

**PROCEEDINGS OF THE
FORTY-FOURTH ANNUAL MEETING OF THE
ZOOLOGICAL SOCIETY OF ISRAEL**

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PROGRAM

Greetings, Prof. J. Tzelgov, President of Achva Academic College
Greetings, Dr. C. Korine, Head of the IZS

SCIENTIFIC SESSIONS

Presiding: Conservation—Chair: A. Bouskila (Ben-Gurion University), Behavior—Chair: S. Markman (University of Haifa), Ecology—Chair: I. Izhaki (University of Haifa), Conservation—Chair: U. Shanas (University of Haifa), Physiology—Chair: Z. Arad (Technion), Marine Biology—Chair: S. Gafni (Beit Berl College), Conservation—Chair: M. Goren (Tel Aviv University), Evolution & Systematics—Chair: D. Por (Hebrew University), Behavior—Chair: G. Bloch (Hebrew University).

GENERAL MEETING OF THE SOCIETY AND CLOSING CEREMONY

Chair of General Meeting: Y. Heller, Hebrew University
Chair of Closing Session: T. Keasar, Achva College

The relation between social environment, neuronal age, and its survival in the brain of the adult songbird

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Some kinds of neurons are spontaneously replaced in the intact, healthy adult brain, but the variables that affect this replacement are not always clear. The aim of this work was to study whether the age of neurons affects their survival when new neurons are recruited in different social environments. To answer this question, male zebra finches were raised to adulthood in a controlled environment, and were then exposed to either a single unfamiliar female (simple social environment) or to 45 unfamiliar zebra finches of both sexes (complex social environment). When exposed to the new social environments, each bird had one of two neuron populations labeled with bromodeoxyuridine (BrdU): 1-month- or 3-month-old neurons. We show that in the Nidopallium Caudale (NC), the age of replaceable neurons and the nature of a social change as well as their rostrocaudal position, determine their survival or death. We suggest that functional correlations of new neuron recruitment and its inferred benefit to the animal might be better perceived when taking into account the position of neurons, their age when lifestyle changes occur, and the nature and magnitude of the lifestyle change.

Diversity of resident and transient fishes within branching corals along a global gradient in regional richness

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Natural communities are composed of two types of species: residents and transients. My aim was to examine whether these species respond similarly to gradients in regional species richness. I sampled fish within branching-corals in three geographically distinct regions representing low, intermediate, and high regional fish diversity. I used a modified species-area relationship (SPAR) to represent the total number of fish species found within the cumulative volume of coral sampled. Each point in the SPAR represents the number of fish species, resident or transient, found within a specific coral species. For transients, I found the SPAR of rich regions to be above that of poor regions, indicating regional influences on local diversity. Moreover, the observed SPAR did not differ from the predictions of a random-sampling null model. In contrast, the SPAR of resident fishes was similar among regions and was lower than that expected from random samples from the regional pool. Consequently, for a given volume of coral the same richness of residents exists in poor and rich regions. These results suggest that higher regional diversity of resident fish is defined by higher coral diversity, indicating that ecological interactions between functional groups (coral and fish) can be powerful drivers of regional biodiversity.

Rare protein changes as a tool to solve Metazoan phylogeny

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Deciphering basal-metazoan relationships is critical to understand the evolutionary changes at the origin of animals. Despite the recent increase of molecular phylogenetic analyses involving sponges and cnidarians, their relationships relative to bilaterian animals are still highly debated. The consensus view, based on rRNA sequences and morphological characters, supports a basalmost position of Porifera among Metazoa. Mitochondrial genes, conversely, support the monophyly of Diploblastica (i.e., Porifera, and Cnidaria). However, the mitochondrial outcome has been considered to be the consequence of a long-branch attraction artifact created by the rapid Bilaterian rate of evolution. Analysis of shared conserved insertion/deletion (i.e., indels) in molecular sequences provides a powerful alternative to sequence-based phylogenetic reconstruction. A high-throughput search was conducted on trace data to identify shared indels present in orthologous protein coding genes of Fungi, Porifera, Cnidaria, and Bilateria. Surprisingly, indel analysis supports the grouping of Porifera with Cnidaria, challenging the classical views of basal Metazoan evolution.

Further studies on the “cosmopolitan” status of “*Salmacina dysteri*” in the Indo-Pacific

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Salmacina dysteri (Huxley, 1855), a minute Atlantic species, was reported by F.A. Potts (1928) from the southern Suez Canal and the Red Sea Gulf of Suez based on Fauvel's (1927, 1933) characterizations. It was considered to be a species with an “almost cosmopolitan” distribution, and an alien ship-dispersed invasive species, e.g., recent records from Hawaii. The possible dispersal by ship complicates analysis of the biogeography of the genus. The species is so small that only SEM magnification can adequately characterize the thoracic uncini (length ca. 10 μ m) and the even smaller abdominal uncini. Thus, we are in the process of trying to review *Salmacina* specimens on which older records are based. Unfortunately type material is not readily available, nor is it simple to obtain material from type localities. Among the material being reviewed are samples identified by P. Fauvel himself. We have learned that *Salmacina* populations from the Gulf of Aqaba, Hawaii, and just now (Fauvel sample) from the Gulf of Suez, cannot be attributed to *Salmacina dysteri* due to the much greater number of teeth in the horizontal rows of their uncini, thus, the “cosmopolitan” designation does not apply. Further elucidation will require genetic analysis.

