"Enlistment day" for the eastern spadefoot toad breeding core

In our Zoological Garden we have a breeding core of over 500 eastern spadefoot toads, all of which are about to enter an aestivation period (summer dormancy). During this period they hardly eat or leave their hiding places. Thus, at this time it is hard to monitor their physical condition or to tend to the soil in the containers in which they are living, as any activity carried out in their containers greatly disturbs them. Consequently, Yael Ballon, who is studying this species for her MSc degree, under the supervision of Prof. Noga Kronfeld-Schor, and Hamutal Ben Ishay, who works as an animal keeper in the Zoological Garden, organised a "volunteers’ day". To our delight many volunteers took up the call, above and beyond our expectations! During this “enlistment day” all the toads were removed from their containers, weighed, new soil was added to the containers, the water containers were refreshed – and now all is ready for the summer. The atmosphere of the day was exhilarating, volunteers came and went, helped themselves to
refreshments and at the end of the day enjoyed a cool beer and biscuits. Yael and Hamutal have asked us to take this opportunity to extend their very grateful thanks to all the volunteers who arrived and worked so hard, contributing to the great atmosphere; and they invite everyone to visit the breeding core in their free time. The photos showing the volunteers at work were taken by Prof. Noga Kronfeld-Schor.

**Release of newts back to nature**

On June 2nd, 2015 a second release took place this season of newts, which have been breeding for the second year running in the amphibian breeding colony of our Zoological Garden. Around 400 newt tadpoles and fully metamorphosed individuals were released this time, at three suitable sites, carefully chosen and near to the site of their original pond at the “Checkpost” area, near Haifa. At these sites and near to them, we had released 1,500 tadpoles two months ago, and last year around 550 individuals after metamorphosis. In recent weeks we have monitored the area, and to our great delight we found three young individuals: two of them had only just completed metamorphosis while one looked older, about one year old. We believe that these individuals are the newts that we had released at the site and adjacent to it around two months ago as well as last year. We consider this to be so because no other newt population is known to exist in the area. The photos, taken by Yael Ballon, show a newt discovered in the area.
News from the reptile yard

A large and impressive specimen of a boa constrictor, a long-term resident of our Zoological Garden but which was kept out of sight to visitors had been housed in the reptile yard. Today, thanks to the initiative of Prof. David Eilam and the devoted work of the animal keepers, Barak Levy and Ovad Hillel, in renovating an old cage for display, our boa is housed in a large and spacious cage, lined with leaves and equipped with a water tub, and can now be seen at the end of the first row of snake cages.

Despite the boa constrictor not being a representative of the fauna of Israel, it contributes to the instruction of students and groups of pupils on various subjects relating to reptiles and locomotion.

There have also been changes to the rodent cages in the northern section of the reptile yard, thanks to the hard work of Barak Levy. In the first cage, closest to the entrance, we now have six Sundevall's jirds (Meriones crassus); in the next cage are a group of ten field voles (Microtus); and in the fifth cage there are two bushy-tailed jirds.
In the vole cage you can see a small version of their habitat. The cage features several chambers, which the voles use to store food or in which to hide. In nature there are tunnels connecting between the chambers, but the cage only has a thin layer of soil, so we can see the tunnels as ditches connecting between chambers or stretching along the walls of the enclosure. The voles move at very high speed along these tunnels, usually after first peeping out from a chamber. They generally all crowd together in one chamber while storing their food in another one. The vole display is part of the large colony of voles, which serves a variety of studies carried out in the laboratory of Prof. David Eilam: Sivan Bodek’s PhD research focuses on the social hierarchy and leadership roles in times of danger; the PhD research of Omri Weiss focuses on the spatial organisation of behaviour in groups of animals; and Chen Rabi’s MSc research focuses on the response of voles to attack by barn owls.

