The Development Strategy of Conservation for *Cacatua sulphurea* in Bontomarannu Education Park, Gowa Regency Animal Park

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**Abstract.** Parrot conservation has been carried out since these birds are threatened with extinction due to trade and habitat degradation. One of the conservation efforts to protect the population of fauna is in the form of the establishment of an Animal Park which can be managed by both the government and the private sector. One of the animal parks in South Sulawesi is the Bontomarannu Education Park, Sokkolia Village, Gowa Regency, South Sulawesi. The purpose of this research, (1) To identify the bioecological aspects of the *Cacatua sulphurea* population and (2) To establish an Ex-situ conservation development strategy for the *Cacatua sulphurea* to be further carried out by the management of the Bontomarannu Education Park. Based on the results of bioecological studies and conservation development strategies, there was a change in daily behavior after dividing their cages, feeding behavior by giving a variety of feed and their breeding by separating each pair of cockatoos in one cage. The conservation development strategy that has been carried out with the result that several pairs of birds have mated and become a reference for best practice in endemic wildlife conservation efforts so that their habitat is similar to life in the wild and is able to survive and reproduce well.

**1. Introduction**

Indonesia is rich in diversity of bird biological resources. According to Indonesian birds (2017) Indonesian birds have 1769 bird species consisting of 435 protected species, 512 endemic species and 448 species with limited distribution. The high number of bird species diversity in Indonesia requires a conservation efforts in order to maintain sustainability to avoid extinction [1].

Parrot conservation has been carried out since these birds are threatened with extinction due to trade and habitat degradation. In 2004, at the 13th Conferences of the Parties Convention on International Trade In Endangered Species of Wild Fauna and Flora (CITES), it was suggested that the status of the Yellow Crested Cockatoo be changed in Appendix 2 to Appendix 1, and came into force on June 24, 2010. Based on this convention, *Cacatua sulphurea* may only be traded between countries if it can be proven that the cathing carried out does not interfere with sustainability in the wild. Seeing the threat status of this bird, the government has enforced a regulation in the form of Law No.7 of 1999 concerning the Preservation of Plant and Animal Species. At the national level, parrots have been protected by the Indonesian government since 1997 through the Decree of the Minister of Forestry No 35 /Kpts-II/1997 [2].
Nationally, Yellow-crested Cockatoo and all its children are protected by Law of the Republic of Indonesia Number 5 of 1990 concerning the conservation of living natural resources and their ecosystems [2]. Based on the March 2019 IUCN Red List, the Yellow Crested Cockatoo (\textit{Cacatua sulphurea}) is in Critically Endangered status and for the Orange crested cockatoo is in Least Concern (low risk) status [3].

Several related studies on cockatoo conservation mentionned that the decrease in parrot population is generally caused by hunting for trade and use as pets and the shrinkage of forest area as their habitat [4]. Birdwatching or birding is a conservation education technique as a medium to raise awareness about the importance of bird conservation in nature [5]. Threatened extinction of the Sumba cockatoo population is increasingly rare in its natural habitat. Hunting and trapping are also a threat to parrots, especially in Tanahjampea [6].

Alternative efforts that can be made to support its preservation as well as the possibility of developing its use are through captive breeding or breeding efforts outside its natural habitat in an ex situ conservation strategy. In order to formulate appropriate management steps in captivity, one important aspect of knowledge that needs to be known is related to the daily activities of behavior [7]. One of the factors that determine the success of captivity is feed [8].

This study aims to examine conservation development strategies for bioecological aspects including: housing, food, health care and reproduction of \textit{Cacatua sulphurea} as ex-situ conservation efforts in animal parks in maintaining the presence of cockatoos in Bontomarannu Education Park, Sokkolia Village, Gowa Regency.

