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Advice Hub

Special consideration/guidance for nest-box studies or monitoring

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SPECIAL CONSIDERATIONS / GUIDANCE FOR NEST-BOX STUDIES OR MONITORING

Nest-boxes and artificial nests are a useful tool in raptor monitoring and studies. Many raptor nests are difficult to find and often studies on natural nest sites are extremely labour intensive and also not cost-efficient. Therefore, nest-boxes have been used in many studies as an appropriate research tool to evaluate breeding biology, dispersal, survival, and diet, in monitoring programs of raptor breeding populations, and in some cases as a conservation management tool for threatened raptors. However, the use of nest-boxes for raptors needs some special considerations before adopting nest-boxes in studies and monitoring since nest-boxes enable full control over local breeding populations of targeted raptors and might be a subject of special licensing as well as responsibility of the nest-box holders and controllers.

DESIGN OF RAPTOR NEST-BOXES

There are in general three types of nest-boxes (Figure 2), but designs are usually species specific, and might affect raptor breeding success as well. Before setting up a raptor monitoring scheme or study using nest-boxes it is important to first learn the

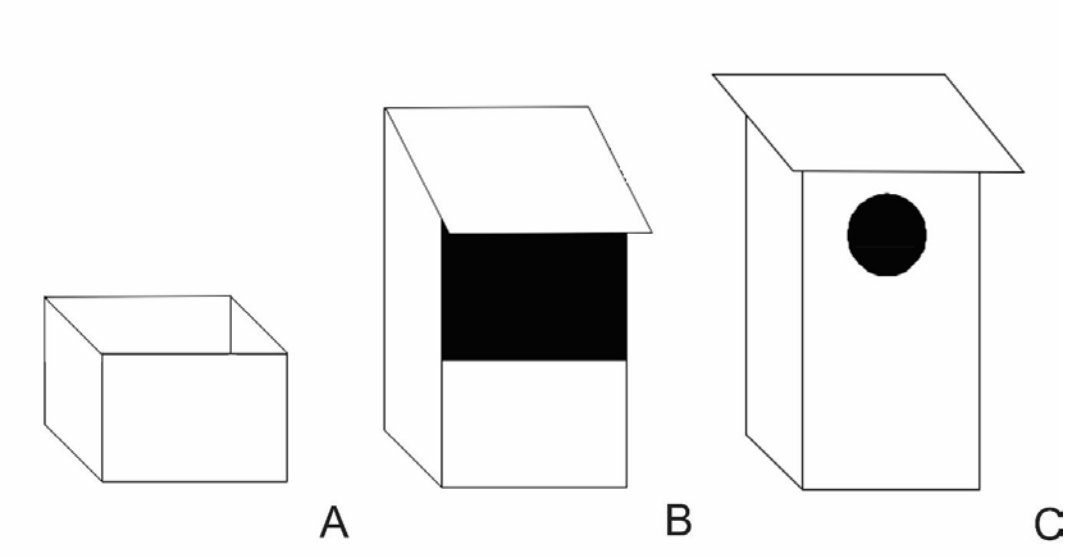

FIGURE 2 – Types of nest-boxes for raptors: A – open nest-box (artificial stick nest, platform or basket), B – semi-open nest-box, C – standard nest-box.

detailed design of the nest-box for targeted species (Table 3), and secondly to use the same or as much as possible similar nest-box design within the monitoring scheme to obtain comparable results between seasons and areas.

RAPTORS BREEDING IN NEST-BOXES

Nest-boxes or artificial nests cannot be used in all raptor species, but mainly in owls and falcons (Table 3). Majority of raptors that accept nest-boxes for breeding are species that naturally nest in tree holes, on the stumps, in rock cervices or in buildings, so in somehow sheltered breeding sites. Also some species breeding in open stick nests are prone to occupy artificial stick nests or platforms, but only few of them are using such man-made structures frequently enough to be reliable to be used in studies or monitoring programs. References given in Table 1 should be further explored for details about species-specific nest-box designs that were used in raptors studies or monitoring programs.

Even if a raptor species is known to occupy the nest-box, in some areas birds can be reluctant to enter the nest-box and study or monitoring using nest-boxes might fail. This is possible especially in habitats that are over-saturated with suitable natural nest-sites, e.g., great availability of tree holes in old forest stands. Therefore, it is advisable to test if raptor species accepts nest-boxes by first setting few nest-boxes or by gathering available data of the nesting cases of targeted raptor in nest-boxes in the selected study area before setting a large number of nest-boxes. It is important to note that there can be considerable time lag between setting up the nest-box and its acceptance by the raptor for breeding, which might take from one to several years. Old breeding pairs already breeding in natural nest-sites might be more reluctant to change the nest to the nest-box, but young pairs establishing their territories can occupy the nest-box faster. The time lag in nest-box occupancy therefore depends largely on breeding pair turnover in the area.