The mechanism of reproduction scheduling in the golden spiny mouse *Acomys russatus*

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Reproduction in mammals is a highly energy-consuming process and must be carefully synchronized with availability of environmental resources. In ecosystems where rains are limited to definite seasons of the year, mammals presumably will restrict their breeding correspondingly in favor of processes essential for survival. While mammals living in predictable ecosystems would benefit by timing their reproduction to an ultimate predictable cue, such as photoperiod, in unpredictable ecosystems (e.g., deserts), they will need to use a more proximate signal. We examined the possibility that water salinity can serve as a signal for modulating reproduction in males via the actions of vasopressin (VP). Treatment with VP resulted in decreased body mass under either short-day (SD) or long-day (LD) photoperiods, and this was more pronounced under

LD. Furthermore, whereas testis mass and size were dependent on photoperiod (bigger in LD-mice), VP treatment led to a significant decrease in LD-mice but not in SD-mice. Accordingly, testosterone levels were lower in all SD-mice compared with LD-mice. VP treatment resulted in a significant decrease in LD-mice and had a smaller although significant effect on testosterone-levels in SD-mice. In conclusion, we suggest that VP plays a role in synchronization of reproduction in *Acomys russatus* males.

Vole outbreak — A synchronized “Vole Year” or localized occurrences

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The vole (*Microtus socialis guentheri*) is a common rodent in Israel, which causes heavy damage to crops and grazing land. Studies have demonstrated that the vole population density has radical cyclic fluctuations, with outbreaks, which terminate in the collapse of the vole populations within a year. A vole population outbreak causes severe damage to the green leafy foliage, harms the dry pasture, and reduces the seed reserve in the soil. A survey of vole activity was carried out by counting the active burrows in specific cross sections in the Golan Heights, three to ten times a year. An increase in vole activity in the northern area of the Golan was identified and its spatial distribution process, up to an outbreak, followed by a collapse, was recorded. Data showed that the vole outbreak occurrences did not bring about a synchronized outbreak throughout the Golan Heights. Moreover, at most of the cross sections, there was no significant change in the vole activity level. The distribution pattern seems to imply a fast progression along the roadside corridor, with a halt at suitable points, and not a “vole year” throughout the area.

Predator identity and spatial scale affect density-dependent survival of Aleppo pine (*Pinus halepensis*) seeds

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Elucidating the key determinants of seed predation is crucial for understanding the recruitment patterns of plants. We tested the effects of tree density in different spatial scales and predator identity on seed survival in an Aleppo pine (*Pinus halepensis*) stand. We placed experimental plots in 89 locations stratified according to tree density combinations on three different scales: 10, 30, and 50 meter radii. Each plot included four seeds: (1) a seed protected from rodents and ants (the major seed predators in the study area), (2) a seed protected from rodents, (3) a seed protected from ants, and (4) an unprotected seed. Plots were examined 11 times during the two-week study period (September, 2006). The seeds that were available only to rodents were predated at a significantly higher rate in plots with high tree density at 30 and 50 meter radii. Seed predation pattern by ants was not correlated to tree density. These results demonstrate that spatial scale and predator type can interplay to determine the pattern of density-dependent predation of tree seeds.

Significance of maternal effect on offspring characteristics in an environment with low resource availability

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The plasticity of various life history traits has evoked continuous interest among biologists but only in recent years have the combined effects of time limitation and food stress, imposed by changing environmental conditions, been addressed. However, it has often turned out to be extremely difficult to measure processes that affect offspring characteristics and maternal fitness at the same time. In this study we analyzed how the seed beetle *Coccotrypes dactyliperda*, with a mixed breeding system, adapts its reproductive investment after encountering a period of low availability of resources. We show that time limitation affects reproductive investment patterns. After experiencing low availability of resources and postponed egg laying, females oviposited far more offspring, with a significantly lower body size. Although both findings could have indicated the known tradeoff of offspring number and size, no such correlation was found. We further propose that mothers that experienced shortage of resources influence their offspring to mature faster at the cost of smaller-than-average size in order to compensate for the loss of time. By modeling the estimated fitness of females encountering a period of low/high availability of resources, we conclude that time of ovipositing is an essential factor to consider when estimating fitness. The model predicts that when estimating the conventional fitness estimates (offspring until grandchildren) there is no significant difference between females encountering low or high resource availability, but once considering the loss of time of reproduction (season) due to low availability of resources there is a major cost in fitness for the females with low resources.

Biodiversity and pollination services provided by bees in natural and agricultural landscapes of the Arava Rift Valley

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Biodiversity preservation in agricultural ecosystems is important for the long-term persistence of wild species and for maintaining ecosystem services. Bee pollination is an essential ecosystem service. Modern agriculture relies on a small number of commercial pollinators, although wild bees provided substantial pollination services in some ecosystems. We studied temporal and spatial diversity patterns of bees in four dominant habitats across the Israeli–Jordanian border in the Arava Rift Valley (gardens, natural landscapes, open watermelon fields, and semi-open watermelon tunnels) and explored the potential pollination services wild bees provide to agriculture. We sampled bees and plants from March to July, using nets and pan traps. Honey bees were dominant in gardens and in agricultural habitats. Wild bees were sampled mostly in natural habitats, at the beginning of the season, and later on in gardens and in agricultural plots. The proportion of wild bees from all sampled bees was significantly higher in open agriculture fields than in tunnels. The four habitat types had different species composition. Wild bee genera richness and abundance were highest in natural habitats and lowest in tunnels. While wild bees have the potential to provide significant pollination services in our ecosystem, their actual contribution at present appears to be very limited.

