



**Past, Present and Future of Israeli Conservation
The 1st Israeli Conference for Conservation Science**

2-4 April 2017, Sde Boker Campus, Ben-Gurion University



Abstract Booklet



Program

Day	Time	Details			
2 nd of April	10:15	Conference bus leaves the Beer-Sheba central train station			
	11:00-15:00	Pre-conference tour - Hiking in the Zin valley and En-Avdat National park, bus to Beer-Sheba leaves after the tour ends			
Day 1 - Monday, the 3 rd of April	09:05	Conference bus leaves the Beer-Sheba train station			
	09:00-10:15	Gathering, registration, coffee			
	10:15-10:30	Introduction			
	10:30-11:30	Plenary I	Plenary, Prof. Hugh Possingham - Does science inform conservation policy?		
	11:30-12:00	Coffee Break			
	12:00-12:30	Origins of conservation session I	Prof. Yoram Yom-Tov - Changes in the terrestrial realm of Israel during the 20th century		
	12:30-13:00		Dr. Uzi Paz - The genesis of nature conservation in Israel (will be given in Hebrew)		
	13:00-13:30		Prof. Yossi Loya - The coral reefs of Eilat: A Historical Perspective		
	13:30-14:45	Lunch Break - Side event 1, organised by BioGIS - Introduction to the BioGIS system (in Hebrew)			
		Contributed talk sessions I-III	Session I - conservation of Landscapes & habitats <i>Seminar room</i>	Session II - conservation sociology and conservation planning <i>Room 32</i>	Session III - Endangered species and invasion biology <i>Evans Auditorium</i>
	14:45-15:00		Noam Ben-Moshe	Gili Greenbaum	Shirli Bar-David
	15:00-15:15		Aviv Avisar	Agathe Colleony	Idan Goodman
	15:15-15:30		Idan Shapira	Maya Tzunz	Bina R.G. Perl
	15:30-15:45		Liron Israely	Opher Mendelsohn	Orr Comay
	15:45-16:00		Break		
	16:00-16:15		Hila Segre	Ofer Steinitz	Shani Shachal
	16:15-16:30		Dana Levy	Liat Hadar	Yehezkel Buba
16:30-16:45	Hila Gil		Ori Frid	Itai Granot	
16:45-17:00	Simon Jamison		Simon Nemptzov	Tali Magory Cohen	
17:00-17:30	Coffee Break				
17:30-18:00	Origins of conservation session II	Prof. Arza Churchman - Environmental psychology and conservation science: what's the connection in Israel?			
18:00-18:30		Mr. Tzafir Rinat - Conservation reporting in Israel and how the public perceives these topics			
18:30-20:30	poster session	Mingling in the poster hall, mixer, music, pizza & beer, bus to Beer-Sheba leaves Midreshet Ben-Gurion at 19:15			
20:30-	Mingling at the student pub				



Day	Time	Details		
Day 2 - Tuesday, the 4 th of April	06:30-08:15	Birding trip at the Ben-Gurion tomb National Park		
	08:05	Conference bus leaves the Beer-Sheba central train station		
	08:00-09:00	Morning coffee		
	08:50-09:00	Announcements		
	09:00-10:00	Plenary II	Plenary, Prof. Richard Grenyer - Data, Theory, Tools, People: some developments that might help conservation work better	
	10:00-10:20	Break		
	10:20-10:40	Status of Israeli conservation today session	Dr. Yehoshua Shkedy - Nature Conservation in Israel: Major Directions	
	10:40-11:00		Mr. Alon Rothschild - A national biodiversity action plan - from a top down failure to a bottom up success	
	11:00-11:20		Dr. Ruthy Yahel - Marine conservation of the Israeli Mediterranean sea - threats and solutions	
	11:20-11:40		Landscape Arch. Yahel Porat - Management of forests for the conservation of unique fauna, flora and habitats - conceptual ideas and examples from the ground	
	11:40-12:00		Coffee Break	
	12:00-12:20		Prof. Tamar Dayan - The importance of natural history data and museums for conservation in Israel	
	12:20-12:40		Prof. David Saltz - The peculiarities of conservation biology – integrating insights into Israeli conservation thinking	
	12:40-13:00	Dr. Daniel Orenstein - Nature, Landscapes and Biodiversity: What do the 99% (non-ecologists) think?		
	13:00-14:15	Lunch Break - Side event 2, organised by HaMa'arag - Linking research, monitoring and nature management (in Hebrew)		
			Session IV - conservation behaviour <i>Evens Auditorium</i>	Session V - conservation policy <i>Seminar room</i>
	14:15-14:30	Contributed talk sessions IV-V	Carmi Korine	Yoav Sagi
	14:30-14:45		Achiad Davidson	Shai Meiri
	14:45-15:00		Adi Barocas	Martin Jeanmougin
	15:00-15:15		Roi Harel	Tal Polak
	15:15-15:30		Break	
	15:30-15:45		Miri Tsalyuk	Yaron Hershkovitz
	15:45-16:00		Hila Shamoon	Ateret Shabtay
16:00-16:15	Ori Segev	Ella Segal		
16:15-16:30	Antonina Polevikov	Amir Perelberg		
16:30-17:00	Coffee Break			
17:00-18:15	Panel discussion	The future of Israeli conservation - where do we go from here Panelists - Hugh Possingham, Richard Grenyer, Sinaia Netanyahu, Yoav Sagi, Yehoshua Shkedy, Assaf Shwartz, and Irina Levinsky		
18:15-18:45	Summation and prize presentation			
19:00	Bus to Beer-Sheba leaves Midreshet Ben-Gurion			
19:30-	Informal dinner at the Juma's pub			

Contributed talk & poster details

Day 1 - Monday, the 3rd of April

Contributed talks session I - conservation of Landscapes & habitats, *Seminar room* (Moderator – Takuya Iwamura)

- 14:45-15:00 **Noam Ben-Moshe*** - Expansion of rock hyrax distribution and the outbreak of leishmaniasis in northern Jerusalem - the 'other side' of urban ecology
- 15:00-15:15 **Aviv Avisar*** - Restoration of coastal dune ecosystems in central Israel following removal of a 60-year old Eucalyptus grove
- 15:15-15:30 **Idan Shapira** - The bird does care: a unified observation on the impacts of rural developments on bird communities
- 15:30-15:45 **Liron Israely*** - Agriculture practices supporting biodiversity conservation in Israel: A meta-analysis
- 16:00-16:15 **Hila Segre*** - Biodiversity patterns in an agricultural landscape: Can uncultivated field-margins help conservation?
- 16:15-16:30 **Dana Levy*** - The Effects of the Historical Land Cover Change on Biodiversity in Israel
- 16:30-16:45 **Hila Gil*** - Identifying Biodiversity Hotspots in Israel
- 16:45-17:00 **Simon Jamison*** - Truth or rare: Habitat preferences, distribution modeling and activity patterns of *Ophiomorus latastii*

Contributed talks session II - conservation sociology and conservation planning, *Room 32* (Moderator - Assaf Shwartz)

- 14:45-15:00 **Gili Greenbaum*** - Some of my best friends are conservationists... Analyzing trends in conservation publications from Israel
- 15:00-15:15 **Agathe Colleony*** - Human preferences for species conservation: Animal charisma trumps endangered status
- 15:15-15:30 **Maya Tzunuz*** - One size does not fit all - the complex relationship between wellbeing and biodiversity
- 15:30-15:45 **Opher Mendelsohn** - Impact and adoption of Mediterranean fruit fly regional IPM
- 16:00-16:15 **Ofer Steinitz** - A novel, spatial, data-driven assessment tool for updating the Israeli Red-list of breeding birds
- 16:15-16:30 **Liat Hadar** - Beyond Active Management: 3 lessons from 30 years of active conservation in Ramat Hanadiv Nature Park
- 16:30-16:45 **Ori Frid*** - Applying ecosystem based management in artisanal fisheries
- 16:45-17:00 **Simon Nentzov** - Israel's role in multilateral wildlife conservation treaties

Contributed talks session III - Endangered species and invasion biology, *Evens Auditorium* (Moderator - Adi Levi)

- 14:45-15:00 **Shirli Bar-David** - Non-invasive population monitoring: generating spatial, behavior and genetic information of the reintroduced Asiatic Wild Ass
- 15:00-15:15 **Idan Goodman*** - The spatial genetic structure of the Nubian ibex population in Israel
- 15:15-15:30 **Bina R.G. Peit*** - Detection of Bd in amphibians in northern Israel - Is it an alarm call for amphibian conservation in Israel?
- 15:30-15:45 **Orr Comay** - From rare to rarer: the unnoticed decline of the grey hamster (*Cricetulus migratorius*) in Israel
- 16:00-16:15 **Shani Shachal*** - Differences between vacant and occupied burrows of *Uromastix aegyptia*
- 16:15-16:30 **Yehezkel Buba*** - Remarkable Size Spectra stability in a marine environment undergoing a massive invasion
- 16:30-16:45 **Itai Granot*** - Habitat niche breadth predicts invasiveness in ascidians
- 16:45-17:00 **Tali Magory Cohen*** - Global invasion in progress - the current and putative distribution of the common myna (*Acridotheres tristis*)

* Participating in the best student talk/poster competition



Day 2 - Tuesday, the 4th of April

Session IV - Conservation behaviour, Evans Auditorium (Moderator - Oded Berger-Tal)

- 14:15-14:30 **Carmi Korine*** - The effect of artificial light on the drinking behavior of desert-dwelling bats
- 14:30-14:45 **Achiad Davidson*** - The effect of hunting on wild boar population structure, dynamic, reproduction and behavior in urban, agricultural and natural areas in Israel
- 14:45-15:00 **Adi Barocas** - Human-carnivore coexistence: Arabian wolves spatially favor but temporarily avoid humans in an extremely arid landscape
- 15:00-15:15 **Roi Harel*** - Can culture movements at different scales predict their survival?
- 15:30-15:45 **Miri Tsalyuk** - Movement patterns unravel variability in resource selection of the Asiatic Wild Ass
- 15:45-16:00 **Hila Shamoon** - Cascading shifts in diel activity cause invisible fragmentation in an open landscape
- 16:00-16:15 **Ori Segev** - Responses of Salamandra infraimmaculata larvae from diverse aquatic habitats under manipulated dissolved oxygen conditions
- 16:15-16:30 **Antonina Polevikov*** - Phenotypic plasticity and local adaptation in response to pool desiccation by Salamandra infraimmaculata larvae from permanent vs ephemeral breeding habitats: Conservation Implications

Contributed talks session V - Conservation policy, Seminar room (Moderator - Tamar Dayan)

- 14:15-14:30 **Yoav Sagi** - Ecology & Evolution of Conservation of Non-Protected Open Space in Israel
- 14:30-14:45 **Shai Meiri** - The global distribution of reptiles and its relevance for land vertebrate conservation
- 14:45-15:00 **Martin Jeammougin*** - Mismatch between habitat science and habitat directive - lessons from the French (counter)example
- 15:00-15:15 **Tal Polak** - Balancing Ecosystem and Threatened Species Representation in Protected Areas and Implications for Nations Achieving Global Conservation Goals
- 15:30-15:45 **Yaron Hershkovitz** - Biological assessment as a supporting tool for the management of aquatic fluvial systems in Israel: Lake Kinneret catchment as a first model
- 15:45-16:00 **Ateret Shabtay** - Realizing marine conservation in enclosed marine infrastructure areas
- 16:00-16:15 **Ella Segal*** - Wildfire management in Mount Carmel, Spatial and socioeconomic characteristics of goat herding
- 16:15-16:30 **Amir Perelberg** - Dividing the Negev into ecological units

Poster session - Lobby of the Biology building, on Day 1 - Monday, the 3rd of April

- Ariel Altman*** - Environmental effects on female group size and genetic relatedness of the Asiatic Wild Ass (*Equus hemionus*)
- Itay Berger*** - Conflicting effects of invasive common mynas (*Acridotheres tristis*) on foraging and nesting behaviors of native house sparrows
- Ron Drori** - Mapping wildfires in Israel
- Alyse Mathalon*** - Microplastic fibers in the intertidal environment surrounding Halifax Harbor, Nova Scotia, Canada
- Sarah Ohayon*** - Marine citizen science: divers survey marine litter in the seabed of the Israeli Mediterranean
- Bina R.G. Peril*** - Relevance of new natural history insights on conservation planning for a once lost frog
- Ittai Renan*** - Long and wide negative effect of the locust spraying in the Negev sand dunes
- Idan Shapira** - Spatial activity of mammals in the vicinity of an unpaved scenic road: effects and recommendations
- Oliver Tallowin*** - Large, small, or no pattern at all, it's on islands where reptiles fall
- David Troupin** - Conservation planning under uncertainty in urban development and vegetation dynamics

* Participating in the best student talk/poster competition





The Swiss Institute for Dryland
Environmental and Energy Research

It is with great delight that I welcome you all to the 1st Israeli Conference for Conservation Science. The science of conservation is an interdisciplinary field of study that deals with maintaining and restoring biodiversity, habitats, and ecosystems and the services they provide to humans. It is unique amongst scientific enquiry as it is both grounded in theory and knowledge from many diverse sub-disciplines, but is also an applied mission driven discipline dealing with an impending crisis. Recent years have seen a great rise in interest and achievements in this field with dedicated conferences, scientific journals, scientists and practitioners. Within this context The Swiss Institute for Dryland Environmental & Energy Research (SIDEER), sees great importance in promoting conservation science within its scope of influence and specifically supporting the 1st Israeli Conference for Conservation Science.

