

ISRAEL ENVIRONMENT BULLETIN

Summer 2002-5763, Vol. 25, No.3

MINISTRY OF THE ENVIRONMENT



STATE OF ISRAEL
MINISTRY OF THE ENVIRONMENT

שלום עם הסביבה



המשרד לאיכות הסביבה
وزارة جودة البيئة
Ministry of the Environment

"Orange Day" 2001

**Protecting
the Gulf of
Eilat/Aqaba**

**Groundwater
Monitoring**

Air Quality 2001

**Raptors and
Pest Control**

**In the
Aftermath of
Johannesburg**



USING RAPTORS IN AGRICULTURAL BIOLOGICAL PEST CONTROL



An innovative project in Kibbutz Sde Eliyahu is tackling one of the most problematic aspects of agriculture (rodents) while reducing the use of dangerous toxins in the fields

Photo of Barn Owl: Uria Shachak



Barn owls (*Tyto alba*) and kestrels (*Falco tinnunculus*) are two of the most abundant raptors living in Israel. They are also the key to the success of the biological pest control project at Kibbutz Sde Eliyahu in the Beit She'an area in northern Israel. The joint venture, led by the Hebrew University in Jerusalem, Tel Aviv University, the International Center for Study of Bird Migration, Latrun, and Kibbutz Sde Eliyahu, uses raptors as an environmentally friendly and economically profitable solution for eliminating rodents from agricultural fields and plantations. The project has been so successful that the kibbutz now produces top class agricultural produce using little to no pesticides.

The Problems

The development of modern agricultural techniques has increased agricultural production and its quality on the one hand, but has increased the number of pests, on the other. Food availability in agricultural fields encourages population growth of small herbivorous mammals, mainly rodents, which cause extensive losses to farm produce. It is estimated that rodents are responsible for the destruction of about 35% of the total world agricultural production.

To combat rodents, farmers have used rodenticides, although this technique is often ineffective since it is short-lived, requires frequent reapplication and leads rodents to become bait-shy. In addition, rodenticides destroy ecosystems, poison the soil and water systems and have secondary health effects on humans and wildlife. Therefore, new options are being examined including the introduction of biological pest control of rodents by such natural predators as barn owls and kestrels. Predation upon rodents by these natural diurnal/nocturnal predators substantially decreases rodent numbers, thus lowering crop damage and eliminating the use of rodenticides.

Israel is an important migration route for raptors, which are important ecological barometers and vital to healthy ecosystems. However, during the late 1960s, hundreds of raptors (some of them threatened and endangered species) were killed throughout Israel, and specifically in the Hula Valley, due to secondary poisoning from eating rodents that were poisoned with rodenticides. Following an unsuccessful conservation plan in Kibbutz Neot Mordechai in the Hula Valley in 1982, Kibbutz Sde Eliyahu, located in Beit She'an Valley, was chosen to spearhead the project due to its environmental awareness and support of nature conservation. Barn owl and kestrel nesting boxes and hunting perches were erected in strategic locations in and around the fields and plantations in order to establish stable barn owl and kestrel populations.

The first couple of years were characterized by ups and downs. The first nest box design came from Europe and did not supply enough ventilation for the 40° Celsius temperatures which characterized summers in the Beit She'an Valley. However, as a result of accumulated experience along with improvements to the nesting box designs, a population of barn owls was formed and has never left the kibbutz during the past 20 years.



Raptors and Rodent Control

Barn owls and kestrels control rodents by causing direct mortality and behavioral changes to their prey (predatory avoidance, habitat selection, and foraging behavior). A rodent living in an environment with predators will forage less than one in a predator-free environment. The presence of predators puts the rodent on constant alert, constantly forced to look over its shoulder (predatory avoidance) and thus able to spend less time foraging and causing crop damage. A constant threat of predation by both diurnal (kestrels) and nocturnal (barn owls) raptors creates an unhealthy stressful environment for the rodents.

During the nesting season of barn owls and kestrels, which is also the most problematic time in terms of high rodent numbers, each pair of barn owls and kestrels must feed their nestlings and themselves. Barn owls lay clutches of up to 12 eggs (average 4-7 young) and kestrels up to six eggs (average 3-5 young) that require their parents to supply large quantities of food in order to ensure the survival of



their offspring. Each pair of barn owls is capable of preying on 20 rodents a night in order to feed their nestlings. A pair of barn owls is capable of killing up to 2,000 rodents in one year. Presently there are around 25 pairs of kestrels and 30 pairs of barn owls (out of sixty nesting boxes) nesting in Kibbutz Sde Eliyahu alone. During the past ten years, other kibbutzim in the Beit She'an Valley, Golan Heights (Keshet, Yonaton, Nov and others), and other locations in Israel, have joined Kibbutz Sde Eliyahu in establishing nesting boxes with similar success.

