs in the new building as the collections are being transferred then unpacked and placed in cabinets and on shelves. We anticipate shelf space to be constraining, but the museum has already taken steps to mitigate this issue should it become a problem. As for cabinets, we are still well short of dedicated storage cabinets even for specimens already in the collections, and as we hope the mammal skin collection is going to be placed in adequate cabinets, even more cabinets will be needed. We continue to use nylon ‘sleeves’ to store bird study skins individually and the use of transparent plastic boxes for skull and skeletal material seems to be fulfilling our expectation that they will keep the material in better shape in years to come. We made no headway in looking into barcoding jars and drawers, so that immediate curation and identification of specimens present in a cabinet or on a shelf can be done. This is now routine in several collections in the world and we hope to adopt such technology sooner rather than later.

Igor and Stas continued to improve the infrastructure of the preparation area, following the structural changes to the buildings in the Zoological Garden. We are anxiously awaiting the move of the databases to a new platform, and being able to make individual-based records freely available to the public over the Internet.

### Visits, teaching and loans

According to our records, 34 people (almost all of them academics) visited the collections and used them last year: 16 in the mammal collections, 3 in the reptile collection, and 15 in the bird collection (Maayan Lev, an archeozoology graduate student at the University of Haifa, visited all three!). Visitors were from Israel, Canada, Ukraine and the USA. Of the 29 Israeli visitors 22 were from outside the Tel Aviv University (TAU). At least 13 courses (9 TAU courses) used collections materials. We have loaned specimens to members of 10 institutions (8 in Israel, 1 in Brazil, and 1 in the USA), sent tissue samples to individuals in 6 institutions (Brazil, the Czech Republic, Israel, Slovakia and Spain) and sent specimen data pertaining to 25 project, to scientists in 11 institutes (Israel, Switzerland, France, Spain and the UK).



## Publications

Despite our appeals to those who borrowed specimens/tissues and/or obtained data, we are not always informed of new publications emanating from the use of our collections. Two books and 18 papers published during the reporting period are therefore likely an underestimate of the true output.

## THE FEATHER IDENTIFICATION LAB

**Avigail Ben-Dov Segal, Roi Dor and Tamar Feldstein-Farkash**

Military and civilian air traffic has increased dramatically over the years. This heavy traffic shares air space with half-billion migratory birds that pass through Israel twice a year (as well as resident birds). This co-existence holds a tremendous risk of bird strikes that often lead to substantial material damage and even loss of human lives. Identifying the risks is an important step for preventing collisions and improving flight safety. Therefore, it is essential to identify bird species responsible for accidents, whether high in the sky or around airfields.

Since 2011 the Feather Identification Lab is working closely with the Israeli Air Force, the Israel Airports Authority, the Civil Aviation Authority and the Israel Nature and Parks Authority, for whom we provide over 100 identifications annually. In addition, we also assist the Israel Nature and Parks Authority with detecting poaching of wild birds and identify bird species collected in new surveys on the effects of wind turbines and electric lines effects on wildlife.

The Lab's main goal is to identify feather remains to the lowest possible taxonomic level. The feathers are identified using various techniques including histological slides for microscopic identification as well as morphological identification of the feathers. We have a comprehensive comparative collection of histological slides of many Palearctic species that is used for microscopic identification, as well as a large comparative feather collection that we continue to expand. Being a part of the Steinhardt Museum of Natural History gives us an opportunity to utilize the largest regional collection of bird specimens (>18,000), which is an invaluable resource for identifying feathers from different species of birds.

The Molecular Systematics Laboratory at the Museum (headed by Dr T. Feldstein-Farkash) now routinely provides genetic identifications of bird remains. This additional information compliments our microscopic and morphological identifications. It is particularly important when damage is caused to aircrafts but the remains do not allow species-level microscopic identification.

So far, the lab examined 124 bird strike cases and 320 cases for the Israel Nature and Parks Authority during the reporting period of 2017–2018. These identifications included 37 genetic analyses.

## THE HERBARIUM

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### THE WATER PLANTS, CYANOBACTERIA AND WATER FUNGI COLLECTIONS

**Razy Hoffman**

**Aims achieved (October 2017 – September 2018)**

Algal surveys continued and the herbarium was upgraded with the addition of over 500 new specimens, mostly seaweeds but also cyanobacteria and seagrasses. Surveys of 2017–2018 revealed some new alien and indigenous seaweeds that had never been reported from the Levantine shore of Israel before. Some of the newly recorded exotic species, found lately, are first records from the Mediterranean Sea. Taxonomical and molecular studies also revealed several new species to science from the Red Sea and the Mediterranean.

Intensive process of cataloging and maintenance of the dry collections of water plants (seaweeds, seagrasses, freshwater algae, Charophyta and vascular plants) cyanobacteria and water fungi started at the beginning of summer 2018.

A new red seaweed species, *Calliblepharis rammediorum* from the Mediterranean Sea off Israel was described *Cryptogamie*, *Algologie*.

Seaweeds that were sampled during the ongoing Bio-Blitz surveys of the benthos in marine protected areas, conducted by the Israel Nature and Parks Authority in autumn 2017 and spring 2018, were identified and listed as requested. Quantitative results of previous surveys of 2015 were published in the Marine Bio-Blitz report in June 2018.

As recognized expert in algal taxonomy and ecology, I refereed five papers this year for peer-reviewed journals. Two manuscripts for *Botanica Marina* and one for each of the following: *Acta Adriatica*, *Biological Invasions* and *Ecology and Evolution*.

As respected expert in seaweed and seagrass invasions, I was invited and participated in a special workshop regarding invasion of marine species to the European waters. This convention, financed by the European Commission, took place in October 2018 at the European Commission Joint Research Center in North Italy. Our research group of experts discussed the potential of future invasions and possible ways to prevent invasions of new alien species. We are preparing a new paper regarding our predictions of the spread of new invasive species in the Mediterranean and the European Atlantic waters.

In January 2018, Dr Martin Vohnik and his student Viktorie Kolátková, from the Institute of Botany, Czech Academy of Sciences, visited our herbarium of marine fungi. We collaborated on studying the fungal parasites of the common seagrass *Halophila stipulacea* from Eilat.

During 2018, I formed new international research collaborations with seaweed experts from Spain (Dr Pilar Díaz-Tapia, University of A Coruña), Belgium (Dr Frederik Leliaert, Scientific Director at Botanic Garden Meise), Colombia (Dr Brigitte Gavio, National University of Colombia) and Thailand (Dr Stefano Draisma, Center of Excellence for Biodiversity of Peninsular Thailand, Prince of Songkla University), and some of them have been studying molecularly specimens from our algal collection.

### Tasks in progress and plans for 2018–2019

The most important task for 2018–2019, to which much time is to be dedicated, is the transfer of the collections to their permanent home at the Steinhardt Museum of Natural History, along with cataloging of all specimens. However, surveys of the aquatic (mostly marine) flora of Israel as well as the maintenance of the collections will continue.

A paper regarding the vegetative and sexual reproductions of the red seaweed *Crouania pumila* and the first occurrence of this Caribbean species in the Red Sea is in preparation for the peer review journal *Botanica Marina*.

A manuscript representing five species of the genus *Padina* from the Levantine Mediterranean shore of Israel is in preparation and expected to be submitted for publication in 2019–2020.

Marine surveys conducted in 2013–2018 revealed that there are over 80 alien algal species along our shores, with many records of new alien species from the Mediterranean Sea. Two review manuscripts representing all the alien species found so far, are in preparation. The first review will deal with the alien species of the Chlorophyta, Phaeophyta and Angiospermae. The second review will report on non-indigenous species of the Rhodophyta, with ca. 50 alien seaweeds found so far! These manuscripts are expected to be submitted for publication during 2019–2020.

The ongoing quantitative study of the algal drift, started in 2005, along the northern shores of Israel, will continue in 2019.

The long term major project to provide two checklists of the seaweeds of the Israeli Levantine Mediterranean Sea and these of the Red Sea, based on the national algal collections of Israel, will continue in 2019.

New papers describing several new species of seaweeds, mostly from the Red Sea as well as from the Mediterranean, are expected to be published in 2019.

## THE FUNGI COLLECTION

### Bruria Gal

The collection was urgently treated this year after being neglected for several years.

### Ongoing projects in the fungi collection

- Relocation of fungi from old store bags into new ones with attached identification labels.

- Sorting the material.
- Databasing: adding new entries, correcting old entries, including locations names and adding geo-references (co-ordinates).
- Preparation of image database of all species in the collection.
- Collecting new material, including preservation in alcohol for further molecular analysis.

## THE BOTANICAL COLLECTION

### Dafna Langgut

All the research in the Laboratory of Archeobotany and Ancient Environments is based on the botanical collection. The lab is mainly focusing on the Israeli flora and curates the following divisions:

- Pollen and Spores Collection (a reference collection)
- Wood Collection (a reference collection)
- Thin sections wood anatomical structure (a reference collection)
- Charcoal Collection (a reference collection)
- Archaeobotanical collection (finds from archaeological excavations)

### Activities related to the reference collections

We collected new samples for our pollen, wood and charcoal reference collections, mainly from Tel Aviv Botanical Gardens (with the assistance of Dr Y. Sapir).

We hosted Tiphanie Chica-Lefort, a PhD student from the Sorbonne University, Paris, who used our wood and charcoal reference collections for her study related to the ancient flora of Israel (March–April, 2018).

Ancient waterlogged wood preservation project. We preserved for future studies two archaeobotanical collections, viz. ~50,000 years old waterlogged wood assemblage from Nahal Mahanaim site and 24,000–10,000 years old waterlogged wood assemblage from Jordan River Dureijat.

Identification of botanical remains (pollen, wood and charcoal remains) for the Israel Antiquity Authority – The Robinson Arc (City of David, Jerusalem), Hirbet Tevet (Jesreel Valley), Shivta (Negev), Ramat Bet Shemesh Project, Mana'at Spur (Jerusalem) and Mount Heret (Nahal Soreq).

Identification of parasite remains for the Israel Antiquity Authority – Caesarea and the Steeped Street (City of David, Jerusalem).

Participation in archaeological excavations in order to collect samples for research purposes: Timna – Southern Arava (February, 2018); Masada (February, 2018); Ramot (February and May, 2018); Caesarea (April and October, 2018); Megiddo (August, 2018); Azeka (August, 2018), Jordan River Dureijat (September, 2018).

### Collection-based research

Mordechay Benzaquen, technician. Main projects: (i) “Crises on the margins of the Byzantine Empire: the paleo-environmental perspective”; (ii) „Early fruit trees cultivation in Chalcolithic (early 5<sup>th</sup> millennium BC) Tel Tsaf, central Jordan Valley”.

Mark Cavanagh, technician. Main projects: (i) “Royal Herodian gardens come alive” – charcoal remains (Herodium Jericho and Masada); (ii) “Wood assamblage from (early) Late Paleolithic NMO (Nahal Mahanayim Site)”.

Helena Roth, technician. Main project: “The charcoal assamblage of Ramat Rahel”.

Dr Eitan Kremer, research assitant. Main project: “The parasite remains from the City of David and Caesarea, the Abbasian period”.

Valentine Epstein, research assitant and lab managger. Main projects: (i) “Vegetation and climate reconstruction of the Epipaleolithic Hula Basin (~24–10 ka) based on palynological analyses”; (ii) “A flower in the desert: Botanical remains of King Herod the Great’s horticulture and agriculture activity at Masada”; (iii) “The ‘Alona Project (Jerusalem): Tracing the invisible hand of ancient agriculture”.

### Active grants

- 2014–2019 The Neubauer Foundation: *Climate changes in the Levant during the Bronze and Iron Ages and their impact on settlement patterns and historical processes* (P.I. together with I. Finkelstein, 250,000\$).
- 2015–2019 Israel Science Foundation: *Royal Herodian Gardens come alive* (P.I., 85,000\$).
- 2015–2019 Israel Science Foundation, equipment grant: *The Laboratory of archaeobotany and ancient environments* (P.I., 28,500\$).
- 2017–2019 Israel Antiquity Authorities: *Archaeobotanical remains in Jerusalem* (P.I., 27,500\$).
- 2018–2020 The Porter Foundation, “Life Under Extreme Conditions at the Dead Sea”: *A flower in the desert: Botanical remains of King Herod the Great’s horticulture and agriculture activity at Masada* (together with G. Stiebel) (P.I., 50,000\$).

### Scientific meetings and lectures

#### Local Conferences

- The Annual Conference of the Sonia and Marco Nadler Institute of Archaeology, Tel Aviv University – The 2017 Excavations of the Institute, October 2017, paper presented: “Under every luxuriant tree”.
- The Annual Conference of the Sonia and Marco Nadler Institute of Archaeology, Tel Aviv University – The 2018 Excavations of the Institute, October 2018, paper presented: “Alona: Reconstructing Iron Age Agricultural Practices at Jerusalem Environs: Integrating Macro and Micro Archaeology”.
- Ba’Merkaz – The Annual Conference of the Archaeology Department and Institute of Tel Aviv Univ. and Israel Antiquities Authority (Central District), Tel Aviv University, April 2018, paper presented: “Go forth from your land and from your birthplace...” – the 55,000–45,000 years BP humid event and its potential link to modern humans spread out of Africa.
- *Invited Lecture*: “The use of plant remains for ancient royal garden reconstruction – the case of Herod’s gardens” at the 2018 Annual Meeting of Plant Ecology in Israel, Tel Aviv University, January 2018.
- *Invited Lecture*: “The citrus route revealed – from south-east Asia into the Mediterranean” at the Citrus Horticultural conference, Volcani Center, February 2018.
- *Invited Lecture*: “Climate changes in the Eastern Mediterranean during the last glacial-interglacial cycle and their potential link to human migrations” at the 2018 Annual Conference for Science and the Environment, Weizman Institute of Science, June 2018.

#### International Conferences

- Society of Biblical Literature (SBL) 2017 Annual Meeting, Boston, USA, November 2017, paper presented: “The migration of plants within the Persian Empire”.
- 2017 Annual Meeting of the American Schools of Oriental Research (ASOR), Boston, USA, November 2017, poster presented: “Dust to dust, Ashes to ashes: the charcoal fertilizers of King Herod the Great” (together with M. Cavanagh [presenter] and G. Stiebel).
- 19<sup>th</sup> International Congress of Classical Archaeology, Cologne/Bonn, Germany, May 2018, paper presented: “Dendroarchaeological Investigations of the Byzantine Negev” (together with M. Benzaquen [presenter]).
- 2018 Annual Meeting of the Historical Metallurgical Society – “What’s mined is yours: Making the most of our metallurgical heritage”, London, UK, June 2018, paper presented: “Environment as a limiting factor: the challenge of copper production in the Timna Valley” (together with M. Cavanagh [presenter] and Erez Ben-Yosef).
- *Invited Lecture*: “More than meets the eye: Microarchaeology at Megiddo and beyond” at the 2017 Annual Meeting of the American Schools of Oriental Research (ASOR), Boston, USA, November 2017.

### Other activities

- Reviewing papers for *Quaternary Science Reviews*, *Tel Aviv, Journal of Archaeological Science: Reports* and *Israel Journal of Plant Sciences*.



- Seminar talks: University of California, Los Angeles; Department of Biblical Studies (TAU); Prehistoric seminar of the Archaeological Department of the Hebrew University of Jerusalem.

#### D. Langgut:

- Reviewed grant proposals for the German-Israeli Foundation for Scientific Research and Development, Israel Science Foundation and European Research Council, as well as for the Ministry of Science and Technology.
- Taught a course of the summer Manna Center Program in Food Safety and Security, July 2018, Tel Aviv University.
- Institute of Archaeology board member, Tel Aviv University (since March 2015).
- Reviewed a Master Thesis (an MA student from the Department of Geography, TAU).
- Editorial board member of the journal *Tel Aviv*, since December 2016 (IF 1.8).