An assessment of the Israeli terrestrial vertebrates' importation process towards effective control over non-indigenous species (NIS) introductions

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Preventive measures are the most effective way to deal with biological invasions. Non-indigenous species (NIS) importation threatens ecosystems and native species, since some of them may find their way into the wild. We studied trade volumes of terrestrial vertebrates in Israel, in order to examine shortcomings of the importation system in controlling NIS introductions. Our sample consists of 1766 records of import permits issued in Israel between 2001 and 2006 from the Israel Nature and National Parks Protection Authority's database representing the following taxa: mammals, amphibians, reptiles, and birds. Each record contains data on ecological-risk code ("True" or "False"); number of permits issued for the species per year; number of individuals actually imported; and reference to Ecological Risk Assessment, if any. NIS constitute a large fraction (98.75%) of the total terrestrial vertebrates permitted, in which most NIS permitted were birds and reptiles. Significant differences were found in the distribution of "true" ecological risk permits among different taxa: a higher percentage belonged to amphibians and reptiles. We found no clear trend of decline in the importation of high-risk species. Our study reveals major flaws of the importation system, emphasizing the need for increasing communication between ecologists and regulators for better policy measures.

Does singing reflect individual parameters in rock hyraxes?

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Songs are usually attributed to birds, yet rock hyraxes (*Procavia capensis*), which are ancestral mammals, sing as well. In our study, a third of sexually mature male rock hyraxes vocalized rich and complex songs. These "singers" were different from the general adult male population in that their cortisol (C) levels were higher than those of silent males. Only in singers were C levels directly associated with social rank, with dominants showing the highest levels. Singers were also on average older and more dominant than most other sexually mature non-singing males. Previous studies have shown that a specific vocalization can closely reflect a specific attribute. Our study also shows that a single complex vocalization contains information that not only allows precise assignment of song to singer, but also provides accurate data on the body size and condition, social status, and hormonal state of the singer. Our results imply that animals, through a complex individual vocalization, can honestly advertise multiple individual attributes. Further research is required to determine whether these attributes reflect individual quality.

Bionomics of the Nile whitefly, *Aleurolobus marlatti*, in Israel

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The Nile whitefly, described as *Aleurolobus niloticus* Piesner and Hosni, was described on *Zizyphus spinachristi* in Egypt in 1934. *Aleurolobus marlatti* was described as a citrus pest in Japan in 1906 and in 1999 the two were synonymized as *A. marlatti*. Different many other whitefly species, immature *A. marlatti* develop on both leaf sides. Its life cycle is closely associated with that of the host plant, with leaf development in the spring and summer inducing whitefly development. The goals of our research were to determine the life cycle of the whitefly in Israel and its host plants. We also wanted to examine the survival value of developing on both leaf sides by comparing parasitization rates. Finally the question of whitefly identity, whether *A. marlatti*

and *A. niloticus* are the same species, was examined. The whiteflies were reared on *Z. spinachristi* and on citrus in the lab and in both cases, they preferred to oviposit under the leaf although both sides were used for oviposition. Males emerge before females and the latter are ready to lay upon emergence. Infested leaves were collected from nature every 1–2 weeks and examined for nymphal location and conditions (alive, dead or parasitized). Emergence and parasitization rates were equal on and under the leaf. Four yearly cycles developed on citrus, 3 on *Z. spinachristi*, and 3 on *Punica granatum*, although the latter is a deciduous tree. The specific identity of the whitefly is being examined using molecular tools and mating experiments.

Aggressiveness covaries with genetic similarity in fire salamander larvae

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Responding differentially to kin and non-kin is known to be adaptive in many species. One example is the inclusive fitness benefits of reducing aggression toward closer relatives. Little is known, however, about the ability of animals to assess differential degrees of genetic relatedness and to respond accordingly with differential levels of aggression. In the present study, we tested whether aggressiveness between body mass-matched pairs of fire salamander (*Salamandra atra*) larvae covaried with the genetic similarity between them. As the most genetically similar group, we assessed aggression between pairs of siblings. We also quantified aggressiveness at three other levels of genetic similarity using geographic distance as a proxy in pairs of larvae from the same pool, from close pools (~5 km), and from distant pools (~30 km). Aggression and associated injuries increased as genetic similarity decreased across the groups. These findings suggest that cannibalistic salamanders can assess their degree of genetic relatedness to conspecifics and vary their behavioral responses depending on the degree of similarity between them along a genetic relatedness continuum.

Reptile diversity in three habitats: Planted pine forest, maquis, and Mediterranean batha in the Meron mountain range

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We studied reptile community composition in three different habitats in the Meron mountain range: planted pine forest, natural maquis, and Mediterranean batha. Our goal was to characterize the reptile community composition and to compare diversity, richness, and abundance.

The research array included 12 sampling plots. In each plot there were 10 pitfall traps, 5 liter buckets. Another sampling method included time-constrained searches with stones and covers upturned in order to find hiding reptiles. Initial analyses reveal that species diversity and richness in the batha habitat are higher in comparison to the natural maquis and to the planted forest habitats. Analyzing similarity percentages showed that the batha plots resemble each other and differ from the other habitats. Species assemblage in the maquis plots resembled that of the planted forest. These results suggest that the batha habitat is important in maintaining high reptile diversity, therefore, preservation of the batha habitat and open batha patches within the dense maquis should be a priority.

