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Abundance dynamic of cattle egret (*Bubulcus ibis* Linnaeus 1758) in Jatibarang landfill, Semarang

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A B S T R A C T

The cattle egret (*Bubulcus ibis*) utilizing landfill sites for foraging is not a new or rare phenomenon. However, to date, there is no scientific data on the presence of cattle egrets in landfill areas on a national scale. This study aimed to determine the abundance dynamics of cattle egrets at the Jatibarang landfill. Data collection on individual count dynamics was carried out using the Concentration Count method. Initially, this method involved identifying strategic areas to facilitate counting individual birds in each Active Zone. Bird censuses were conducted from 06:00 to 18:00 WIB using hourly photographic documentation. Data on the dynamics of cattle egret abundance in each Active Zone were tabulated using Microsoft Excel 2016, and graphs were produced to show the average number of individuals during the study. The results showed that the abundance dynamics varied among Active Zones, influenced by the status of waste disposal activities, which affected the availability of abundant food. The distribution patterns and utilization levels of cattle egrets in the three Active Zones differed due to variations in waste conditions, influencing the number and types of insects (larvae and adults). Active Zone 1 was intensively used by cattle egrets, with numbers reaching between 140 and 1505 individuals.

Keywords: Abundance dynamics; cattle egret; Jatibarang landfill

1. INTRODUCTION

The cattle egret (*Bubulcus ibis*) is a member of the Ardeidae family of waterbirds. Unlike other egrets, this species is known for consuming a wider range of prey (McKilligan, 2005), including insects, reptiles, plants, small mammals, and birds (Baxter & Fairweather, 1989). Its diverse dietary preferences allow the species to adapt to various habitats, including polluted environments such as landfills (Alikodra, 2018). The utilization of landfills by cattle egrets for foraging is not a novel phenomenon; it was first recorded in the United States in 1978 (Custer & Osborn, 1978) and has also been documented in several developing countries, including Indonesia.

Most developing countries still use open dumping systems for waste management, where waste is simply discarded into prepared ground depressions (DLH, 2017). Besides causing environmental pollution, this method affects wildlife, including cattle egrets. These landfills, primarily composed of organic waste, become breeding grounds for fly larvae, a favored food source for cattle egrets. According to Dalio (2018), a cattle egret can consume 3,000–4,000 fly larvae. The constant availability of food at landfills eliminates intraspecific competition (Abigail et al., 2013).

Previous studies (e.g., Bostan et al., 2006; Hashmi et al., 2012) have shown that cattle egrets foraging in urban waste areas not only feed on larvae but also on imago insects, lizards, and frogs exposed to wastewater, leading to heavy metal accumulation and thinner eggshells. While similar studies have been conducted in countries such as the USA, Ghana, India, Pakistan, and Sri Lanka, there is no known research on cattle egrets in Indonesian landfill areas. Therefore, this study investigates the use of the Jatibarang landfill by cattle egrets, aiming to provide foundational data for future research.

2. MATERIAL AND METHODS

2.1 Study site and period

The study was conducted over 15 days from March 11 to 29, 2019, at the Jatibarang landfill in Semarang. The number of cattle egret individuals was estimated using the Concentration Count method,

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which is suitable for species that congregate in large groups in specific areas (Bibby et al., 2000). Initially, strategic areas were identified to facilitate bird counts in each Active Zone. Observations took place from 06:00 to 18:00 WIB, with photo documentation every hour during the birds' activity periods. Each Active Zone was observed in five replicates.

