

Raptors' Plasticity of Nest Site Selection

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The occupation of suitable habitats depends greatly on the capability of raptor species to use different types of nest sites. Species with high plasticity in this respect are able to cover coherently and completely their species area, depending only on food availability. Species which are fixed on one special type of nesting can not cover all areas where they could live, e.g. rock nesters in wooded plains without rocks or tree nesters in steppes bare of trees. In some of these species with fixed and therefore restricted nest site selection there exist subpopulations clumped in remote areas using a quite different nest type, by this being able to occupy vast territories which otherwise could not be used as a breeding area by that species.

According to their different plasticity of nest site selection, raptors may be grouped into the following categories:

1. The majority of raptor species are firmly fixed on a special type of nest site according to a narrow genetical disposition. That group is further labelled as "fixed type"; e.g. Sparrow-hawk is tree nester, Griffon Vulture is rock nester exclusively.
2. A number of species regularly exhibit plasticity of nest site selection. These species use different nest site types within a continuous area and even within the nesting range of one pair, depending on distribution and availability of either nest site type. This group is further labelled as "ubiquists", and their plasticity is due to a wide genetical disposition; e.g. Kestrel or Golden Eagle belong to this group.
3. Only in very few species, originally belonging to the fixed type group, may subpopulations exceptionally originate with very differing nest site selection. These are spatially separated from their conspecifics of the normal fixed nesting type. The differing nest site selection is based on early experience and thus continued by tradition. Members of this group are further labelled as "tradition founders"; e.g. the Peregrine with tree nest and tree hollow tradition and the Red Kite with rock nest tradition, both in few places in the world.

As demonstrated in the classification and in Table 1, plasticity of nest site selection may be based on genetical disposition or on tradition. The deciding difference between both is due to the unequal probability of transition between the nest site types in the tradition founders: unhindered transition from the tradition to the genetically fixed type; no, or extremely exceptional, transition from the inborn type to the tradition type, which latter is normally acquired by early individual experience. This is the only reason why in the tradition founders their extraordinary nest site selection occurs spatially isolated and at only few places on the globe but, where once established, they are clumped together and in good numbers, coherently covering the vacant area - i.e. the deviating type of nesting does not represent a suboptimal ecological situation. Currently the most outstanding example of isolated tradition is the nesting in tree-holes of Peregrines nowadays confined to only one place in the world: South Victoria in Australia. This tradition is another and

quite separate line compared to tree-nesting of Peregrines in nests of other birds! Thus ubiquitous and tradition founders may be discriminated in the field by the distribution pattern of the different nest sites they use, as schematically shown in Figures 1a and 1b.

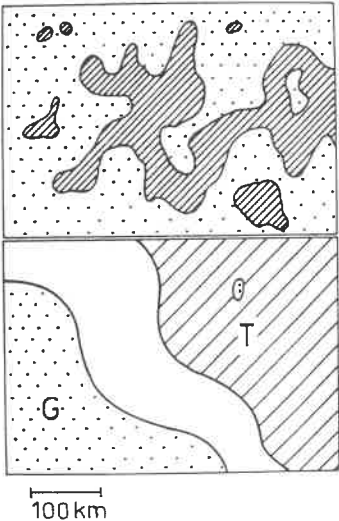
Table 1. Groups and examples of nest site selection types in birds of prey.

Group and Species (few examples)	tree nest	tree hollow	pylon nest (tree dummy)	ground	rock	building (rock dummy)
Fixed tree nester:						
Sparrow Hawk <i>Accipiter nisus</i>	+					
Honey Buzzard <i>Pernis apivorus</i>	+					
Hobby <i>Falco subbuteo</i>	+		+			
Ubiquists:						
Kestrel <i>Falco tinnunculus</i>	+	+	+	+	+	+
Golden Eagle <i>Aquila chrysaetos</i>	+		+		+	
Saker Falcon <i>Falco cherrug</i>	+		+		+	+
Fixed rock nester:						
Egyptian Vulture <i>Neophron percnopterus</i>					+	
Eleonora's Falcon <i>Falco eleonora</i>				+	+	
Tradition founder:						
Peregrine <i>Falco peregrinus</i>	[+]	[+]		+	+	+
Red Kite <i>Milvus milvus</i>	+				[+]	

Symbols: + freely accessible nesting type
[+] accessible by tradition only

Figure 1a. Mixed distribution pattern of two nesting types of ubiquitous according to regional availability of nest sites.