#### Media coverage

Our Lab received broad coverage in the national and international media during the last year:

- Ancient Near East Today – January, 2018
- <http://www.asor.org/anetoday/2018/01/citrus-mediterranean>
- The Times of Israel – April, 2018
- <https://www.timesofisrael.com/toi-asks-the-experts-what-are-the-most-important-finds-of-israeli-archaeology/>
- New York Times – April, 2018
- <https://www.nytimes.com/2018/03/30/climate/egypt-climate-drought.html>

## THE PALEOSCIENCES GROUP

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### THE PALEONTOLOGICAL COLLECTION

#### Daniella E. Bar-Yosef Mayer

Cataloguing of the paleontological collections at the museum continued. The largest component of the collection is the private collection donated by the Late Professor Heinz Bitinsky-Salz, formerly a professor of entomology at the Tel Aviv University, who collected fossils as a hobby.

The collection was identified and tagged, and each item was registered in the digital catalogue and given catalogue numbers. As each item was added to the catalogue, we reviewed the taxonomic identification for updated scientific names using internet sites *The Paleobiology Database* (and its section *Fossilworks*), as well as online catalogues of other museums such as the Musée National d'Histoire Naturelle in Paris and relevant scientific publications. However, the identifications itself were not verified, that have to await research by specialists. In addition, we checked the geographic names of collection sites.

The intensive cataloguing was performed by Dr Olga Orlov-Labkovsky, who prepared thin sections or slides of foraminifera and added them to the collections database, and by Daniella Bar-Yosef, who dealt with molluscs. Additional groups will be catalogued at a later date.

A detailed report of Dr Orlov's activities is presented separately. As regards molluscs, to date, we added 3400 records corresponding to approximately 11,100 individual specimens. They belong to at least 894 genera and approximately 2000 species. While the majority of specimens were collected around the world, and mostly in Europe, 1168 records (about one-third) are from Israel. Chronologically, our world-wide palaeontological collections consist of organisms belonging to as early as the Ordovician, some 450 million years ago, and from Israel as old as the Triassic, about 250 million years ago. The most recent fossils date to the Pleistocene, e.g. some last two million years.

In addition to the Bitinsky-Salz collection, there are additional fossil collections awaiting cataloguing: Nathan Shalem, Yael Khalifa, Vitsker, Bet Ussishkin, Maabarot, and Bet Gordon. The recent transition to the new museum building over the summer of 2018 slowed down cataloguing as compared to previous years.

## FOSSIL FORAMINEFERA

Olga Orlov-Labkovsky

### Research

During the academic year 2017–2018, I continued to carry out research in the fields of taxonomy, systematic, nomenclature, palaeobiogeography and palaeoecology of the Upper Paleozoic foraminifera.

In cooperation with Dr Dorit Korngreen of the Geological Survey of Israel (Jerusalem), I continued to work on the project “Foraminifers of the Permian-Triassic (P/T) transition in the Coastal Plain of Israel”. Some results of this project were presented at the 5<sup>th</sup> International Paleontological Congress in Paris (July 9–13, 2018) and at the 5<sup>th</sup> IGCP 630 Field Workshop on the *Permian and Triassic integrated stratigraphy and climatic, environmental and biotic extremes* in Yerevan, Armenia (October 8–14, 2017).

### Collections

During the reporting period I focussed on the preparation of the fossil material in the Paleontological collection and the organization of a database for microfossils.

I continued to work on the collections of foraminifera (thin-sections or slides) of the Carboniferous system (Upper Paleozoic) in the Central and South Tien-Shan (Central Asia: Uzbekistan, Kyrgyzstan, Tajikistan and Kazakhstan).

At present, representatives of 3 families of the order Schwagerinida comprising 30 genera and 138 species (63 holotypes) are already in the database:

- Family Rugosofusulinidae: Genera *Rugosofusulina* Rauser, 1937, *Dutkevitchia* Leven & Scherbovich, 1978, *Kahlerella* Bensch, 1996, *Rugosochusenella* Skinner & Wilde, 1965, *Benshiella* Leven, 2008, *Schagonella* Davydov, 1980.
- Family Schwagerinidae: Subfamily Paraschwagerininae: Genera *Occidentoschwagerina* Miklukho-Maclay, 1956, *Paraschwagerina* Dunbar & Skinner, 1936, *Likharevites* Davydov, 1987.
- Subfamily Schwagerinidae: Genera *Schwagerina* Moeller, 1877, *Sphaeroschwagerina* Miklukho-Maclay, 1956, *Alpinoschwagerina* Bensch, 1972.
- Subfamily Pseudoschwagerininae: Genera *Pseudoschwagerina* Dunbar & Skinner, 1936, *Robustoschwagerina* Miklukho-Maclay, 1956, *Zellia* Kahler et Kahler, 1937.
- Family Pseudofusulinidae: Subfamily Pseudofusulininae: Genera *Daixina* Rosovskaya, 1949, *Nonpseudofusulina* Leven, 2008, *Grozdilovia* Bensch, 1987, *Pseudofusulina* Dunbar et Skinner, 1931, *Thompsonites* Bensch, 1987, *Praepseudofusulina* Ketat & Zolotukhina, 1984, *Andersonites* Syomna, Soloveva & Bensch, 1987, *Shichanella* Bensch & Kireeva, 1987, *Sakmarella* Bensch & Kireeva, 1987, *Tastubella* Bensch & Kireeva, 1987.
- Subfamily Chusenellinae: Genera *Concavutella* Bensch, 1987, *Dunbarinella* Thompson, 1942, *Pseudochusenella* Bensch, 1987, *Chusenella* Hsu, 1942, *Zigarella* Davydov, 1982.

In addition, I continued curation of other families of the orders Schwagerinida and Ozawanellida and preparing Foraminifera slides for cataloging and databasing.

## ARCHEOMALACOLOGY

Daniella E. Bar-Yosef Mayer

The past academic year was dedicated to activities that relied on the collection-based research at the Steinhardt Museum of Natural History. Archaeomalacological shell assemblages of sites in Israel continued with Jordan River Dureijat, being the main focus of activities. The excavation, directed by Gonen Sharon from Tel Hai College, exposed a shell midden on the bank of the Paleolake Hula dated back to the end of the Pleistocene, ca 20,000–11,000 years ago. Lacustrine species were identified in the collection and analyzed, revealing environmental changes throughout the site's occupation.

Shells from the Middle Palaeolithic site of Misliya, Mt. Carmel were studied in collaboration with Prof. Mina Weinstein-Evron and Dr Iris Groman-Yaroslavski from University of Haifa. Shells from the Upper Palaeolithic site of Manot Cave continued to be examined with a preliminary report

underway. Manot was a large collaborative effort with the lead researchers from Ben-Gurion University, the Israel Antiquities Authority, Tel Aviv University, and several other institutions both in Israel and abroad. Several Pre-Pottery Neolithic B shell assemblages were investigated by Ms Heeli Schechter, a graduate student at the Hebrew University of Jerusalem, with the main focus on shell beads in Neolithic burial contexts. The archaeomalacological assemblage from Tel Tsaf, an Early Chalcolithic site in the Jordan Valley, was studied in collaboration with Prof. Yosef Garfinkel of the Hebrew University of Jerusalem. The shells from a Hellenistic pit in the site of Tel Bet Yerah were studied, in collaboration with Prof. Rafi Greenberg from the Institute of Archaeology, Tel Aviv University.

Additional research activities included the study of beads from the Late Bronze/Early Iron Age site of Timna, with the assistance of Ms Getta Rosenzweig from the Weizmann Institute and in collaboration with Prof. Erez Ben-Yosef from the Institute of Archaeology, Tel Aviv University.

In addition to the above, I served on the evaluation committee of Marjolein Bosch, a PhD student at Leiden University, the Netherlands, gave talks at conferences in the UK and France, and presented three guest lectures at Israeli universities:

- *Paleoenvironmental reconstruction based on mollusc shells: Çatalhöyük as a test case*. Guest lecture for the paleoenvironmental course taught by Dafna Langgut, Institute of Archaeology, Tel Aviv University.
- *Introduction to Archaeomalacology*. Guest lecture for the archaeozoology course taught by Lidar Sapir-Hen, Institute of Archaeology, Tel Aviv University.
- *Middle and Upper Palaeolithic shell beads: When, where and why*. Department of Maritime Civilizations, University of Haifa.

## ARCHEOZOOLOGY

### Lidar Sapir-Hen

During the reporting period, the Laboratory of Archeozoology was established and equipped, and archeozoological collections were moved to the proper storage facilities in the new museum building.

#### Overview

During the last year I was engaged in research and published articles in reputable journals, supervised MA and PhD students and taught courses, participated in international conferences and in archeological excavations:

Advised two MA students and one PhD student. The students' work was based on faunal assemblages from archeological sites, and relies on the mammal comparative collections of the SMNH.

Teaching at TAU: Animal remains in archeology; MA seminar in Archaeological Science; Practical workshop in archeozoology; Archaeology of dogs. Teaching included frontal lectures and practical workshop based on the mammal collections and archeozoological collections of the SMNH.

Presented papers at four international conferences (Boston, USA; Paris, France; Tel Aviv, Israel), where I also chaired a session (Boston), and delivered invited lectures at department seminars (Boston University, Tel Aviv University).

Actively participated in archeological excavations at Timna and Masada (February 2018), Azekah, Tel Hadid and Megiddo (August 2018). My participation included advising site directors on retrieval methods of findings, and lectures to students at the field school using comparative collections.

Carried out research on archeological assemblages, relying on the mammal and bird collections at TAU and Israel Antiquities Authority (IAA): EPPNB Tzomet Ahihud, Hellenistic Givaty, Middle and Late Bronze Megiddo, Late Bronze and Iron Age Timna, Late Bronze Azekah, and Iron Age Ophel.

#### Visiting scholars to the Archeozoological collection

Dr Deirdre Fulton, Baylor Univ., USA, and Dr Max Price, Massachusetts Institute of Technology, USA.

## ANCIENT DNA

Meirav Meiri

Having received a grant from Yad Hanadiv to establish an ancient DNA laboratory at the Steinhardt Museum of Natural History (SMNH), we were busy setting the lab in collaboration with architects and engineers. The laboratory will focus on archeological remains of animals and plants, and will be open to all scientists in Israel.

**I worked on the following projects during the reporting year:**

*MB animal mobility and palace economy at Tel Kabri: The case of cattle*

Collaborators: Assaf Yasur-Landau, University of Haifa, and Philipp W. Stockhammer, Ludwig-Maximilians University, Munich, Germany, and Max Planck Institute for the Science of Human History, Jena, Germany.

We aimed to understand animal mobility within the palatial polity of Kabri, focusing, as a test case, on the mobility of cattle. Cattle was chosen mainly as its mobility was mentioned in the Middle Bronze Age texts, but also as cattle mobility was already established by DNA study for the Late Bronze / Early Iron Age transition. Therefore, we wanted to know if the palace acquired individual animals from distant regions, and how much genetic variability we can identify within the herds.

For this project I have extracted 16 cattle bones, none of which, unfortunately, yielded DNA. Therefore, due to bad preservation we decided to close this project.

*Were mules a common draft animal in the Iron Age Levant? Timna as a case study*

Collaborators: Lidar Sapir-Hen and Erez Ben-Yosef, both Tel Aviv University.

Although mules appear in Ancient Near Eastern sources as early as the Middle Bronze Age, they are rarely identified in the archaeological record of the southern Levant. However, their near complete absence in assemblages most probably reflects challenges in distinguishing equids based on the typically fragmentary assemblages of bone remains. Here we suggested applying aDNA techniques on bones and dung remains from Early Iron Age Timna, in an attempt to identify the presence (or lack thereof) of mules in one of the key centers of trade and transportation of the period.

So far, I tested five equid bones, none of which, unfortunately, yielded DNA. I expect further material to analyze.

*The Byzantine wine of the Negev Desert*

Collaborators: Guy Bar Oz, University of Haifa, Roberto Bacilieri, INRA-CIRAD-Montpellier, France, and Tom Gilbert, University of Copenhagen, Denmark.

During the Byzantine period between the 5<sup>th</sup>–7<sup>th</sup> centuries AD, the Byzantine Negev wine was highly esteemed across the Levant, North Africa and Europe. However, the knowledge of the specific cultivar grown *in situ* by the Negev farmers and its unique capacity to adapt to the arid conditions were lost with the Islamic conquest of the southern Levant in the mid-7<sup>th</sup> century AD. With the ancient and modern DNA techniques, we want to pinpoint the closest living cultivars to the ancient variety.

Two ancient grape seeds from Ovdad dated back to the 8<sup>th</sup>–9<sup>th</sup> centuries yielded sufficient amount of DNA using capture and NGS techniques. I was able to compare them to the panel reference, which comprised from cultivars across the world. The two ancient samples fell very close to the Middle East group that includes among other cultivars from Turkey, Syria, Iran, Afghanistan, and Lebanon.

As we lack modern local references to compare our ancient material, we collected 33 modern grape samples across Israel, including wild grapes and feral varieties especially in the Negev. The DNA was extracted and the samples were sent to France for the single nucleotide polymorphisms (SNPs) analyses. Presently, I await results to integrate them into the analyses.

*Goat mobility in the Negev mountains*

Collaborators: Israel Finkelstein, Tel Aviv University, and Ruth Shahack Gross, University of Haifa. In this project, we studied the origin of the Negev mountains goats. We wanted to test whether

the genetic signature of the goat populations in the Negev changed over time, and how these data could elucidate the trade connections.

Thirteen modern saliva samples representing local breeds were extracted and parts of the mitochondrial DNA (mtDNA) were amplified. Seventeen ancient bone samples from the Negev were also tested, but only two yielded mtDNA. Both modern and ancient samples belonged to haplogroup A, which is present in 90% of the individuals across the world. As we did not detect any change through time in the genetic signature of goats and realized that due to their population history, the ancient DNA is not the best tool to answer our question, we decided, therefore, to close this project.

## DAN DAVID CENTER FOR HUMAN EVOLUTION AND BIO-HISTORY RESEARCH

Israel Hershkovitz, Hilla May and Rachel Sarig

Below is a summary of research and field projects, utilized funding, and collaborations, followed by a more detail elaboration on some aspects of the Center’s activities put together by Dr Hilla May.

### Ongoing research projects (2017–2018)

- Nesher-Ramla skull (140,000 years old): *Early presence of the Neanderthals in the Levant.*
- Geulla cave teeth (100, 000 years old): *Neanderthal-Homo sapiens introgression.*
- Har Safsuf cave human remains: *Human migration in the Chalcolithic.*
- Natufian and Neolithic jaws: *Micro-evolutionary trends in the masticatory system during the Holocene.*
- Manot cave hominins: *Who were the Levantine Aurignacians?*
- Natufian, Neolithic and Chalcolithic femora: *Changes in physical burden during the Holocene.*
- Ancient DNA studies: (A) *Anatolian migration during the Chalcolithic;* (B) *The geographical origin of the Natufian people;* (C) *Jews from the Second Temple period and their association with present Jewish populations.*
- The teeth from Qesem cave: *Who were the Achelu-Yabrudians?*
- The Qafzeh Cave hominins: *Malocclusion or maladaptation?*
- Tel Rehov human remains: *The Assyrians in Israel.*

### Ongoing field projects

- Manot Cave excavation (Early Upper Paleolithic).
- Tinsmet Cave project (Middle Paleolithic).
- Skhul Cave project (Middle Paleolithic).
- Tabun Cave project (Middle Paleolithic).
- Geulla Cave project (Middle Paleolithic).
- Nahal Yarmuoth, Pre-Pottery Neolithic B site in the lowland of Israel.
- Timna, a Bronze Age site in the southern of Israel.