TABLE 3 – Overview of European raptor species and types of nest-boxes that can be used for their monitoring (marked with green tick) or not (marked with red cross), but in some cases nest-box designs are known but not extensively used or tested in studies or monitoring programs (marked with orange question mark).

Given references are of selected research or monitoring in which specific nest-box designs are described: 1 - Skujina et al. (2021), 2 – Saurola (2021), 3 - Taylor (1994), 4 - Roulin 2020, 5 - Korpimäki & Hakkarainen (2012), 6 - van Nieuwenhuyse et al. (2008), 7 - Suhonen et al. (2007), 8 - Baroni et al. (2020), 9 - Malle & Probst (2015), 10 - Iezekiel et al. (2021), 11 - Garner & Milner (1998), 12 - Kotyman et al. (2015), 13 - Southern (1970), 14 - Petty et al. (1994), 15 - Mebs & Scherzinger (2000), 16 - Vrezec et al. (2018), 17 - Sulkava & Huhtala (1997), 18 - Pomarol (1996), 19 - Bux et al. (2008), 20 - Village (1990), 21 - Valkama & Korpimäki (1999), 22 - Fargallo et al. (2001), 23 - Charter et al. (2007), 24 - Kotyman et al. (2015), 25 - Ristow et al. (1988), 26 - Ivanovsky (2016), 27 - Fiuczynski et al. (2009), 28 - Chavko & Deutschova (2012), 29 - Chavko et al. (2014), 30 - Mebs & Schmidt (2006), 31 - Sielicki & Mizera (2009)

ENGLISH NAME	LATIN NAME	OPEN NESTBOX	SEMI-OPEN NESTBOX	STANDARD NESTBOX	REFERENCES
Osprey	*Pandion haliaetus*	✓	✗	✗	1, 2
Black-winged Kite	*Elanus caeruleus*	✗	✗	✗	
Lammergeier	*Gypaetus barbatus*	✗	✗	✗	
Egyptian Vulture	*Neophron percnopterus*	✗	✗	✗	
Honey Buzzard	*Pernis apivorus*	✗	✗	✗	
Griffon Vulture	*Gyps fulvus*	✗	✗	✗	
Black Vulture	*Aegypius monachus*	✗	✗	✗	
Short-toed Eagle	*Circaetus gallicus*	✗	✗	✗	
Lesser Spotted Eagle	*Clanga pomarina*	✗	✗	✗	
Greater Spotted Eagle	*Clanga clanga*	✗	✗	✗	
Booted Eagle	*Hieraaetus pennatus*	✗	✗	✗	

ENGLISH NAME	LATIN NAME	OPEN NESTBOX	SEMI-OPEN NESTBOX	STANDARD NESTBOX	REFERENCES
Steppe Eagle	*Aquila nipalensis*	X	X	X	
Spanish Imperial Eagle	*Aquila adalberti*	X	X	X	
Imperial Eagle	*Aquila heliaca*	X	X	X	
Golden Eagle	*Aquila chrysaetos*	X	X	X	
Bonelli's Eagle	*Aquila fasciata*	X	X	X	
Levant Sparrowhawk	*Accipiter brevipes*	X	X	X	
Eurasian Sparrowhawk	*Accipiter nisus*	X	X	X	
Northern Goshawk	*Accipiter gentilis*	X	X	X	
Marsh Harrier	*Circus aeruginosus*	X	X	X	
Hen Harrier	*Circus cyaneus*	X	X	X	
Pallid Harrier	*Circus macrourus*	X	X	X	
Montagu's Harrier	*Circus pygargus*	X	X	X	
Red Kite	*Milvus milvus*	X	X	X	
Black Kite	*Milvus migrans*	X	X	X	
White-tailed Eagle	*Haliaeetus albicilla*	X	X	X	
Rough-legged Buzzard	*Buteo lagopus*	X	X	X	
Long-legged Buzzard	*Buteo rufinus*	X	X	X	