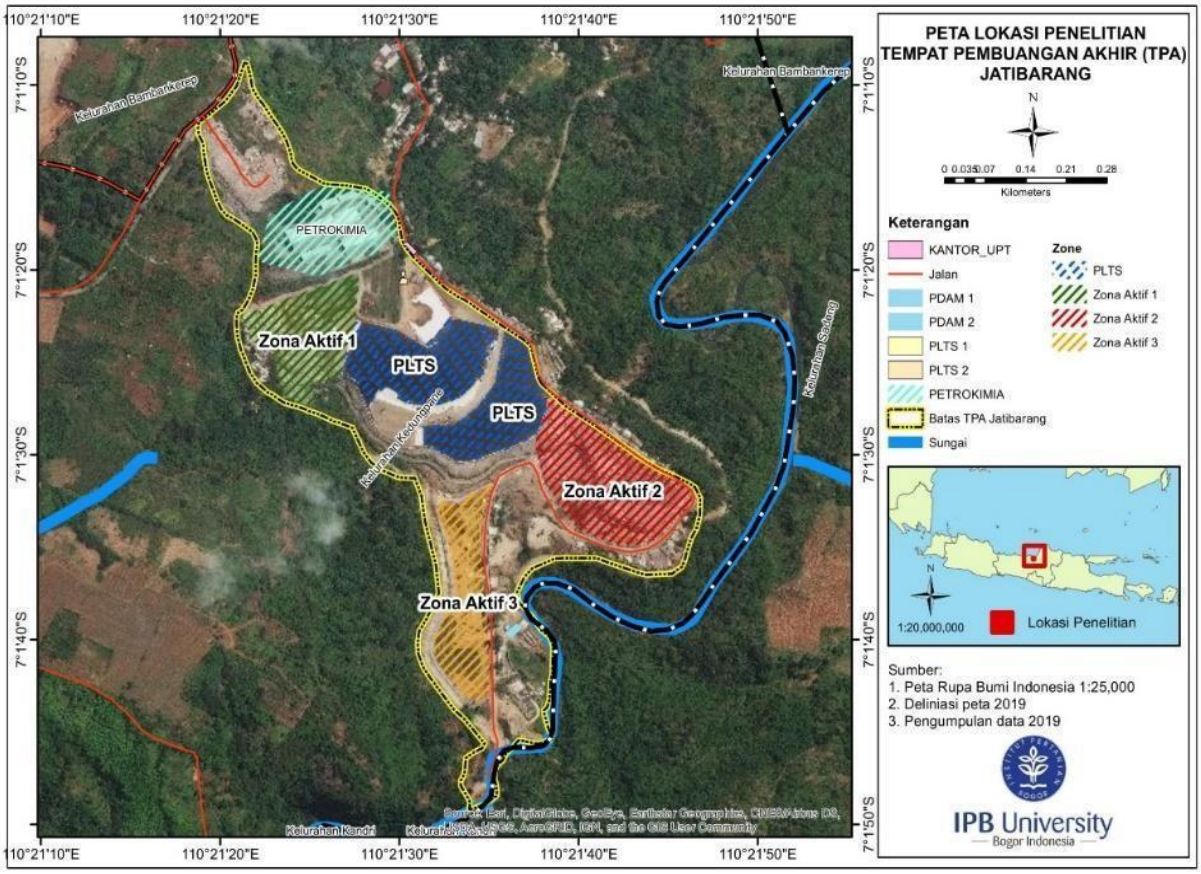

Figure 1. Research location map

2.2 Counting method

Cattle egret counts were derived from photographs using gridline-point and mark-point techniques—horizontal and vertical guiding lines used to reduce counting bias and facilitate tallying. This method is a modification of the block method by Howes et al. (2003). Only cattle egrets were included in the abundance dynamics data. The hourly averages of egret counts were calculated, tabulated in Microsoft Excel 2016, and visualized as graphs showing the average number of individuals during the study period.

3. Results and Discussion

Cattle egrets observed in each Active Zone at the Jatibarang Landfill exhibited varying abundance dynamics. Observations showed that the species most frequently visited Active Zone 1 due to abundant food availability. Flocks of egrets arrived in large numbers from the northern coast and immediately spread throughout Active Zone 1 to forage. The highest number of individuals was recorded in the morning between 06:00 and 09:00, reaching 1,364–1,505 individuals (Figure 2).