Origin of species: Allopatric in Israel and sympatric in “Evolution Canyon”

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Speciation and adaptation are the central twin processes of organic evolution. Mayr considered

the origin of new species the most important single event in evolution. Here I describe allopatric speciation regionally in Israel and sympatric speciation locally in "Evolution Canyon", Lower Nahal Oren, Mount Carmel, Israel. Blind subterranean mole rats of the *Spalax ehrenbergi* superspecies in Israel, earlier recognized as one classical species, represent an evolutionary model of speciation in action. The superspecies involves four morphologically almost indistinguishable chromosomally divergent allospecies with $2n = 52, 54, 58$, and 60 representing a progressively increasing Robertsonian series, primarily through fission. The four cytotypes are distributed clinally and parapatrically along a north-south ecological gradient of increasing aridity. The distribution is correlated with four climatic regimes: *Spalax galili*, $2n = 52$ (cool-humid); *Spalax golani*, $2n = 54$ (cool-semidry); *Spalax carmeli*, $2n = 58$ (warm-humid); and *Spalax judaei*, $2n = 60$ (warm-dry). Their distribution is significantly correlated with increasing aridity and temperature both southward and eastward. Natural hybridization separates the species but strong premating and postmating isolating mechanisms separate the species and selection against hybrids is very high. The "Evolution Canyon" model unravels evolution in action in diverse taxa across life from bacteria to mammals. Remarkably, beside interslope adaptive radiation between the xeric and warm "African" south-facing slope and the mesic and cool "European" north-facing slope, separated on average by 200 meters, interslope incipient sympatric speciation was found across life in bacteria (*Bacillus simplex*), soil fungi (*Sordaria fimicola*), plants (*Hordeum spontaneum*), fruit flies (*Drosophila melanogaster*), beetles (*Oryzaephilus surinamensis*), and mammals (*Acomys cahirinus*). The "Evolution Canyon" model represents the Israeli ecological equivalent of the Galapagos Islands. Microclimatic selection overrides drift and migration and drives both interslope adaptive radiation and incipient sympatric speciation.

What are the factors that affect insectivorous bat biodiversity in the Jerusalem metropolitan area?

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Urban development is considered as one of the main risks to biodiversity. On the other hand, the urban environment is complex and provides many new and diverse habitats. Open areas and green corridors within the city itself are important to the preservation of urban biodiversity. The goals of our research were to identify the species of insectivorous bats and to study their activity patterns in the various habitats of the Jerusalem metropolitan area. The area was divided into three different habitats—the city center, the living neighborhoods, and "green" areas—and bat detectors were placed in twenty-five locations in and around the city. Altogether, a total of 2280 detector hours were recorded. Nine insectivorous bat species were found in the Jerusalem metropolitan area, but most of the recorded activity was of a single species, *Pipistrellus kuhlii*, which was present in all habitats. The other species were recorded mainly at the edge of the urban area. A positive dependence was found between bat biodiversity and the distance from the city center, but none with the habitat type. We conclude that although Jerusalem provides many green habitats, most of the insectivorous bats occur outside the urban environment.

Possible relation between hormones, new neuronal recruitment, and parental care in birds

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Hormonal control of avian parental behavior involves several hormones such as testosterone and prolactin. These hormones also affect neurogenesis and new neuronal recruitment in adult brains. In Zebra Finches (*Taeniopygia guttata*), it has been shown that an increase in neuronal recruitment in the parent brain, in a region involved with sound processing, occurs when young fledge but still need parental care. This increase is followed by a significant decrease a month later, when the young reach independence. The aim of this work was to measure plasma levels of testosterone and prolactin during a reproduction cycle, to try correlating them with the previous neuronal findings. Blood samples were taken from both sexes at different stages during a reproductive cycle and analyzed by ELISA. Testosterone levels were similar throughout the breeding cycle, suggesting that this hormone does not affect neuronal recruitment. Prolactin levels were highest at hatching. This peak precedes by 3–4 weeks the increase in neuronal recruitment. In mammals there is evidence that high prolactin levels increase neuronal survival. It is also known that in the avian brain, 3 weeks are required for neuronal migration from the birthplace to a target region. Taken together, we suggest that high prolactin levels positively affect neuronal survival and recruitment.

A predesigned artificial reef planted with corlas as a tool to attract fish and divers

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In recent years the use of Artificial Reefs (ARs) as tourist diving attractions has increased worldwide. Concurrently, coral transplantation has been used to shorten the development of a natural and attractive community on ARs. In the current, ongoing, research we are monitoring the ability of a planned AR to attract fish and divers and to mitigate pressure from the natural coral reef. The AR was deployed in Elat, Red Sea, in April 2007. Measurements taken were the number of divers visiting the AR and an adjacent natural knoll, diving time inside MPA, and fish richness and abundance on AR. Most measurements were taken before, after deployment, and after transplantation. Initial evidence suggests a greater influence of AR design than coral transplantation on fish community, despite an increase in species richness by ~30% within days after transplantation. The AR is frequently visited by divers, mainly course dives, qualified divers, and introductory dives, and less so for guided dives. To date, the AR didn't change diving behavior and time usage inside MPA. Moreover, comparison of AR to a similar reef knoll showed no change in divers' usage after transplantation. Higher community involvement by divers may increase visiting time and subsequently generate a change in diving behavior.

