BONELLI'S EAGLE CONSERVATION IN ISRAEL

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The Bonelli's eagle is in danger of extinction in Israel (and probably in all neighboring countries): from a population of about 50 nesting pairs in the 1940's in all mountainous areas, the population decreased to 25 pairs in the late 1970's and 15 pairs or known territories nowadays (Table 1).

This dramatic decline is due to synergism of rapid changes and human interference in the ecosystem: mainly with massive and uncontrolled use of pesticides to deliberate poisoning of predators, rodents and seed eating birds in the 1950's until the mid-1970. To lesser extent, but still very significant on small population are the effects of electrocutions, lead poisoning from predating on shot birds, disturbances by aviation flying in the canyons where the eagles nest and robbing chicks from nests, mainly in Samaria and

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# pairs	year
60	1940's
50	1952
29	1979
19	1995
14	2010
12	2012
13	2015*
14	2016*
14	2017*

Table 1.- Number of known pairs in breeding territories.

Judea desert. Since anthropogenic factors are the main cause for this decline, most of the remaining pairs are in the Judean Desert and the Negev - the arid habitats. This is probably due to the fact that the arid habitats are far less occupied by humans and with less interference in the ecosystem. But even the population in the desert or arid habitats is endangered: nests are robbed each year, particularly by Palestinians, in East Samaria. Adding to that, juvenile and immature Bonelli's eagles (BE) disperse to lowlands that are cultivated and with many powerlines that run through the open landscape. Thus, since 2011 18 individuals were electrocuted in Israel and one Israeli BE was electrocuted in Sudan. It is clear that without active management the species will extinct from Israel and probably from all the Middle-East (before or soon after).

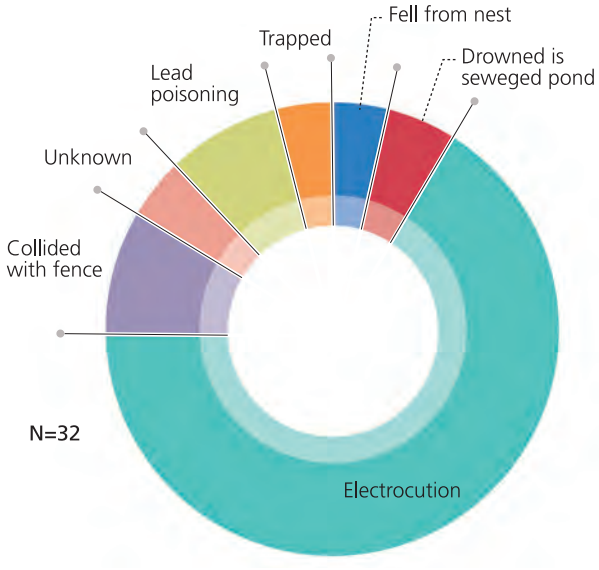
Thus, the species is considered as critically endangered in the Israeli Red Data book.

In 1996, a joint project, name "Porsim Canaf", was establish in order to prevent the extinction of endangered raptors' species in Israel. The partners of "Porsim Canaf" project are: The Nature & Parks Authority, The Society for the Protection of Nature in Israel and the Israeli Electric Corporation. The Nature & Parks Authority, within this framework conducts multidisciplinary activity in order to prevent this extinction and to recover the BE population. The Israeli Electric Corporation is obligated to insulate dangerous pylons.

In order to set the project goals and the appropriate measures it was imperative to identify the endangering factors and their magnitude (Graph 1).

Monitoring of the nesting enabled to get some demographic parameters in order to use in population viability models (Table 2).

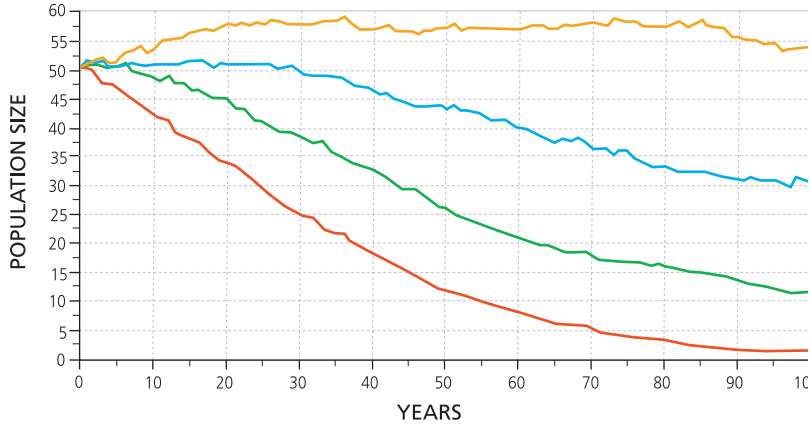
Using demographic models and empirical measures proves that by increasing the breeding success rate, and reducing mortality caused by: secondary poisoning by pesticides; lead poisoning and electrocution can immediately improve the status of the species. Graph 2 presents the dynamic of the BE population in four scenarios for the current estimated population (50 individuals).



Graph 1.- The causes for the mortality or injury of 32 BE that were collected in Israel since 2011.