The time is ripe to establish a dedicated conservation science conference in Israel that will promote environmental stewardship amongst the various agencies, NGOs and academic institutions. We are very happy to be able to host this event at the Sde-Boker campus of the Ben-Gurion University. I expect that this meeting will serve as the cornerstone to greatly develop further conservation inquiry and practice in Israel, for generations to come. It should further foster greater interest amongst specialists and the general public to this unique human endeavor, and aid in the training of dedicated conservationist for the future.

In the hope that we will have a fruitful and stimulating meeting

Prof. David Saltz, Director

A handwritten signature in blue ink that reads 'David Saltz'.

The Swiss Institute for Dryland Environmental & Energy
Research,

Ben-Gurion University of the Negev



We are delighted to welcome you all to the 1st Israeli conference for conservation science!

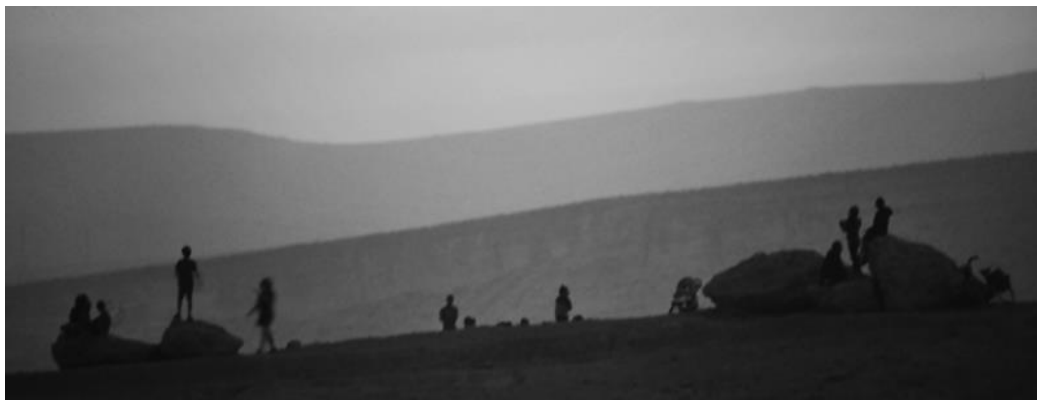
The last three decades have marked the rise of conservation biology as a bona-fide scientific discipline. Beyond scientific enquiry, conservation biology is paramount for our ability to maintain global biodiversity and healthy ecosystems, for future generations. It is therefore central for delineating environmental policies and for responsible decision making at all levels - from the legislator to the park ranger. Originally, conservation biology dealt predominantly with ecological means of preserving small and declining populations of animals and plants, endangered due to human actions. However in recent years, there has been a growing recognition of the imperative role that human actions and attitudes at various levels have, not only in contributing to the problems, but also in any attempt at solving them. Alongside these, today we are much more aware of the many services natural ecosystems provide humans. Attempts are made to quantify and incorporate these services at all stages of initiatives for safeguarding biodiversity. Therefore conservation grew out of the confines of biology into a truly inter-disciplinary field - conservation science.

We are therefore very happy to establish the 1st Israeli conference for conservation science, to promote these topics in Israel with its unique setting and peculiarities.

We hope that the conference will help in cementing conservation science as a unique scientific discipline, with dedicated scientists, practitioners, paradigms, tools etc. We further wish that the meeting will serve to establish an Israeli conservation science community for interactions amongst people interested in conservation from diverse fields and organizations.

We hope you all find the meeting invigorating and enjoyable.

Oded Berger-Tal, Takuya Iwamura, and Uri Roll





Acknowledgments

We would like to extend our deepest gratitude to many people that helped make this conference a reality!

Members of the Scientific committee: Assaf Shwartz, Adi Levi, Shirli Bar-David, Simon Nemtzov, Yaron Ziv, Yehoshua Shkedy, Eran Brokovich, and Irina Levinsky.

Participants of the final panel discussions: Hugh Possingham, Richard Grenyer, Assaf Shwartz, Yehoshua Shkedy, Irina Levinsky, Yoav Sagi, and Sinaia Netanyahu.

Session Moderators: Tamar Dayan, Adi Levi, and Assaf Shwartz

Referees of lectures and posters that were up for student prizes: Simon Nemtzov, Shirli Bar-David, David Saltz, Adi Levi, Ofer Steinitz, Margareta Walczak, Hadas Hawlena, Merav Seifan, Amiyaal Ilany, Idan Shapira, Daniel Orenstein, Sarig Gafny, and Carmi Korine.

Volunteers that helped in many ways: Gili Greenbaum, Inbal Tiano, Irene Stevens, Einat Bar-Ziv, Reut Vardi, Ibrahim Salman, Irith Aloni, Gilad Ben-Tzvi, Yuting Fu, Yael Lehnardt, Ron Efrat, Emmanuel Lourie, Danielle Mayer, Nitzan Segev, Yuval Hadar, Nevo Sagi, Shirli Bar-David, Amir Lewin, Yuval Cohen, Bina R.G. Perl, Aiste Klimasauskaite, Capucine Baubin, Noam Ben-Moshe, and Amos Zerah.

Special thanks to Mrs. Yael Kaplan, and Mrs. Cochy Abuharon.

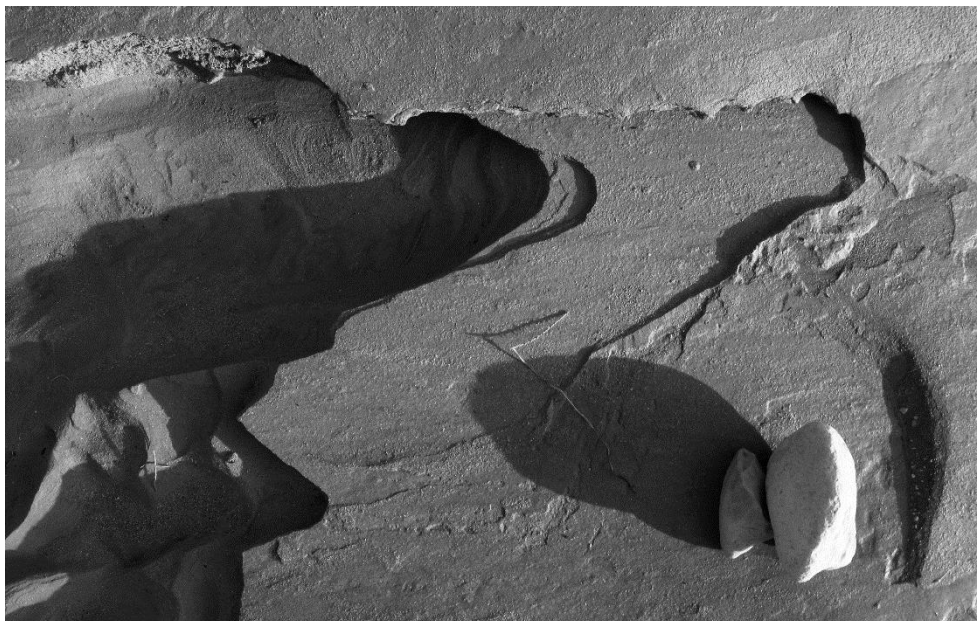




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Keynote talks





Does science inform conservation policy?

Hugh Possingham^{1*}

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I will tell four stories about how science has (and has not) transformed conservation policy and conservation actions on the ground in a megadiverse country - Australia. The examples cover: marine protected areas, allocation of funding for threatened species conservation projects, biodiversity offsetting and land-clearing laws. The take-home message is “turn up and listen, but don’t always obey”.



**Data, Theory, Tools, People: some developments that might help conservation work
better**

Richard Grenyer^{1*}

¹ School of Geography & the Environment, University of Oxford, UK

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In this talk I will present some current perspectives, from my group and others, that might be of interest if we take a medium-term view of the future of conservation, both as a science and as an activity. I definitely don't claim that these should be all the interesting perspectives, at all! But I have tried to focus on some fairly large and common challenges that conservationists face, and how we might approach them. I will cover biodiversity as a source of material inspiration, biodiversity as a means of increasing human wellbeing, the limits of evidence-based conservation, the rise of conservation cultureomics (trying to understand what actually matters to whom, and why) and why we might need to think more about the concepts of agency over the future and anti-politics.



Invited talks





Changes in the terrestrial realm of Israel during the 20th century

Yoram Yom-Tov^{1*} and Uri Roll^{2,3}

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During the course of the twentieth century many changes took place in the status, distribution, and abundance of vertebrates in the area that today encompasses Israel and the Palestinian Authority. In this area, comprising ca. 28,000 km², the human population grew from ca. 0.65 million inhabitants at the beginning of the 20th century to at least 10 million today. This 16-fold increase in population size led to an increased use of land for human needs – construction of buildings, roads, and so forth. Many changes also took place in agricultural land-use as well as agricultural practices. The area of cultivated land (excluding pine tree planting) increased by about 50% to about 3,000 km², irrigated area increased by ca. 135-fold, from 15 km² at the beginning of the twenties century to 2,000 km² approximately one hundred years later. These changes (and many others) had a major, and in many cases fatal, effect on the animal life of Israel. About a dozen species of vertebrates were exterminated from Israel, and more than 50% of its vertebrate fauna decreased in numbers and distribution. In this talk we'll discuss some of these changes and compare them to those occurring other countries.



The genesis of nature conservation in Israel

Uzi Paz*

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At the turn of the 20th century Israel was a desolate and neglected province of the Ottoman Empire. Tree and shrub felling was practiced throughout the country unregulated, and hunting and poaching of mammals and birds was commonplace.

After the 1st world war, the British Mandate government legislated several laws to protect the natural resources of Israel – the hunting law (1924), the forestry act (1926) and the fisheries act (1927). However, these were rarely enforced.

The spiritual connection of the gentile Jews to the holy-land was not manifested in the first waves of Zionist immigration to Israel. The founders of the practical Zionism often referred to the country as a wasteland. Alterman's 'Road poem' demonstrates this relationship well – "wake up wasteland, your die has been cast, we are coming to conquer you". Conquering the wasteland became a central motif in the early days of the State of Israel – justifying not just the Jews' historic right to the land, but their moral one as well. Wasteland, according to the founders of Israel, were all uncultivated lands such as swamps sandy habitats or deserts.

Shortly after the founding of the state, a national planning unit was set up under the prime minister's office. In it, a master plan for the physical planning of the state was established. This plan included a chapter on 'saving the landscape and national parks', which designated eight regions for this purpose. The Zionist establishment did not recognize, at this stage, the importance of nature reserves within this framework, and the Hebrew term for 'nature reserve' was yet coined.

In 1951, following the commencement of the work to drain the Hula swamp, a committee for the conservation of nature was set up by several scientists, led by Professor H. Mendelssohn. Two years later, it published a short booklet entitled 'the protection of nature', which served as the ideological platform for the conservation of nature in Israel. Professor H. Mendelssohn also suggested to contact the Israeli chief of staff to ban hunting of gazelles in the Negev.