### Grants (2017–2018):

Granted by Institute/Company	Total Amount
Schreiber Foundation Sackler Faculty of medicine TAU	40,000 NIS
Israel Science Foundation (ISF)	651,000 NIS
Israel Science Foundation (ISF)	576,156 NIS
Irene Levi-Sala CARE Archaeological Foundation	5,000 USD



Granted by Institute/Company	Total Amount
Rekanati Medical Research Foundation, Sackler Faculty of Medicine	70,000 NIS
National Geographic Society	34,000 USD
Leakey Foundation	24,000 USD
Wenner-Gren Foundation	20,000 USD
Broad-ISF	378,000 USD
Gerda-Henkel Foundation	68,000 Euro
Bi-national Science Foundation	220,000 USD
Australian Research Council	254,000 USD

**Active collaboration projects with foreign researchers:**

- Gerhard Weber (University of Vienna, Austria)
- Anne-Marie Tillier (Université Bordeaux, France)
- Dominique Grimaud-Hervé (Muséum national d'Histoire naturelle, Paris, France)
- David Reich (Harvard University, US)
- Svante Pääbo (Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany)
- Johannes Krause (Max Planck Institute for the Science of Human History, Jena, Germany)
- Rolf Quam (Binghamton University, US)
- Bruce Latimer (Case Western Reserve University, Ohio, US)
- Luca Fiorenza (Monash University, Australia)
- Paul O'Higgins (The University of York, UK)

**Active collaboration (incl. joint research grants) with Israeli archaeologists:**

- Dr Yossi Zaidner (Hebrew University)
- Dr Uri Davidovich (Hebrew University)
- Dr Dina Shalem (Kinneret College)
- Prof. Ofer Marder (Ben Gurion University)
- Prof. Mina Weinstein Evron (Haifa University)
- Dr Reuven Yeshurun (Haifa University)
- Dr Dani Nadel (Haifa University)
- Dr Ron Shimelmitz (Haifa University)
- Dr Omri Barzilay (Israel Antiquities Authority)
- Prof. Udi Weiss (Bar Ilan University)
- Dr Guy Stibel (Tel Aviv University)
- Prof. Erez Ben-Yosef (Tel Aviv University)
- Prof. Avi Gopher (Tel Aviv University)

**Masters and Doctoral students who used the collection for their research:**

- Einat Kedar (PhD)
- Sarah Borgel (PhD)
- Hadas Avni-Levine (PhD)
- Mila Rajapova (Hejja) (PhD)
- Ruth Kallevag (PhD)
- Victoria Roul (PhD)
- Amal Bader Farraj (PhD)
- Samuel Francis (MSc)
- Itay Nudel (PhD)
- Waseem Habashi (PhD)
- Yoli Bitterman (MSc)
- Michal Peer (PhD)
- Efrat Gilat (Research project – MD student)

## BIO-HISTORY AND EVOLUTIONARY MEDICINE LABORATORY

Hilla May

The Laboratory is an inter-disciplinary laboratory focusing on two major topics: evolutionary history of anatomical systems and their impact on current populations' health, and reconstruction of ancient populations' daily life, based on their skeletal remains, with emphasis on the interaction between genetic and socio-cultural factors.

During the reporting period, several research projects, based on the anthropological collection, were carried out in my laboratory. In addition, collaboration with foreign universities, based on the anthropological collection, were continued/commenced. Moreover, several original papers and abstracts of papers presented at conferences were published.

### Research activity based on the anthropological collection:

*Ancient DNA from Chalcolithic Israel reveals the role of population mixture in cultural transformation:* we examined whether the unique material culture of the Late Chalcolithic period in the southern Levant (4500–3900/3800 BCE) is associated with population migration. We generated genome-wide ancient DNA from 22 individuals from Peqi'in Cave, Israel. These individuals were part of a homogeneous population that can be modeled as deriving ~57% of its ancestry from groups related to those of the local Levant Neolithic, ~17% from groups related to those of the Iran Chalcolithic, and ~26% from groups related to those of the Anatolian Neolithic. The Peqi'in population also appears to have contributed differently to later Bronze Age groups, one of which we show cannot plausibly have descended from the same population as that of Peqi'in Cave. These results provide an example of how population movements propelled cultural changes in the deep past.

*Who were the people of Timna?* During 2017–2018 several skeletons were excavated at Timna site, Israel. These skeletons are being studied to reveal the origin of the miners at Timna as well as the manner of their occupation.

*Middle Ear Disease (otitis media, OM) in terminal Pleistocene–Holocene Levant populations.* After developing a reliable method for identifying pathological processes associated with OM in skeletal remains (middle ear and ossicles), we studied the prevalence of OM in prehistoric and historic populations during the Holocene. Consequently, we revealed how lifestyle, type of habitation, and settlement density affected the prevalence of this pathology in past populations (e.g., Natufian hunter-gatherers, Neolithic early farmers and Chalcolithic farmers). This study was carried out by a Post-doctoral fellow, Dr Fluernova, from March 2015 to March 2017 (in her first half year she received 50% scholarship from VATAT) and Efrat Gilat (MD student).

*Changes in proximal femora shape following changes in physical burden and lower limb bone morphology at the origins of agriculture in the Levant.* The aim of this study is to reveal the influence of the transition from hunting-gathering to farming economics on the physical burden and daily life activities of the people that were part of the transition. This quest is examined from various aspects (e.g. biomechanical analysis, 3D curvature analysis and 3D shape analysis of the femur), by Hadas Levine, an MSc student and Victoria Roul, a PhD candidate.

*Subsistence transition and mandibular morphology.* The aim of this study is to examine the differences in diet consistency and food preparation techniques in pre- and post-agricultural revolution populations in the southern Levant based on mandibular characteristics and 3D shape analysis. This study is carried out by Ariel Pokhojaev.

### Collaborations with foreign universities based on the anthropological collection

The origin of the Chalcolithic population from the southern Levant in collaboration with Prof. David Reich, Department of Genetics, Harvard Medical School, USA.

The origin of the Natufian and Neolithic populations from the southern Levant, in collaboration with Dr Johannes Krause, Max Planck Institute for the Science of Human History, Jena, Germany.

The effect of diet on mandibular morphology using finite element analysis in collaboration with Dr Ekaterina Stansfield and Prof. Paul O'Higgins, Centre for Anatomical & Human Sciences, Department of Archaeology and Hull York Medical School, University of York, York, UK.

## MOLECULAR SYSTEMATICS LABORATORY AND TISSUE COLLECTION

Dorothee Huchon and Tamar Feldstein-Farkash

The molecular systematics laboratory of the Steinhardt Museum of Natural History at Tel Aviv University (SMNH) offers identification of museum samples when morphological identification is uncertain. In 2018, the laboratory moved from its temporary location at the Institute for Cereal Crops Improvement to the new building of the Steinhardt Museum of Natural History. The new premises provide separate rooms for conducting different procedures to avoid DNA contamination.

### Operational

During the reporting period, tissues from various animals, including birds, fish, amphibians, insects and sponges, were processed:

- Identification of birds as part of an ongoing service we provide for the Israeli Air Force and to the Israel Airports Authority for the identification of birds that collided with airplanes (birdstrike) amounts to 61% of the molecular lab work.
- Identification of the Israeli amphibian fauna using material archived in the tissue collection.
- Identification of the Israeli freshwater fish fauna, in collaboration with the Israeli National Park Authority.
- Identification of Mediterranean sponge species in collaboration with Prof. Micha Ilan from the School of Zoology, Tel-Aviv University.
- Identification of mole crickets (*Gryllotalpa* sp.) in collaboration with Ittai Renan from the Entomology Lab for Ecological Monitoring, SMNH.

The Molecular Systematics Collection of the SMNH consists of frozen or alcohol-preserved tissues of vertebrates and invertebrates. We encourage its use by the international, non-profit research community. In the new Museum building, an entire room is equipped with deep freezers, most of which have voucher material.

During the past year, 1444 tissue samples were added to the Museum tissue collection, including 218 mammals, 264 birds and 142 reptiles.

### Research

Dorothee Huchon worked on the genome of comb jellies (Invertebrata: Ctenophora). Ctenophora is a distinct phylum of gelatinous invertebrates found in all marine environments. While most species of ctenophores are planktonic, the order Platyctenida comprises species that are benthic as adults. To date, the assessed number of ctenophore species ranges between 100–150 and it is believed that many species still remain to be discovered, especially of the order Platyctenida. As a continuation study of our previous work on Israeli Platyctenida which was funded by the Israeli Taxonomy Initiative, we have characterized the first complete mitochondrial genomes for members of the order Platyctenida. Our work show that these genomes present an extreme rate of evolution that not only affects the nucleotide substitution but also gene rearrangements (Arafat *et al.* 2018).

## THE MUSEUM DATABASE

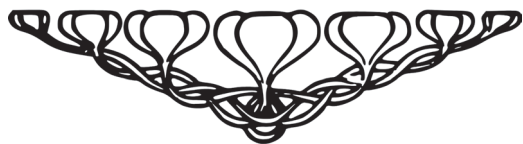
Tirza Stern

50,836 new records were added to the SMNH database, to a total of 476,249 entries in the database. At present, the SMNH database contains the following numbers of entries in the following groups:

- |                        |  |
|------------------------|--|
| • Foraminifera – 757   | • Bryozoa – 259                          |
| • Coelenterata – 13310 | • Brachiopoda – 45                       |
| • Porifera – 1163      | • Mollusca – 63286                       |
| • Vermes – 222         | • Arthropoda (other than insects) – 7274 |



- Insecta – 294884
- Echinodermata – 2323
- Ascidiacea – 1008
- Pisces – 14739
- Amphibia – 2744
- Reptilia – 18655
- Aves – 21672
- Ornithology Lab – 549
- Mammalia – 15830
- Fossils – 3394
- Lichens – 1345
- Fungi – 5625
- Water plants – 5905
- Marine parasites – 2
- Molecular Laboratory – 850
- Forensic – 408



## THE ISRAEL TAXONOMY INITIATIVE

**Daniella E. Bar-Yosef Mayer**

Conservation of biodiversity—the variety of life forms on earth—depends on scientific knowledge and expertise. Government agencies, research institutes, and conservation organizations around the globe have identified an alarming gap between existing taxonomic knowledge of biodiversity and the need for this information to guide conservation practices. Taxonomic research is essential for identification of the great majority of living organisms, to understand the evolution of life, and to halt the loss of species; but the state of the discipline is presently inadequate. Many sophisticated tools and models—morphological, biochemical, and genetic—as well as advanced software, are available for taxonomists; however, basic research lags seriously behind needs. The Millennium Ecosystem Assessment—a UN taskforce to review the trends and implications of changes in global ecosystems—identifies the lack of knowledge of species and their geographic distributions as one of the impediments to sustainable development; the international treaty of the Convention on Biological Diversity initiated the Global Taxonomy Initiative in an effort to remedy this situation.

In Israel, where geographic, topographic, and climatic conditions have produced amazing and unique diversity of life, taxonomic research is declining. A recent report submitted to the Israel Academy of Sciences and Humanities demonstrated that within 10 years—the average period required to train a young taxonomist—Israel would have no scientists in research or teaching positions who can train the next generation of taxonomists. Thus, a major and urgent effort is required to salvage this field and to ensure the continuation of the critical discipline.

In addition to nature and environmental conservation, taxonomic research has applied implications for agriculture, the economy, human welfare and health; it is therefore crucial that it remains viable in face of fleeting fashions in scientific research.

The Israel Taxonomy Initiative is a consortium of government ministries and agencies, research universities and higher education institutions that aims to promote training of taxonomists and basic knowledge of Israel's biodiversity by

- Providing doctoral and post-doctoral fellowships;
- Providing funding for overseas training for graduate students;
- Providing funding for biodiversity surveys;
- Inviting taxonomists from the international scientific community to teach short courses on local species groups.

Our goal is to revitalize Israeli taxonomy and increase our knowledge of biodiversity, thus promoting the contribution of science to conservation of Israel's ecosystems and developing the sustainable use of the country's natural assets.

**The following grants have been awarded to date**

**Doctoral Scholarships:**

2017/18: Tom Shlezinger, scleractinian corals; Shlomi Aharon, spiders.

**Visiting Scholars:**

2017/18: Jiri Hulcr and Andrea Lucky, bark beetles; Michael Wilson, Auchenorrhyncha (leafhoppers, planthoppers, treehoppers, spittlebugs and cicadas).

In February 2018, Dr Michael Wilson from the National Museum of Wales, Cardiff, UK, presented his 5-day course (facilitated by M. Spodek) on the taxonomy of Auchenorrhyncha (Hemiptera) with an emphasis on economically important agricultural pests. The course was attended by 20 participants, including MSc and PhD students, agricultural specialists, researchers, technicians and museum staff.

# EDUCATION AND SCIENCE COMMUNICATION DEPARTMENT

**Yael Gavrieli**

With opening the doors of the Steinhardt Museum of Natural History – Israel National Center for Biodiversity Studies in July 2018, a new ‘era’ begun. We officially closed Nature Campus and moved on to become Education and Science Communication Department of the SMNH. Beyond the title, changes were many: transferring the activities held mainly in the zoological and botanical gardens to the museum galleries, expanding the guides teams, adapting old programs and developing new ones, intensifying the volume of activities, and of course, developing new working processes with the SMNH marketing and operations teams.

Below are major accomplishments of the Education and Science Communication Department during the first year of operations.

**Development & adaptation of new programs**

Several new formats of programs were introduced and run:

- **Guided Tour.** The tour is designed for 75–90 minutes and is flexible in adapting to various audiences, from children to adults. Some groups require only “light” interpretation, while for other groups we introduced wireless tour guide system that allows addressing several groups of visitors clearly and discreetly in the busy galleries, without interference among groups.
- **Science Time.** The format is a 2-hour program for school children groups that focuses on a specific theme. It is comprised of 30-minute presentation of the theme and reviewing main concepts and terms, after which the group is divided into subgroups of maximum 20 people that proceed with a 45-minute hands-on research workshop and 45-minute guided tour at one to three museum’s exhibitions.
- **Science Day.** This format expands the Science Time program with a 60 minutes’ tour at either the zoological or botanical garden.
- **Explore the Nature.** Families with 5–10 years old children are invited to explore hands-on specimens from our educational collection in a 50-minute workshop that also includes a “scientific” crafts kit and games. The workshop is offered on weekends, Thursday afternoons and school vacations.
- **Behind the Scene – the Collections.** Once a month we invite the public (from age 10 and above) to meet one of our collections managers and to learn about her/his collection first hand.
- **Explainers @ exhibitions.** On weekends and school vacations guides are stationed at the exhibitions. They offer the visitors interpretations and instigate discourse among the visitors.

**New educational resources and “lesson” plans**

During the last year we adapted many educational resources – lesson plans for various new program formats and often accompanying worksheets. These include:

Age group	Topic	Guided tour at	Science time workshop
Kindergarten	Observing biodiversity	SMNH Zoo	
Kindergarten	Exploring nature	SMNH Zoo Botanical garden	
Kindergarten	Characterization and classification of the natural world	SMNH Zoo Botanical garden	
1–3 Grades	Biodiversity & us	SMNH Botanical garden	Museum bakery

Age group	Topic	Guided tour at	Science time workshop
1–3 Grades	Predators & prey	Zoo	Museum dentist clinic
1–3 Grades	Furs & feathers	SMNH Zoo	
4–6 Grades	Exploring invertebrates	SMNH	Small & successful
4–6 Grades	Birds & flying	SMNH Zoo	Feathers, beaks and more
4–6 Grades	Food webs	SMNH Zoo	Museum restaurant
7–9 Grades	The web of life	SMNH Botanical garden	
7–9 Grades	Evolution	SMNH Zoo Botanical garden	Unraveling the mystery of the ancient wing
7–9 Grades	Food webs	SMNH Zoo	Museum restaurant
7–9 Grades	Adaptation – organism & its environment	SMNH Zoo Botanical garden	Feathers, beaks and more
10–12 Grades	Evolution	SMNH Zoo Botanical garden	Unraveling the mystery of the ancient wing
10–12 Grades	The web of life	SMNH Botanical garden	
10–12 Grades	Food webs	SMNH Zoo	Museum restaurant
10–12 Grades	Adaptation – organism & its environment	SMNH Zoo Botanical garden	Feathers, beaks and more
Families	Explore the nature		Explore nature hands-on
Families	Flora of Israel & the world	Botanical garden	
Families	Museum highlights	SMNH	Museum travel log
Families	Museum highlights	SMNH	Smartphone app

### Enlisting & Training new guides

In order to expand the museum team of educators, we designed a selection process, including a selection day, when we introduce the SMNH to the candidates and then examine their skills as potential museum educators.