2. Methods

This study analyzed the bioecological aspects including: housing, feed, health care and reproduction of \textit{Cacatua sulphurea}. Researchers acted as observers and also as participants in the Development of Conservation Strategies. The research objects were birds of \textit{Cacatua sulphurea} in Bontomarannu Education Park, Gowa Regency. The data collected were related to technical aspects of bird conservation and ecological studies including feeding behavior and breeding of cockatoos using the scan animal sampling method, namely direct observation and recording.

Data collection used were interviews, observation, and data collection using field notes and shooting techniques. Interview transcripts carried out were drawing conclusions from data collection, interview results, and field notes. Observations were made on two species of parrots in the time until the cockatoos mated.

Data analysis was in the form of reporting the presentation of data and drawing conclusions from interviews, and field notes using the guidelines for scoring the behavior of eating and breeding. The data collected includes the power of: Conservation techniques, covering aspects of housing, feed, and health care, as well as reproduction (mating), conditions of temperature, and humidity of the cage.

3. Results and Discussion

3.1 Population

The conservation techniques discovered during the research included housing, food, health care and reproduction aspects. The other supporting aspects are the temperature and humidity conditions of the cage. Based on the results of the research that has been carried out in Bontomarannu, it is known the total population of \textit{Cacatua sulphurea} is 28 tail consist of 12 large yellow crested Cockatoo and 16 tail small yellow crested Cockatoo were kept together in one cage measuring 4.5 m$^2$, iron walls with palm leaves and tree trunks as perches and rest as figure 1.
The implementation of in the Development of Conservation Strategies is carried out by placing the parrot according to the species in each cage presented in table 1. As follow:

**Table 1.** Number of Cockatoo samples per breed in cages.

| No. | Types of Species                  | Number of Samples (tail) | Number of cages |
|-----|----------------------------------|--------------------------|-----------------|
| 1.  | Large yellow crested Cockatoo    | 12                       | 4               |
| 2.  | Small yellow crested Cockatoo    | 16                       | 1               |

The temperature and humidity during the study are presented in table 2 as follow:

**Table 2.** The temperature and humidity during the study

| No. | Variable   | Unit | Retrieval data                  |
|-----|------------|------|---------------------------------|
| 1.  | Temperature| °C   | Observed at 09.00 and 16.00 WITA |
| 2.  | Humidity   | %    | Observed at 09.00 and 16.00 WITA |

### 3.2 Conservation Techniques

#### 3.2.1 Housing Aspects

The cage is an important part of the breeding activity designed to meet the needs of birds and is an effort to breed species outside their natural habitat. The proper cage conditions for parrots are in a place free of flooding, away from noise and crowds, in a place that is easily accessible and monitored, not disturbed by air pollution [9].

Recapitulation of the development of conservation strategies for *Cacatua sulphurea* begins with the housing aspect, namely by separating cages for different types of cockatoos, namely, large yellow crested Cockatoo and small yellow crested Cockatoo. This separation is intended to make it easier for the Cockatoo to find a mate so that they can reproduce. In addition to the separation of each species, feed is also a determining factor for successful breeding of cockatoos [9].
3.2.2 Feed Aspect

The feed given is in the form of long beans, corn, banana, papaya and other vegetables. The condition of the cage has a palm leaf roof and iron walls and there is a piece of tree trunk without leaves and twigs. The recapitulation of the development of conservation strategies for *Cacatua sulphurea* begins in the housing aspect, namely by separating the cages between *Cacatua sulphurea sulphurea* and *Cacatua sulphurea citrinocristata*. This separation also makes it easier for the cockatoo to find a partner for reproduction. Apart from the separation of each species of feed, it is also a determining factor for the successful breeding of Cockatoos.