In 1953 the Society of the Protection of Nature in Israel (SPNI) was set up by Amotz Zehavi. Thanks to its activities, on-the-ground conservation actually commenced. The SPNI employed rangers-guides



in the Western Galilee, the Hula reserve and the coral reef reserve in Eilat, and led the campaign against mining of 'zifzif' (coarse sand) along the Mediterranean coast.

In 1955, again following the initiative of Mendelssohn, the wildlife protection law passed, and a hunting bureau was set up in the Ministry of Agriculture. In late 1958 the Department for the Conservation of Nature was established in the Ministry of Agriculture and the hunting department was annexed to it. I officiated as its first director. From its onset, this department led many arduous campaigns against many of the executive institutions of Israel such as the JNF/KKL, Mekorot, Tahal, Ma'atz, and others. Amongst the significant achievements of this department was cementing the list of the future reserves, in the mindset of the national planners and practitioners, and approving the foundation of the Nature Reserve Authority. A notable campaign at that time, in which Department for the Conservation of Nature collaborated with the SPNI, succeeded in canceling five building plans on Mount Carmel. It also was successful in designating this entire region as a national park, which also incorporates nature reserves.

From its early days, the Nature Reserve Authority started fostering several nature reserves (Ha-Tanur, Tel-Dan, Pa'ar Cave, Taninim River, and Ha-Masrek), making them accessible to the public and exposing their natural splendor. Another early scheme of the Nature Reserve Authority, that got a lot of public attraction, was the campaign to save the wild flowers of Israel, which was conducted in collaboration with the SPNI.



The coral reefs of Eilat: A Historical Perspective

Yossi Loya^{1*}

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The coral biodiversity of Eilat's reefs went through dramatic changes over the past five decades, which can be roughly divided into six periods. I) Prior to 1970 – 'the good years' – the reefs exhibited high coral diversity, abundance and live cover. A quantitative baseline study (10 m line transects monitored from the reef flat to 30 m depth) provided the foundation for continuous monitoring of the coral community structure for the next 45 years. II) From 1970-1979 – 'the oil pollution years' – Chronic oil spills occurred 2-3 times a month, resulted in adverse effects to coral reproduction. III) From 1979-1986 – 'Recovery of the reef' – exhibiting similar coral diversity and live cover to that of 1970 (i.e. 57.8% cover and 49.1 colonies/10 m transect). IV) From 1986-1996 – 'Sewage pollution years' – The human population of Eilat increased sharply, resulting in sewage discharge onto the reef of ca. 2.8 million m³/year (which ceased after a sewage treatment plant was built in 1995). This resulted in declines of coral diversity and cover compared with 1986 (i.e., -19% in live cover and -24% in number of colonies). V) From 1995-2008 – 'The fish-cages pollution years' – Net-pen fish farming yielding 2,800 tons of fish in 2006 caused eutrophication of the reef (240 tons of N and 40 tons of P, annually). This resulted in damage to coral reproduction, enhancement of algal growth and competitive exclusion of corals by algae (i.e. -61% coral cover and -47% in number of colonies compared with 1993). In 2008, following a government decision, the fish cages were removed. VI) From 2008-2016 – 'Hopeful years' – signs of increased recovery and restoration of the reef.



Environmental psychology and conservation science: what's the connection in Israel?

Arza Churchman^{1*}

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Conservation science deals with the preservation, protection, or restoration of the natural environment. Environmental psychology deals with the relationship between people and their physical-social environment. I will be talking about the way in which these two fields interconnect and why they need to be interconnected. More and more we are aware of the importance of the intervention of people in the natural environment and what their impact is upon it. The issues within conservation science are basically seen as being objective ones, while environmental psychologists emphasize that the behavior of people in general and with regard to the conservation of the natural environment is subjective. Therefore, in order to understand how to influence this behavior and help them to understand the need for conservation, there are many questions that we need to ask and answer. For example: What do they know about the issues? What are they willing to do about them? How can we change behavior? The complexity of these questions is magnified by the existence of a variety of groups of people in terms of culture, socio-economic status, education, and so forth. One way to cope with this complexity is the participation of the relevant people in the decision-making process. I will give examples of the way in which this has happened in Israel, its problems and its successes.



Conservation reporting in Israel and how the public perceives these topics

Zafrir Rinat^{1*}

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Conservation reporting in Israel is mainly targeted on immediate conflicts that involves various human activities. The media will usually show interest in covering conservation stories when it has reason to believe that the public can identify with the issues, as often happens with special natural sites, beaches and iconic wildlife and plants species. The fact that the environment movement in Israel expanded its activities to open landscapes, urban nature and ecosystems services has made the media coverage of nature conservation more challenging. I will talk about this challenge with some examples regarding current stories.



Nature conservation in Israel: major directions

Yehoshua Shkedy^{1*}

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Israel's human population growth rate is high (about 2% per annum) and the population density is high as well (~350 people per km²). About 5000 km² of the area are protected in nature reserves though large parts are shared with other stakeholders, like army training zones. Most of the northern part of the country is highly fragmented, and this stress is being accelerated due to development throughout the country. A major conservation goal and effort is directed to getting more protected areas as nature reserves, representing all natural ecosystems, and protecting national ecological corridors network. Usually, only when habitat protection is not successful, there is a need to deal with individual species. We protect endangered species, control over-abundant species and eradicate invasive species. These are the main cases where intervention in nature management is needed. Adaptive management of reserves and species ranges from "sit and do nothing" to management of a single population, habitat management and rehabilitation of entire ecosystems. There is no default: no-intervention is as much a management choice as any other option. Yet, non-intervention is often preferred since it is inexpensive, reduces work load and more importantly, when possible, nature usually sets itself up better than we do. Thus, intervention is always considered carefully. Management activities are monitored as well as major ecosystem processes. When knowledge is absent or limited, management should follow or go together with research. Monitoring and research are needed for adjusting management when necessary, and for preparations for expected changes. The Mediterranean Sea is getting lately a lot of attention. Conservation and development efforts are going side by side, trying to avoid all the mistakes done on land. It means, above all, large reserves, concentrating development and infrastructure to certain limited areas and fisheries management. As most biodiversity exists outside of protected areas, mainstreaming biodiversity thinking is a major theme in its protection. Israel does not have yet a strategic biodiversity plan, and it reduces the effectiveness of cooperation with other governmental and non-governmental organizations that impact nature.



A national biodiversity action plan – from a top down failure to a bottom up success

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Israel is a biodiversity hotspot, as part of the Mediterranean Biome, and an important migratory flyway. It is also a country with an extreme 1.8% population growth rate, on its way to become the most densely populated country in the world, and is under massive development pressures for housing, infrastructures and agriculture. Though 25% of the terrestrial area is designated as nature reserves (half of this area is also a firing zone), most of the area is located at the southern region, with a number of critical ecosystems only poorly protected. At sea, only 0.25% of the Mediterranean is protected. Hence, Biodiversity cannot be conserved only through the reserve network. Despite the fact that Israel has ratified Convention on Biological Diversity (CBD), its Ministry of Environmental Protection has failed to establish a national biodiversity action plan and to allocate necessary resources for the convention's implementation. A legislation framework for biodiversity conservation has yet to be established or mainstreamed into national policy. In light of this governmental top-down failure, bottom up initiatives have been pushed forward by SPNI, Israel Nature and Parks Authority (INPA), and other organizations, with the government lagging behind. For example I) A comprehensive fisheries management reform was approved in the Knesset after a 4 year campaign. II) Partnerships with 15 businesses, including leading national infrastructure companies, were formed, and biodiversity considerations were mainstreamed into their internal procedures. III) The Israeli Defense Forces (IDF) became a partner in conservation through the 'nature defense forces' project encompassing 40 army bases. IV) Legal actions have been taken to regulate wild afforestation activities in sensitive habitats through an appeal to the Israeli Supreme Court. V) An IAS bill is being promoted in order to prevent invasions. This bottom-up approach has yielded numerous successes, but in order to effectively sustain Israel's ecosystems, the government must fulfill its obligation to the public and form a cross-sector strategic action plan securing the necessary funds for its implementation and a legal framework. Civil society cannot carry this heavy burden on its own.



Marine conservation of the Israeli Mediterranean Sea - threats and solutions

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The area of the Israeli territorial waters in the Mediterranean Sea is larger than the country's land area. This marine environment is subjected to a growing anthropogenic pressure due to rapid development of infrastructure such as gas and oil, water desalination and ports. Habitat destruction, overfishing, massive biological invasions, pollution and warming are also contribution to the deterioration of the marine environment. A holistic approach to the conservation of the marine environment takes into account all components of the ecosystem including the diversity of species at the different levels of the food web and habitat diversity. Using marine spatial planning tools can aid in: solving conflicts between users; the establishment and operation of vast marine reserves; maintaining sustainable fishing management; the prevention of pollution (and, when possible, biological invasions); regulating and mitigating industrial and transportation activities and effective enforcement of conservation laws and regulations. Nevertheless, all these require good scientific knowledge, based on reliable and relevant data, which are scarce along the Levantine coast. In order to bridge this gap and establish a baseline for future studies, we gathered together most of the Israel's marine scientists and carried out a large-scale survey of several of Israel's marine-reserves with varying levels of active enforcement. We examined both the sessile and the fish communities within each reserve and nearby control sites. Our data indicate that, given a suitable habitat composition and size, together with proper management and enforcement, a marine reserve can lead to an increase in the total biomass (of fish, for example), and higher abundance of rare species and larger, reproducing individuals. Reserves were also shown to improve, via spill-over of adults and larvae, the status of the marine environment.



Biodiversity and unique Natural assets and habitats Conservation in Israel's forests - conceptual ideas and examples from the ground

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The policy documents of KKL declares that forests and open spaces managed by KKL, preserve high biodiversity and unique natural assets and habitats, which are significant for conservation. Therefore, the new Forest Management Policy of Israel aims toward increasing complexity and diversity of the forests structure, while encouraging native species and natural regeneration, the conservation of unique natural assets and habitats and the elimination of invasive species in the forests. Examples for the implementation of conservation actions that have been carried out include the designation of specific forests areas as unique natural assets and habitat for conservation according to the forests master and management plans. In addition to that, a specific organizational GIS database for unique natural assets and habitats, and a new array of surveys and long term monitoring plans (such as the new forest status survey and the long-term monitoring plan for raptors nesting in the forests) was developed. The collected knowledge from this array, as well from a wide structured scientific research, is being translated into conservation practices and management instructions.



The importance of natural history data and museums for conservation in Israel

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"Effective conservation and management of biodiversity depends in large part on our understanding of taxonomy. Unfortunately, inadequate taxonomic information and infrastructure, coupled with declining taxonomic expertise, hinders our ability to make informed decisions about conservation, sustainable use and sharing of the benefits derived from genetic resources" The Convention on Biological Diversity.

The myriad of species already identified and the millions of species that await discovery are building blocks of natural ecosystems. Their identification coupled with knowledge of their basic biology and their evolutionary interrelationships are increasingly understood as key data for understanding patterns of biodiversity and their conservation implications, as well as to mainstreaming biodiversity considerations into diverse economic and development activities. Understanding that our goal is to preserve functioning ecosystems has highlighted the importance of this knowledge in addition to that of few charismatic species. Natural history collections are critical and testable archives of nature and hubs of taxonomic research. They are key to studying species distributions, macroecological patterns, and temporal changes in species and communities, as well as microevolutionary change in response to human-induced stressors. Additionally, they allow the study of environmental pollutants, pathogens, and stable isotopes, allowing insight into the dynamics of environmental change. In recent years natural history collections have become the focus of numerous studies of the impact of climate change on species distributions and microevolution. New distribution modeling techniques, Next Generation Sequencing, ancient DNA techniques, and advances in stable isotope studies – have added new options and depth into the study of natural history collections in the service of conservation.