Eighty candidates, some veterans of Nature Campus and others new, were trained in four training courses to become museum guides. The 42–44-hour training course focused on familiarizing with the museum exhibitions and acquiring museum-education skills. Currently we employ 66 educators, most of them graduate students in Life Sciences.

### Guides professional development

The completion of the training course was a prerequisite for the guides willing to join the education team. However, they continued to build their skills as museum educators in several channels:

**On-line resources for the SMNH guides**

We developed an education website for the guide, which includes all lesson plans, guidelines, administrative procedures, background resources and more.

**Newsletter**

A monthly newsletter reviews updates at the exhibitions and gives background information for exhibits and museum education.

**In-service training**

Every few weeks we run a short in-service training that helps the guides with interpretation of new or unfamiliar exhibitions.

**Education in numbers**

Since opening the museum on July 4, 2018 until December 31, 2018 (i.e., during 6 months) we hosted 438 groups, a total of 9,096 visitors, as follows:

*Visitors according to program*

Program	Number of groups	Number of visitors
Birthdays	6	104
Science day & science time	48	970
Series of science time	43	824
Guided tour at the botanic garden	17	359
Guided tour at the botanic garden	27	534
Guided tour at the SMNH	280	6025
Other	6	52
Combined guided tour	11	228
<b>Total</b>	<b>438</b>	<b>9096</b>

*Visitors divided by age group*

Age group	Number of groups	Number of visitors
Kindergarten	6	114
Elementary school	89	1805
High school	32	575
Middle school	26	471
IDF	4	68
Students	23	643
Mixed	58	752
Adults	144	3482
Pensioners	56	1186
<b>Total</b>	<b>438</b>	<b>9096</b>

*Other characteristics of unique groups*

Special audience	Number of visitors
Parents on maternity leave	40
Tour guides	40
Educators	205
Gifted children	215
Special needs	83
Nature & Parks Authority	87
Israel Science Academy	18
Ministry of Agriculture & Rural Development	18



*Special programs and events*

Special events	Date
Kindergarten teachers conference	16 Oct. 2018
ICOM-NATHIST conference	5–6 Nov. 2018
In-service training of Nature & Parks Authority’s rangers – south district	11 Nov. 2018
In-service training of Nature & Parks Authority’s education and community team	27 Nov. 2018
In-service training of Nature & Parks Authority’s rangers – central district	27 Nov. 2018
Interpretation forum	24 Dec. 2018
In-service training of kindergarten teachers Da-Gan	26 Dec. 2018

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## THE ISRAEL NATIONAL CENTER FOR AQUATIC ECOLOGY

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*National project for aquatic taxonomy, ecological assessment and river management.*

**Members:** Dr Yaron Hershkovitz, Tuvia Eshcoli, Etai Kahna, Avital Katz, Dafi Lavi.

**MSc students:** Adi Weiss, Lior Bentor.

**Steering Committee:** Prof. Tamar Dayan, Dr Menachem Goren, Nissim Keshet, Dr Dana Milstein, Alon Zask, Dr Amir Erez.

The Israel National Center for Aquatic Ecology was established in 2015 by the Israel Nature and Parks Authority, The Ministry of Environmental Protection and the Steinhardt Museum of Natural History. Its main goal is to develop and implement an official bioassessment scheme for the aquatic ecosystems for Israel, namely main rivers and their surrounding catchments. Although we conduct mostly applied ecological research, our work is based on taxonomy and fundamental understanding of species and their biological needs. Ultimately we aim to disseminate knowledge among practitioners, river managers, academia and stakeholders, as well as the general public.

In 2017–2018, we continued our work to develop bioassessment tools for the monitoring of streams in Israel.

### Main activities in 2017–2018

- *Biological assessment of Ashelim stream industrial wastewater spill.* A 5-year monitoring to assess the impact of highly acidic wastewater spill on the aquatic ecosystem of Ashelim Wadi (Judea desert).
- *Ecological assessment as a supporting tool for river basin management: the southern Jordan and its tributaries as a model.* A 2-year project to develop an aquatic assessment system, compatible with the European Water Framework Directive methodology for reporting on the ecological status of fluvial ecosystems of the Lower Jordan watershed. Supported by the Landscape Protection Fund of the Israel Land Authority (2017–2019).
- *Ecological assessment as a supporting tool for river basin management: the Kishon and its tributaries.* Supported by the Kishon River Authority.
- *The ecological state of aquatic ecosystems in Israel.* A review chapter on the current ecological state of streams in Israel, as part of the Israel State of Nature Report (2019), led by the Ha-Maarag.
- *Identifying the eco-hydrological niches of macroinvertebrates to assess the impact of prolonged drought in the Upper Jordan River.* A study to investigate the effects of a 5-year long drought on the unique ecosystem of the upper Jordan River system.
- *The ecological role of riparian buffer strips in agricultural landscapes: the Zippory stream as a model.* A study to investigate the ability of riparian woody vegetation to mitigate human impact on streams in a rural region.

### Project reports (Oct. 2017 – Sep. 2018)

Hershkovitz, Y. (2018) *A hydrobiological survey of the Yarqon stream, from source to mouth – spring 2017.* Submitted to the Yarqon River Authority. [In Hebrew]

Milstein, D. & Hershkovitz, Y. (2018) *The impacts of drought on the ecological condition of the upper Jordan tributaries.* [In Hebrew]

## THE ENTOMOLOGY LABORATORY FOR APPLIED ECOLOGY

### Ittai Renan

Arthropods are the most diverse group in terrestrial systems, accounting for over 85% of all known organisms. Arthropods inhabit a tremendous variety of niches across wide spatial scales and exhibit a variety of feeding habits and life forms that form, after the plants, a basis for most terrestrial food webs. Because of their high and fast reproduction rate, arthropod communities are sensitive to short and long term environmental changes. Large numbers of arthropod species and specimens can be efficiently collected. For these reasons the group is utilized as a rich data source for ecological monitoring and ecosystem management.

Current researches in the lab focus on conservation and ecological management questions, utilizing arthropods as a sensitive tool for the assessment of ecological quality and ecosystem response to anthropogenic activities. Assessment includes multivariate analysis of community structure and composition, integrating various ecological indices and experimental approaches. The taxonomic identification is the basis of the analysis in each research. The identifications rely on insects in the Steinhardt Museum of Natural History and its experts as well as worldwide experts of different insect groups. The large scale arthropod sampling from different sites, seasons and methods, supplements the collection with valuable specimens: rare, new to Israel fauna and species new to science.

The lab's activity spans geographically from Ramot Yissakhar in the north to Sedom in south of the Dead Sea. The current lab researches deal with monitoring of arthropod communities in borders between agricultural and natural landscapes and ecological corridors, providing operational recommendations for management restoration in national parks, estimating impacts of local anthropogenic pressure on sensitive ecological systems and monitoring population of a rear butterfly.

The projects run in collaboration with the Ministry of Environmental Protection, the Ministry of Agriculture & Rural Development, Israel Nature and Parks Authority, The Society for the Protection of Nature in Israel, Israel's National Ecosystem Management Assessment Program, Ramat Hanadiv, and the education program "BioBlitz" in Arad.

This year we ran seven different research projects, published ten reports and presented our studies in Italy at a conference, and three conferences in Israel. The lab employs one full-time worker and five part-time workers, and a master student.

The Entomology Lab for Applied Ecology aims to provide a high resolution tool for understanding ecological systems in order to conserve the Israel's biodiversity.

### Reports (all in 2018)

- KKL: *Little fire ant monitoring, Agamon Hula.*
- Ramat Hanadiv: *Arthropod monitoring in the little fire ant pest control range.*
- INPA: *Little fire ant, background and methods of eradication – A review.*
- SPNI, INPA: *Butterfly survey in the Ein Dor region.*
- INPA: *Distribution map of the little fire ant in Israel.*
- INPA: *Arthropod sampling in national parks in the Lower Galilee.*

### Invited lectures (in 2018)

- XIII symposium in memory of Orna Eshed – Invasive species, Ohalo College, Katzrin: *The little fire ant – Where did it come from and where are we going?*
- Green Campus Appreciation Conference for Green Institution Guides, Ben-Gurion University of the Negev, Beer Sheva: *The little fire ant.*
- Life at the Dead Sea – A symposium on the challenges of nature conservation and ecological research in the Dead Sea region, Masada: *Changes in the Arthropod community in wet habitats in the Dead Sea region.*

- Life at the Dead Sea – A symposium on the challenges of nature conservation and ecological research in the Dead Sea region, Masada: *The little fire ant in the Dead Sea region*.
- Round table – Invasive species, the National Park Authorities, Jerusalem: *The threat of the little fire ant in Israel*.
- Agricultural Committee of the Regional Councils, Tel Aviv: *Potential damage by the little fire ant to the Israeli agriculture*.



## HAMAARAG — ISRAEL'S NATIONAL NATURE ASSESSMENT PROGRAM

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**Irina Levinsky, Managing Director**

HaMaarag—Israel's National Nature Assessment Program—is a consortium of independent scientists and organisations that are responsible for natural resource management in Israel, operating from The Steinhardt Museum of Natural History. Our partners include The Ministry of Environmental Protection, The Nature and Parks Authority, the Jewish National Fund (KKL-JNF), with additional financial support from a private fund.

HaMaarag's primary mission is to assess the state of nature in Israel. We aspire to contribute to the advancement of knowledge-based management of open spaces and natural resources, via continuous production of scientific knowledge on the state of ecosystems and biodiversity in Israel. This knowledge is accessible to decision-makers as well as to the general public.

### **Main achievements in 2018**

#### **State of Nature report 2018**

The State of Nature in Israel report 2018 describes the state of nature and its dominant trends quantitatively and qualitatively, and is based on information gathered within the framework of HaMaarag's National Program for Terrestrial Biodiversity Monitoring as well as external monitoring programs. The report provides an up-to-date and reliable assessment of the state of nature in Israel for decision makers, and will be available on our website [www.hamaarag.org.il](http://www.hamaarag.org.il) (in Hebrew, with an English executive summary).

#### **Israel National Ecosystem Assessment — Final report**

The final report of the Israel National Ecosystem Assessment, including key findings of a 5-year assessment, was due to be out at the end of 2018. The project aimed to increase the awareness of Israel's dependence on functioning ecosystems and their multi-dimensional value. In addition, it would produce a knowledge base to assist managers and policy-makers in assimilating the value of biodiversity and ecosystem services in the planning and management of Israel's landscapes.

#### **The National Program for Terrestrial Biodiversity Monitoring**

We completed the third full-scale monitoring cycle of the National Program for Terrestrial Biodiversity Monitoring. The program aims to assess the state of Israel's biodiversity and nature and significant changes taking place within them. The program monitors the flora and fauna throughout Israel on a regular basis through field surveys, surveillance cameras and sensors.

#### **Evrona Nature Reserve Ecosystem Monitoring Program**

We completed the third year of the five year monitoring program, assessing the effects of the oil spill in Evrona Nature Reserve, and submitted an interim report to the Nature and Parks Authority. The results indicate that the oil spill affected all the monitored taxonomic groups — from vegetation to bats.

#### **Ashalim Stream Ecosystem Monitoring Program**

A large-scale leakage of acidic affluent with high concentrations of heavy metals from a local fertilizer plant affected 20 kilometers of the Ashalim stream in Judean Desert in summer 2017. The Nature and Parks Authority appointed HaMaarag to develop, coordinate, monitor and analyse a five-year assessment of the ecological consequences of the leakage, and the naturally occurring rehabilitation processes within the ecosystem. We designed and developed the monitoring program and completed the first monitoring year.



## THE OPEN LANDSCAPES INSTITUTE

*Annual summary for 2017/18 and forecast for 2018/19*

Uri Ramon, Amir Perelberg, Aviv Avisar

### Overview of activities during 2017–2018

*Nature and Landscape Surveys* were carried out in Lower Jordan Valley, Alonim Hills, Elot Ada forest, Beit Gamliel forest, Eastern Lower Galilee, Harod valley, South-West Jerusalem Hills, Upper Zinn Basin and the Southern Negev. The Open Landscape Institute (OLI) is a partner in development and implementation of methodology in the following fields: improving the assessment of ecological valence of natural, forested and agricultural landscapes, assimilating the value of vacation and leisure into the surveys, examining the possibility of integrating remote sensing, vegetation mapping in arid regions, developing monitoring programs with professionals from HaMaarag and the Israel Nature and Parks Authority (INPA), surveys of endangered plant species, and identifying and developing conservation tools for sites with high value for biodiversity conservation (hotspots).

A number of studies and research projects concerning environment and agriculture were carried out. Additional studies in progress in this field are detailed below.

It was the second year of the institute operating from the Steinhardt Museum of Natural History, Tel-Aviv University. The new location inspires new initiatives and research activities in collaboration with students and faculty members from the Tel Aviv University and other research institutes.

The main challenges that the Institute is facing this years include:

1. Strengthening and expanding activity in fields defined within the Institute's core practices:
  - 1.1. Ecological and landscape background for planning – conducting and developing methodology for nature, landscape and human heritage surveys.
  - 1.2. Agriculture and environment – developing knowledge, expanding dialog circles, supporting professional and public processes, and developing tools for assessing the ecological valence of arable landscapes.
  - 1.3. Integrating field surveys and remote sensing to obtain the best outcome for mapping of vegetation and conservation value.
2. Expanding and assimilating outcomes for various target audiences:
  - 2.1. Developing tools for disseminating knowledge: workshops, lectures for planners and university students in relevant fields, instructors and more.
  - 2.2. Increasing professional and public exposure of the accumulated knowledge: updating the Institute's Website and expanding the mailing list.
3. Strengthening connections and expanding collaboration with the partner organizations in the Open Landscape Institute and colleagues from the Steinhardt Museum of Natural History and academia.
4. Professional and budget strengthening: determining the budgetary basis for the coming years, absorbing new employees and training them to carry out the intended tasks.

### Detailed Report for 2018 – Nature and Landscape Surveys

#### **Vegetation monitoring within the National Assessment of the State of Nature (HaMaarag)**

This year we further expanded the use of high resolution aerial photographs in the semi-arid and arid monitoring regions in three monitoring units: the semi-arid belt, the Negev ridge, and the extreme-arid region.

#### **Survey of endangered plant species**

A survey of 40 endemic Red Data Book species, defined as high priority, was completed. The survey will continue next year, and will also include sub-endemic species. A full report for this stage is in preparation, and should be completed by the end of 2018.

#### **Hevel Eilot: Southern Arava and Uvda Valley surroundings**

This survey supported the ongoing process of a master plan for open landscapes in the Hevel Eilot Regional Council. This area is characterized by a higher level of endemism within the planning

region, in which development pressures are strong. The work was performed in close collaboration with the planning team and advisors from the council. The survey report is in preparation, and should be completed by the end of 2018.

#### **Alonim Hills, Northern Nazareth Mountains and Tura'n valley**

This survey was carried out in a region that exhibits a range of preserved vegetation landscapes such as open forests of gall oak, which are threatened by strong development pressure from both settlement and infrastructure. A draft of this survey report was submitted for comments, and a final report should have been published by the end of 2018.

#### **Basalt plateaus of the Eastern Lower Galilee**

A region with extensive open landscapes, which are only partly protected. The survey was carried out along with preparation of master plans for the open landscapes of the regional councils in this area. A draft of this survey report was submitted for comments, and a final report should have been published by the end of 2018.

#### **Negev Highlands: Upper Zin Basin**

This survey supported the ongoing process of a master plan for open landscapes in the Negev Highlands Regional Council, which includes large parts of the upper section of the Zin River Basin, as well as relatively small areas of the Ro'ah River and Boker River basins. A draft of this survey report was submitted for comments, and a final report should have been published by the end of 2018.

#### **Elot Ada forest**

The survey was conducted in collaboration with local community and the KKL-JNF. A draft of this survey report was submitted for comments, and a final report should have been published by the end of 2018.

#### **Eastern Wadi Ara**

A landscape survey was conducted in 2018, to support the planning process in this region. A draft of this survey report was submitted for comments, and a final report should have been published by the end of 2018.

#### **Harod valley**

A landscape survey was conducted in 2018, to support the planning process in this region. A draft of this survey report was submitted for comments, and a final report should be published at the beginning of 2019.