ENGLISH NAME	LATIN NAME	OPEN NESTBOX	SEMI-OPEN NESTBOX	STANDARD NESTBOX	REFERENCES
Common Buzzard	*Buteo buteo*	✗	✗	✗	
Barn Owl	*Tyto alba*	✗	✗	✓	3, 4
Boreal Owl	*Aegolius funereus*	✗	✗	✓	5
Little Owl	*Athene noctua*	✗	✗	✓	6
Northern Hawk Owl	*Surnia ulula*	✗	✗	✗	
Eurasian Pygmy Owl	*Glaucidium passerinum*	✗	✗	✓	7, 8
Eurasian Scops Owl	*Otus scops*	✗	✗	✓	9
Cyprus Scops Owl	*Otus cyprius*	✗	✗	✓	10
Pallid Scops Owl	*Otus brucei*	✗	✗	✗	
Long-eared Owl	*Asio otus*	✓	✓	✗	11, 12
Short-eared Owl	*Asio flammeus*	✗	✗	✗	
Snowy Owl	*Bubo scandiacus*	✗	✗	✗	
Eurasian Eagle Owl	*Bubo bubo*	✗	✗	✗	
Pharaoh Eagle Owl	*Bubo ascalaphus*	✗	✗	✗	
Brown Fish Owl	*Ketupa zeylonensis*	✗	✗	✗	
Tawny Owl	*Strix aluco*	✗	✓	✓	13, 14
Desert Owl	*Strix hadorami*	✗	✗	✗	

ENGLISH NAME	LATIN NAME	OPEN NESTBOX	SEMI-OPEN NESTBOX	STANDARD NESTBOX	REFERENCES
Ural Owl	*Strix uralensis*	?	✓	✓	15, 16
Great Grey Owl	*Strix nebulosa*	✓	✓	✗	17
Lesser Kestrel	*Falco naumanni*	✗	✓	✓	18, 19
Common Kestrel	*Falco tinnunculus*	✓	✓	✗	20, 21, 22, 23
Red-footed Falcon	*Falco vespertinus*	✓	✓	✗	24
Eleonora's Falcon	*Falco eleonorae*	✓	✗	✗	25
Sooty Falcon	*Falco concolor*	✗	✗	✗	
Merlin	*Falco columbarius*	✓	✗	✗	26
Eurasian Hobby	*Falco subbuteo*	✓	✗	✗	27
Lanner Falcon	*Falco biarmicus*	✗	✗	✗	
Saker Falcon	*Falco cherrug*	✓	✓	✗	28, 29
Gyrfalcon	*Falco rusticolus*	?	✗	✗	30
Peregrine Falcon	*Falco peregrinus*	✓	✓	✗	31

SETTING UP THE NEST-BOXES

In setting up the nest-boxes for study or monitoring purposes, three issues should be considered: (1) independency of neighbouring nest-boxes so that each nest-box can be potentially occupied by different breeding pairs, (2) safety of the breeding birds and (3) practicality for annual nest-box inspections.

NEST-BOX INDEPENDENCY: When nest-boxes are used for monitoring, i.e., monitoring of annual fluctuations of the number of breeding pairs, nest-boxes should not be set too close. Most of the raptors, except some colonial or semi-colonial breeding birds of prey and falcons, are usually very territorial, therefore the second nest-box within the occupied territory might remain unoccupied simply because of aggressive behaviour of a territorial pair preventing the second pair to occupy otherwise empty nest. The recommended distances between nest-boxes depend on the raptor territorial size, which might differ in different areas and are dependent on the food conditions, e.g., prey availability. Poorer are food conditions, larger are territories.

SAFETY OF THE BREEDING BIRDS: The nest-boxes must not pose an ecological trap for breeding raptors, meaning that nest failures must not be due to human interferences or increased predation. This means that nest-boxes must be set high enough and out of the reach from people, and designed in a way to prevent increased predation, what is relevant especially for smaller raptor species. Owls and falcons do not build their nests but lay eggs on the bottom of the nest-box. Therefore, it is necessary to secure isolation of the egg laying place of the nest-box by placement of a thick layer of saw dust, straw or dry grass. Also nest-box design should be considered carefully, since some designs are risky for raptors or their characteristics may limit reproduction. A fragile nest-box or a nest-box with flooding problems can cause nest-failures.

PRACTICALITY OF ANNUAL INSPECTIONS: In monitoring schemes the nests are checked from one to three or more times annually, usually when ringing and catching adults and chicks. Therefore, the nest-boxes should be set in a way that it is practical for annual inspections, but considering safety of breeding birds and general breeding demands of target raptor species. When setting up a nest-box monitoring scheme it is important to get permissions from landowners or area managers (i.e., in protected or other areas with legal restrictions), where this is necessary.