The peculiarities of conservation biology: Integrating insights into Israeli conservation think

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Conservation Biology is a mission driven applied science dealing with, what has become in just a half a century, a global crisis. Similar to medicine, setting priorities and decision-making in conservation is a pivotal and complex issue, but in contrast to medicine where the decision involves two people (doctor and patient) decisions in conservation biology are multi-personal and multi-tier from the level of the field personnel through the professionals, management and finally politicians.

Epistemologically I recognize 4 modules that are key to decision makers and managers in conservation which still need to improve within the conservation community in Israel: First, the philosophy and ethics of conservation - although constantly evolving - are poorly known amongst biologists and are often reviewed too briefly merely as part of a basic conservation biology course. Second, several fundamental concepts in conservation that are complex and not readily quantifiable (e.g. biodiversity, ecosystem services) are simplified as part of the pedagogical process potentially leading to errors in decision making. Third, as in all applied sciences, conservation biology relies on basic science (mainly ecology), this linkage to basic theory is vital if paradigms are to evolve in conservation, but is relatively weak. Fourth, because conservation biology deals with preventing or slowing the degradation of current conditions (as opposed to most other applied sciences that focus on improving current condition), statistical inference should be more concerned with Type II errors. In this respect null-model hypothesis testing falls short and does not support decision making, nevertheless the recent advances in this respect (i.e. multi-model inference) have yet to be integrated into decision-making processes in the relevant Israeli agencies. These issues are not sufficiently addressed in conservation biology courses, environmental programs, and the working protocols of agencies which may, in turn, hamper decision making.



Nature, Landscapes and Biodiversity: What do the 99% (non-ecologists) think?

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While ecologists are well equipped professionally to define and characterize contemporary conservation challenges, they are less equipped to offer viable solutions. This is because the drivers of these challenges are social in nature, and as such, depend on societal values, which are only in part influenced by scientific knowledge. To shift trends of ecosystem degradation, we will need to address such values systems. In this talk, I present insights derived from multiple studies querying various publics in Israel regarding their preferences for nature, landscapes and environment. Using questionnaires, interviews and focus-group discussions, I investigate what elements of the natural environment are most appreciated by the public and how these preferences are related to values systems, demographic characteristics and/or professional knowledge. Research was conducted from the hyper-arid Arava Valley to the Mediterranean chaparral and planted forests of the Galilee, and results were consistent across ecosystem types. There is strong appreciation for nature and landscapes among the general public, although this appreciation is often vague and unspecific. Respondents lacking a strong ecological background view the natural environment holistically – appreciating the “landscape”, with little emphasis on specific biological components within. Ecologists, on the other hand, tended to emphasize preferences for specific components of biodiversity. Respondents most often describe natural landscapes as good settings for social interactions (i.e. an extension of their homes), in stark contrast to respondents with stronger ecological backgrounds, who see nature as a place for solitude and a means of “escape” from civilization. I will conclude with a short discussion regarding the implications of the research for environmental policy priorities and land management.



Side events





Introduction to the BioGIS system

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The aim of the BioGIS system is to allow professionals and the public at large to explore and analyze Israel's biodiversity in a simple and straightforward manner. The principal goal of BioGIS is to integrate existing information on the composition and geographical distribution of the flora and fauna of Israel in a unified open-access Geographical Information System (GIS) that is available to the public on the Internet and equipped with user-friendly, state-of-the-art tools for data analysis and visualization. The system is being developed as a long-term, dynamic database, and reflects the current state of knowledge on the distribution of plant and animal species in Israel. In this short presentation we will explore together the BioGIS system.



Linking research, monitoring and nature management

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Open space managers in Israel are required to make decisions that affect ecosystems and biodiversity. The management of open spaces should be based on the understanding of those ecosystems and timely knowledge on their state. However, this information may not be accessible, or even exist. Research provides insights to understanding the system and monitoring provides information on its state and trends, yet the application of existing data is not always straight forward. In this workshop, we will present examples of applying monitoring data for decision making and discuss open questions in the management of open landscape and nature in Israel, and the data required to answer these questions.



Contributed talks





Restoration of coastal dune ecosystems in central Israel following removal of a 60-year old *Eucalyptus* grove

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Approximately 17% of Israeli coastal dunes are still reasonably intact, and less than 12% are nationally protected areas. In first decades after Israel's establishment, great efforts were made to stabilize coastal dunes, using exclusively non-native plant species. Today these species, especially *Eucalyptus camaldulensis*, cover broad areas, effectively stabilizing the sand and profoundly modifying the native ecosystems and landscapes, both above- and below-ground. The current study focuses on the first three years of a restoration process following removal of 20 ha of a *E. camaldulensis* forest, planted in the 1950s on coastal sand dunes at the Alexander River National Park. We used two different restoration methods, compared with two types of untreated controls – Eucalyptus grove and natural sand dune ecosystem. We included 10 replicates for each treatment, each 1000 m². Variables measured were soil properties and plant, arthropod and reptile diversity and abundance. A year after clear-cutting, we saw dramatic changes in soil properties (Moisture content, % organic matter, pH, and rate of decomposition). Furthermore, all taxa display a shift in species diversity and community assembly towards species associated with sandy habitats preoccupying restored plots. Our preliminary results indicate positive trends in the initial phases of restoration of coastal sand dunes.



Non-invasive population monitoring: generating spatial, behavior and genetic information of the reintroduced Asiatic wild ass

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Small threatened populations are of special concern in conservation biology. Information about their distribution, behavioral patterns and genetic diversity is crucial in order to generate management and conservation protocols. Due to their rarity and sensitivity it is difficult to obtain such information on small populations using conventional invasive research methods. Between 1982-1993, the endangered Asiatic wild ass (*Equus hemionus*) was reintroduced to the Negev Desert. We used non-invasive techniques to collect information on the reintroduced population. Based on field surveys of feces-mounds we developed a species distribution model which enabled the detection of preferred habitats and activity centers and the identification of potential pathways, important for maintaining connectivity within the population. We established non-invasive genetic protocols to extract DNA from feces, and based on their genotypes, we inferred the population's genetic structure and diversity. A genetic structure has evolved since reintroduction onset, probably as a result of founder effects, impact of landscape features on gene-flow and the species behavioral patterns. We revealed a strongly polygynous mating system which might affect the population's genetic diversity, effective population size, and persistence. The non-invasive approaches developed in this study can support conservation decision making processes and can be further applied to other systems.



Human-carnivore coexistence: Arabian wolves spatially favor but temporally avoid humans in an extremely arid landscape

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Large carnivores have a disproportionately high risk of conflict with humans. Current evidence suggests that the survival, abundance, and persistence of these species are negatively affected by human activity. Thus, large carnivores are predicted to spatially avoid human-dominated areas. Yet, as the global human footprint grows, it is crucial to understand the circumstances when large carnivores can persist in human proximity. Using GPS location data, we quantified the space use and movement of protected Arabian wolves in the arid Negev desert. Contrary to the spatial avoidance prediction, wolves spent a large proportion of their time in proximity of human infrastructure, suggesting a strong spatial association with human activity. Wolves showed temporal avoidance of human activity by increasing activity and movement during the night. In addition, during night, wolves used space in proximity of human infrastructure in proportion to its availability. Combined with recent diet analyses, our findings suggest that wolves nutritionally rely on human subsidies. Given the scarcity of ungulate prey resources in the surrounding landscape, wolves appeared to fine-tune their movement and space use to persist in the vicinity of humans. We conclude that legal protection and tolerance by humans can promote close spatial coexistence with large carnivore populations.



Expansion of rock hyrax distribution and the outbreak of leishmaniasis in northern Jerusalem - the 'other side' of urban ecology

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In recent years, the distribution of rock hyraxes has increased in populated areas in Israel, following the creation of suitable habitats as a consequence of human land-use changes. While it prompted urban conservation and reconciliation opportunities such as hyrax parks this also presented threats to human health. Hyraxes are the main reservoirs in Israel of *Leishmania tropica*, a severe cutaneous disease. Following an outbreak of leishmaniasis in Jerusalem we surveyed two neighborhoods and their environs in order to map the hyrax habitats and prepare a plan, which would lead to the removal of hyraxes living in proximity to residential areas. We found that over 1,000 hyraxes inhabited the outskirts of Jerusalem's neighborhoods, predominantly in artificial habitats and usually not in the open natural habitats beyond. Many animals forage in gardens, a process supported by familiarity with the urban area. We expect that treating existing habitats may actually lead to increased colonization of hyraxes in the city, and that hyraxes will continue to expand their range in the coming years. The subject of the project and the solutions for the problem raise a number of issues regarding urban ecology and conservation for integrating wildlife into populated areas.



Remarkable size spectra stability in a marine environment undergoing massive invasion.

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Biological invasions are increasing globally and are considered a major cause for biodiversity loss. Most notable is the Mediterranean Sea, which is subject to an ongoing invasion of Red Sea species through the Suez Canal in one of modern history's most important biogeographical transitions. We used Size Spectra (SS), a reliable index of food web structure often used to evaluate the effect of fishing, in order to examine how the influx of Red Sea species into the Mediterranean Sea has impacted the local community's size structure. We used data on trawl catches along Israel's shoreline from two time periods spanning 20 years in order to obtain the community's SS using length-based size classes. This serves as the first attempt of using SS in order to examine the effect of biological invasions, one of today's most pressing ecological issues. We found that the biomass of non-indigenous species increased in 20 years, especially in small and large species. The biomass of indigenous species did not decrease accordingly, which suggests competition between indigenous and non-indigenous species in the Mediterranean may be weaker than previously assumed. However, as non-indigenous species biomass increases, competition for now-limiting resources may result in biomass loss.



Human preferences for species conservation: Animal charisma trumps endangered status

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Much research has recently focused on people's commitment to biodiversity conservation by investigating their 'willingness-to-pay' (WTP). Because of the public's preferences for more charismatic species, conservation programs are often biased toward these species. Our study aimed to explore the determinants of WTP among 10,066 participants in a zoo conservation program. The program aims to raise money to support conservation programs and involves donating money to 'adopt' an animal in the zoo. We explored whether participants were influenced by scientific characteristics of the animal (conservation status and phylogenetic distance from humans) or by more affect-related characteristics (charisma). We found that participants did not choose an animal to adopt because of its endangered status, and did not donate more to endangered species than to other species. Instead, they were more likely to choose a charismatic species. Those who chose a less charismatic species gave more money on average to the program than others, suggesting a higher commitment among the former. This type of conservation program may not be an effective way of reconnecting people with conservation issues related to endangered species. Zoos should communicate more strongly on endangered species and increase the ratio of endangered over charismatic species in such programs.



From rare to rarer: the unnoticed decline of the grey hamster (*Cricetulus migratorius*) in Israel

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Population trends of rare species are hard to identify, as individuals occur so uncommonly in conventional population assessment methods – often appearing as an anecdote or a curiosity to the surprised surveyor. The rare grey hamster (*Cricetulus migratorius*), currently listed as Least Concern in Israel, is an alarming example of a rare species diminishing unnoticed. Its occurrence in owl pellets (a common tool for assessing rodent biodiversity) was always scant, yet repeated surveys suggest that this species' range has contracted. We collected and analyzed owl pellets from Israel north of Beer Sheba, and compared the occurrences of grey hamsters to those noted in the equivalent literature since the 1940's. In addition, we mapped museum specimens of grey hamsters collected in Israel and consulted the results of extensive nation-wide rodent trappings carried out by Israel's Ministry of Agriculture in the 21st century. In the 1940's, grey hamsters occurred throughout the study area. However, repeated large scale surveys conducted after the 1970's failed to find any grey hamsters in the Western Negev, The Shfela or Judea Mountains. Our results suggest that grey hamsters are now locally extinct in these regions, and that conservation measures should be considered for the remaining population.



The effect of hunting on wild boar population structure, dynamic, reproduction and behavior in urban, agricultural and natural areas in Israel

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Throughout Europe and Asia as well as in Israel, populations of wild boars (*Sus scrofa*) demonstrate a steady increase in recent decades. This results in increased conflicts between wild boars and humans. Culling wild boars is the most widespread management tool throughout the world in attempts to minimize these conflicts. Yet, studies demonstrate that populations of wild boars exposed to high hunting pressure have shorter generation times leading to higher reproduction rates. The mechanisms of this phenomenon have not been examined to date and culling practices have been going on undisturbed. Our research goal is to evaluate the effects of hunting on wild boars population structure, dynamic, behavior and reproduction in four different land uses: urban with and without hunting, agriculture with hunting and nature reserves with no hunting. To do so, we are using motion triggered cameras, giving up densities (GUDs) and analysis of stress and reproduction hormones levels in hair. Our results, so far, show striking behavioral differences between boars in urban and open spaces based on GUD studies and analysis of videos, suggesting a lower perceived risk of humans in urban areas, and putatively affecting the reproduction potential of boars in human vicinity.