In the aspect of feed, there are variations in the feed given, namely in the form of seeds such as sunflower seeds, long beans, corn and complementary feed in the form of fruit. The eating behavior is done well where the legs are used to hold the fruit while the beak breaks or opens the fruit stalk. Parrots tend to have a form of food that is easy to grasp with the legs and the beak, then sliced and cut into small pieces [10]. Feeding is given 2 times a day, at 09.00 am and 16.00 pm.
3.2.3 Health care aspects
Care and health aspects also need to be considered. Care for parrots in the form of cage cleanliness, bird hygiene, checking the temperature and humidity of the cage, and providing complementary vitamins. The development of conservation strategies showed a change in the behavior of birds *Cacatua sulphurea*. Temperature and humidity are environmental factors that affect bird life which have an impact on breeding and the success of captive breeding [11].

3.2.4 Reproductive aspects
The breeding period for the yellow crested cockatoo takes place from September to October. If the bird is in captivity, breeding takes place twice a year, namely January to April and the second from September to November [12]. What plays a role in the breeding of parrots is their nest hole. From the observation that in one cage the large number of cockatoo polls, there is only one cage hole which does not support a pair of birds to mate.

Mating for yellow crested cockatoos is marked by the process of selecting a partner, then a long courtship process. Cockatoos will probe each other by erecting their crests. In the forging process, the process of observing trees which will be used as nests is also carried out. Usually, the yellow crested cockatoo will play around the nest trees to protect and ensure that the nest holes in the chosen trees are safe [13].

From the results of the development of conservation strategies in the reproductive aspect where the separation of *Cacatua sulphurea* which are seen in pairs, they are placed in different cages equipped with nest holes as a place to make out. Cockatoo mating takes place in June and July. Mating is successful after separating the cages for each pair of birds that are prepared for mating.

*Figure 4. Cockatiels Ready to Mate*
4. Discussion

The implementation of the development of a conservation strategy for yellow crested cockatoos in the Bontomarannu Animal Park is carried out based on Law of the Republic of Indonesia Number 5 of 1990 concerning the conservation of natural resources and their ecosystems. The success in developing parrot conservation is based on several aspects that have been implemented. The development of a conservation strategy that was carried out was initiated by separating the cockatoo based on its type, which was originally a large yellow crested cockatoo and small yellow crested cockatoo placed in the same cage as other types of cockatoo. The separation of cages based on the type is intended so that the cockatoos feel comfortable and will be able to find a partner for later marriage.

The development of a conservation strategy that is carried out in addition to cage separation, environmental factors are also a determining factor in captivity, namely temperature and humidity of the cage. Poultry will maintain its body temperature within the normal range to be able to survive and reproduce because it is classified as a homeothermic (warm blooded) animal [14]. Temperature and humidity are measured every morning and evening according to the temperature of the environment around the animal park, namely 29-31°C with humidity between 65-68% which has an impact on reproduction and success in conservation efforts.

The variety of feed given to cockatoos is also very supportive. Cockatoos with bent beaks usually eat grains as well as fruit as complementary feed. The feed given is in the form of sunflower seeds, long beans, vegetables, and fruits such as bananas and papayas. The more types of feed that are given to a productive female parent, the higher the chances of productivity in producing eggs, so that there are more opportunities to hatch eggs [15].

The success of Cacatua Sulphurea Conservation Development can be seen from how these cockatoos are able to survive outside their natural habitat and are able to mate to produce eggs so that their population numbers increase. With the separation of the cage is able to help the cockatoo to marry and find a partner. Separation of 3 pairs of large yellow crested cockatoos that have been paired, if they are ready to mate, they will enter the nest hole as a place to make out. Cockatoo marriages after separation of the cages occur in June and July 2020.

5. Conclusion

The development of the Cacatua sulphurea Conservation Strategies in the Bontomarannu Education Park, Gowa Regency has increased in terms of development from the aspects of housing, feed, care and health, and reproduction. Based on the results of research that has been carried out, Cacatua sulphurea on the large yellow crested Cockatoo and small yellow crested Cockatoo are able to survive in different environmental conditions from their natural habitat because these parrots have mated after developing a conservation strategy and are supported by several studies that have reported successful breeding of Cockatoos.

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