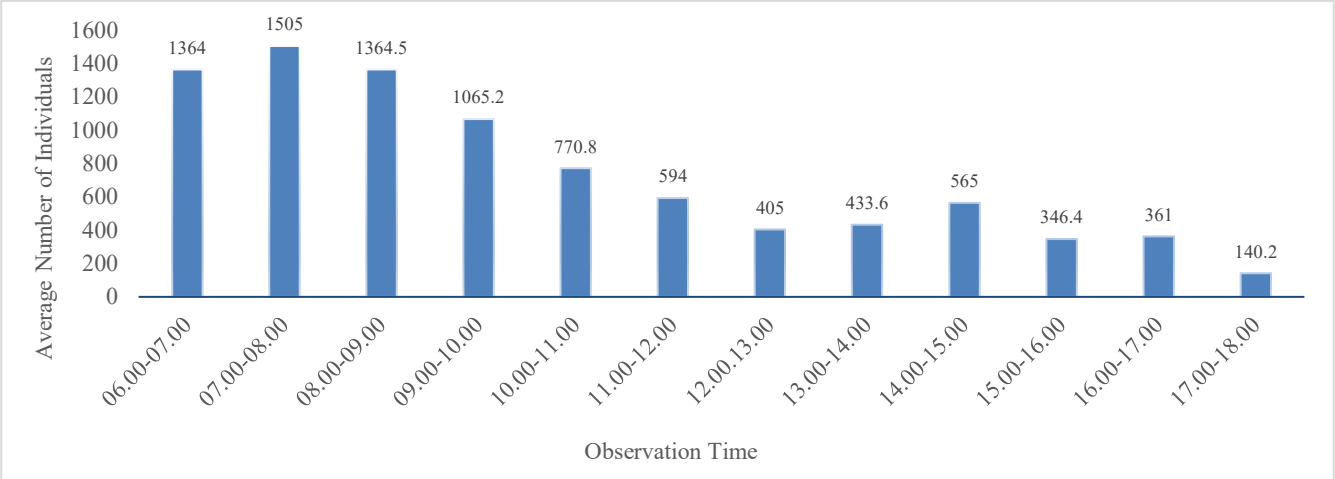

Figure 2. Abundance dynamics of cattle egret in Active Zone 1

In contrast, by midday (12:00–13:00), their numbers decreased as many individuals dispersed to other zones. By the afternoon (15:00–17:00), egret numbers dropped to 140–361 individuals as they began returning to their roosts along the northern coast. In Active Zone 2, the absence of waste disposal activities affected the availability of insect prey (larvae and adults). The presence of cattle egrets in the Jatibarang landfill area can be seen in Figure 3.

Figure 3. Foraging activity of cattle egret at Jatibarang landfill

During early morning hours (06:00–08:00), only 1–2 individuals were observed, as most egrets headed directly to Zones 1 and 3. At 09:00, however, 27–50 individuals arrived from those zones. By midday (11:00–12:00), numbers decreased to 17–31 individuals, with the highest number in the afternoon around 15:00, reaching 211 individuals. This increase may be attributed to cattle returning to their pens through Zone 2, which the egrets followed. By 16:00, the count dropped to 32 individuals before the birds returned to their roosts at 17:00. Zone 3 had similar conditions to Zone 2 (figure 4). The highest abundance occurred in the morning (06:00–08:00), with 135–169 individuals. By 09:00, the number declined as birds moved to Zones 1 and 2. Disturbances from hunters also caused the birds to shift to safer locations. Because this zone is furthest from the main landfill area and receives less supervision, observations were conducted from a distance using binoculars to minimize disturbance. Between 10:00–13:00, egret numbers declined to 4–11 individuals. During the afternoon (14:00–16:00), numbers rose again to 21–57 individuals, likely as the birds searched for food sources not found in Zones 1 and 2.