#### **Negev ecosystems**

This project aims to divide the arid area of Israel into ecological units, based on the national scale division done by INPA. A draft of this report should have been submitted by the end of 2018.

### **Detailed Plans for 2019 – Nature and Landscape Surveys**

#### **Vegetation monitoring within the National Assessment of the State of Nature (HaMaarag)**

A survey in four additional monitoring units—Coastal and internal sands, Mediterranean natural and planted forests—is planned using high resolution aerial photographs in the monitoring process.

#### **Coastal area of Regional Municipality Mate Asher survey**

This area is characterized by unique rocky beaches and scattered sandy patches, with distinctive sand particles composition. This comprises a series of rare habitats that harbor many endangered plant species. The regional municipality is conducting a detailed planning of this area, and the survey attempts to provide the required ecological background to support the planning process.

#### **USA park region survey**

In recent years OLI completed several surveys in the western Jerusalem ridge. This project will complete the work of this region.

**Gomer hills area survey**

This is a core area in the Judea lowland region, one of Israel's largest and most valuable open landscapes, and an ecotone between the Mediterranean and the arid ecoregions. Most of the area is defined as a fire-zone, and the purpose of the survey is to prepare a required background for sustainable management of the military activity in this area, and specifically mitigate the risks of wild fires resulting from this activity.

**Yatir-Judea desert ecological corridor survey**

INPA is preparing a plan for a national latitudinal ecological corridor, from the Mediterranean shore to the Rift Valley in the east. This survey is meant to complete the missing information required for this plan, in the area between Mt. Amasa nature reserve, to the Judea desert nature reserve.

**“BISLAH” survey**

The training zones of the Israeli infantry troops school (BISLAH) spread along a substantial area of the Negev northern ridges, between Sede Boqer in the south to Dimona in the north. Most of this region is part of the national ecological corridors network, and a very sensitive landscape. The purpose of the survey is to prepare a required background for sustainable management of the military activity in this area.

**Possible other surveys and projects not approved yet**

Regional municipality Yizre'el survey; Regional municipality Eshkol survey; Ruth hills – Lavan River survey; Ecological corridors at the Northern district of Israel; Division of the Mediterranean area of Israel into ecological units; National scale remote sensing mapping of vegetation.

**Detailed Research Plans for 2019****Identifying critical sites for nature conservation in Israel: ‘Hotspots’**

This project is designed to locate, map and classify sites with great importance for biodiversity in Israel, and to describe their state and existing threats to them as a basis for advancing conservation efforts to protect associated natural values. The project will continue in 2019.

**Agricultural practices, which support biodiversity and suit Israel**

This project is designed to identify agricultural practices that support biodiversity and are relevant to Israel in terms of her climate, agricultural crops and farm structure. The first part of the project analyzing the Mediterranean climate zones was completed in 2017. The project was presented at a number of Israeli and international scientific conferences. The second part of the project dealing with desert and arid zones will be completed at the beginning of 2019.

**Developing a methodology for surveying agricultural landscapes as part of nature and landscape surveys**

Examining and experimenting with methods for estimating the importance of agricultural landscapes, with different spatial and farming characteristics, for biodiversity conservation. A draft of the project's final report was completed on 2017 to be presented to the expert panel in 2018. The final report should be available at the beginning of 2019.

**Barriers for treating light pollution in Israel. Standardization, planning and enforcement**

*Part A – Standardization.* “Light pollution – standardization gaps between Israel and other countries”. The first chapter reviews literature on light pollution standards in Israel and abroad. In the second chapter, interviews with key figures from state institutions and green organizations will be presented. The interviews are an efficient tool in mapping position toward light pollution.

*Part B – Planning.* “Barriers to planning for the treatment of light pollution in Israel”. This part needs further resource to be completed.

**Assimilation of agro-ecological principles in working instructions in avocado plantations with Milopri Agricultural Corporation**

Assimilation of agro-ecological knowledge (cover crops, hedgerows) into mandatory working instructions of about 2500 hectares of avocado. As part of the project, three pilots are currently

in operation: Adjusting summer-nectar plants for use in plantation fences, re-introducing endangered plants species into previous agricultural habitats, and restoration of runoff for an agricultural winter pool.

**Alternatives for managing visitors along the eastern canal of the Jordan River, while meeting nature conservation challenges**

This is literature review on the means of managing travelers in Israel and abroad.

**Economic and planning models for incentive and management of goat pasture**

These are intended for reduction and combustion material and maintaining buffer lines against fires.

**A master plan for goat grazing in the Carmel and Misgav**

Protection from fires and preservation of the ecosystem functions, and the economic aspect.

**Agricultural practices supporting biodiversity in Megido regional council**

Implementation of Integrated Pest Management agro-principles in Megido's agriculture practice.

**National scale ecological background development, for national planning.**

We collect information from various bodies engaging in endangered biodiversity mapping, in order to create information layers that will enable incorporation of ecological knowledge into national planning.



## PUBLICATIONS

The Steinhardt Museum of Natural History is an important research infrastructure, used by scientists within and outside of the Tel Aviv University. Below is the list of 2017–2018 publications, which covers all works of the TAU members affiliated with the SMNH. It also includes publications—entirely or partly based on our holdings—of researchers from other institutions, but our follow-up is incomplete in this regard.

### Articles in refereed and other journals

1. Abbas, J., Hamoud, K., Peled, N. & HersHKovitz, I. (2018) Lumbar Schmorl's nodes and their correlation with spine configuration and degeneration. *BioMed Research International Art.* 157402. <https://doi.org/10.1155/2018/1574020>
2. Abbas, J., Slon, V., Stein, D., Peled, N., HersHKovitz, I. & Hamoud, K. (2017) In the quest for degenerative lumbar spinal stenosis etiology: the Schmorl's nodes model. *BMC musculoskeletal disorders*, 18(1), Art. 164. <https://doi.org/10.1186/s12891-017-1512-6>
3. Arafat, H., Alamaru, A., Gissi, C. & Huchon, D. (2018) Extensive mitochondrial gene rearrangements in Ctenophora: insights from benthic Platyctenida. *BMC Evolutionary Biology*, 18, Art. 65. <https://doi.org/10.1186/s12862-018-1186-1>
4. Arndt, E., Givan, O., Edelist, D., Sonin, O. & Belmaker, J. (2018) Shifts in Eastern Mediterranean fish communities: Abundance changes, trait overlap, and possible competition between native and non-native species. *Fishes*, 3(2), Art. 19. <https://doi.org/10.3390/fishes3020019>
5. Assmann, T., Boutaud, E., Buse, J., Gebert, J., Drees, C., Friedman, A.L.L., Khoury, F., Marcus, T., Orbach, E., Renan, I., Schmidt, C. & Zumstein, P. (2018) The tiger beetles (Coleoptera, Cicindelidae) of the southern Levant and adjacent territories: from cybertaxonomy to conservation biology. *ZooKeys*, 734, 43-103. <https://doi.org/10.3897/zookeys.734.21989>
6. Baeckens, S., Martín, J., García-Roa, R. & van Damme, R. (2018) Sexual selection and the chemical signal design of lacertid lizards. *Zoological Journal of the Linnean Society*, 183(2), 445-457. <https://doi.org/10.1093/zoolinnean/zlx075>
7. Baeckens, S., Martín, J., García-Roa, R., Pafilis, P., Huyghe, K. & Van Damme, R. (2018) Environmental conditions shape the chemical signal design of lizards. *Functional Ecology*, 32(2), 566-580. <https://doi.org/10.1111/1365-2435.12984>
8. Bar-Shmuel, N., Rogovin, E., Rachmilevitch, S., Friedman, A.L.L., Shelef, O., Hoffmann, I., Rosenberg, T., Behar, A., Shavit, R., Fengqun Meng & Segoli, M. (2018). Tripartite symbiosis of plant-weevil-bacteria is a widespread phenomenon in the Negev Desert. *Scientific Reports*, 8, Art. 2420. <https://doi.org/10.1038/s41598-018-20828-w>
9. Bar-Yosef Mayer, D.E. (2018) Shell ornaments and artifacts in Neolithic Cyprus and correlations with other Mediterranean regions. *Quaternary International*, 464(A): 206-215. <https://doi.org/10.1016/j.quaint.2017.06.034>
10. Bar-Ziv, M.A. & Scharf, I. (2018) Thermal acclimation is not induced by habitat-of-origin, maintenance temperature, or acute exposure to low or high temperatures in a pit-building wormlion (*Vermileo* sp.). *Journal of Thermal Biology*, 74, 181-186.
11. Bar-Ziv, M.A., Subach, A., Hirsch-Ionescu, A., Belmaker, J., Zweifler, A. & Scharf, I. (2018) Comparison of wormlions and their immediate habitat under man-made and natural shelters: suggesting factors making wormlions successful in cities. *Zoology*, 130, 38-46. <https://doi.org/10.1016/j.zool.2018.08.004>
12. Bates, A.E., Helmuth, B., Burrows, M.T., Duncan, M.I., Garrabou, J., Guy-Haim, T., Lima, F., Queiros, A.M., Seabra, R., Marsh, R., Belmaker, J., Bensoussan, N., Dong, Y., Mazaris, A.D., Smale, D., Wahl, M. & Rilov, G. (2018) Biologists ignore ocean weather at their peril. *Nature*, 560, 299-301. <https://doi.org/10.1038/d41586-018-05869-5>
13. Batta, Y. & Yefremova Z. (2018). *Technites flavipes* (Mercet) (Hymenoptera: Encyrtidae) is a parasitoid on *Pauropsylla buxtoni* comb. n. (Hemiptera, Psylloidea) on cultivated fig trees. *Phytoparasitica*, 46, 471-480. <https://doi.org/10.1007/s12600-018-0677-3>



14. Bronstein, O. & Kroh, A. (2018). Needle in a haystack—genetic evidence confirms the expansion of the alien echinoid *Diadema setosum* (Echinoidea: Diadematidae) to the Mediterranean coast of Israel. *Zootaxa*, 4497(4), 593-599. <https://doi.org/10.11646/zootaxa.4497.4.9>
15. Bronstein, O., Kroh, A. & Haring, E. (2018) Mind the gap! The mitochondrial control region and its power as a phylogenetic marker in echinoids. *BMC Evolutionary Biology*, 18(1), Art. 80. <https://doi.org/10.1186/s12862-018-1198-x>
16. Cohen, S.B. & Dor, R. (2018) Phenotypic divergence despite low genetic differentiation in house sparrow populations. *Scientific Reports*, 8, Art. 394. <https://doi.org/10.1038/s41598-017-18718-8>
17. Comay, O. & Dayan, T. (2018) From micromammals to paleoenvironments. *Archaeological and Anthropological Sciences*, 10(8), 2159-2171. <https://doi.org/10.1007/s12520-018-0608-8>.
18. Comay, O. & Dayan, T. (2018) Taphonomic signatures of owls: new insights into micromammal assemblages. *Paleogeography, Paleoclimatology, Paleoecology*, 492, 81-91.
19. Comay, O. & Dayan, T. (2018) What determines prey selection in owls? Roles of prey traits, prey class, environmental variables, and taxonomic specialization. *Ecology & Evolution*, 8(6), 3382-3392. <https://doi.org/10.1002/ece3.3899>
20. Corrales, X., Coll, M., Ofir, E., Heymans, J.J., Steenbeek, J., Goren, M., Edelist, D. & Gal, G. (2018) Future scenarios of marine resources and ecosystem conditions in the Eastern Mediterranean under the impacts of fishing, alien species and sea warming. *Scientific Reports*, 8, Art. 14284. <https://doi.org/10.1038/s41598-018-32666-x>
21. Dalongeville, A., Andrello, M., Mouillot, D., Lobreaux, S., Fortin, M.-J., Lasram, F., Belmaker, J., Rocklin, D. & Manel, S. (2018) Geographic isolation and larval dispersal shape seascape genetic patterns differently according to spatial scale. *Evolutionary Applications*, 11(8), 1437-1447. <https://doi.org/10.1371/10.1111/eva.12638>
22. Davidovich, H. & Ribak, G. (2018) Loaded flight in male *Ischnura elegans* and its relationship to copulatory flight. *Journal of Insect Physiology*, 110, 44-56. <https://doi.org/10.1016/j.jinsphys.2018.08.008>
23. Davidovich, U., Ullman, M., Langford, B., Frumkin, A., Langgut, D., Yahalom-Mack, N., Abramov, J. & Marom, N. (2018) Distancing the dead: Late Chalcolithic burials in large maze caves in the Negev Desert, Israel. *Bulletin of the American Schools of Oriental Research (BASOR)*, 379, 113-152. <https://doi.org/10.5615/bullamerschoorie.379.0113>
24. Dorchin A., Danforth, B.N. & Griswold, T. (2018) A new genus of eucerine bees endemic to southwestern North America revealed in phylogenetic analyses of the *Eucera* complex (Hymenoptera: Apidae: Eucerini). *Arthropod Systematics & Phylogeny*, 76(2), 215-234.
25. Dorchin A., López-Urbe, M.M., Praz, C.J., Griswold, T. & Danforth, B.N. (2018) Phylogeny, new generic-level classification, and historical biogeography of the *Eucera* complex (Hymenoptera: Apidae). *Molecular Phylogenetics and Evolution*, 119, 81-92. <https://doi.org/10.1016/j.ympev.2017.10.007>
26. Dorchin, A. & Praz, Ch. (2018) Taxonomic revision of the Western Palaearctic bees of the subgenus *Pseudomegachile* (Hymenoptera, Apiformes, Megachilidae, Megachile). *Zootaxa*, 4524(3), 251-307. <http://dx.doi.org/10.11646/zootaxa.4524.3.1>
27. Dornelas, M. *et al.* (incl. Malamud, S., Blowes, S.A., van Rijn, I., Givan, O., Belmaker, J.). (2018) BioTIME: a database of biodiversity time series for the Anthropocene. *Global Ecology and Biogeography*, 27(7), 760-786. <https://doi.org/10.1111/geb.12729>
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206. Gewing, M., Goldstein, E., Buba, Y. & Shenkar, N. (In press) Temperature resilience facilitates invasion success of the solitary ascidian *Herdmania momus*. *Biological Invasions*. <https://doi.org/10.1007/s10530-018-1827-8>
207. Grady, J.M., Read, Q., Record, S., Zarnetske, P., Baiser, B., Thorne, K. & Belmaker, J. (In press) Size, niches, and the latitudinal diversity gradient. *Teaching Issues and Experiments in Ecology*.

208. Koch, L., Shainer, I., Gurevich, T. & Holzman, R. (In press) The expression of *agrp1*, a hypothalamic appetite-stimulating neuropeptide, reveals hydrodynamic-induced starvation in a larval fish. *Integrative Organismal Biology*. <https://doi.org/10.1093/iob/oby003>
209. Levy, O., Dayan, T., Porter, W.P. & Kronfeld-Schor, N. (In press) Time and ecological resilience: can diurnal animals compensate for climate change by shifting to nocturnal activity? *Ecological Monographs*. <https://doi.org/10.1002/ecm.1334>
210. Marusik, Y.M. & Zonstein, S.L. (In press) Redescription of Central Asian *Filistata seclusa* (Araneae: Filistatidae) with establishing a new combination. *Arachnologische Mitteilungen*.
211. May, H., Sella-Tunis, T., Pokhojaev, A., Peled, N. & Sarig, R. (In press) Changes in mandible characteristics during the terminal Pleistocene to Holocene Levant and their association with dietary habits. *Journal of Archaeological Science: Reports*. <https://doi.org/10.1016/j.jasrep.2018.03.020>
212. Meiri, M., Stockhammer, P.W., Morgenstern, P. & Maran, J. (In press) Mobility and trade in Mediterranean antiquity: Evidence for an 'Italian connection' in Mycenaean Greece revealed by ancient DNA of livestock. *Journal of Archaeological Science: Reports* 23. <https://doi.org/10.1016/j.jasrep.2018.10.011>
213. Palmisano, A., Woodbridge, J., Roberts, N., Bevan, A., Shennan, S., Fyfe, R., Cheddadi, R., Greenberg, R., Kaniewski, D., Khater, C., Langgut, D., Leroy, S.A.G., Litt, T. & Miebach, A. (In press) Holocene landscape dynamics and long-term population trends in the southern Levant. *The Holocene*.
214. Pickholtz, R., Kiflawi, M., Friedlander, A. & Belmaker, J. (In press) Habitat utilization by an invasive herbivorous fish (*Siganus rivulatus*) in its native and invaded range. *Biological Invasions*. <https://doi.org/10.1007/s10530-018-1790-4>
215. Sokolover, N., Ostrovsky, A.N. & Ilan, M. (In press) *Schizoporella errata* (Bryozoa, Cheilostomata) in the Mediterranean Sea: Abundance, growth rate, and reproductive strategy. *Marine Biology Research*. <https://doi.org/10.1080/17451000.2018.1526385>
216. Vered, G., Kaplan, A., Avisar, D. & Shenkar, N. (In press) Using solitary ascidians to assess microplastic and phthalate plasticizers pollution in marine environments. *Marine Pollution Bulletin*.
217. Zonstein S. (In press) A revision of the spider genus *Anemesia* (Araneae, Cyrtaucheniidae). *European Journal of Taxonomy*.