**Romantic dramas on the grass**

Fifteen years ago in the Zoological Garden, living a peaceful and tranquil life, were four swans: two white swans (males) and a pair of black swans (male and female), which produced infertile eggs. About a year ago one of the black swans died, and for a period of time the black female wandered alone and lonely, before eventually joining the two white swans. Throughout the entire past year the three swans lived a peaceful social life. However, about a month ago one of the white swans began to wander around alone in the internal parking lot, near the keepers’ dining room. Each time the keepers returned him to
the grass area, but he kept coming back, without any perceptible reason. He even began to swim in a small water tub in the area, and it seemed that he was beginning to look upon the parking lot as his permanent home. The mystery was solved after a few days: it seems that the other white (male) swan and the black female had begun to establish a bond, and our hero was no longer a part of the former threesome. All that we can now do is to follow and see how it all develops.

**Newsflash from the Zoological Garden**

- We have finally solved the mystery of the alien egg in the grey goose nest, whose photo featured in the April newsletter. After it hatched, it was clear that this was an **Egyptian goose** egg and not a peahen egg, as we had previously thought. According to Prof. Yoram Yom-Tov, in conversation with Dr Ron Elazari, it seems that among ground-nesting birds, whose chicks are precocial, no mechanism has developed for preventing parasitism, such as the ability to identify an alien egg, due to the relatively low energetic cost of raising such chicks in comparison with raising altricial chicks.

- The two groups of **eagle-owls**, which are located side by side in the northern part of the Zoological Garden, were once considered as two populations or sub-species of the species *Bubo bubo*. However, about five years ago they were reclassified as different species – the northern population is called the Eurasian eagle-owl (*Bubo bubo*) and the desert population is the Pharaoh eagle-owl (*Bubo ascalaphus*). Some of these eagle-owls have been with us for the last 40 years (!), having originated in our old Zoological Garden in Abu Kabir.

- The **seagull chicks** that wander around the lawn have grown a great deal. It is nice to follow them and observe how they are still being closely accompanied by their parents.

- Our male **houbara bustard** continues to dance… some of the hibiscus shrubs that hid his cage from the path have been cut back, to make observing him easier.
Garlic – when nothing else blooms

There are many species of wild garlic (*Allium*), all of them are geophytes – plants with a subterranean storage organ. Some species are very familiar to us: *Allium sativum* and *Allium cepa* are familiar kitchen items, although better known in their common names – garlic and onion, respectively. The onion layers, which we use in salads, are actually the bases of the leaves that have become storage organs (scale leaves), whereas the garlic cloves are secondary vegetative reproduction bulbs, branched from the mother bulb that has withered. Subterranean storage organs enable the plant to be active during the preferable season (in Israel most species are active at the end of winter, in spring and early summer), while in the stressful summer the above-ground parts dry out and the plant is dormant.

*Allium* species contain an interesting blend of secondary metabolites, such as allicin, that contain sulphur and give these plants their typical strong odour and taste. These organic compounds have antiseptic properties and various medicinal uses, such as preventing cancer, preventing blood clots, etc.
Some 25 species of wild garlic grow in Israel, many of them in our Botanic Garden. Currently, a few species are finishing flowering, such as the wild leek (*Allium ampeloprasum*), which features a tall, upright flowering stem that can reach up to 2 m in height. The ball-like inflorescence bears dozens of flowers. This species appears in shades ranging from purple to white. This is the wild relative from which the leek that is used for cooking was domesticated. Around the bulb of the wild leek many reproductive bulbils develop, creating a mass of flowers around the mother plant.

Several species of wild garlic are currently in bloom in the display of Israeli miniature plants in front of the garden office. The display includes *Allium phanerantherum*, *Allium kollmannianum* and *Allium albotunicatum*; the two latter are “red plants”, listed in the Red Data Book of Israel’s rare and endangered plants. *Allium kollmannianum* grows on loess soils in the triangle between Be’er Sheba, Arad and Dimona, an area prone to high pressure of land degradation due to development of Bedouin settlement, afforestation, agriculture and infrastructure. This is an endemic species to Israel, described to science only 25 years ago. It blooms in a cryptic cream-beige colour that camouflages it against the background of the desiccated vegetation. The reason for its unusual colour and flowering season still remain to be studied.