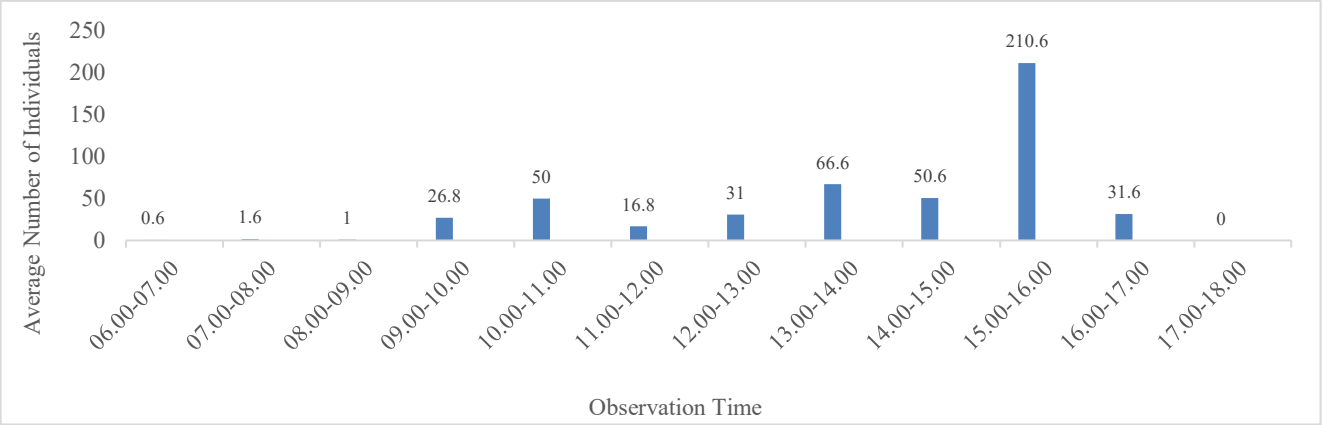

Figure 4. Abundance dynamics of cattle egret in Active Zone 2

Active Zone 1 remained the most frequently visited area, especially between 06:00 and 09:00, with peak numbers between 140 and 1,505 individuals. Waste leveling by excavators made it easier for egrets to find Diptera larvae and adults, such as *Musca domestica* and *Chrysomya megacephala*. This is consistent with findings in Karadiyana Landfill, Sri Lanka, where cattle egrets preferred active dumping areas (Marasinghe et al., 2018), and in Karale, India, where they fed on Muscidae and Calliphoridae flies. Cattle also contributed to food access by tearing open waste bags in search of organic material, exposing larvae that egrets then consumed. Scavengers who sorted plastic waste also inadvertently made larvae more accessible. This behavior was similarly observed in landfills in India (Abigail et al., 2013).

By midday (12:00–13:00), egret numbers declined to 405 individuals, with some resting in trees behind the hill and others moving to different zones. High temperatures at this time reduced foraging activity (Ardley, 1985). Waterbirds, including egrets, prefer to rest in nearby vegetation when food is abundant (Jumilawaty, 2011). From 14:00 to 15:00, numbers increased slightly as some individuals resumed feeding or rested. By evening (15:00–17:00), numbers decreased to 346–361 individuals before dropping to 140 at 17:00–18:00 as the birds returned to their roosts.

In Zone 2, the number of individuals never exceeded that of Zone 1. Between 06:00 and 09:00, only 1–2 individuals were recorded. The lower insect abundance (especially small first and second instar larvae) made feeding more difficult, as these were harder to capture with their sensitive beaks (Howes et al., 2003). From 09:00 to 16:00, bird numbers fluctuated between 16 and 210, with potential prey including mollusks, annelids, and arachnids.

In Zone 3, overall egret numbers were lower than in the other zones. The area was dry and contained minimal organic waste. The highest abundance occurred in the morning (135–169 individuals), with diverse food sources including Diptera (unidentified), *Hermetia illuscens*, *Chrysosoma* sp., *Eristalinus megacephala*, and Dermaptera. By 09:00, the birds moved to other zones seeking different prey. Hunting disturbances made this area less attractive, with only 4–11 individuals seen between 10:00 and 13:00. By 14:00–16:00, numbers increased slightly to 21–57 individuals.

4. CONCLUSION

The abundance dynamics of cattle egrets in each Active Zone were influenced by the operational status of the waste disposal sites. Differences in waste conditions affected the quantity and types of insects (including larvae and adults) available. The results showed that the highest number of cattle egret individuals was observed between 06:00 and 09:00. The number of individuals utilizing Active Zone 2 was similar to that in Zone 3, though the intensity of area usage for foraging differed. The maximum number of individuals using Zone 2 intensively was 211, while Zone 3 had 135–169 individuals. The level of utilization as a foraging area was also influenced by differences in insect species found as egret prey.

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