## Books/Chapters in books

1. Bar, A. & Haimovitch, G. (2018) *A field guide to reptiles and amphibians of Israel*. 2<sup>nd</sup> edition. The Israeli Nature and Parks Authority Press, Jerusalem. [In Hebrew]
2. Bar-Yosef Mayer, D.E., Choyke, A.M. & Bonsall, C. (Eds) (2017) *Not just for show: The archaeology of beads, beadwork, and personal ornaments*. Oxbow Books, Oxford.
3. Choyke, A.M. & Bar-Yosef Mayer, D.E. (2017) Introduction. In: Bar-Yosef Mayer, D.E., Choyke, A.M. & Bonsall, C. (Eds), *Not just for show: The archaeology of beads, beadwork, and personal ornaments*. Oxbow Books, Oxford, pp. 1-4.
4. Cohen-Shacham, E., Dayan, T., Ghermandi, A., HersHKovitz, Y. & Akron, A. (2018) Cultural Ecosystem Services in the Lake Kinneret Watershed, Israel (Chapter 10). In: Díaz Carrión, I.A., Sedas Larios, E.E.J. & Burgillo Cuesta, M. (Eds), *Servicios ecosistémicos en humedales*. SEDEMA, México, México, pp. 291-339. ISBN: 978-607-7844-92-1.
5. Langgut, D. (2018) The history of etrog in ancient Near East and Israel: Archaeobotanical and historical evidence. In: Goldschmidt, E.E. & Bar Yosef, M. (Eds), *The etrog (Citrus medica) source book*. Mosad Harav Kook, pp. 121-135. [in Hebrew]
6. Mienis, H.K. (2018) Additional archaeomalacological material from the excavation of Shallale. In: Dar S. & Ben-Ephraim Y. (Eds), *Discovering – The lost city of the Carmel*. The Israel Exploration Society, Jerusalem, p. 29-37.
7. Mienis, H.K. (2017) Shells from areas H and Q. In: H. Geva (Ed.), *Jewish Quarter Excavations in the Old City of Jerusalem conducted by Nahman Avigad, 1969–1982*. Volume VII: Areas Q, H, O-2 and Other Studies, Final Report. Israel Exploration Society & Institute of Archaeology, Hebrew University of Jerusalem, p. 269-271.

8. Yom-Tov, Y. (2018) *Seeing sound: Bats – between myth and reality*. Magness Press, Jerusalem. 251 pp. ISBN 978-965-572-563-6 [In Hebrew]

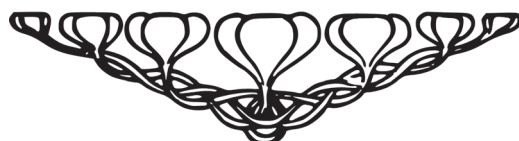
#### Accepted for publication

9. Eppelbaum, L.V. & Katz, Yu.I. (In press) Deep tectono-geodynamic aspects of development of the Nubian-Arabian Region. In: Jawad, L. (Ed.), *The Arabian seas biodiversity, environment challenges and conservation measures*. Springer.

#### Papers presented at scientific meetings

- 2017 Long-term bottom trawl fishery surveys of elasmobranchs off the Israeli Mediterranean coast. *The 21st European Elasmobranch Association Annual Scientific Conference*. 12–14 October 2017, Amsterdam, The Netherlands. (Barash, A., van Rijn, I., Lubinevsky, H., Goren, M., Tchernov, D.).
- 2017 Some tectono-geodynamical features of the Eurasian-African region. *Transactions. of the V Intern. Conference “Geology and Hydrocarbon Potential of the Balkan-Black Sea Region”*. Varna, Bulgaria, 18–22 September 2017. P. 13–20. (Eppelbaum, L.V., Katz, Y.I.)
- 2017 Spatial variation in foraminifera distribution and occurrence in response to changes in the sedimentary environments and global changes; the tropical Middle – Late Permian to Early Triassic marginal marine strip of Gondwana supercontinent. *The 5<sup>th</sup> IGCP 630 Field Workshop on the Permian and Triassic integrated stratigraphy and climatic, environmental and biotic extremes*. Yerevan, Armenia, 8–14 October 2017. (Orlov-Labkovsky, O., Korngreen, D.)
- 2017 The estuarine environments: new insights from combining isotopic, sedimentary and biostratigraphy constrains on the tropical Middle – Late Permian to Early Triassic marginal marine strip of Gondwana supercontinent. *The 5<sup>th</sup> IGCP 630 Field Workshop on the Permian and Triassic integrated stratigraphy and climatic, environmental and biotic extremes*. Yerevan, Armenia, 8–14 October 2017. (Korngreen, D., Orlov-Labkovsky, O., Zilberman, T.)
- 2017 Keynote lecture: Middle and Upper Palaeolithic shell beads: When, where and why. *EU-Beads Workshop, Cambridge University, UK*. 4–7 October 2017. (Bar-Yosef Mayer, D.E.)
- 2017 Upper Palaeolithic explorers: The geographic sources of shell beads in Early Upper Palaeolithic assemblages in Israel. *EU-Beads Workshop, Cambridge University, UK*. 4–7 October 2017. (Bar-Yosef Mayer, D.E.)
- 2018 Babysitting hosts: An efficient transmission mechanism of invasive *Gastrocotylinea* species. *XIV International Symposium on Flatworm Biology*. 27–31 August, Alghero Sardinia/Italy. (Rothman, S.B.S., Diamant, A. & Goren, M.)
- 2018 Distribution, mineral forms, and bioavailability of heavy metals in soils, their impacts on soils biogeochemical properties (Angren-Almalyk mining industrial area, Uzbekistan). *The International Conference CONTAMINATED SITES (2018)*. 8–10 October 2018, Banská Bystrica, Slovak Republic. (Shukurov, N., Kodirov, O., Kersten, M., Steinberger, Y., Pen-Mouratov, S.)
- 2018 Effect of piscivorous and omnivorous colonial birds' activity on soil biota structure, abundance and diversity in the Mediterranean region. *The 33<sup>rd</sup> Symposium of the European Society of Nematologists (ESN) Symposium*. 9–13 September 2018, Ghent, Belgium. (Pen-Mouratov, S., Dayan, T.)
- 2018 Combining foraminifera identification, their extirpation and occurrence,  $\delta^{18}\text{O}$ ,  $\delta^{13}\text{C}$  and % carbonate curves define global events in eutrophic environments and promote world-wide insights. *The 5<sup>th</sup> International Paleontological Congress*. Paris, France, 9–13 July 2018. (Korngreen, D., Orlov-Labkovsky, O.)
- 2018 Mediterranean shell middens: Clues from inland sites. *The Archaeology of submerged landscapes. The 18<sup>th</sup> International Conference of the UISPP*. Paris, France, 4–9 June 2018. (Bar-Yosef Mayer, D.E.)
- 2018 The symbolic use of shell beads in the Palaeolithic of the circum-Mediterranean. *Prehistoric Personal Adornment in Social and Economic Context. The 18<sup>th</sup> International Conference of the UISPP*. Paris, France, 4–9 June 2018. (Bar-Yosef Mayer, D.E.)
- 2018 Shell beads in Neolithic burial contexts - the curious case of Kfar Hahoreh. *Prehistoric Personal Adornment in Social and Economic Context. The 18<sup>th</sup> International Conference*

- of the *UISPP*. Paris, France, 4–9 June 2018. (Schechter, H., Goring-Morris, N., Bar-Yosef Mayer, D.E.)
- 2018 The East-Mediterranean cereal leaf miner *Syringopais temperatella* Lederer and its larval parasitoids in Israel. *37<sup>th</sup> Conference of the Entomological Society of Israel*. Rehovoth, 9 October 2018. Abstracts, p. 72. (Yefremova, Z., Kravchenko, V., Meltzer, N.)
- 2018 The Anti-Lebanon ridge as the edge of the distribution range for Euro-Siberian and Irano-Turanian faunistic elements in the Mediterranean biome (Noctuidae Lepidoptera): A case study. *The 3<sup>rd</sup> International Congress of the Middle East Butterflies, Israeli Lepidopterist Society*. 31 May – 2 June 2018. Abstracts, p. 28. (Kravchenko, V., Friedman, L.-L., Muller, G.)
- 2018 First results of the study of soil testate amoeba communities from the Salonga National Park (Central Congo). *9<sup>th</sup> International Symposium on Testate Amoebae (ISTA9): Recent advances and future research priorities*. Belfast, Northern Ireland, UK, 10–14 September 2018. Abstracts, p. 52. (Bobrov, A., Kravchenko, V.)
- 2018 The swimming speed-thrust relationship in foot-propelled diving birds and its energetic and behavioral implications. *PSG annual meeting 2018*. La Paz, Mexico, 21–24 February 2018. (Ribak, G.)
- 2018 Insects as inspiration for miniature flying robots. *Beneficial Expression of Insects*. Afula, Israel, 6 March 2018. (Ribak, G.)
- 2018 Flight control in a small parasitoid wasp (*Eretmocerus mundus*): controlling body pitch using clap-and-fling wing flapping kinematics. *SEB 2018*. Florence, Italy, 3–6 July 2018. (Ribak, G., Dafni, E.)
- 2018 Changes in the arthropod community in the Dead Sea region. *Annual meeting of the Zoological Society of Israel*. Bar Ilan University, Ramat Gan, Israel. (Renan, I.)
- 2018 Two decades of a dramatic change in the arthropod community of the Dead Sea region (poster). *XI European Congress of Entomology*. Napoli, Italy, 2–6 July 2018. (Renan, I.)
- 2018 The spread of the little fire ant in Israel (poster). *The Annual Conference for Science and the Environment, Weizmann Institute of Science*. Rehovot, Israel, 20–21 June 2018. (Renan, I.)





## GRADUATE STUDENTS

Much active scientific research is conducted by graduate students. Here we list the graduate students of faculty members affiliated to the Steinhardt Museum of Natural History at the Tel Aviv University (SMNH). We list also a few graduate students from other higher education institutions, but names and affiliations of many others from Israel and abroad who used the collections are not included. (Asterisked are students, who are supervised by faculty members affiliated to the SMNH but who has not utilized the Museum collections for their research.)

### PhD students

- 2009— Ittai Renan (A. Freidberg)  
Taxonomy and ecology of dune insects in the western Negev.
- 2011— Orly Cohen (E. Geffen)  
Selection variation among spadefoot toad tadpoles along the edge-core gradient.
- 2011–2018 Itay Berger (T. Dayan).  
The influence of invasive Common Myna (*Acridotheres tristis*) on the behavioral ecology of native House Sparrow (*Passer domesticus*).
- 2012— Einat Shachar (N. Dorchin)  
Taxonomy and ecology of oak gall wasps in Israel (Hymenoptera: Cynipidae).
- 2013— Roi Maor (T. Dayan)  
The evolution of activity patterns in mammals: a macroevolutionary and macroecological approach.
- 2013— Aviv Avisar (T. Dayan)  
Ecological restoration following eucalypt removal from the Nahal Alexander National Park.
- 2013— Lee Eyal-Shacham (Y. Loya)  
Legislation of marine protected areas in Israel: Mediterranean and Red Sea reproductive strategies of deep reef (60 m depth) corals.
- 2013— Ya'arit Levitt-Barmatz (N. Shenkar)  
Diversity and spatial distribution of *Caridea* species along the coasts of Israel.
- 2013— Sigal Orlansky (F. Ben-Ami)  
The costs and benefits of resistance to parasites: The case of *Daphnia similis*.
- 2013— Tom Schlesinger (Y. Loya)  
Recruitment of stony corals at the coral reefs of Eilat.
- 2013–2017 Hilla Shamoun (T. Dayan)  
Anthropogenic effects on the carnivore guild in an agro-rural-natural landscape.
- 2013–2018 Opher Mendelssohn (T. Dayan)  
Impact and adoption of fruit flies' area wide integrated pest management.
- 2013–2018 Zohar Yanai (N. Dorchin).  
The mayflies (Insecta: Ephemeroptera) of Israel: taxonomic and ecological aspects.
- 2013–2018 Maya Saar (I. Scharf)  
Foraging behavior and personality of *Messor* ants under field conditions.
- 2014— Tali Magoty Cohen (R. Dor)  
Ecology and genetics of a recent avian invasive species in Israel.
- 2014— R. Meoded (M. Ilan and J. Piel)  
Sponge secondary metabolite pathways.
- 2014— Liat Koch (R. Holzman)  
Functional morphology of the suction feeding mechanism in larval fishes.
- 2014— Alex Slavenko (S. Meiri and A. Allison)  
Macroevolution and macroecology of mountain reptiles.
- 2014— Yishai Weissman (E. Geffen)  
Procaviidae vocalizations: From specific elements to phylogenetics.



- 2014— Dayana Yahalomi (D. Huchon)  
Evolution of Myxozoan mitochondrial genomes.
- 2014— Stan Yavno (R. Holzman)  
Functional morphology of the suction feeding mechanism in larval fishes
- 2015— Daniel Berkowic (R. Dor, N. Sapir and Y. Leshem)  
Movement ecology of overwintering black kites (*Milvus migrans*) in the North-West Negev.
- 2015— Hezi Buba (J. Belmaker)  
Functional response in Mediterranean fishes.
- 2015— Yael Goll (E. Geffen)  
Leadership in rock hyrax society.
- 2015— Tal Idan (M. Ilan)  
Mediterranean mesophotic sponge gardens.
- 2015— \*Noa Katz (I. Scharf)  
Dispersal and habitat selection in the context of animal personality: wormlions — a test case.
- 2015— Yonatan Meresman (G. Ribak)  
*Hind-Wing flexibility in the scarab beetles (Coleoptera: Scarabaeidae): Aerodynamic effects and wing adaptation to various ecological demands.*
- 2016— Andressa Duran (S. Meiri and D. Chapple)  
Lizard macroecology.
- 2016— Ori Frid (J. Belmaker)  
Mediterranean fishes community structure.
- 2016— Tal Gorgon (N. Shenkar)  
*Polycarpa mytiligera* as a model organism for regenerative studies.
- 2016— Itai Granot (J. Belmaker)  
Community assembly and specialization across latitudinal gradients.
- 2016— Ziv Kassner (G. Ribak)  
The mechanics and behavior of aerial interception by insects.
- 2016— Michaela Kolker (R. Holzman and S. Meiri)  
Larval fishes in the Mediterranean of Israel.
- 2016— Itai Nodel (R. Sarig)  
Secondary dentin evaluation using computerized tomography: application for anthropology and forensics.
- 2016— Renanel Pickholtz (J. Belmaker)  
Stress and movement patterns of fishes.
- 2016— L. Raijman (M. Ilan)  
Red Sea mesophotic sponges.
- 2016— Abra Spiciarich (L. Sapir-Hen)  
Religious and socioeconomic diversity of ancient Jerusalem and its hinterland during the 8–2 centuries BC: A view from the faunal remains.
- 2016— Svetlana Vaisman (T. Dayan)  
Exotic and invasive molluscs in Israel (provisionary title).
- 2017— Tal Amit (Y. Loya)  
Ecology and physiology of coral symbiotic populations.
- 2017— Assaf Ben-David (T. Dayan)  
Citizen science as a tool for strengthening one's sense of community and sense of place through ecological research on the effect of land use on biodiversity.
- 2017— Francesca Falco (T. Dayan)  
Solving scale mismatches in agro-biodiversity conservation policy: an effectiveness comparative analysis.
- 2017— Rachel Schwarz (S. Meiri and D. Chapple)  
Habitat selection in reptiles.