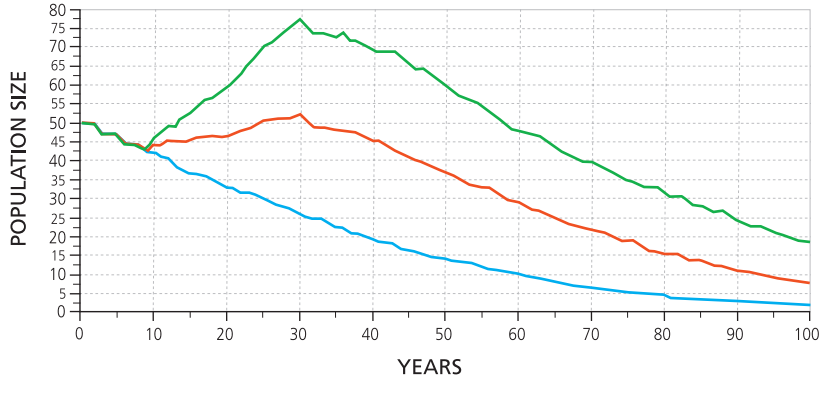
year	# pairs	# nesting pairs	# fledglings	Nesting success per breeding attempt	Nesting success per occupied territories (population)
2015	13	12	9	0.75	0.69
2016	14	10	10	1	0.71
2017	13	11	14	1.27	1.08
Total	**40**	**33**	**33**	**1.0 (±0.4)**	**0.83 (±0.3)**

Table 2.- Best nesting results in Israel 2015-2017.



Graph 2.- Demographic scenarios of the BE population in Israel, with and without conservation measures: red - current breeding success rate; dark green - without robbing nests (real figures); blue - with breeding rates and as documented in the 1970's; light green - without robbing nests and disturbances of overhead flights of helicopters.

In order to prevent the extinction, a multi-disciplinary approach is required. Restocking captive born eagles is a measure that can postpone the extinction (Graph 3) or allow the project to gain the time needed to mitigate the endangering factors to the desired demographic scenario: halting the decrease in breeding pairs and the recovery of it to the population size of the 1970's.



Graph 3.- Demographic scenarios of the BE population in Israel without and with restocking of captive born eaglets: blue- without restocking; red - 2 eaglets per year; green - 4 per year.

The four main conservation measures within the framework of the "Porsim Canaf" project:

1. Insulating power lines' pylons in areas of high activity of Bonelli's eagles and near nesting sites. This is rather conventional method that is used worldwide.
2. Guarding on nests that are prone to be robbed halting the decrease (mainly in eastern Samaria and Judea mountains) see below.
3. Acclimatizing and Releasing of captive bred eaglets in areas which were deserted (Mt. Carmel) by the species or on the brink of extinction (Golan Heights), see below.
4. Reducing the disturbances of military and civilian aviation in canyons and near cliffs were Bonelli's eagles and other endangered raptors are nesting or used to nest. Since 1998 the Israeli Air force adopted a policy of restricted flights zones that are sensitive for endangered raptors. The INPA is promoting new regulation for civilian aviation in nature reserves in regards to heights and distance from endangered raptors' nests.

Monitoring and guarding nests that are exposed to robbers

This is the far more quick and easy measure to increase the population by natural mean. Each year, a survey to allocate all active nests is performed in the months during January and February. According to the findings, 2-3 sites, which are relatively accessible and are not protected by the topography and geography, are guarded by local citizens. The guarding starts at about 3 weeks old and lasts until fledging. Usually, local Bedouins or villagers are employed. They are provided them with binoculars, a telescope and communication means.

Reintroduction and restocking

A reintroduction plan of the BE to the Mediterranean habitat in Israel had started in mid-1990's by establishing a captive breeding nucleus. Releases of captive born BE started in 2003 (Table 3). The method used was conventional hacking at fledging age. It was later modified to a soft release from flight cages at the age of about 4-5 months old: the first few weeks the fledglings were left with the parents (usually foster parents) to practice

year	released	losses/ mortality	breeding pairs in the wild (at least one is a captive born)	Successful breeding
2003	2	-	-	-
2004	0	-	-	-
2005	2	-	-	-
2006	1	-	-	-
2007	1	-	-	-
2008	3	-	-	-
2009	6	-	-	-
2010	3	-	-	-
2011	4	1 electrocuted in 2016		
2012	4	1 shot Lebanon		
2013	4	-	1	1
2014	5	-	2	?
2015	2	1 Newcastle virus	3	1
2016	4	2 electrocuted (1 in Sudan)	3	2
2017	6	2 electrocuted	3	2
Total	**47**	**7**	**10**	**6**

Table 3

hunting with their parents and the kill. Then, prior to the release they are acclimatized in a separate cage at the release site for another month.

2014 was the first year of breeding of BE in the whole Galilee since 1978. The formed pair was of captive born birds that were acclimatized and released in Mt. Carmel. Already a year before a mate, a female, in a productive pair in Judea desert was identified as captive born and released bird. All released birds are born at the INPA breeding center at Hai-Bar Carmel nature reserve.

Photo 1.- A wild Bonelli's eagle with a fostered chick (captive born).

Photo 2.- A helicopter is hovering in a canyon in Judea desert in a rescue mission. On the cliff at the background, the nesting BE (the same pair in the photo 1), deserted their nest as e result of the rescue.

Photo 3.- Two Golden Eagle eaglets tied near a Bedouins camp before they are sold in the West Bank. Both were robbed from the nest in Judea desert.

Photo 4.- A poisoned adult BE below its nest.

Photo 5.- An adult captive born BE. Was release as an eaglet and matured in the wild. The antenna of its transmitter can be seen above its tail.

Photo 6, 7.- The breeding aviaries.

Photo 8.- A pair drinking from a Nubian Ibex's water trough in Judea desert.