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The influence of *Acacia saligna* on a terrestrial arthropod community

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The sandy Israeli coastal plain habitat has declined by 75% during the last hundred years, due to urban development. In addition, extensive regions that were not directly damaged are now suffering from rapid encroachment of the invasive species *Acacia saligna*. The aim of this research

was to examine the similarity between arthropod communities beneath the trees and in open sites within an *Acacia* grove. The research was carried out during the spring seasons of 2005–2006 in the *Acacia saligna* grove at Nizzanim sands. Arthropods were sampled using dry pitfall traps and the data were compared to data on arthropods previously collected in the natural sandy habitats of Nizzanim by Adi Ramot. The results show a clear decline in species number, and three times fewer specimens, under the *Acacia* trees than in the open sandy sites. Moreover, the psammophile species that were common in all the other sites were replaced with mesophiles in the *Acacia* grove.

Foraging mode and time allocation of the lizard *Acanthodactylus schreiberi* at Cesarea sand dunes^o

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Lizards forage actively or from ambush and anywhere between these extremes. Lizard's tendency to one of these modes and time allocation to foraging in the open versus the bush may vary with conditions. The lacertid *Acanthodactylus* specializes on sandy habitats. In Cesarea, *Acanthodactylus schreiberi* is the only diurnal lizard, while in Nizzanim, *A. scutellatus* occurs in semi-stabilized and shifting dunes, but not in stabilized ones. I compared dune type preference of *A. schreiberi* in transects in Cesarea and Nizzanim and examined whether the foraging of *A. schreiberi* differs among habitats by observing individuals during 10–30 min to determine time allocation. I measured Moves-Per-Minute (MPM), Percent-Time-Moving (PTM), and Percent Time in Open (PTO). Numbers of *A. schreiberi* did not differ between dune types in Cesarea, while in Nizzanim, more individuals were on stabilized than on semi-stabilized dunes, and almost none were found on shifting dunes. In Cesarea MPM and PTM were highest in shifting and lowest in stabilized dunes, and PTO in the stabilized was significantly higher than in any other dune type. Lizard transect showed that preferences of *A. schreiberi* change with presence of a competitor. Furthermore, in the shifting dunes, *A. schreiberi* tends to forage more actively and spends less time in the open.

Suppressing the European berry moth (*Lobesia botrana*) populations using the SIT/IS method

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Lobesia botrana is a polyphagous pest that is widely distributed in vineyards and various fruit orchards in Israel and Europe. It is a good candidate for Sterile Insect Technique through Inherited Sterility programs since most females mate only once, thus competition among males is limited. This study was aimed to identify the optimal radiation dose to achieve high survival of treated males and high sterility in their male offspring. Gamma radiations of 100 and 200 Gy each were applied on 100 male pupae, while 100 pupae served as control. All males were coupled with laboratory reared, untreated females and their F1 and F2 offspring followed. Pupae survival was lowest in the high radiation dose. The percentage of males that had offspring showed no significant difference between low radiation dose and control, but high radiation dose resulted in adults with fewer offspring. In the second generation (F2) there was a reduction in the number of adults in both treatments, with average number of F2 offspring of control males much higher than that of radiated males. We concluded that radiation of 200 Gy resulted in high mortality and premature sterility of treated males, while 100 Gy achieved high survival of treated males and a good reduction of F2 offspring.

Joint parent–offspring control of brood size in a polyembryonic parasitoid wasp

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Brood size has important implications for the fitness of both parents and offspring. When resources available for offspring are limited, brood size and individual fitness are traded off. Accordingly, parasitoid females often adjust egg number to host quality. In polyembryonic parasitoid wasps, each egg develops into many genetically identical embryos through clonal division. Thus, offspring may further adjust brood size by controlling the degree of embryonic division. Aggression between competing clones may also enable offspring to affect brood size. We investigated how relatedness between competing clones affects final brood size in the polyembryonic wasp *Copidosoma koehleri*. We allowed two wasp eggs (laid either by one female, or by different females) to develop in a host, and counted the emerging adults. Relatedness between male clones did not affect brood size. However, female-containing broods of related clones were larger than broods of non-related clones. Additional data suggest that relatedness probably reduces larval aggression rather than increasing clonal division. Next, we tested whether ovipositing females avoid hosts parasitized by a non-relative, where their offspring may incur aggression. Surprisingly, females avoided self-parasitized hosts, and preferred allo-parasitized hosts. We suggest that offspring survival is not the main selective force driving host choice.

Do island extinction rates apply to mainlands?

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Insular faunas are useful for studying evolutionary processes, but the extent and whether they apply to the mainland remain unclear. Insular extinction rates are expected to correlate negatively with mainland altitudinal ranges (differences between maximum and minimum elevations for a species). Extinction rates of 35 reptile species, deduced from present ranges on land-bridge islands in the eastern Mediterranean Sea and geological history, correlated negatively with their altitudinal distribution on three mountainous regions around the Mediterranean Sea: Iberian peninsula; Mt. Hermon, Israel; and the Rif mountains, Morocco. In Spain and Israel, relatively low statistical significances of the correlations was due to outlying species with particular life histories affecting extinction estimates (Natrix: high habitat specialization; Testudo and Chamaeleo: low dispersability) or estimates of altitudinal ranges (Hemidactylus: recent invasion; Mabuya: viviparity). My results suggest that species vulnerability, estimated from island distributions, can apply to the mainland, if biological particularities are carefully considered.