- 2017— Talya Shalom (T. Dayan)  
Other dimensions of Globalization: The evolutionary development of environmental standards for the agricultural industry in a country that leans upon exporting its agricultural production.
- 2017— Tomer Urca (G. Ribak)  
The dispersal flight of (*Batocera rufomaculata*): The biomechanics, physiology and ecology of a tree-boring beetle.
- 2017— Gay Yohananoff (M. Ilan)  
Measuring sponge filtration.
- 2018— Rona Nadler-Valency (T. Dayan)  
Human-large carnivore coexistence.
- 2018— Liron Israely (T. Dayan)  
Agricultural landscape complexity – The case study of Beit Natufa valley.
- 2018— Guy Sinaiko (S. Meiri)  
Taxonomy of Israeli cicadas.

### MSc students

- 2013— Or Ben-Zvi (Y. Loya)  
Fluorescence in shallow vs. deep water (mesophotic) corals.
- 2013— Erez Shpirer (D. Huchon)  
Identification of nematocyst-restricted genes in Myxozoa.
- 2013— Michal Zeitsov (T. Dayan)  
Barn owls as biological control agents in the northern Negev.
- 2013–2017 Yanir Klein (T. Dayan and N. Kronfeld-Schor)  
Interspecific effects on spiny mouse reproduction.
- 2014— Lior Avidan (R. Holzman)  
Assessment of fish community in the Northern Gulf of Aqaba (Eilat).
- 2014— Mordechai Benzaquen (D. Langgut and I. Finkelstein).  
The Archaeological wood remains of Tel Megiddo: Interpreting environmental conditions and cultural preferences through the analysis of botanical remains.
- 2014— Bar Feldman (Y. Loya)  
Reproductive strategies of selected mesophotic corals vs. shallow corals.
- 2014— Mila Grinblat (Y. Loya)  
Connectivity between mesophotic corals and shallow corals.
- 2014— Liraz Levi (R. Holzman)  
Quantifying suction flows in larval fishes.
- 2014— Gila Hanuca (A. Hefez)  
Instar-related development of *Cales noacki*.
- 2014— Erez Shoham (Y. Benayahu)  
Mesophotic octocorals.
- 2014–2017 Assaf Ben-David (T. Dayan and I. Itzhaki)  
The effect of encroaching pine forests on birds in Ramat Hanadiv.
- 2014–2018 Tzlil Labin (T. Dayan and N. Kronfeld-Schor)  
Light pollution in a desert community.
- 2014–2018 Noa Keidar (N. Dorchin)  
The role of enemy reduced space in host-associated differentiation of gall inducing midges.
- 2014–2018 Naomi Gordon (E. Geffen)  
Vocal repertoire in female rock hyraxes in relation to social structure.
- 2015— Adi Ashkenazi (M. Ilan)  
Mediterranean *Stryphnus* from the deep sponge garden.
- 2015— M. Levi (M. Ilan)  
Mediterranean Irciniids from the deep sponge garden.

- 2015— Mark Cavanagh (D. Langgut and E. Ben Yosef)  
An Anthracologic Investigation into Fuel Sources at the Iron Age Copper Smelting Site of Timna 34.
- 2015— Iris Hershko (R. Sarig)  
Characterization of hunter-gatherers, early farming communities and modern populations in the Levant based on dental morphological traits and micro CT analysis.
- 2015— Corrine Jacobs (R. Holzman)  
The evolution of suction flows in ray-finned fish.
- 2015— Simon Jamison (S. Meiri)  
Natural history of little-known Israeli reptiles.
- 2015— Helena Roth (D. Langgut and Y. Gadot)  
Wood economy and botanical reconstruction of Early Roman Jerusalem.
- 2015— Jamie Shapiro (D.E. Bar-Yosef Mayer and E. Spanier)  
Changes in the food habits and possible competition of the mango tilapia, *Sarotherodon galilaeus*, and the silver carp, *Hypophthalmichthys molitrix*.
- 2015–2018 Roni Hoofien (D.E. Bar-Yosef Mayer and O. Lipschits)  
The beads from Tel Azekah as a tool for dating and understanding the cultural, economic and trade connections at the site.
- 2015–2018 Hanan Arafat (D. Huchon)  
Deciphering the complete mitochondrial genome of three Platyctenida (Ctenophora).
- 2016— Nir Bonda (N. Dorchin)  
Testing the suitability of the weevil *Melanterius compactus* for the biological control of *Acacia saligna* in Israel.
- 2016— Aviv Ben-Tal (N. Shenkar)  
Ascidian mucous mesh.
- 2016— David David (S. Meiri and S. Gafny)  
Captive breeding and the conservation of *Pelobates syriacus*.
- 2016— Hilla Davidovich (G. Ribak)  
Biomechanics and mate selection in the copulatory flight of damselflies.
- 2016— Shirad Galmour (L. Sapir-Hen)  
The early Neolithic at Ahihud: hunters, farmers, and the rest.
- 2016— Tal Gavriely (J. Belmaker)  
Fish movement ecology.
- 2016— \*Tomer Gilad (I. Scharf)  
Effect of climate conditions on dispersal and population dynamics in the red flour beetle.
- 2016— Or Greber (G. Ribak and A. Ayali)  
Neurophysiology and mechanics of aerial righting in locusts.
- 2016— Yuly Marom (R. Sarig)  
Taxonomic characterization of hominin in the Kebara Cave in relation to dentition.
- 2016— Heeli Schechter (D.E. Bar-Yosef Mayer and N. Goring-Morris)  
PPNB shell beads of northern Israel.
- 2016— Amir Sarig (G. Ribak)  
Flight biomechanics and direction preference of miniature insects in wind conditions.
- 2016— Gal Vered (N. Shenkar)  
Ascidians as bio-indicators of micro-plastic and phthalates in marine environments.
- 2016— Gal Navon (N. Shenkar)  
Influence of pharmaceutical residuals on benthic filter feeders.
- 2016–2018 Ella Avidor (E. Geffen)  
Characterizing habitat requirements and occupancy of the Hula painted frog.
- 2016–2018 Gavin Stark (S. Meiri)  
Comparative reptile longevity.
- 2016–2018 Michael Bar-Ziv (I. Scharf)  
Comparison between urban and natural populations of trap-building predators.

- 2016–2018 \*Or Keissar (I. Scharf)  
Predator-induced changes in vector traits, and their cascading effects on the spread of plant viruses.
- 2016–2018 Liron Israely (T. Dayan)  
The implementation of biodiversity conservation practice using social marketing to farmers in Israel.
- 2016–2018 S. Shoam (M. Ilan)  
Arsenic tolerant bacteria from sponges.
- 2017– \*Darar Bega (I. Scharf)  
The influence of surface complexity, learning and motivation on food foraging in *Cataglyphis niger*.
- 2017– Barel Asraf (F. Ben-Ami)  
The significance of multiple infections for the host population.
- 2017– Anna Azem (F. Ben-Ami)  
The significance of host age in host-parasite coevolution.
- 2017– Guillermo F. Anderson Benaïm (N. Shenkar)  
Development of a biological assay for bioplastic products.
- 2017– E. Ben-Dor Cohen (M. Ilan and O. Yarden)  
Mesophotic sponge associated fungi.
- 2017– Lior Bentor (T. Dayan).  
The ecological role of riparian corridors in agricultural landscape: the macroinvertebrate community of the Zippory stream as a model.
- 2017– Hadar Elazar (S. Meiri and R. Dor)  
Common Myna behavior in invasion core versus invasion front.
- 2017– Hamutal Fridman (T. Dayan)  
Anthropogenic effects on resident bird communities in Israel.
- 2017– Carmel Herold (T. Dayan)  
Effects of fire on the arthropod community in Kfir National Park.
- 2017– R. Moskovich (M. Ilan and G. Yahel)  
Sponge filtration mechanism.
- 2017– Linoy Namdar (L. Sapir-Hen)  
Human animal interaction in the Pottery Neolithic.
- 2017– Adva Olga Peretz (S. Meiri and N. Merom)  
The water vole in Israel: from archaeology to extinction to reintroduction?
- 2017– Olga Rybak (R. Dor)  
Breeding biology and conservation of Little and Common Terns in Israel.
- 2017– Bar Shemesh (T. Dayan)  
Calibrating the potential species richness accumulation curve to sampling timing, during detailed botanic transects in the Mediterranean phytogeographic region of Israel.
- 2017– Adi Weiss (T. Dayan)  
Identifying the eco-hydrological to assess the impact of prolonged drought in the Upper Jordan River.
- 2018– Gali Ofer (S. Meiri)  
Distribution of reptiles and mammals in Israel and beyond.
- 2018– \*Liat Dror (S. Meiri and N. Kronfeld-Schor)  
Activity transitions across lizard radiations.

## Post-doctoral fellows

- 2011–2018 Razi Hofman
- 2015– Guy Sion, *Laterality in gecko brains – relationships with behaviour and morphology.*
- 2016– Tatiana Tunis-Sella, *The evolutionary history of the human chin.*
- 2016– Liron Goren, *The diversity of Sponge-inhabiting Polychaeta in Israel.*
- 2016– Shane Blowes, *Scale-dependencies in the drivers of large-scale diversity gradients.*
- 2016– Iris Bernstein, *Ecological tools and their applications for integrating biodiversity aspects in land-use planning.*
- 2016– Ronit Justo-Hanani, *Understanding ecological policy innovation in the EU: science and politics in the new bio-invasion legislation and management reform.*
- 2017– Orr Comay, *Mountainous Levantine micromammal communities as tools paleoecology: Implications for Manot Cave.*
- 2017–2018 Yuval Itescu, *Taxonomy and ecology of Echis coloratus.*
- 2017–2018 Rony Izhar, *Taxonomy and diversity of the trematodes in freshwater snails.*
- 2018– Marco Antonio Ribeiro Junior, *Taxonomy of Israeli reptiles.*
- 2018– Gal Eyal, *Comprehensive and taxonomical study of the mesophotic coral fauna from the Gulf of Eilat/Aqaba.*
- 2018– Zafrir Kuplik, *The ascidian fauna along the Mediterranean coast of Israel: Taxonomy and ecotoxicology.*
- 2018– Bat-Sheva (Shevy) Rothman, *Fish parasitofauna along the Israeli Mediterranean coast with emphasize on invasive hosts and the taxonomy of monogenean species.*
- 2018– Or Givan, *The morphological trait structure of nonindigenous fishes in the Mediterranean.*





## VISITING SCIENTISTS AT THE STEINHARDT MUSEUM OF NATURAL HISTORY

The attached list includes visitors, who came personally to use the collections of the Steinhardt Museum of Natural History during 2017–2018. Much use was made of the collections by other scientists, who did not visit them in person. Some researchers got identification services for their projects and others had lists of specimens and locations mailed to them. Moreover, during this period numerous parcels with scientific material were mailed abroad to researchers at their home institutions.

Date	Name	Institute	Country	Taxonomic group
2017 Dec	N. Segev	Yotvata	Israel	Insecta
2017 Dec	M. Weinberg	Tel Aviv University	Israel	Chiroptera
2018 Feb	M. Wilson	National Museum of Wales	UK	Insecta
2018 Feb	J. Hulcr	University of Florida	USA	Insecta
2018 Feb	A. Lucky	University of Florida	USA	Insecta
2018 Mar	T. Assman	Lueneburg University	Germany	Insecta
2018 Mar	F. Popa	Schwartzwald National Park	Germany	Insecta
2018 Mar	J. Buse	Schwartzwald National Park	Germany	Insecta
2018 Mar	E. Heise		Germany	Insecta
2018 Mar	W. Ziegler		Germany	Insecta
2018 Mar	J. Gebert		Germany	Insecta
2018 Mar	S. Ligaard	Vestby	Norway	Insecta
2018 Mar	A. Gromov	Bingen	Germany	Chelicerata
2018 Mar	R. Balbis	University of Haifa	Israel	Fish
2018 Mar	R. Ramoutilova	Charles University, Viničná	Czech Rep.	Anthropology
2018 Mar	J. Bruzek	Charles University, Viničná	Czech Rep.	Anthropology
2018 Mar	M. Anton	University of Panthéon-Sorbonne (Paris) /Centre de Recherche Français à Jérusalem	France/Israel	Anthropology
2018 Apr	D. Coutinho Nogueira	Université de Bordeaux	France	Anthropology
2018 Apr	S. van Munster	Kirstenbosch National Botanical Gardens	South Africa	Insecta
2018 Apr	O. Bidzilya	Institute of Evolutionary Ecology, Kiev	Ukraine	Insecta
2018 Apr	A. Heibi		Israel	Insecta
2018 Apr	D. Ides	Ostrava,	Czech Rep.	Insecta
2018 Apr	J. Kohn	Ostrava	Czech Rep.	Insecta
2018 Apr	W. Grosser	Ostrava	Czech Rep.	Insecta
2018 Apr	K. Markello	California Academy of Sciences	USA	Echinodermata

Date	Name	Institute	Country	Taxonomic group
2018 Apr	P.	University of Vienna	Austria	Mollusca
2018 Apr	J. Stegu	University of Vienna	Austria	Mollusca
2018 Jun	E. Bahar	Weizmann Institute	Israel	Crustacea
2018 Aug	Ch. Pardovich	Haifa University	Israel	Reptilia: Chelonia
2018	R. Quam	Binghamton University	US	Anthropology
2018	A.-M. Tillier	National Centre for Scientific Research, Paris	France	Anthropology
2018	E. Elron		Israel	Crustacea
2018	H. Azulay	Israel Nature and Parks Authority	Israel	Crustacea
2018	E. Brayer	Weizmann Institute of Science	Israel	Crustacea
2018	E. Yegorenkova	Ul'yanovsk State Pedagogical University	Russia	Insecta
2018	M. Brandeis	Hebrew University	Israel	Aves
2018	N. Thie	Hebrew University	Israel	Aves
2018	Y. Kiat	Israel bird banding center	Israel	Aves
2018	O. Shenar	Israel Nature and Parks Authority	Israel	Mammals
2018	E. Hoter	Private	Israel	Aves
2018	Y. Talmor	Private	Israel	Aves
2018	P. Gol'din	Schmalhausen Institute of Zoology	Ukraine	Mammals
2018	I. Gal	Sde-Boque high school	Israel	Aves
2018	Y. Wasserlauf	Tel Aviv University	Israel	Aves
2018	M. Zaitzove-Raz	Tel Aviv University	Israel	Herpetology
2018	A. Peretz	Tel Aviv University	Israel	Mammals
2018	E. Amichai	Tel Aviv University	Israel	Mammals
2018	M. Zaitzove-Raz	Tel Aviv University	Israel	Mammals
2018	O. Comay	Tel Aviv University	Israel	Mammals
2018	Sh. Galmor	Tel Aviv University	Israel	Mammals
2018	Y. Vortman	Tel-Hay College	Israel	Aves
2018	Staff	The Israeli Wildlife Hospital	Israel	Mammals
2018	Staff	The Ministry of Agriculture and Rural development	Israel	Aves
2018	Staff	The Ministry of Agriculture and Rural development	Israel	Mammals
2018	Staff	The Israeli Wildlife Hospital	Israel	Aves
2018	M. Lev	University of Haifa	Israel	Aves

Date	Name	Institute	Country	Taxonomic group
2018	P. Bicciu	University of Haifa	Israel	Aves
2018	Y. Kiat	University of Haifa	Israel	Aves
2018	H. Pardovich	University of Haifa	Israel	Herpetology
2018	M. Lev	University of Haifa	Israel	Herpetology
2018	L. Weissbrod	University of Haifa	Israel	Mammals
2018	N. Marom	University of Haifa	Israel	Mammals
2018	H. Lev	University of Haifa	Israel	Mammals
2018	M. Lev	University of Haifa	Israel	Mammals
2018	Sh. Tsedek	University of Haifa and Tel-Hai College	Israel	Mammals
2018	H. Greenfield	University of Manitoba	Canada	Aves
2018	H. Greenfield	University of Manitoba	Canada	Mammals
2018	T. Greenfield	University of Saskatchewan	Canada	Mammals
2018	M. Belmaker	University of Tulsa	USA	Aves
2018 Jan	M. Vohnik	Institute of Botany, Czech Academy of Sciences	Czech Rep.	Seawater fungi
2018 Jan	V. Kolátková	Institute of Botany, Czech Academy of Sciences	Czech Rep.	Seawater fungi
2018 Mar	T. Chica-Lefort	Sorbonne University, Paris	France	Wood & charcoal

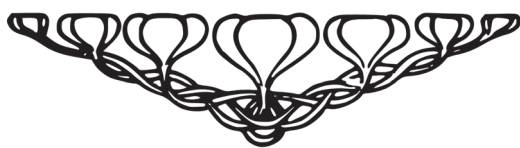


## SUPPORT FOR ACADEMIC AND OTHER COURSES

The natural history collections of the Steinhardt Museum are extensively used in higher education institutions. Some courses are TAU-based, several of which are compulsory for first and second year students and are taught to hundreds of them. Other universities (Technion, Bar-Ilan University, Open University) use our facilities for their specialized courses, as does the Bezalel Academy of Arts and Design. Many activities of the Museum’s Education and Science Communication Department also make use of the collections for varied audiences.

