Nest Characteristics of Little Black Cormorant (*Phalacrocorax sulcirostris*) at Tanjung Rejo, North Sumatera

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Abstract: Breeding season of avifauna is initiated from mating choice and nesting step. Nest is an important aspect in cormorant survivability. Prior entering breeding season, male cormorant construct nest to lure the females. Size and composition of nest directly determine the success of breeding and birdlings survivability. In this study, we examined nest constructions within 5 plots consisted of 15 stands for nest occurrence and 10 stands for nest characteristics at Tanjung Rejo, Deli Serdang, North Sumatera. The results showed that black cormorant preferred to place their nests on 4 stand species: *Exocoecaria agallocha, Rhizopora apiculata, R. mucronata,*and *R. stylosa.* Black cormorant nests shaped like concave bowl and placements are not considered specific to certain site of stands. Twig characteristics are from straight-branched, straight-unbranched, branched, falciform-branched and falciform-unbranched. The conclusion of this study is that selection upon nest tree species, placement and structures are important part of the breeding success of black cormorant.

1 INTRODUCTION

Black cormorant is one species of water bird from Phalacrocoracidae. The breeding season of these species begin as follows: partial nest construction by males, invitational dance by males, finding a mate, and complete nest construction from both sexes. (Jumilawaty 2002).

Nest is a material that greatly determines the breeding success and survival of birds. Nests have various functions including laying eggs, incubating eggs, raising and nurturing birdlings and protecting offsrprings from weather and predators. The shape and arrangement of the nest is a characteristic of each species intended for protection and safety needs for the young.

Material composting the nest of each species also varies according to the availability of nature. The process of building nests in birds is one of the factors that determine the existence of a species, which is largely determined by the process of selecting available resources from the environment (Ayas, 2008). Generally birds build a bowl-shaped nest that is open at the top, for birds with large nest material most often used are large-sized twigs (Campbell and Lack, 1985).

In addition to the material of the nest material, the success of birds breeding are also determined by the choice of nest location, nest tree species and wind factors. In Tanjung Rejo, North Sumatra, the selection of places to nest and nest trees greatly affects the success of breeding from more than 2500 pairs of water birds consisting of 6 species of water birds that use these locations as breeding sites. Generally, each species of water bird will build and utilize natural resources around it to avoid competition in choosing nesting sites and nest material. The study aims to determine the characteristics of the nest tree by black cormorants that breed in Tanjung Rejo, North Sumatera.

2 MATERIALS AND METHODS

2.1 Materials

The tools used in this study were: Global Positioning System (GPS) device, scales, tape measure, colored-cloth ribbons, ropes, compass, calipers, binoculars, cameras and stationeries.

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2.2 Nest Tree Characteristics

Characteristics of the nest tree species utilized by black cormorants, were obtained by measuring 15 trees samped randomly. To avoid the resampling of the trees, each stands is marked using colored-cloth ribbons. The nest tree species parameters measured including:

1. Species of tree used as nesting place
2. H_{tree} (tree height) nesting place.
3. H_{trunk}, tree height from roots / rhizopor
4. D_{tree}, the diameter of the nesting tree, is measured by using a tape measure on a stem with a height of 1.30 m from the ground or water surface or 10 cm from the top of the buttress root.
5. N_{nest}, the number of nests on one tree
6. $Distance_{in}$, the nest distance to the main stem
7. $Distance_{out}$, the nest distance to the edge of the canopy
8. $Distance_{nest}$, the distance to the nearest nest in one nest tree
9. Top, the distance of the nest to the top of the canopy
10. $Distance_{edge}$, the distance of the nest tree to the pond
11. $Distance_{form}$, the distance of trees to different vegetation.
12. N_{trunk}, the number of trunk supporting nests

2.3 Nest Characteristics

To determine the characteristics of the nest, 10 (ten) black cormorant nests were measured. The nest composition parameters measured including:

- Nest length (cm) is the longest part of the nest
- Nest width (cm) is the widest part of the nest
- Nest depth (cm) is the perpendicular distance from the inner base
- Nest height (cm) is the distance from the lower nest to the highest part of the nest.
- Nest edge (cm) is a perpendicular distance from the nest's mouth to the base of the nest.

2.4 Nest Analysis

All measurement data on variables related to nests and trees are analyzed using statistical methods expressed by the average values and standard deviations.

3 RESULTS AND DISCUSSION

3.1 Nest Tree Characteristics

Tanjung Rejo pond area is a breeding place for water birds owned by individuals with an area of 4.5 ha. There are 6 species of water birds inhabit this location as a place to breed simultaneously. The water birds found in this location use mangrove plants that are scattered at the pond location randomly, according to their body size.

Large-sized water birds will choose locations difficult to reach by human disturbances in which located in the middle of the pond position, and usually not found at the edge of the pond area. Smaller birds like black cormorant choose to place nest in random fashion, scattered in all locations both in the middle and at the edge of the pond area.

The selection of this breeding location by the water bird found in this breeding location is thought to be closely related to safety factors to ensure the success of breeding and survival and the population of each species, and the strength of the nest tree.

Large-sized water birds need a tree that is comfortable and strong enough to refute the nest which will be filled by birdlings and females, while the smaller cormorants ranging from 58 - 61 cm in body sizes prefer smaller mangrove trees. The mangrove trees found in Tanjung Rejo belong to a small group of secondary mangrove forests.