Applying ecosystem based management in artisanal fisheries

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Artisanal fisheries are among the most common fishing techniques in the world. Unfortunately, due to overfishing and various other anthropogenic stressors, artisanal fisheries are on the verge of collapse worldwide. In Israel, data on fishing are scarce, with almost no record of artisanal fishing landings. The aim of this study was to quantify the catch of set nets in order to establish optimum fishing methods that can benefit both local fish communities and fishermen. We found that smaller mesh sizes did not necessarily catch large quantities of younger individuals but rather smaller species. Hence, the proportion of juvenile fish did not differ between nets of different mesh sizes while community structure did. These results suggest that mesh size restrictions, will not result in the decrease in catch of individuals below reproductive size but rather shift the species composition of the catch towards large bodied predatory species. This is unlikely to achieve neither the rebuilding of fish stocks nor increase in fishermen's profitability. We suggest that fisheries management in our region should focus on reducing fishing pressure incorporated with ecosystem based fisheries management, such as the closures of reproductive or recruitment areas and marine protected areas.



Identifying Biodiversity Hotspots in Israel

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Israel is characterized by a high-level of biodiversity, but is also among the most densely populated countries. Therefore, many small and fragmented biodiversity hotspots are at risk of extinction following anthropogenic activities. The project, initiated by OLI, is conducted jointly with the Israel Nature and Parks Authority & the Ministry of Environmental Protection, and supported by the Open Land Protection Fund, focuses on identifying sites with significant levels of biodiversity that are under human threat. It targets small size sites (up to 1 km²) which are not protected as nature reserves. About 400 sites were identified so far throughout the country. Our aim is to draw the attention of planning authorities and land-managers to these sensitive sites and enable their protection. We developed a systematic methodology for evaluating the ecologic valence of these sites as well as the level of anthropogenic threats. It enabled clear and efficient prioritization, so that the most vulnerable sites can be protected first. Geographic locations and information collected for each site were uploaded onto a GIS with a dynamic internet interface, which enables public access, editing and contribution of additional data. For a selection of sites, a detailed program for monitoring and preservation was prepared.



The spatial genetic structure of the Nubian ibex population in Israel

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Spatial genetic structure analyses provide estimates of genetic and demographic connectivity and can be used to identify movement barriers and past demographic events. Because direct monitoring of endangered and elusive species can be difficult and cause large disturbance, genetic techniques have been frequently used in conservation projects. The Nubian ibex (*Capra nubiana*) has a patchy distribution throughout its range in Israel. The goal of this study was to describe the large-scale genetic structure of the *C. nubiana* population in Israel and to evaluate possible mechanisms that could explain it. Using eight polymorphic microsatellites, four subpopulations were sampled and genotyped. Significant genetic differentiation was found among ibex subpopulations (AMOVA $F_{st}=0.1$; $p=0.001$). Contrary to our predictions, the strongest differentiation was found between the two closest subpopulations from the same core zone, the Negev Highlands. Since geographic distance and landscape features cannot explain these results, it is likely that the genetic structure is influenced by behavioral processes. High levels of breeding site fidelity measured at these two sites support the hypothesis that behavioral changes, namely habituation to human presence, may have promoted genetic differentiation between the two closest subpopulations.



Habitat niche breadth predicts invasiveness in ascidians

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A major focus of invasion biology is understanding traits associated with invasion success. Most studies assess these traits in the invaded region, while only few compare invasives to the pool of potential invasives in their native region. We focus on the *niche breadth hypothesis*, which is commonly evoked but seldom tested, which states that generalist species are superior invaders since they are capable of thriving under a wide set of conditions. Based on the introduction of tropical species into the Mediterranean via the Suez Canal, we define ascidians in the Red Sea as the pool of potential invasive species. We then determine whether invasive ascidians differ in their traits from these species. We constructed unique settlement plates, each representing six different niches, to assess ascidian niche breadth. Plates were deployed in similar habitats in the native and invaded regions. Invasive ascidians identified on plates in the Red Sea demonstrated a wider niche breadth than non-invasives ascidians, supporting the *niche breadth hypothesis*. We suggest that such patterns may often be obscured when conducting trait-based studies in the invaded regions alone. These findings indicate the potential of screening species in their native regions for niche breadth in order to estimate invasiveness potential.



Some of my best friends are conservationists... analyzing trends in conservation publications from Israel

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The recently developed field of scientometrics aims to elucidate the manner in which we conduct science, highlighting gaps, trends and needs of the scientific community. Here we explored various aspects of conservation-related scientific publications, in order to uncover temporal, topical and institutional patterns of conservation science in Israel. We further explored the co-authorship network constructed from these data. We extracted 953 conservation-related publications from ISI Web-of-Science's Core-Collection, using 17 conservation terms as 'Topic' and Israel as 'Country'. These publications span 30 years, and include 881 unique authors. Publication number increases greatly in recent years, following global trends, and Israeli journals feature prominently among the outlets. Recent years also show an increase in large collaborations, predominantly with authors from abroad – mostly with the US, Australia, and Mediterranean countries. Israeli institutions focus on different topics in their conservation related publications. The publication network constructed using Israeli authors as nodes is scale-free and contains a giant component which includes 2/3 of authors. This indicates a fairly well-connected network with many central 'hubs', distributed between institutions. Major Israeli institutions differ in network centrality measures. Put together, we highlight the peculiarities of the Israeli conservation science undertaking, and suggest future directions for improvements.



Beyond Active Management - 3 lessons from 30 years of active conservation in Ramat Hanadiv Nature Park

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Complex interactions exist between objective scientific data, their interpretation and applied meanings. Ramat Hanadiv, a privately-owned Mediterranean Nature Park in Northern Israel, is managed according to the “adaptive management approach”, followed by a long term monitoring program (LTER). Within this framework, vegetation structure, diversity of selected biological groups, flagship species and re-introduced species are monitored routinely as a basis for educated decision-making. Management operations include cattle and goat grazing alongside rare, out-breaking and invasive species management. Thirty years of applying the active management approach in the park, aimed to conserve its biological assets, among other goals, resulted in three main lessons: (1) Scientific knowledge is never sufficient, hence most management decisions are not objective but value-driven; (2) Highest ecological values exist in the most disturbed habitats; and (3) No park (or reserve) is an island! The community is and should be a central player in most management decisions. Our experience emphasizes the need to develop scientific concepts that will provide better understanding how different perceptions and values affect interpretation of scientific knowledge and its application in management decisions.



Can vulture movements at different scales predict their survival?

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Vulture populations worldwide are declining rapidly, highlighting the need to ensure their persistence and the ecosystem services they provide. Because the scale of movement is known to affect individual fitness, we investigated if it could predict survival in a population of Griffon vultures (*Gyps fulvus*). Vultures soar over large areas in search of food and occasionally for breeding opportunities. We hypothesized that survival should not be strongly affected by the scale of the performed movements due to the low cost of movement and the low risk of predation for our study species. By GPS-tracking ~100 individuals during 2009-2016 (375±120 days per individual; mean±std) we obtained survival data and characterized the local and large-scale movements of vultures and intensity of use of protected areas in Israel. Mortality rate was largely explained by anthropogenic effects (~50%) and was spatially spread with no clear structure. Vultures in their first year covered greater distances and showed lower survival rates compared to adults. This finding, combined with the low breeding success in the local population, explains its low level of recruitment. Documenting extensive movements at the regional and larger scales highlights the challenge of conserving such wide-ranging species and calls for developing large-scale conservation efforts.



Biological assessment as a supporting tool for the management of aquatic fluvial systems in Israel: Lake Kinneret catchment as a first model

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Sound biodiversity protection relies on well-established taxonomic and ecologic knowledge. Aquatic biomonitoring is well established worldwide for determining the ecological state of aquatic habitats. In Israel such approaches are still minimal. The goal of the Israel National Aquatic Center is to support decision makers by providing the ecological information on stream ecosystems. Here we present Israel's first river-basin biomonitoring program, using the Lake Kinneret catchment as a model. The procedure comprised of 4 steps: stream typology, stressor gradient, macroinvertebrate analysis, and bio-indicator evaluation. Typological work identified 11 stream types, ranging from temporary calcareous and basaltic streams to large perennial sections of the Jordan River. Common stressors are mostly linked to excessive water use, cultivation, recreation, and grazing. We identified over 130 taxa of macroinvertebrates (n=50 sites), including endemic species, such as beetles, stoneflies, caddisflies and snails. Results generally indicate that the biota is in good ecological status, though influenced from geomorphological features, e.g. elevation, stream size and geology. The outcome of the study will enable prioritising management practices for the protection of aquatic systems and their communities, while providing essential knowledge on the spatial distribution and habitat requirements. We intend to further develop this biological monitoring scheme throughout Israel.

Agriculture practices supporting biodiversity conservation in Israel: A meta-analysis



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Farmlands can play an important role in supporting biodiversity conservation. The aim of this study is to identify wildlife-friendly farming practices, which may be incorporated into Israeli farms, given the local climate, biodiversity, and the prevalent agricultural branches. We focused on identifying scientific evidence for the contribution of various agricultural practices - considering the fragile economic condition of Israel's agricultural sector. An additional aim was to identify knowledge gaps and directions for future research. A meta-analysis of 110 Mediterranean studies was conducted, 17 of which carried out in Israel, and included quantitative evaluation of the influence of agricultural practices on the conservation of various taxonomic groups. 17 biodiversity-supporting agricultural practices were identified. The practices found to contribute to conservation in the largest number of studies are conserving natural patches in agricultural areas and cover crops. 34% of the studies dealt with bird conservation in farms (none of them in Israel), while only 3% dealt with reptiles and amphibians. Only 2% of the studies dealt with vegetables farms, whereas vegetables comprise 14% of the farming sector in Israel. This study provides a tool to support decision-making processes in identifying practices that should be promoted by biodiversity and agro-ecology policy.



Truth or rare: Habitat preferences, distribution modeling, and activity patterns of

Ophiomorus latastii

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Ophiomorus latastii is a rare and understudied skink listed as ‘critically endangered’ in Israel’s RedList. In this work we aimed to study its distribution, habitat preference and activity patterns. We conducted field surveys throughout Israel during 2016 to uncover new presence locations, and gain insight on its abundance, diurnal and annual activity patterns. We further conducted a habitat suitability model using all of its known localities in Israel and 12 environmental variables, by employing a maximum entropy method. Altogether we had 150 sightings throughout the year, predominantly on or near rocky hills, in flat areas with high porosity soil. We found *O. latastii* to be active throughout the day, also during summer, and emerge to upper soil layers following rainfall. Our model accurately identified its known distribution centers and highlighted new potential suitable habitats. It identified soil, precipitation and slope as the main predictors of the skink’s distribution. We highlight the region of Lahav as the potential core of the Israeli population with greatest abundance. Nevertheless, suitable habitats in this region are not protected by law. In order to safeguard the prolonged persistence of this rare species, immediate measures need to be taken to ensure this region is not developed.



Mismatch between habitat science and habitat directive – lessons from the French (counter) example

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The European Habitat Directive encompasses a conservation policy devoted to conserve habitats rather than single species. This ambition has strong ecological justifications, and inspires other initiatives such as the IUCN red list of ecosystems. Evaluating this policy is therefore pivotal to identify and reproduce best practices. However, the habitat aspect of this policy has so far not been systematically assessed. To make up for this lacuna, we take advantage of decision-aiding methodologies to introduce a new normative framework. According to this framework a conservation policy is positively evaluated if it contributes to conservation, is science-based, operational and legitimate. Based on an exploration of the published literature and unpublished reports and databases, we identify knowledge gaps plaguing the European habitat conservation policy. We argue that, due to these knowledge gaps, the contribution of this policy to the conservation of habitats is unproven, it is not science-based, not operational and not legitimate. Our study draws heavily on the French implementation. Analyzing this example, we highlight knowledge gaps that carry lessons for European conservation policies as a whole, but also for conservation initiatives focused on habitats in a broader geographical and political context. We then identify concrete means to strengthen habitats conservation policies.