Nesting Sites and Food

Barn owls are cavity dwellers, which nest naturally in tree holes as well as in barns (hence the name, 'barn owl') and old houses. However,

urbanization, house remodeling and modernization have taken a toll on barn owl nesting sites. The addition of nesting boxes effectively replaces natural sites by man-made cavities. The weather-friendly and effective nesting boxes, which have been designed in Kibbutz Sde Eliyahu over the past 20 years, have been most successful in attracting barn owls.

Just like barn owls, kestrels do not make nests but rather lay their eggs in date trees, ledges on cliffs or buildings, cavities in trees, or abandoned nests of other birds (crows). Kestrels also nest in nesting boxes that, when established, allow them to inhabit environments lacking natural nesting sites. Both barn owls and kestrels are able to nest next to one another at distances of less than 10 meters.

Raptor populations are controlled by two main factors: food and nest sites. Once nesting sites are established, barn owls will come and do what they do naturally: hunt rodents. No further steps are necessary. Both barn owls and kestrels are opportunistic predators with a strong preference for rodents, but other food sources will do when the rodent population decreases. Significantly, during periods of rodent decline (due to the hunting of raptors and other environmental factors), moderate sized barn owl and kestrel populations remain on their home ranges and do not disperse, by switching to alternative prey such as birds and lizards. Thus, the creation of a continual predatory pressure on the rodents inhibits their population growth.

The supply of nesting sites, a friendly environment (toxin free), and food, allows barn owls and kestrels to flourish. The trick of the game is patience. Farmers have to first and foremost add nesting boxes and cease using rodenticides that cause secondary poisoning to raptors in

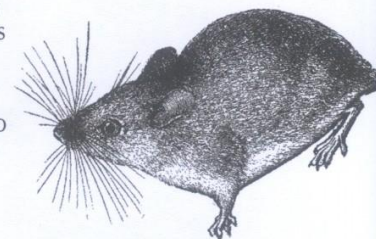


Photo: Motti Charter

Shauli Aviel, coordinator of the project, holds a barn owl next to its nesting box

order to give raptors a chance to do what they do well. Use of rodenticides will inevitably lead to failure since raptors eat the rodents and then become poisoned by secondary poisoning. This in turn allows the rodent populations to grow freely and cause agricultural damage.

Education and Cooperation

An important goal of the project is farmer education, both concerning the insufficiencies and side effects of rodenticides and the benefits of raptors as biological pest controls. Using the twenty years of experience that has been accumulated at Kibbutz Sde Eliyahu as a model, local farmers are learning the techniques of establishing nesting boxes.

Yet education is not limited to the immediate vicinity. In fact, an active barn owl nest at Kibbutz Sde Eliyahu can be viewed in real time as part of the educational project, "Migrating Birds Know No Boundaries," on the website: www.birds.org.il. School children and the general public are able to monitor the whole nesting season in real-time as well as recorded video clips.

Hopes are also high that the project will spread to Israel's neighbors, Jordanian and Palestinian alike, connecting people and educating farmers on both sides of the border on measures to reduce rodenticide use. Israel's Ministry of Regional Cooperation is already funding a project to write a manual in Arabic that will be available to farmers on the Jordanian side of the Beit She'an Valley, educating them in the techniques of biological pest control.

Once farmers grasp the concept that their 'winged' neighbors can solve such problems as rodent damages and poisoning, barn owls and kestrels can rise to the occasion and control rodents. By living in harmony, both farmers and raptors will be able to



Left:
Female kestrel
incubating eggs
inside a nesting box

Below:
Motti Charter
examines a
22-day old kestrel
chick

Photo: Motti Charter

reap the benefits of coexistence. Using raptors in biological pest control is not a short-term quick fix gimmick but rather a long-term environmentally friendly solution to overcome one of the most problematic aspects of agriculture (rodents).

The sky is truly the limit for use of biological pest control.

Acknowledgments: Since the late eighties, two Masters students from the Hebrew University of Jerusalem, Gila Kahila and Eitan Aram, conducted research projects on various aspects of barn owls and rodent populations. Presently, two graduate students are researching both the barn owl (Yoav Motro) and the kestrel (Motti Charter) populations. Throughout the twenty years, Shauli Aviel, member of Kibbutz Sde Eliyahu and a licensed bird bander, has and continues to be the coordinator and the backbone of the project. Special thanks to Motti Charter for providing the information for this article as well as the accompanying photographs.