Effects of management on reptiles in Adulam reserve

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Decades of passive conservation policies in the mediterranean maquis have increased woody vegetation density, decreased biodiversity of many taxa and elevated fire hazards, warranting active management of woody vegetation. Israel Nature and National Parks Protection Authority and Ben-Gurion University of the Negev established a long-term ecological research (LTER) node at Adulam Nature Reserve (southern Judean lowlands), studying management effects on floral and faunal biodiversity. Woody vegetation was manually removed from six 2000 m² plots in 2003, and grazing by goats was initiated in 2004 (fencing excludes goats from half of each plot). Preliminary analysis of management effects on reptiles includes animals observed (active or sheltered) during five surveys (2002–2006), totaling 243 observations of reptiles (23 species) and amphibians (1 species). Species dispersal between south and north facings did not differ significantly. Data from compiled years show (Wilcoxon/Kruskal-Wallis Test) grazing significantly increased species richness ($Z = -3.61$, $p = 0.0003$) and abundance ($Z = -3.44$, $p = 0.0006$), separately also vegetation-removal significantly increased species richness ($Z = -2.312$, $p = 0.0208$) and abundance ($Z = -2.601$, $p = 0.0093$). Since year-by-year analysis shows significant treatment effects only in the early years, vegetation removal should probably be repeated to maintain high species richness and abundance. We recommend enhancing reptile data resolution by augmenting sampling effort and methods (e.g., add pitfall trapping).

Distribution and genome size variability of *Oryzaephilus surinamensis* at a local site in Israel

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Our model species, *Oryzaephilus surinamensis* (L.) (Coleoptera, Silvanidae), has been an important stored product pest at least from the Late Neolithic era. Our study showed that the feral populations of this species are present in northern and central Israel, where they develop in fallen oak acorns. At the microsite “Evolution Canyon” (“EC”), lower Nahal Oren, Mt. Carmel, the distribution of *O. surinamensis* abundance was positively and significantly correlated with abundance of oak trees and of acorns. We also examined the variability in genome size in *O. surinamensis* and our results showed the significant differences between (i) sexes, (ii) feral populations and indoor pest populations, and (iii) populations inhabiting different climatic biotopes at “EC”. The high level of genetic and ecological variability observed in and among the populations of *O. surinamensis* guarantees continuation of the research on the interpopulation dynamic of this species and on interactions between outdoor feral and indoor pest populations.

Ecophysiological aspects in nesting of rose-ringed parakeet (*Psittacula krameri*) in Israel

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Many bird species nest in holes, which partly isolate them from the ambient environment and provide many advantages, such as protection from predators and extreme weather conditions. However, respiratory gas concentrations within these holes might be lower than normal atmospheric values. We measured physical characteristics of cavities, recorded eggs and nestling development and nesting behavior of parents, and examined gas concentrations, temperature, and humidity inside nest cavities and potential adaptations of the birds to gas problems. Mean cavity volume was 2.4 L and mean height from the ground, 3.5 m. Oxygen concentration inside the cavity

was always lower than the ambient one, with lowest recorded value of 19.1%. Temperature was always higher (by 8–15 °C) than the ambient one. Mean relative humidity was 49% and mean egg water loss was 20.8% (higher than usually observed in other species). Mean incubation length was 24 days and mean hatching to fledging time was 48 days (double the expected). We conclude that in spite of potential problems, incubation conditions in nesting cavities were within normal range. It remains to be seen how much of this situation results from the birds' development and behavior and how much is attributed to changing conditions in and outside the nest.

Predator-released kairomones repel oviposition by the mosquito *Culiseta longiareolata*

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Previous work showed that *Culiseta longiareolata* (Diptera: Culicidae), a potential vector of West Nile Virus, is strongly repelled by one or more kairomones released by the aquatic predator *Notonecta maculata* (Hemiptera: Notonectidae) when ovipositing. Isolating the kairomone(s) can potentially provide an environmentally friendly method of mosquito population reduction. Using a behavioral assay, we found that the mosquito is repelled without having to touch the water, indicating that at least one component of the kairomone is highly volatile. Volatile compounds were extracted from *Notonecta*-conditioned water using Solid Phase Microextraction (SPME). Two hydrocarbons found in *Notonecta*-conditioned water, but not in control water or in water conditioned from another predator (*Anax imperator*) that does not chemically elicit an oviposition avoidance by *Culiseta*, were tested as potential oviposition repellents in outdoor artificial pool experiments using synthetic compounds of these hydrocarbons. Our preliminary results indicate that both compounds cause oviposition repellency and that the combined effect is additive.

Flight speed of *Pipistrellus kuhlii* bats during commuting and foraging

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Economical flight speeds of animals are often predicted from the aerodynamic theory, which suggests that animals may minimize energy expenditure either per distance (maximum range speed, V_{mr}) or per time (minimum power speed, V_{mp}). We predicted that the aerial-hawking bat, *Pipistrellus kuhlii*, will use high speed (close to V_{mr}) during commuting from the roost to the foraging sites and a slower speed (close to V_{mp}) during foraging. To test these predictions we reconstructed flight tracks for commuting and foraging bats using an acoustic flight tracking system that records echolocation calls in the field and localizes their source. We found that commuting flight was significantly faster than foraging flight, even after controlling for its lower tortuosity. Data on wing morphology of captured bats was used to generate V_{mr} and V_{mp} for the study population. These data showed that measured commuting flight was slower than the

expected Vmr, and foraging flight faster than the expected Vmp. However, the energetic costs of these deviations were almost negligible, suggesting that bats use context-dependent flight speeds to minimize energy expenditure. Commuting bats minimize energy expenditure per distance, and foraging bats minimized energy expenditure per time. Overall, our findings agree with the predictions of aerodynamic theory.