Black cormorants that breed in Tanjung Rejo chose to lay their nest only on 4 species of mangrove trees from 10 species found in this region, namely: *Exocoecaria agallocha, Rhizopora apiculata*, *R. mucronata* and *R. stylosa*. This selection is thought to be closely related to the biological factors i.e. the size-specific nesting site (Table 1).

The tendency of black cormorantss to choose *R. mucronata* is closely related to tree architecture and nesting habits that are always in groups. *Rhizophora mucronata* has many scattered branches and twigs, a broad canopy and strong branches to support the nest until reaching 16 nests per stand. (Jumilawaty, 2002).

Table 1. Nest tree characteristics of *P. sulcirostris*

Tree parameters	Mean
H_{tree} (m)	3.5 – 5.5
H_{trunk} (m)	0.0 – 0.5
D_{tree} (cm)	12.5 – 22.5
$Distance_{edge}$ (m)	12 – 13
$Distance_{form}$ (m)	1.0 – 2.5
N_{nest}	18 – 25
D_{trunk}(cm)	2.5 –4.5
$Distance_{in}$ (cm)	30 – 175
$Distance_{out}$(cm)	50 – 120
N_{trunk}	2 – 3
$Distance_{nest}$ (cm)	30 – 150
Top (m)	0.5 – 1.2

In comparison to the results of Jumilawaty's (2002), selection of nests by black cormorants on Rambut Island, the Jakarta bay is consisted of two species, namely *Excoecaria agalocha* and *R. mucronata*, displaying a different result to the recent. The height of the nest tree and placement are also different where the cormorants on Rambut Island chose trees with a height (H_{tree}): 7 – 10 m and diameter of trunk placed with nests (D_{trunk}): 6 – 8 m, while in this study, we obtained H_{tree}: 3 – 5 m and D_{trunk}: 2.5 – 4.5 m .

Black cormorants chose specific trees to place their nests for safety and success breed and to raise their offsprings. The selection of nest trees by black cormors is strongly influenced by the availability of trees or resources in research locations, competition, body weight and safety factors which are safe from exposure to wind and human disturbances, tree structure, density of leaves and wing structures.

Cormorants generally form heterogeneous colonies with other water birds such as buffalo egrets, large egrets, and herons, generally inhabited by 5 – 18 nests. A tree possessing a strong structure to accommodate large numbers of nests and each nest is generally inhabited by 3 – 4 birdlings.

Our opinion is in accordance with the results of Mardiastuti's (1992), through the study of nest trees selection by water birds in Pulau Rambut which were greatly influenced by several factors: (1) safety from the wind, (2) tree structure, (3) foliage density and (4) wing structure. Furthermore, Rukmi (2002), stated that in the selection of nest trees; the most important thing is that the tree structure is considered quite safe during breeding season to support the success of breeding.

3.2 Nest Characteristics

The shape of a cormorant nest is very easy to distinguish from other species characterized by its dirty appearrance due to feces deposits and shaped like a concave bowl (Figure 1). The type and size of the nest is strongly influenced by species, and the availability of nest material. This is in accordance with the opinion of Campbell and Lack (1985). The type and size of nests constructed by bird pairs vary greatly and are strongly influenced by several factors, namely; bird species, nest location and availability of nest material. Generally birds build a bowl-shaped nest that is open at the top, placed at large branches.

Figure 1. Nest and eggs of Black cormorant

The cormorant build a regular, solid and coarse – textured nest characteristics. The base of the nest consists of long, large-diameter branches that serve as supporting platform so that the eggs and offsprings can be safely placed on the tree. While the top layer consists of fine and small branches, serve as to maintain humidity of the nest during incubation and chick development. The further characteristics of the nest can be seen in Table 2.

The nest microclimate can accelerate the incubation of eggs and the development of birdlings by shortening the period of offspring development hence increasing their survavibility in the wild (Welty, 1982).

Table 2. Nest characteristics of black cormorant

Parameters	Value (Mean ± S.D)
Nest depth (cm)	5,38 ± 1,59
Nest width (cm)	39,36± 8,12
Nest length (cm)	29,66 ± 2,18
Nest height (cm)	16,69 ± 3,92
Nest edge (cm)	7,03 ± 1,89

Porous structures of nest between branch gaps allow water to flow and quickly pass through the nest during rain and enhancing the drying of the nest. The existence of these gaps can help sanitize

the nest, so that the liquid waste metabolized from the birdlings may flow out from the nest through the gaps, and are not pooled on the nest surface.

Concave bowl-shaped nests are thought to be closely related to protection for altricial type offspring. Bowl-shaped nests will provide better protection than flat nests, especially for altricial birds, characterized by its resistant and sturdy properties than the possibility of damaged nests from both inside and outside (Collias and Collias, 1984).

In our study, we obtained different results regarding the nest length and edges as compared to our previous study (Jumilawaty, 2002). The nest length was smaller and the edge was thicker in this study. Based on observations on 2 nest samples, it was found that the characteristics of the branches were divided into 4 straight-branched, straight-unbranched, branched, falciform-branched and falciform-unbranched. Nests are generally composed of dried branches and twigs.

4 CONCLUSIONS

Nest is an important feature in breeding success and survavibility. Nest tree selection, placement and structures are supporting factors in specific of breeding success of black cormorants.

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