CONTROLLING OF THE NEST-BOXES AND DATA COLLECTION

Breeding productivity monitoring is conducted as annual successive survey of nest-box occupancy in the area with set up network of nest-boxes. Each nest-box is georeferenced. First checking of the nest-box should be conducted in early breeding season (brooding female ringing, clutch size record). Clutch size can be recorded by climbing to the nest or using high pole nest camera to speed up nest checking. It is important to note that many raptors are extremely sensitive when incubating eggs and disturbance during this period might cause desertion of the nest (for species specific sensitivity check Kania 1992). Second checking of the nest-box should be conducted for nestling ringing and brood size record – exact timing depends on the state of the breeding at first visit. There might be more visits needed in the case of larger broods when the youngest chick might not be big enough for ringing. Growth of chicks might differ between raptor species, but in general the most suitable time is 5-10 days before chicks are leaving the nest, what is also suitable time to collect necessary samples of blood or feathers

CAUTION:

- For active collecting of samples special permit and skills are usually required, so please check the section Procedures to comply with the European and National legislation during raptor sampling.
- In third checking later in the season it is necessary to check nest-boxes that were empty earlier for possible late clutches, especially in prey poor seasons. Later in the season, summer/autumn, the active nests in the current year should be visited again for collecting of breeding material for diet analysis and addled eggs for contaminant analysis.
- The parameters recorded during breeding productivity monitoring are clutch size, brood size, brooding female age including biometric parameters (e.g., wing length, weight, head length including bill, etc.), nestling age (after measurements compared to the growth curve), time of breeding, ring number. These parameters are crucial for evaluating breeding success in the population, life time reproduction success and also more advanced analysis of survival.
- Some raptors, especially breeding females, rarely males, can be extremely aggressive by the nest and might vigorously attack the ringer/fieldworker several times while checking the nest and ringing the chicks. It is therefore absolutely necessary that ringing is conducted in two and the person climbing to the nest should have protected head and back, but in the way not to harm attacking female.

1 Photo example: Female Ural Owl (Strix uralensis) attacking ringer during inspection of the brood in the nest-box. **(photo: Jernej Polajnar)**

MAINTENANCE OF THE NEST-BOXES

Nest-boxes which are not regularly maintained are dangerous for breeding raptors and should be removed. Nest-boxes set outdoors are exposed to different environmental factors and in time start to decay or broke and eventually fall on the ground, what might happen also during the breeding season. Therefore, it is necessary to annually check the condition of the nest-box and replace or remove it if breeding is not anymore safe. Also, it is highly recommendable to replace nest material, saw dust, straw, or dry grass, after each breeding season if the nest was occupied, especially in owls and falcons which do not build the nests. This helps reducing the risk that rotten prey remains, excrements and parasites might affect future breeding success in the nest-box.

2 Photo example: Nest of the Tawny Owl (Strix aluco) in a nest-box placed on a thick layer of the sawdust om the bottom. (photo: Al Vrezec)

SKILLS, LICENSES AND PERMITS REQUIRED FOR NEST-BOX STUDIES

There are specific skills for surveyors required since they need special ringing license for ringing raptors in the nest (issued by the national authority, e.g., Environmental Agency, and National Ringing Center), and need to have skills in handling birds including age identification skills. For catching breeding adults, it is fairly easy to catch the female in the semi-open and standard nest-boxes, but less so in open nest-boxes or artificial nests. Catching males is usually more demanding. Field equipment for the survey include ladders, high pole nest camera, security belt, clothes for protection, helmet with soft coating and eye protection (especially in more aggressive species), gloves, butterfly net, standard ringing equipment, and optionally traps or mist-nets for male catching.

LIST OF RECOMMENDATIONS FOR NEST-BOX SURVEY RESULTS REPORTING

There are many different approaches in nest-box studies and no real standardization trial has taken place yet. One of the reasons is also that reports of nest-box survey results seldom include details that are important to be considered when comparing results from different regions and studies. In order to overcome this problem we propose a list of recommendations for reporting results in the nest-box studies to minimize biases in interpretations and comparisons of results:

1. Nest-box dimensions
2. Location of nest-boxes
3. Maintenance procedures of nest-boxes
4. Protection of nest-box occupants
5. Inspection of nest-boxes
6. Study-site characteristics

USEFUL LINKS & REFERENCES

https://www.barnowltrust.org.uk/barn-owl-nestbox/tawny-owl-nestbox/

https://www.bto.org/sites/default/files/tawny-owl-nest-box-plan.pdf

https://www.rspb.org.uk/birds-and-wildlife/advice/how-you-can-help-birds/nestboxes/nestboxes-for-owls-and-kestrels/

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FIGURES AND CHARTS


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