Figure 1b. Disjunct distribution of genetically fixed G and tradition T type of nesting separated by un-occupied territory. A few isolated pairs of G within the area of T occur regularly, but never the reverse.



Tradition founding in the proper and outstanding manner is presently known from few raptor species only: Peregrine, Red Kite, Common Buzzard (rock-nesting); but certainly more examples will be found. Tradition founders can exhibit their capability only in special and remote habitat conditions bare of the inborn nest site type. But in far from all such localities will the tradition of a new nesting type arise. Therefore an established nesting tradition once collapsed may never return spontaneously. Thus, populations representing a special nesting tradition need more attention to prevent their accidental extinction. If they are extinct they essentially need management, using imprinting on nest site type for reintroduction.

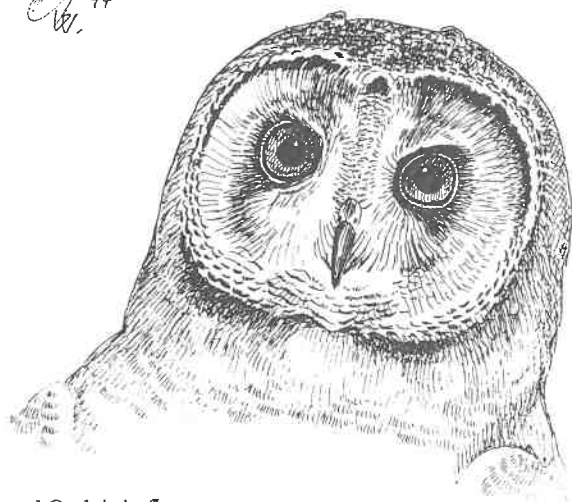
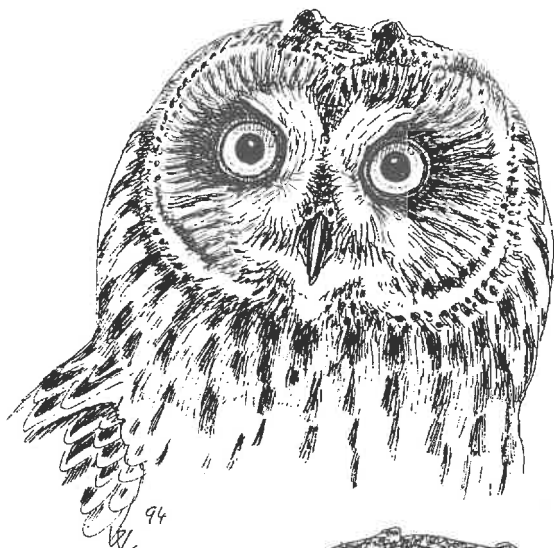
In many other species, mainly of the ubiquist group, tradition influences nest site selection, too, but in a less outstanding way. For instance ground nesting of Ospreys, ground nesting and the use of tree-holes in Kestrels, or the new fashion of nesting on power pylons, e.g. by Osprey and different falcon species, mostly occurs locally and clumped. But such local traditions arise in many places, are less extraordinary, and members of those nesting traditions are in continuous contact with their conspecifics of the normal nesting type. Mainly the transition from one type of nesting to the other does not seem to be blocked or hindered in any direction. This latter feature of unequal transition is diagnostic for tradition founders in the proper sense, as explained above.

In conclusion, the formation of tradition influences nest site selection in many species with gradual differences. In the ubiquists and some fixed type nesters it is an additional enlargement of their genetical disposition; in a few fixed type species, here named tradition founders, it is a narrow way to escape the restrictions of their genetically fixed nesting behaviour.

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Short-eared Owl *Asio flammeus*
and Marsh Owl *Asio capensis*