Course	Name	Institute	Taxonomic group
Biogeography	Sh. Meiri	Tel Aviv University	Mammals
Biogeography	Sh. Meiri	Tel Aviv University	Reptilia
Biogeography	Sh. Meiri	Tel Aviv University	Aves
Bird Biology (Technion)	Y. Fuchs	Technion	Aves
Bird Biology (Bar Ilan)	Sh. Barkan	Bar-Ilan University	Aves
Bird faunistics	R. Dor	Tel Aviv University	Aves
Bone identification	L. Sapir	Tel Aviv University	Aves
Curatorship course	H. Zemer	Bezalel Academy of Arts and Design	Aves
Curatorship course	H. Zemer	Bezalel Academy of Arts and Design	Mammals
Faunistics	Sh. Barkan	Bar-Ilan University	Mammals
Mammal Faunistics	E. Geffen, Y. Yom-Tov, R. Dor	Tel Aviv University	Mammals
Reptile Faunistics	E. Geffen, Y. Yom-Tov, R. Dor	Tel Aviv University	Reptilia
Tracking course	A. Ben-David	Tel Aviv University	Mammals
Vertebrates	D. Eilam	Tel Aviv University	Mammals
Zooarchaeology	L. Sapir-Hen	Tel Aviv University	Mammals
Zoological Garden & Museum Tours	Sh. Meiri, T. Dayan, R. Dor, Y. Yovel	Tel Aviv University	Mammals
Zoological Garden & Museum Tours	Sh. Meiri, T. Dayan, R. Dor, Y. Yovel	Tel Aviv University	Reptilia
Zoological Garden & Museum Tours	Sh. Meiri, T. Dayan, R. Dor, Y. Yovel	Tel Aviv University	Aves
Hemimetabola	N. Dorchin	Tel Aviv University	Insecta
Holometabola	N. Dorchin	Tel Aviv University	Insecta
The Invertebrates: Comparative Functional Biology (academic course)	M. Ilan, Y. Benayahu, N. Shenkar	Tel Aviv University	Invertebrates, Insects, Histology

Course	Name	Institute	Taxonomic group
Ichthyology (academic course)	M. Goren	Tel Aviv University	Fishes and Museum Class
Taxonomy of Auchenorrhyncha (Hemiptera)	M. Wilson	National Museum of Wales	Insects
Trips in the experimental zoo and Natural History Museum (academic course)	T. Dayan	Tel Aviv University	Birds, Mammals and Reptilia
Biology and Systematics of Marine Invertebrates: (academic course)	Y. Benayahu	Interuniversity Institute for Marine Sciences	Invertebrates
Topics in Fish Biology (academic course)	R. Holzman, M. Kiflawi	Interuniversity Institute for Marine Sciences	Fishes
Osteology and Anthropology (academic course)	I. HersHKovitz	Tel Aviv University	Anthropology
Physical Anthropology (academic course)	Y. Rak	Tel Aviv University	Anthropology
Chapters in Human Evolution (academic course)	Y. Rak	Tel Aviv University	Anthropology
Human Evolution: fossil evidences (academic course)	Y. Rak	Tel Aviv University	Anthropology
Dental Anthropology (academic course)	R. Sarig	Tel Aviv University	Anthropology
Museology (academic course)		Tel Aviv University	Mammals, Birds, Insects
Outstanding program of arts (academic course)		Tel Aviv University	Mammals, Birds, Entomology
Faunistics (academic course)	Z. Arad	Technion	Birds, Mammals
Vertebrates (academic course)	S. Barkan	Open University	Birds, Mammals
Bird-Watching		Israeli Air Force	Birds
Bird-Watching		The Society for the Protection of Nature in Israel	Mammals, Birds





## SUPPORT FOR VARIOUS INDIVIDUALS & ORGANIZATIONS

The Steinhardt Museum of Natural History functions as a national facility by providing services to the scientific community, other organizations and to the general public. Below we list samples of the services provided by our staff during the past academic year. The list is not exhaustive, for under the current condition of under-staffing we are unable to monitor and record all such activities.

Purpose	Name	Institute	Taxonomic group
Taxonomic guidance	V. Sepliarsky	Plant Protection and Inspection Services, Israel	Insects
Taxonomy identification	S. Vaisman L. Gidron	Plant Protection and Inspection Services	Insects, molluscs
Taxonomy identification		Israel Nature and Parks Authority	Insects, molluscs, bird feathers
Taxonomy identification		Ministry of Environmental Protection, Israel	Insects
Taxonomy identification		Ministry of Health, Israel	Insects
Taxonomy identification		Ministry of Agriculture, Israel	Insects, spiders
Taxonomy identification		Israel Defense Forces	Insects
Taxonomy identification		Hebrew University, Israel	Insects
Taxonomy identification		Porter School for Environmental Sciences, Israel	Insects
Taxonomy identification		Ben Gurion University, Israel	Insects
Taxonomy identification		The Israel National Aquatic Ecology Center	Insects
Taxonomy identification		CSA Ocean Sciences Inc., USA	Porifera
Shipment of specimens	Ang Put	Chinese University of Hong Kong, China	Alcyonacea (soft corals)
Shipment of specimens	C.S. McFadden	Harvey Mudd College, California, USA	Alcyonacea (soft corals)
Taxonomy identification		Marine Venture International, Inc., USA	Bryozoa
Taxonomy identification	H. Azulay	Israel Nature and Parks Authority	Crustacea
Taxonomy identification	E. Elron	Survey	Crustacea
Taxonomy identification	E. Brayer	Weizmann Institute of Science, Israel	Crustacea
Taxonomy identification		Israeli Air Force	Bird feathers

Purpose	Name	Institute	Taxonomic group
Taxonomy identification		Israel Airports Authority	Bird feathers
Taxonomy identification		Civil Aviation Authority	Bird feathers
Shipment of specimens	K. Markello	California Academy of Sciences, USA	Echinodermata
Data request	Sh. Bar-David	Ben-Gurion Univ., Israel	Mammals
Data request	E. Bar-Ziv	Ben-Gurion Univ., Israel	Mammals
Data request	A. Hinckley Boned	Estación Biológica de Doñana-CSIC, Spain	Mammals
	B. Shacham	Hebrew University, Israel	Herpetology
Data request	K. Raiter	Hebrew University, Israel	Herpetology
Data request	R. Rabinovich	Hebrew University, Israel	Mammals
Data request	F.J. Weise	IUCN Hyena Specialist Group, Switzerland	Mammals
Data request	D. Decruyenaere	Museum national d'Histoire naturelle de Paris, France	Mammals
Data request	H. Shamoon	SMNH, HaMaarag, Israel	Mammals
Data request	L. Ben Altabet, G. Ofer	SMNH, Open Landscape Institute, Israel	Herpetology
Data request	L. Ben Altabet, G. Ofer	SMNH, Open Landscape Institute, Israel	Mammals
Data request	A. Livne	Technion, Israel	Mammals
Data request	M. Antonio Ribeiro	Tel Aviv University, Israel	Herpetology
Data request	O. Levi, G. Stark	Tel Aviv University, Israel	Herpetology
Data request	A.. Peretz	Tel Aviv University, Israel	Mammals
Data request	E. Amichai	Tel Aviv University, Israel	Mammals
Data request	M. Zaitzove-Raz	Tel Aviv University, Israel	Mammals
Data request	O. Comay	Tel Aviv University, Israel	Mammals
Data request	D. Rom-Shiloni	Tel Aviv University, Israel	Mammals
Data request	E. Coombs	University College London, UK	Mammals
Data request	H. Pardovich	University of Haifa, Israel	Herpetology
Data request	R. Talbi	University of Haifa, Israel	Herpetology
Data request	L. Weissbrod	University of Haifa, Israel	Mammals
Data request	N. Marom	University of Haifa, Israel	Mammals
Data request	Sh. Tsedek	University of Haifa and Tel-Hai College, Israel	Mammals
Data request	A. Arnon	University of Haifa, Israel	Mammals
Loan	G. On	Beza'el art school, Israel	Aves

Purpose	Name	Institute	Taxonomic group
Loan	E. Maza	Primary school, Israel	Mammals
Loan	H. Zemer	Primary school, Israel	Mammals
Loan	Ronko	Ronko, Israel	Aves
Loan	O.J. Ungar	Sourasky Medical Center, Israel	Mammals
Loan	A. Livne	Technion, Israel	Mammals
Loan	Dept. Education and Science Communication	SMNH, Israel	Mammals
Loan	E. Amichai	Tel Aviv University, Israel	Mammals
Loan	M. Zaitzove-Raz	Tel Aviv University, Israel	Mammals
Loan	O. Comay	Tel Aviv University, Israel	Mammals
Loan	Sh. Galmor	Tel Aviv University, Israel	Mammals
Loan	Sh. Samson	Tutim production services, Israel	Aves
Loan	D. Mesquita	Universidade Federal da Paraíba, Brazil	Herpetology
Loan	A. Arnon	University of Haifa, Ramat HaNadiv, Israel	Mammals
Loan	S. Goldberg	Whittier College, USA	Herpetology
Tissue samples	Sh. Bar-david	Ben-Gurion University, Israel	Mammals
Tissue samples	E. Bar-Ziv	Ben-Gurion University, Israel	Mammals
Tissue samples	D. Jablonski	Comenius University, Bratislava, Slovakia	Herpetology
Tissue samples	K. Tamar	Institute of Evolutionary Biology, Barcelona, Spain	Herpetology
Tissue samples	J. Smid	National Museum in Prague, Czech Republic	Herpetology
Tissue samples	E. Gefen	Tel Aviv University, Israel	Herpetology
Tissue samples	D. Mesquita	Universidade Federal da Paraíba, Brazil	Herpetology
Shipment of specimens	A. Zhan	Research Center for Eco-Environment Sciences, Chinese Academy of Sciences	Tunicata
Shipment of specimens	R. Morerie de Rocha	Universidade Federal do Paraná, Brazil	Tunicata
Shipment of specimens	L. Manni	University of Padova, Italy	Tunicata
Shipment of specimens	P. Gilbert	University of Wisconsin, USA	Tunicata

Purpose	Name	Institute	Taxonomic group
Shipment of specimens	Kuhlmann	Zoological Museum of Kiel University, Germany	Insects
Shipment of specimens	Hodek	Brno, Styria, Czech Republic	Insects
Shipment of specimens	Orbach	Qiryat-Tiv'on, Israel	Insects
Shipment of specimens	Guéorguiev	National Museum of Natural History, Bulgaria	Insects
Shipment of specimens	Jaschhof	Station Linné, Färjestaden, Sweden	Insects
Shipment of specimens	Praz	University of Neuchâtel, Switzerland	Insects
Shipment of specimens	Tschorsnig	Staatliches Museum für Naturkunde, Germany	Insects
Shipment of specimens	Redei	Hungarian Natural History Museum, Hungary	Insects
Shipment of specimens	Marata	Monte San Giusto, Italy	Insects
Shipment of specimens	Poltavsky	Rostov-on-Don University, Russia	Insects
Shipment of specimens	Griswold	USDA-ARS Bee Biology & Systematics Laboratory, USA	Insects
Shipment of specimens	Jaschhof	Station Linné, Färjestaden, Sweden	Insects
Shipment of specimens	Stuke	Leer, Germany	Insects
Shipment of specimens	Haran	Orléans University, France	Insects
Shipment of specimens	Azarkina	Inst. of Systematics and Ecology of Animals, Siberian Branch of the Russian Academy of Sciences, Novosiborsk, Russia	Spiders
Shipment of specimens	Cuccodoro	Muséum d'histoire naturelle, Geneve, Switzerland	Insects
Shipment of specimens	Straka	Charles University in Prague, Czech Republic	Insects
Shipment of specimens	Bakker	Naturalis Biodiversity Center, Leiden, The Netherlands	Insects
Shipment of specimens	Schmidt	Zoologische Staatssammlung München, Germany	Insects
Shipment of specimens	Gusenleitner	Biologiezentrum Linz, Austria	Insects
Shipment of specimens	De Meyer	Royal Museum for Central Africa, Belgium	Insects
Shipment of specimens	Whitmore	The Natural History Museum, London, UK	Insects
Shipment of specimens	Wawer	Museum and Institute of Zoology, Polish Academy of Sciences, Warsaw, Poland	Insects
Shipment of specimens	Evenhuis	Bishop Museum, Honolulu, Hawaii, USA	Insects

Purpose	Name	Institute	Taxonomic group
Shipment of specimens	Bidzilia	Institute for the Evolutionary Ecology, National Academy of Sciences of Ukraine, Ukraine	Insects
Shipment of specimens	do Nascimento Machado	Universidade Federal de Santa Maria, Santa Maria, RS, Brazil	Insects
Shipment of specimens	Mühle	Nußdorf am Inn, Germany	Insects
Shipment of specimens	Hiermeier	Zoologische Staatssammlung München, Germany	Insects
Shipment of specimens	Langer	Niederwiesa, Germany	Insects
Shipment of specimens	Riley	Texas A&M University, USA	Insects
Shipment of specimens	Gaimari	California Department of Food and Agriculture, USA	Insects
Shipment of specimens	Kasparyan	Zoological Institute, Russian Acad. of Sciences, St Petersburg, Russia	Insects
Shipment of specimens	Matov	Zoological Institute, Russian Acad. of Sciences, St Petersburg, Russia	Insects
Shipment of specimens	Korotyaev	Zoological Institute, Russian Acad. of Sciences, St Petersburg, Russia	Insects
Shipment of specimens	Xiaolin Chen	Institute of Zoology, Chinese Acad. of Sciences, Beijing, China	Insects
Shipment of specimens	Mueller	ETH Zurich, Switzerland	Insects
Shipment of specimens	Terzo	University of Mons, Belgium	Insects
Shipment of specimens	Pisanty	Agriculture and Agri-Food Canada, Ottawa, Canada	Insects
Shipment of specimens	Praz	University of Neuchâtel, Switzerland	Insects
Shipment of specimens	Kuhlmann	Zoological Museum of Kiel University, Germany	Insects
Shipment of specimens	Dathe	Deutsches Entomologisches Institut, Müncheberg, Germany	Insects
Shipment of specimens	Pauly	Institut Royal des Sciences naturelles de Belgique, Belgium	Insects
Shipment of specimens	Whittington	Plymouth Marjon University, UK	Insects
Shipment of specimens	Pauly	Institut Royal des Sciences naturelles de Belgique, Belgium	Insects
Shipment of specimens	Kundrata	Palacky University, Olomouc, Czech Republic	Insects
Identification		Israel Antiquity Authority	Botanical remains



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