*Allium albotunicatum* is limited in distribution to a few isolated sites in the Judean and Samaria Mountains, while more common at high altitudes in the Hermon Mountain. It shares the same flowering season and colouration of *A. kollmannianum*, which raises the question of why many *Allium* species bloom in the dry season, with almost invisible floral colours. This is still an unanswered question, waiting to be resolved.
New in the Garden: Renewal of the lichen collection

The garden’s unique lichen collection was renewed, with samples collected from various desert habitats, representing the variety of lichen species from the arid region of Israel. This live collection is the only one of its kind in Israel and one of the few in the world. The lichen collection was established by the previous director of the garden, Prof. Jacob Garty, who still continues his research on the taxonomy and ecology of the lichen species of Israel. Lichens are a classic example of tight mutualism: an organism composed of two different organisms, living in cooperation and completely dependent on one another (symbiosis). Lichens comprise an alga and a fungus, and their symbiotic relationship enables the lichens to grow even in the harshest habitats on earth, such as in deserts, atop tall mountains and near the poles. The fungus establishes itself in the substrate, creating a protective layer against dehydration and solar radiation and comprises the bulk of the lichen. The alga, protected within the layers of the fungus, produces energy (sugar) by photosynthesis, as in any other plant. The evolution of this successful combination, which took place many eons ago, has proven to be so successful that it continues to exist today. In contrast to plants, the lichen thallus lacks protective layers, making it permeable to air pollutants. Consequently, lichens are good bioindicators for detecting air pollution, offering a warning sign for humans. Unfortunately, for this very reason many lichen species in the botanical garden do not last long in the polluted air conditions of Tel Aviv near the Ayalon highway, and the collection
must be renewed every few years. Last week fresh individuals of *Ramalina maciformis*, *Caloplaca ehrenbergii* and *Guellia canescens*, all species growing on flint rock, were added to the collection in the Garden. Some endolithic lichens are also present in the collection, growing in limestone. These lichens actually grow inside the rock, near to its surface.

**A deadly dilemma: The pitcher plant flowers in the tropical greenhouse**

The tropical pitcher plant *Nepenthes alata* is a carnivorous plant endemic to the Philippines, and a natural dweller of the tropical rainforest. Like all other plants, it uses light to photosynthesize sugar, but because of shortage of nitrogen nutrients in the ground the plant complements its diet by trapping and digesting insects. The insects are attracted to the colour and fragrance of the pitcher-shaped traps, drown in the liquid inside, and are digested by special enzymes in this liquid. The traps develop at the tip of the midrib of the leaf, whose shape gives this plant its common name. The petiole of the leaf is broad, wing-like, from which the plant species’ scientific name is derived. The petiole is green and fulfils the role of photosynthesis usually fulfilled by the leaf blade in most other plants. However, the pitcher plant is not only a predator of insects. It also needs them for pollination. Killing its pollinators would obviously be disadvantageous to the plant, so in order not to inadvertently trap the pollinators, a separation has evolved between the organs used for predation (pitcher) and for reproduction (flowers). The pitcher plant displays a spatial separation, as well as distinctive colour and odour differences between the flowers and the traps.
These plants are currently flowering in the Garden’s tropical greenhouse: the top photograph (previous page) presents the pitcher-like trap and the bottom one – the male inflorescence.

These types of species create many hybrids, both in nature and in cultivation, and some of those in our garden seem to be the result of a natural hybridization between *N. alata* and *N. ventricosa*, named *Nepenthes X ventrata*.

**Pretty but stinky: *Caralluma speciosa* flowers in the succulent collection**

*Caralluma speciosa* is an East-African plant from the Oleander family (Apocynaceae; formerly Asclepiadaceae), to which also belong *Calotropis procera* (Sodom’s apple) and *Nerium oleander*. This is a succulent plant that stores water in its green and fleshy stems, while its leaves degenerate and modify to tiny thorns. It resembles a cactus in its morphology, but belongs to a very distant family. Such succulent modifications have evolved independently in different un-related groups of plants as an adaptation to life in arid habitats. Only two cactus-like succulent plant species grow in Israel, both of which are other *Caralluma* species.

*Caralluma speciosa* is now flowering in the garden’s succulent collection, displaying a surprising chocolate-brown and yellow colour, with interesting shades and patterns. Although its odour is unpleasant, resembling a sewer, this presents a fragrant attractant for flies, which serve as pollinators.