Mosquito oviposition and the aging effect

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We studied the effect of physiological age on the oviposition behavior of *Aedes aegypti* following two successive gonotrophic cycles using a choice experiment under laboratory conditions. Blood-engorged mosquitoes (n = 10) were introduced into individual cages that contained four oviposition sites (choices) with different salinities: Distilled water (DW), 0.33% NaCl (T1), 0.67% NaCl (T2), and 1% NaCl (T3). The oviposition substrate (seed germination paper) was changed daily and the number of oviposited eggs (the response variable) was recorded. The initial oviposition activity ceased on the tenth day of the experiment and two days later a second blood-meal was offered to the original cohort of mosquitoes; only five became visibly blood-engorged. The oviposition activity was again followed for 12 additional days. During the first oviposition period (days 1–10 of the experiment), the mosquitoes oviposited predominately in the DW and T1 treatments and completely avoided the T3 treatment ($p < 0.001$). In contrast, the oviposition pattern during the second gonotrophic cycle (days 12–24 of the experiment) was less polarized, suggesting that the physiologically older mosquito may be less selective. The implications of these data are discussed in the context of lethal ovitrap strategies for the control of urban container-breeding mosquitoes.

The impact of farming on vegetation cover and rodent community structure in extreme-arid sandy desert

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Farms in arid environments create water- and nutrient-enriched terrestrial islands. During the last decades, extensive agricultural practices have been implemented in hyper-arid deserts. The present study examines vegetation cover and rodent community structure in a sandy habitat bordering with farms in the southern Arava, Israel. I hypothesized that the dense vegetation characterizing the dunes is supported by the annual 2 million cubes of water irrigating the close farm. I drilled 19 boreholes (<6.5 m) to locate the level of groundwater. I measured the vegetation cover in the field and, by photogrammetry, of historical aerial photos. Finally, I sampled the rodent community structure by live-trapping and track identification on the sand. The inter-dune boreholes revealed an unfamiliar groundwater table of a depth of 1.5–6 m below surface. Field measurements and photogrammetry presented a significant increase in bush density during the last decade along the habitat-farm edges. The rodent sampling in close-to-farm locations revealed abundant population of the generalist species *Gerbillus nanus*, and absence of the native specialist species *G. gerbillus*. The increasing density of local vegetation (*Haloxylon persicum*) may be related to subsurface flow of irrigation water towards the dune. This change negatively affects the psammophilic endangered gerbil (*G. gerbillus*), and positively serves the generalist one.

Motives for introducing species: Palestine's common carp as a case study

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Species' introductions might lead to biological invasions, which in turn pose a serious threat to global biodiversity. There is already a lot of research about the ecological and physiological aspects of introductions and invasions, but until today there has been relatively little research into the social and economic motives that initiate such species' introductions. Learning the reasons and motives for such introductions may help us identify them in advance, and—if needed—prevent unwanted introductions. One common assumption relates introductions to ethnic cultural traditions, while another assumption connects it to economic reasons. Based on archival material from the 1920s, 1930s, and 1940s, this research takes the introduction of the common carp (*Cyprinus carpio*) to Palestine's freshwaters in the 1930s. The research examines the contribution of such cultural and economic motives to the process while suggesting a third motive, an intellectual and operational one. It concludes by assessing the ways these three motives may still be intertwined in introduction processes in the modern era.

From tissue to polyp: The re-morphogenesis process of the coral *Fungia granulosa*

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Asexual reproduction through budding is well known in Cnidaria and in particular Fungiid corals (class: Anthozoa). Buds in the species *Fungia granulosa* were shown to develop from remnants of adult tissue. This process consists of the tissue "balling-up", settling, forming a mouth, septae, and tentacles. These processes can be referred to as re-morphogenesis. Here I describe cellular processes occurring during reorganization of different tissue layers during re-morphogenesis using light microscopy, histology, and TEM. Bromodioxymethyluridine (BrdU) was used to determine where and when cell proliferation occurs. Results showed that throughout tissue reorganization, ectodermal layers remain relatively intact, whereas the endoderm undergoes intensive cellular damage. Cell proliferation occurred in both tissue layers. Cells proliferated in the ectodermal layer throughout the re-morphogenesis process, whereas in the endodermal layer cell proliferation occurred later, mostly during septal development. The major cellular processes occurring during re-morphogenesis are programmed cell death, cell proliferation, cell migration, and cell differentiation, known to occur during regeneration and development of cnidarians.

The ability of the coral tissue to return to a larval-like stage demonstrates their "immortality", and thus provides a model organism to study basic physiological processes in scleractinian corals. Thus, this work is of ecological importance that will help preserve the coral reef ecosystem.