The effect of artificial light on the drinking behavior of desert-dwelling bats

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Desert-dwelling bats constitute more than half of the mammal species in the Negev Desert and are, by far, the most numerous nocturnal predators in these regions. Most bat species are endangered for many reasons, such as loss of foraging habitat, human disturbances at roosting sites and light pollution. 88% of the desert-dwelling bats (17 species) use bodies of open water for drinking, and the frequency of drinking events increases towards the lactation period and in summer when these resources become scarce. Several species of the desert bat fauna are also negatively affected by artificial lights. As a result, the accessibility to drinking sites may be prevented if these sites and the surrounding areas are illuminated. In the present study, we illuminated three active drinking sites in the Negev and in the Dead Sea area, and compared bat drinking activity in lit vs. unlit sessions. We found that artificial illumination significantly decreased the drinking activity of most bat species and, particularly, of desert-dwelling bats. Given the importance of open bodies of water for drinking and foraging by bats and other desert fauna, illumination of such sites should be prohibited or at least mitigated when strictly necessary, for example, for security reasons.



The Effects of the Historical Land Cover Change on Biodiversity in Israel

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Israel's landscape has changed dramatically over the last century with the increase in human land use, which is known to cause loss, modification, and fragmentation of habitats. In Israel, land use and cover change (LUCC) occurred along a climatic gradient as Israel includes several climatic zones in a relatively small area. One of the questions is whether a set of species adapted to a certain climate may be affected differently by the degree of LUCC (e.g. Mediterranean species vs arid species). In this study we aimed to understand how animal species, under different climates, respond to the historical changes in the Israeli landscape. We created a land cover dataset for several periods between 1950 and 2010 along the Mediterranean-arid bioclimatic transition zone from aerial photos, satellite images and historical maps, and measured the impact of LUCC on animal habitats. We show that although the largest landscape transformation occurred along the Mediterranean region, arid and semi-arid species suffered from the greatest habitat loss. This spatial evidence offers a better understanding of the role of land cover in the distribution of species from different climatic regions and can serve as a basis for future planning decisions.



Global invasion in progress – the current and putative distribution of the common myna (*Acridotheres tristis*)

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Invasive species pose a threat to the natural environment, raising global conservation concerns. The common myna (*Acridotheres tristis*) is considered one of the most successful avian invaders in the world. Its native distribution includes South Asia and the Indian subcontinent, but it has now successfully invaded many countries including Australia, USA, South Africa and more. The goal of our research was to determine the current global distribution of the myna and illuminate the factors influencing it. In order to do so, occurrence data was collected and a range map was generated. Biotic, a-biotic, topographic and anthropogenic factors were examined in order to assess their effect on the current distribution. Subsequently, by selecting locations with similar characteristics, areas suitable for myna occurrences were identified and mapped using a Species Distribution Model. The results indicate a dramatic expansion in invasive common myna distribution worldwide. Various environmental factors, particularly urbanization, were found to be correlated with its current distribution. Additionally, new areas were determined as suitable for colonization by this species, hence being at risk for future invasion, should no prevention steps be taken. The results of this study identify susceptible habitats for common myna invasion, and perhaps for other successful invaders.



The global distribution of reptiles and its relevance for land vertebrate conservation

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Conservation of species relies on our knowledge of where they reside. To-date, most large-scale conservation planning for all biodiversity has been predominantly based on the distributions of amphibians, birds, and mammals. These taxa have particular ecologies and physiologies, which may be relatively rare in other animals. We map and analyze for the first time the global distributions of all reptiles, comprising a third of land vertebrate species. We show that overall diversity patterns, range-restricted richness, and richness hotspots for lizards and turtles differ from those of other tetrapod groups. Existing protected areas, and regions designated for conservation globally represent reptiles poorly compared to birds and mammals. Adding reptile distributions to a prioritization scheme for all tetrapods reveals many new locations that become important for conservation, predominantly in arid, grassland, and savannah habitats. Overall, the unique distribution patterns of reptiles require additional conservation attention in regions previously under-prioritized, in order to secure the prolonged persistence of all land vertebrates.



Impact and adoption of Mediterranean fruit fly regional integrated pest management

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Environmentally friendly agricultural practices are vital for conservation, both globally and in Israel, where agriculture comprises a major part of open landscapes. IPM (Integrated pest management) is an environmentally effective method for optimization of pest management activities, but it is often difficult for farmers to adopt since it requires significant trust, additional professional knowledge and attention. Wide area management is a new IPM approach which utilizes information gathered from large number of farmers for decision support and thus increases IPM efficacy and assists in gaining farmers' confidence and cooperation. We analyzed the impacts of the regional management project of the Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann), in 5,000 deciduous plots in Northern Israel from 2012-2016, providing a unique evaluation of regional IPM at such large spatio-temporal scales. The results demonstrate that establishing a high level professional regional advisory and scouting team and gradually promoting sustainable practices among farmers can provide them with confidence to follow expert suggestions and IPM practices. Improving farmers' participation allowed replacement of aerial spraying with pesticide-free mass trapping in about 70% of the project region, while also reducing pest infection rates among farmers who fully followed the advisory team instructions.



Israel's role in multilateral wildlife conservation treaties

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Since the 1960s, the world has increased international cooperation for conserving species and ecosystems. The UN members have adopted numerous multilateral environmental agreements, many related to wildlife conservation. Israel's international policy is to engage fully in multilateral fora. Israel has become an important pro-conservation party in international wildlife conservation treaties. Israel Nature and Parks Authority representatives are in leading roles in the CITES Convention on endangered species trade, placing Israel firmly amongst the pro-conservation bloc with USA, Kenya and India. Israel's geographic position makes it tremendously important for migratory bird conservation, and Israel is actively involved in the Convention on Migratory Species, the African-Eurasian Waterbirds Agreement and EuroBats treaties. Known for its protection of marine species, Israel is active in the Biodiversity Protocol of the Barcelona Convention (for protection of the Mediterranean Sea), and the work of the ACCOBAMS treaty on Mediterranean cetaceans. As globalization escalates concomitantly with increases in mobility and international air trade, there's been global elevation of invasive alien species threats to biodiversity such that preventing their spread is a primary goal of the Convention on Biodiversity (CBD). To achieve CBD targets, Israel needs better mainstreaming of biodiversity policy.



Dividing the Negev into ecological units

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Israel's Nature and Parks Authority divided Israel into 23 natural terrestrial ecosystems, to be used as a working tool for the authorities to identify under-protected and threatened ecosystems, establish planning priorities, advance protection plans, and serve as a basis for management and monitoring procedures. This national scale mapping was found to be too coarse at the regional level management and conservation efforts in the arid area of Israel, the Negev. We therefore conducted a more detailed characterization and mapping of this region, based on the collection, analysis and integration of existing literature, databases, landscape surveys, available GIS layers, remote sensing aids, and two rounds of expert workshops. Five major ecosystems were defined, based on the strongest identified ecological factor: two based on the amount of precipitation – Arid desert scrublands and Hyper-arid desert; and three based on soil composition – Internal sandy patches, Loess patches and Salinas. These were subsequently divided based on geography, geology, pedology, geomorphology, landscape and botany. Botanic characterization included: general vegetation forms; and lists of dominant, endangered, rare and endemic species. This work will be used to conduct detailed statutory planning of future protected areas, prepare monitoring programs and conduct efficient management steps at the Negev open landscapes.



Detection of *Bd* in amphibians in northern Israel – Is it an alarm call for amphibian conservation in Israel?

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Chytridiomycosis, an infectious disease caused by *Batrachochytrium dendrobatidis* (*Bd*), is now considered a significant driver of global amphibian declines. So far, the impact of *Bd* on the seven amphibian species occurring in Israel has not been studied. In order to assess the threat of this fungal pathogen to Israel's amphibians, particularly to the unique Hula painted frog (*Latonia nigriventer*), we conducted a first *Bd*-screening in northern Israel. We further analysed the skin microbial communities and the innate immune defences of *L. nigriventer* as some individuals were found to be infected by low loads. Fortunately, the species showed no signs of the disease, and our preliminary data suggests that the skin mucosome of *L. nigriventer* contains antimicrobial peptides and bacteria belonging to species or genera known to produce anti-*Bd* metabolites. However, even though this species did not appear to be imminently threatened by the *Bd* genotype present in northern Israel, nothing is known about the defensive potential of any of the other Israeli amphibians. Against the backdrop of the high number of enigmatic declines caused by this pathogen, a more comprehensive, Israel-wide study on *Bd* remains indispensable.



Balancing Ecosystem and Threatened Species Representation in Protected Areas and Implications for Nations Achieving Global Conservation Goals

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Balancing the representation of ecosystems and threatened species habitats is critical for optimizing protected area (PA) networks and achieving the Convention on Biological Diversity strategic goals. Here we provide a systematic approach for maximizing representativeness of ecosystems and threatened species within a constrained total PA network size, using Australia as a case study. We show that protection of 24.4% of Australia is needed to achieve 17% representation for each ecosystem and all threatened species habitat targets. When the size of the PA estate is constrained, trade-off curves between ecosystem and species targets are J-shaped, indicating potential “win-win” configurations. For example, optimally increasing the current PA network to 17% could protect 9% of each ecosystem and ensure that all threatened species achieve at least 78% of their targets. This method of integrating species and ecosystem targets in PA planning allows nations to maximize different PA goals under financial and geographical constraints.



Phenotypic plasticity and local adaptation in response to pool desiccation by *Salamandra infraimmaculata* larvae from permanent vs ephemeral breeding habitats: Conservation Implications

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Drought can result in high mortality to amphibians in breeding sites. Depending on the habitat type (ephemeral or permanent) amphibian larvae might develop plasticity in time to metamorphosis (especially in ephemeral habitats), and/or local adaptation. Here, we assessed for the ability of the endangered *Salamandra infraimmaculata* larvae originating from different habitat types to react plastically to pond desiccation cues and to determine whether populations are locally adapted. Using a common garden experiment, salamander larvae from ephemeral and permanent ponds were kept under two different water-level regimes (constant or decreasing). Time to metamorphosis was significantly shorter and survival was significantly lower for both habitat types under the decreasing water-level regime in comparison to the constant water level regime. For wet mass at metamorphosis, there was no significant main effect or interaction. Snout-vent length was significantly larger in both larvae originating from permanent habitats had significantly longer snout-vent length (SVL) than larvae originating from ephemeral habitats and under the constant water level conditions. Our results show that larvae from both habitat types are able to react plastically in response to water level regime to avoid death from desiccation. Finally, the significant difference between origins nested within habitat type indicated local adaptation.



Ecology and Evolution of Conservation of Non-Protected Open Space in Israel

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Over the last three decades the Open Landscape Institute (OLI), in collaboration with other conservation organizations, has been engaged in a comprehensive operation to incorporate conservation policy and practices of non-protected open space into Israel's national agenda. The activity has been focused on natural and agricultural open spaces not under statutory protection, aimed at maintaining their biodiversity, ecological features and their cultural landscape character. The activity has concentrated on incorporating conservation policy into the fields of planning, land management and rural and agricultural land-use. The challenges have been coped with by collecting and analyzing data and knowledge by conducting nature and landscape surveys and applied research that led to consolidate recommendations for sustainable land-use policy and tools. These efforts have contributed to some significant breakthroughs. The very term 'open spaces' is now well recognized by decision-makers and the public. The planning system incorporates the need to protect open space in its policy and planning schemes. Many of OLI recommendations were assimilated into the land management legislation by including the commitment to protect open areas and through the creation of the Open Land Protection Fund which allocates by law 1% (about 70 million NIS per annum) of the state's income from land development to conservation projects. There is still a need to better implement the new policy and practices, but the fact that they are now anchored in legislation and regulation pave the way to achieving better protection of the limited open space left in Israel and the precious natural and cultural legacy enveloped in its landscape.



Wildfire management In Mount Carmel; Spatial and socioeconomic characteristics of goat herding

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Goat grazing is an efficient and cost-effective tool for wildfire management in Mediterranean regions. Following recent wildfire events, targeted goat grazing for wildfire management was recommended as desirable solution on Mt. Carmel. However, the small number of goat herds and the poor knowledge on their spatial distribution makes this a challenging task. Our research aimed to identify the main characteristics of goat flocks on Mt. Carmel, considering current grazing patterns, stocking rates, spatial and socioeconomic traits of goat herding. Grazing density and spatial distribution of 14 goat flocks was monitored using GPS collars and included interviews of flock owners. We estimated that there are around 1300 goats altogether with a mean flock size of 93 ± 20.2 goats. We identified two main grazing strategies: flocks lead by a dominant shepherd and flocks escorted only by shepherd dogs. These two strategies that may be based on cultural differences, differed in pasture use intensity. We suggest a new approach for assessing the potential of grazing services that can be provided by local goat flocks. The understanding of the different grazing strategies and the socioeconomic traits can be used to direct appropriate management for different scenarios.



Responses of *Salamandra infraimmaculata* larvae from diverse aquatic habitats under manipulated dissolved oxygen conditions

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Dissolved oxygen (DO) that varies spatially and temporally in surface water also due to anthropogenic perturbations. When DO drops below levels necessary for sustaining aquatic life, it becomes a significant water quality impairment. The Near eastern fire salamander (*Salamandra infraimmaculata*), an endangered species in Israel, can be affected by DO concentrations. The species breeds in Israel in water bodies that range from ephemeral ponds, where DO levels can fluctuate drastically daily and seasonally, to permanent streams, where DO levels are mostly constant and near saturation. We tested inter-population variation in larval response to different concentrations of DO. We exposed larvae collected from populations occupying three habitat types (flowing streams, permanent ponds, and ephemeral ponds) to high or low DO concentrations. Larvae exposed to low and high DO significantly increase and decrease their gill size respectively. Gill size change differed significantly between habitat types but not between populations within the same habitat type. We found no interaction between DO treatment and habitat type. Results suggests that larvae across the geographic region and the habitat types sampled are both adapted to local DO conditions and plastic in their ability to respond to variations in DO through rapid change in gill size.



Biodiversity patterns in an agricultural landscape: Can uncultivated field-margins help conservation?

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Maintaining food supply at least cost for conservation is one of the greatest challenges in conservation today. For over two decades now, the EU is subsidizing the implementation of agro-environmental practices to create multifunctional agricultural ecosystem. While mounting empirical evidence demonstrates that these efforts are fruitful in temperate Europe, little is known about their effectiveness in Mediterranean environments. Here we explore the potential contribution of one of the most commonly used practices in Europe, uncultivated field-margins, as mean to promote ecological corridor in Emek-Harod valley (IL). Emek-Harod is located in an intensive agricultural area with few semi-natural patches that separates two important ecoregions in Israel. We conducted a landscape-scale ecological survey to evaluate biodiversity in common agro-ecological land-uses for five taxonomic groups throughout the agricultural season. Our results indicate that uncultivated field-margins are highly biodiverse, despite suffering from high disturbances. In some cases field-margins contribute more to biodiversity than large semi-natural patches. Yet, field-margins are not equally important for all taxa and their relative importance varies with agricultural activity throughout the year. These results indicate that field-margins can help promote ecological corridors in agricultural areas in Israel, but we must consider focal species and their seasonal dynamics in corridor planning.



Realizing marine conservation in enclosed marine infrastructure areas

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Growing human population increasingly requires resources from the marine environment. As a result, conservation of the marine environment faces many challenges from coastal infrastructures which greatly and negatively affect the marine environment. The goal of this study is to integrate marine conservation in areas dedicated to infrastructures, and thus provide support for marine ecosystems rather than degradation. We examined enclosed infrastructures along Israel's Mediterranean coastline, where public access is limited and which are typically viewed as threats to the marine environment. We used Ecopath with Ecosim ecosystem modelling program to examine various infrastructure management scenarios and their potential contribution to marine conservation. Based on the results, we developed marine spatial planning approach which aims to find ways to meet development needs while enhancing marine conservation through improved policy. Management scenarios examination suggests that enforcement of existing access prohibition regulations will maintain vulnerable species abundance and therefore may contribute to increase connectivity within a network of existing and proposed marine protected areas along the coast. The results may contribute to sustainable development and ecosystem-based management, both important to the field of marine spatial planning, as they demonstrate a unique approach to operationalize marine conservation beyond that provided by marine protected areas.



Differences between vacant and occupied burrows of *Uromastyx aegyptia*

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Burrows of the herbivorous lizard *Uromastyx aegyptia* are crucial for their survival, providing shelter from the elements and predators. Excavating new burrows is expensive and risky. Lizards often attempt to take-over burrows or use abandoned ones. Assuming that the best burrows are occupied, we characterized the variation within vacant burrows to detect those that are most similar to occupied ones. Our objective was to distinguish active from vacant burrows and to indicate which of the vacant burrows are most suitable for release of translocated *U.aegyptia*. We classified 182 burrows in Northern Arava valley into occupied, vacant-open and collapsed. We recorded various burrow characters: dimensions, direction, and distances to plants, wadis and other burrows. Occupied burrows differ from all the rest – collapsed, open vacant burrows and from random points. Occupied burrows are in unique spots, seldom found randomly in the study site and some of them may have been used by many generations of lizards. Occupied burrows are characterized by wide visual-fields and proximity to small wadis. Collapsed burrows are often far from edible plants. Among vacant open burrows (20% of all burrows) and collapsed (27%) there are suitable sites for release of translocated lizards, quite similar to occupied burrows.



Cascading shifts in diel activity cause invisible fragmentation in an open landscape

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Human activity poses novel risks and opportunities for wildlife, potentially altering species' behavior and demographics. Behavioral changes in one species may promote direct or indirect trait-mediated interactions (TMI or TMII, respectively), which extend the effects to other species in the community. Specifically, human-induced shifts in wildlife spatio-temporal activity patterns may alter species interactions and reduce co-existence, with impacts to landscape permeability. However, how such changes affect wildlife communities is still poorly understood. We used remotely-operated cameras to measure the activity of five co-occurring mammal species along a disturbance gradient in an agricultural-natural matrix. We find that carnivores shifted activity to areas of increased human influence, but avoided humans temporally by restricting their activity to nighttime, thus increasing predation risk to nocturnally-active prey. Combined with perceived risk from humans during daytime, this resulted in prey exclusion from large areas of the agricultural matrix. Human activity thus triggered a cascading effect, mediated by predator behavioral changes, which reduced landscape permeability to the point of fragmentation. These results underline the need to consider wildlife temporal activity patterns in conservation and land management planning.



Effect of rural settlements and agricultural fields on local bird distribution and community structure

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Rural anthropogenic activities can have substantial effects on the natural environment. In Israel, many such activities are nested within important natural ecosystems, but knowledge is still missing about the direct effect they pose on these ecosystems. Moreover, whether these activities affect different ecosystems and habitats in different manners is even less understood. We report here on the effects of rural settlements and agricultural fields on local bird communities from five ecosystems unites across Israel, as part of Hamaarag's National Terrestrial Biodiversity Monitoring Program. We observed differences between bird communities close to- and far from- anthropogenic activities in all five ecosystems. These differences were attributed mainly to increase in commensal, generalist species, and decrease in local, specialised species, in sites close to the activity. In some cases, commensal and invasive species were also found in sites far from the activity, whereas local characteristic species were scarce or absent altogether. These findings are the first unified observation on the effect of rural anthropogenic activities in varied ecosystems and habitats across Israel. The results show that these activities negatively affect all ecosystems, and that further development projects should take these effects into consideration, regardless of the nature of the surrounding environment.



A novel, spatial, data-driven assessment tool for updating the Israeli Red-list of breeding birds

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Regional Red-Lists are crucial for planning and prioritizing conservation efforts at the national level. We developed an online, computerized assessment tool to update the Israeli Red-List of breeding birds (last updated 2002). This tool includes an algorithm that determines the IUCN Red-List categories for species using standard criteria based on species spatial distribution, abundance and calculated trends of these parameters. The algorithm takes into account regional adjustments according to IUCN recommendations. Spatial distribution of birds was constructed for different decades using both filtered field-sightings (for quality and breeding period) and grid-based scorings gathered from 33 experts using a web-based geographic platform for species assessment. The tool provided transparent, automated Red-Listing for 208 bird species and revealed new findings, such as the superior performance of expert scorings, relative to existing raw field-sightings data, in reflecting species distribution and/or abundance trends. This project demonstrates the applicability of an automated mechanism for regional conservation status assessment based on a species' actual demographic and distributional data over time. The combination of cutting-edge information technology and multi-source data input will greatly improve real-time conservation assessments, which is essential for effective conservation policy in the face of rapidly changing threats for local avifauna.



Movement patterns unravel variability in resource selection of the Asiatic Wild Ass

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Understanding the response of wildlife movement patterns to natural resources is crucial for conserving essential habitats for species. However, resource selection varies with climate, changing landscapes, and time scales. We studied resource selection of a globally endangered species, the Asiatic Wild Ass (*Equus hemionus*), by examining its movement patterns in response to environmental variables across diurnal and annual temporal variation, and across individual variation (sex and reproductive state). Specifically, we compared movement direction and speed in response to climate, topography, vegetation, water and human disturbance. We marked seven individuals (four males and three females) with GPS-GSM collars that recorded location every hour. We used step selection function (SSF) and logistic regression on speed. *E. hemionus* preferred regions with water, high vegetation cover and high precipitation, and walked closer to roads and trails. As expected, movement speed was slower in landscapes rich in resources and on surfaces that impede movement, such as steep slopes. Temporal variation in resource selection reflected the behavioral patterns and the ecological importance of each resource across seasons. Our method, combining SSF with movement speed, contributes to detecting important habitats of populations and assists in the management of resources vital to an endangered species.



One size does not fit all – the complex relationship between wellbeing and biodiversity

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Urbanization increasingly separates people from nature, affecting the way they benefit from it and their willingness to conserve it. Conserving biodiversity in cities was proposed as a win-win solution to jointly achieve ecological and social objectives. We explored how urban biodiversity provides wellbeing benefits for visitors of public gardens in Netanya by sampling birds, butterflies and plants in 24 public gardens and conducting 600 semi-structured interviews with visitors. Interviews examined nature-related subjective wellbeing, relatedness to nature, perceived species richness and ecological knowledge. Linear models were used to investigate the relationships between these measures, while accounting for demographic variables. Relationships between measures of wellbeing, sampled and perceived species richness were found to be mediated by respondents' level of connectedness to nature. Thus, people who perceived themselves as more connected to nature benefited more from species-rich gardens, while there were no, or even negative effects of species richness on wellbeing benefits for people who were less connected to nature. Our results demonstrate that the relationship between biodiversity and wellbeing is not as straightforward as commonly argued and suggest that enhancing biodiversity in cities might not suffice to align the agendas of public health and species conservation.



Poster Presentations





Environmental effects on female group size and genetic relatedness of the Asiatic Wild Ass (*Equus hemionus*)

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Conservation of Equids is ominous, with six out of seven extant species ranging from threatened to critically endangered. Recent climate change and desertification projections raise conservation concerns towards desert dwelling equids. Such populations, especially lactating females need to cope with patchier, more unpredictable resource distribution. Females live in highly variable fission-fusion groups, which were hypothesized to plastically adjust to the environmental conditions, affecting both individuals' and groups' fitness. We examined internal and external factors that may affect female group size variability in the reintroduced population of the endangered Asiatic wild ass (*Equus hemionus*) in the Negev Desert, Israel. Two environmentally different wild ass subpopulations were sampled using direct observation of female groups, by Unmanned Aerial Vehicle and GPS collared individuals. Additionally, to examine the genetic effect on the social dynamics, fecal samples were collected from observed groups and DNA was extracted and amplified using nine microsatellite markers and a mitochondrial sequence. Results show that neither genetic relatedness nor maternal kinship affect female wild ass group size; yet differences in demography, environment, ectoparasite load and reproductive state do. This study could point conservation planners towards the factors that affect arid inhabiting equid societies, especially in light of global climate change.