Two new morphological factors putatively affecting auditory sensitivity in tetrapod vertebrates, with ecological implications

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We tested auditory sensitivity (by the round window's compound action potential threshold),

and morphological factors affecting it, in gekkotan lizards, comparing among seven species and within two of them, and considering ecological implications. Auditory sensitivity correlated with body size, intra- and inter-specifically. This presumably is partly deriving from two factors. (1) The number of hair-cells in the inner ear, that inter-specifically (not intra-specifically) correlates with animal size. (2) The hydraulic ratio in the middle-ear's impedance matching mechanism, i.e., ratio of tympanic membrane area to columellar footplate area, as this ratio increases both inter- and intra-specifically with animal size. Now we add two factors, each statistically strongly correlated with auditory sensitivity both inter- and intra-specifically (in *Eublepharis macularius*). (3) Absolute size of the tympanic membrane, presumably because when its area increases, its ratio of area to anchoring circumference increases, and its effective area (in man and cat 60–70% of absolute area) increases. (4) Absolute size of the columella footplate, presumably because the footplate is restrained within the oval window by the annular ligament, and as its ratio of area to circumference increases, its mobility improves. Putatively, these four factors improve the hearing of larger tetrapods, which may vocally communicate across wider spaces.

In situ incubation of sea turtle eggs: The effect of humans on nest survival

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Current conservation efforts by the Israel Nature and National Parks Authority (INPA) of sea turtles (*Caretta caretta* and *Chelonia mydas*), focus on relocating beach nests to “incubation farms” located within protected nature reserves, in an attempt to maximize female reproductive success.

In light of the growing number of sea-turtle nests discovered in the past few years, INPA is considering the future possibility of in situ incubation, i.e., retaining turtle nests on the beach nesting sites and only adding a protective device to minimize nest predation. Protective devices, however, expose the nest location to human eyes, thus increasing the risk of human harm. To evaluate nest vulnerability due to intentional human disturbance, we conducted preliminary experiments using artificial nests at two beaches, Hof Nitzanim Nature Reserve and Hof Hasharon National Park. Artificial nests included protective devices, yet did not contain eggs. We regularly examined 30 nests for 60 days (mean sea turtle egg incubation length) to document any disturbance. At Nitzanim, where off-road vehicles are the major problem, nest survival probability was 72%. At Hof Hasharon, nest survival probability was 60%, and most disturbances were caused by humans on foot. Additional experiments will verify the nesting success currently documented and help establish the future conservation strategy of sea turtles in Israel.

Interactions between little fire ants *Wasmannia auropunctata* queens—Behavioral and chemical aspects

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The little fire ant (LFA), *Wasmannia auropunctata*, is an invasive species that arrived in Israel 8 years ago and is spreading throughout Israel. In its invasive range the ant is characterized by the lack of intraspecific aggression, and clonal reproduction resulting in “supercolonies” that contain multiple queens (polygynous) and no territorial boundaries. Genetic analysis of the Israeli populations revealed that they all originate from a single mother and father.

Polygyny may result in a reproductive conflict between queens that are trying to achieve a genetic predominance by suppressing the reproduction developments of other queens. In this

research we examined if there are phenotype differences that affect queen reproduction ability and their attractiveness to workers. We measured the reproductive output of queens isolated with 150 workers for a week. Our preliminary data indicate that despite being clones, queens show phenotypic variation in fecundity, which is positively correlated with their weight. Using a preference bioassay, we further show that heavier queens are more attractive to workers. We further test the hypothesis that the queens are discriminated on the basis of their pheromonal composition. To test the hypothesis we are quantifying the secretions of two prominent glands, the postpharyngeal and Dufour's.

The evolution and the messages encoded in the sex hormones (a literature survey)

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We assume that hormones transfer reliable information about the activity of the secreting cells, information that the receiving cells need in order to function. The handicap principle suggests that there is a logical relationship between the signal and the message encoded in it. Reliable chemical signals are either noxious chemicals that harm the producing cells in a way related to their message, e.g., the steroid hormones and GnRH, or they are complicated molecules like glycoproteins, providing evidence on the synthesizing ability of the secreting cells. We also attempt to understand how the complex communication system of the sex hormones could have evolved step by step, each step providing an advantage to the organism. Preliminary results that support our approach will be presented. Recent information that FSH and LH are produced also by the gonads, suggests that these hormones first functioned in the gonads, serving in the communication among its cells. We assume that they still serve this function. When the hypophysis took over it used this ready-made communication system.

Seed dispersal by the reintroduced Persian fallow deer (*Dama mesopotamica*) in the Judean Mountains, Israel

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Introduction of an animal to a new environment can have significant effects on the plants' community. The Persian fallow deer has been gradually reintroduced in Israel since 1996. Here we report on the potential of the Persian fallow deer as a seed disperser via endozoochory. 168 samples of Persian fallow deer feces were collected from the Judean Mountains over one year. Each sample was divided into three parts: the contents of one third were analyzed in the lab, and the tree seeds were identified. Another third of each sample was sown in a greenhouse, and the viability of the seeds was determined. The last third was sown in the field, to test if the process occurs in nature as well. 36 species of herbs germinated from the feces, and germination was stronger in the greenhouse than in the field. Of the trees, carob (*Ceratonia siliqua*) seeds were the only intact seeds found in our feces samples. The ingestion had a significant positive effect on the carob seeds. Our results provide evidence of the influence that the reintroduced deer may have on the local Mediterranean flora by contributing to long-distance seed dispersal, and specifically to the distribution of carob trees.