Conflicting effects of invasive common mynas (*Acridotheres tristis*) on foraging and nesting behaviors of native house sparrows

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Although the Common myna is an aggressive species that was introduced to many parts of the world, little is known about its influence on native species' behavior. This study examines the influence of the presence of mynas on the foraging and nesting behaviors of house sparrows. Using a video camera the vigilance of foraging sparrows was quantified in the presence and absence of mynas. The influence of mynas on the nesting behavior of sparrows was also examined by placing a Myna decoy near sparrows' nests while the nestlings were being fed. Using a captive sparrow's colony we measured its breeding success in the presence and absence of mynas. Surprisingly, in the field, sparrows that foraged alongside mynas were less vigilant than sparrows that foraged without mynas. On the other hand, when presented near the sparrow nest, the myna's decoy decreased nestlings feeding rate. Furthermore, breeding success was significantly lower alongside mynas compared to the control. Thus, our results suggest that sparrows perceive their environment as safer when foraging alongside mynas, but treat mynas as threat when encountering them in the vicinity of their nest. Consequently, invasive mynas may improve the foraging success of native sparrows but reduce their breeding success.



Mapping wildfires in Israel

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Wildfires occur frequently across Israel, and while moderate fires can have a positive effect on biodiversity, large-scale fires may damage habitats severely. To map the spatial and temporal occurrence of wildfires over Israel 16 years of remote sensing data were used. The extent of burned area was mapped from MODIS MCD45 collection 5 product, and analyzed along with land-cover data derived from LANDSAT 8. Results show that wildfires occurred mainly in grasslands and shrublands, recurring yearly at many places. Wildfires in Mediterranean maquis and planted forest had an average smaller area and their occurrence frequency was lower. MODIS fire product is known to underestimate the extent of burned area because of its low spatial resolution. A case study comparing MODIS product with burnt area derived from higher resolution sensors (LANDSAT 8 and SENTINEL 2) is shown and discussed. While the higher spatial resolution sensors can map the burned area more accurately, the strength of the MODIS product lies in its high temporal resolution. We conclude that a synergy between several sensors is needed.



Microplastic fibers in the intertidal environment surrounding Halifax Harbor, Nova Scotia, Canada

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Humans continue to increase the use and disposal of plastics by producing over 240 million tons per year, polluting the oceans with persistent waste. The majority of plastic in the oceans are microplastics (<5 mm). In this study, the contamination of microplastic fibers was quantified in sediments from the intertidal zones of one exposed beach and two protected beaches along Nova Scotia, Canada's Eastern Shore. From the two protected beaches, polychaete worm fecal casts and live blue mussels (*Mytilus edulis*) were analyzed for microplastic content. Store-bought mussels from an aquaculture site were also analyzed. The average microplastic abundance observed from 10 g sediment subsamples was between 20 and 80 fibers, with higher concentrations at the high tide line from the exposed beach and at the low tide line from the protected beaches. Microplastic concentrations from polychaete fecal casts resembled concentrations quantified from low tide sediments. In two separate mussel analyses, significantly more microplastics were enumerated in farmed mussels compared to wild ones (~180 fibers/ mussel compared to ~110 fibers/ mussel, respectively). This research is relevant to the development of the health and safety of aquaculture industries. Future studies should investigate the health impacts of microplastics and the contaminants they harbor.



Marine citizen science: divers survey marine litter in the seabed of the Israeli Mediterranean

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Marine litter is a growing global problem, posing a great threat to both marine ecosystems and humanity. However, knowledge on marine litter is very limited. Many recreational divers are enthusiast for marine conservation and can thus contribute to marine litter data collection which doesn't require high scientific skills. The Society for the Protection of Nature in Israel together with the Israeli Diving Federation established the divers volunteer program '*Mishmar hayam*' (sea guard), which supports marine conservation through citizen science. Divers are trained in marine ecology and survey methods. Volunteers then conduct surveys which quantify and categorize marine litter using UNEP standards. Initial surveys indicated that plastic was the most common material, up to 84%. There is a high correlation between the coastal use, and marine litter recorded, suggesting that most litter originates from the adjacent coast; in Givat Aliya for example (previously used as a dumping site for building materials), there was a larger proportion of construction materials, and Caesarea port (popular fishing area) had more fishing related litter. The information collected by the divers, helps mapping the extent of marine litter along the Israeli coast, and is crucial to understanding its origins and finding solutions for the problem.



Relevance of new natural history insights on conservation planning for a once lost frog

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Despite the fact that the recently rediscovered Hula painted frog (*Latonia nigriventer*) has lately been identified as the sole relict of a clade that was thought to have gone extinct during the Pleistocene, this species has remained one of the rarest and most poorly understood amphibians worldwide. In order to be able to formulate precise conservation strategies, we gathered data on multiple aspects of the Hula painted frog's natural history. Our surveys confirmed that *L. nigriventer* is a localised species with elusive habits. The species appears to follow an opportunistic breeding phenology and has a tadpole morphology similar to its well-studied sister group *Discoglossus*. However, the adults' extended annual presence in the aquatic habitat is a major difference from species of *Discoglossus* that mostly breed in ephemeral water bodies. The revelations that *L. nigriventer* exhibits a relatively low dispersal ability and strongly depends on aquatic habitats, should guide future conservation planning. To date, most of the canals within its distribution range are only aquiferous during the rainy season when the species appears to be less active. Newly created permanent canals in close vicinity to each other could offer this ancient frog species more suitable alternatives and may even enhance dispersal.



Long and wide negative effect of the locust spraying in the Negev sand dunes

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Swarms of locusts (*Schistocerca gregaria*) invaded the Negev sand dunes during the spring of 2013. Four weeks later, tens of millions of locust larvae hatched and spread across the dunes. In order to reduce swarm numbers, pesticides were sprayed over more than 100 km² during the course of six weeks. We examined the impact of the intensive spraying on the terrestrial arthropod community. Arthropod samplings were conducted at springs 2013-2016. Eight sprayed and eight control plots were sampled using 25 pitfall-traps open for 48 hours. 13,000 specimens representing 282 species were collected. No significant differences were found in the arthropod community between the sprayed and unsprayed plots in 2013. However in 2014 and 2015 univariate and multivariate analyses revealed a significant decrease in diversity indices in the sprayed plots. Nevertheless, in 2016 most of the indices become similar again between sprayed and control plots. These findings suggest that there is a lag in the impact of the spraying on the ecosystem and that only after three years it starts to recover. Arthropods constitute a major role in all terrestrial environments and our four-year research provides a better understanding of the response and consequence of severe pesticide spraying on an ecosystem.



Spatial activity of mammals in the vicinity of an unpaved scenic road: effects and recommendations

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Roads affect wildlife via vehicle run-overs, but also as genetic, demographic and behavioural barriers. We studied the effect of an easy car-access, unpaved scenic road, along a segment of the Shikma River central drainage basin on the local mammal community. The aim of the study was to formulate recommendations for the feasibility of constructing an additional road within the river basin. We used trap-cameras to assess mammal activity close to- and far from- the road during winter and spring. We found no road effects on species presence. However, total activity and activity of specific species was negatively affected by the road, mostly during winter when traffic volume was high. Moreover, endangered species, such as the mountain gazelle, were negatively affected by the road during both seasons. Our results suggest negative effects of the road, depending on season and species. We therefore do not recommend on the construction of a second road. If such a road is still considered, a further, thorough research of road effects must be conducted. We also recommend imposing traffic regulations on the existing road, especially when traffic volume is high.



Large, small, or no pattern at all, it's on islands where reptiles fall

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A major extinction event in the Late Quaternary primarily affected large-bodied vertebrate 'megafauna', a trend well documented in both mammals and birds. Similar evidence in other groups, such as reptiles, is however, lacking. We assess the relationship between body size and Late Quaternary extinction in reptiles at the global level. We contrast body size and geographic bias among 82 recently extinct and 10,090 extant reptile species. We further examine these trends among major reptile groups: crocodiles, lizards, snakes and turtles, while testing and correcting for a size bias in the fossil record. Extinct reptiles were larger than extant ones; however, we also reveal varying sub-group trends. Extinct lizards and turtles were large, extinct crocodiles were small and snakes revealed no trend. Extinctions were particularly prevalent on islands, with 73 of the 82 extinct species being island endemics. Body size played a complex role in the extinction of Late Quaternary reptiles. Larger lizard and turtle species were clearly more affected by extinction mechanisms such as over exploitation and invasive species. Insularity was by far the strongest correlate of recent reptile extinctions, suggesting that size-biased extinction mechanisms are amplified in insular environments.



Conservation planning under uncertainty in urban development and vegetation dynamics

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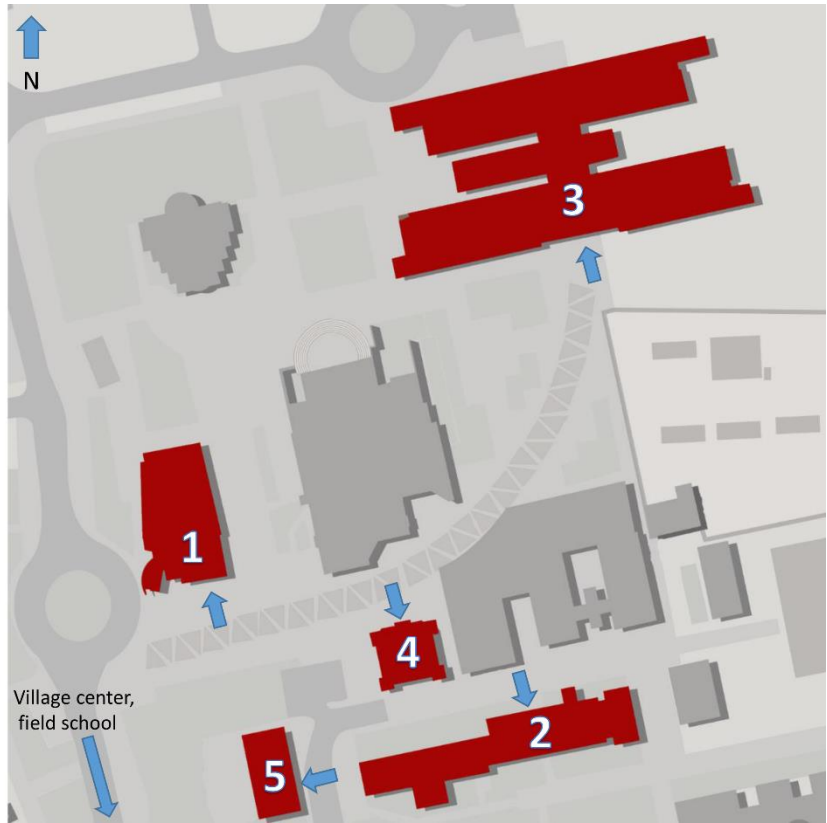
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We compared three approaches for utilizing scenarios in conservation area selection: considering a full set of scenarios (all-scenarios portfolio), assuming the realization of specific scenarios, and a reference strategy based on the current situation (current distribution portfolio). Our objective was to compare the robustness of these approaches in terms of their relative performance across future scenarios. We focused on breeding bird species in Israel's Mediterranean region. We simulated urban development and vegetation dynamics scenarios 60 years into the future using a cellular-automata simulation model. For each scenario, we mapped the species' available habitat distribution, identified conservation priority areas using the site-selection software MARXAN, and constructed conservation area portfolios using the aforementioned strategies. We assessed portfolio performance based on the number of species for which representation targets were met in each scenario. The all-scenarios portfolio consistently outperformed the other portfolios, and was more robust to 'errors'. On average, the all-scenarios portfolio achieved representation targets for five additional species compared with the current distribution portfolio (approximately 33 versus 28 species). Our findings highlight the importance of considering a broad and meaningful set of scenarios, rather than relying on the current situation, the expected occurrence of specific scenarios, or the worst-case scenario.



Conference venue map

- 1) Evens Auditorium – main conference venue
- 2) Seminar room (for parallel sessions)
- 3) Biology building – Room 32 (for parallel sessions), main lobby for poster presentations & social event
- 4) KKL building for lunches
- 5) Student pub





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