

The influence of bird pest attack on rice damage and production in Kuantan Singingi

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Abstract. Birds pest in rice field activities are one of the important pest that attack. It has even caused 161,4 ha of crop loss and 124.05 ha of heavy damage in Riau. This need to be handled and managed properly. This study was initiated by identifying the types and effects of bird pest attacks on the damage and production of rice crops in Kuantan Singingi. This study was used a survey method by making plots (10x10 m), bird pests species and populations by using a point transect. Observations were carried out in the morning, afternoon and evening. Bird species identification refers to the MacKinnon Bird Guide in Sumatera, Jawa, and Bali. Diversity of birds pest was calculated by the Shannon-Wiener index, species richness by margaleft index, and species dominance by the Simpson index. This study were observed 1.045 birds attack of paddy field. Koto Kari site was observed 479 individual, 332 individu in Kampung Baru, and 214 in Sangau *Lonchura striata* was observed as many as 635 individuals. Species diversity index was 0.667, species richness index 0.288, density 0.616 and dominance value 0.527. the highest frequency of bird pest visit was in Koto Kari site which was 42 times while based on the species was *Lonchura striata* 71 times with an attack time in the morning of 83 times. The highest damage to panicles by bird pest was caused by *Lonchura maja* at 46.09% but the highest loss of rice wight was caused by *Lonchura striata*.

1 Introduction

Rice is one of the main sources of carbohydrates for most Indonesian people. As the main source of carbohydrates, rice has an important value in providing nutrition and energy. White rice contains fiber of 0.42%, and 8.70% protein, and 0.14% reducing sugar [1]. Even some varieties that have undergone breeding processes such as the IR 36 line have carbohydrates content between 85.06%-90.16%, amylose 12.94%-20.81%, and amylopectin 69.35%-76.17% [1].

As a staple food, rice production in Indonesia is still relatively low. Rice production data in 2020 amounted to 54.65 million tons, or increase of 45.17 thousand tons (0.08%) compared to 2019. More than 50% of rice production was donated by the center of the island of Java (East Java, West Java, and Central Java) while in Sumatera, especially the Province of Riau. Its only amounted to 243.685 tons [1].

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One of the reasons for the low rice production in Riau Province is the attack of plant disturbing organisms. One of which is birds pest. Birds pest are one of the pest that attack rice plants in Riau and even the cause of parched covering an area of 161.14 ha and heavy damage covering 124.05 ha [1].

Agricultural lands are a habitat for several species of birds, especially those that depend on agricultural commodities such as corn for their food source [2] and rice is the living habitat of several species of birds [3] as well as being an important pest in the paddy [4]. Birds pest attack paddy in the vegetative and generative phases [5] and even attack the seeds of paddy in the nursery [6]. In the generative phase, birds pest attack especially when entering the grain-filling phase [7]. As a result, controlling this pest is very difficult because because its involves many stages and wide scope [8]. Research and policy should be conducted concurrently to develop the management of birds pest in the development phase of the crop [4], especially at the local level, such as in the Kuantan SIngingi district, where there have been no reports of birds pest attacking paddy as well as efforts to control and manage them.

2 Material and methods

The tools was used in this study are Bushnell binoculars, a field guide book for identifying birds (MacKinnon et al, 2010), stationary, tally sheet, and individual of birds observed during this study. The method was used in this studi is survey techniques. Three observations site were set. In each which an observation plot was made with a size of 10x10 meters on paddy fields. Observation of birds pest species and their populations was carried out by direct observation at each research site by using the point transect method. Observation time was divided into 3 parts, in the morning (17.00-10.00 am). Afternoon (11.00-14.00 am) and evening (15.00-17.00 pm). Repeat observations were carried out for 7 days at each research site.

There are two types of data collected, primary data (number of species, number of individual birds attacking paddy, attack frequency, number of intake and attacked rice panicles in one clump, weight of intake and attacked rice grains, and control techniques carried out by farmers). The secondary data was collected by interviews with some farmers regarding the types of birds that attacked and control efforts that were carried out, in addition to searching on the internet. Identification of birds species refers to MacKinnon et al. 2020, birds pest species diversity was calculated by the Shannon-Wiener index, species richness by the margaleft index, and species dominance was calculated by the Simpson index. The average observed of individual of birds pest was calculated by the type of individual at the location divided by the number of replicates at that site.

Observation of crop damage was carriied out when birds attack paddy. After the attack occurred, the observer went straight to the infected paddy. And then counted the number of intact and attacked paddy panicles (not iintact), all of which were collected and weighed using a digital scale. Damage caused by birds pest is calculated by : panicle damage = $(x-y)/x \times 100\%$. (a= number of intact panicles; y = number of panicles attacked); while the weight damage is calculated by = $(a-b)/a \times 100\%$. (a= intact panicle weight and b= infected panicle wight).

3 Result and discussion

During the study, 1.045 individual birds were observed attacking paddy in Kuantan Singing with the highest number observed in Koto Kari Site with 479 individuals followed by Kampung Baru site with 332 individuals and in Sangau Site with 214 individuals (Table. 1).

Table 1. Number of species of bird pest to attack paddy plant in Kuantan Singingi.

No	Family/Spesies	Site			Total
		Kampung Baru	Sangau	Koto Kari	
1	<i>Lonchura striata</i>	216	122	297	635
2	<i>Lonchura maja</i>	114	92	182	388
3	<i>Ploceus philippinus</i>	2	0	0	2
	Total	332	214	479	1045

Based on the species number, *Lonchura striata* was the highest number of individuals observed, namely 635 individuals, followed by *Lonchura maja* with 388 individuals, and the least was *Ploceus philippinus* with 2 individuals. *Lonchura maja* is a very common bird species found in Indonesia [9]. Meanwhile, this species and *Lonchura striata* are bird species that are still able to survive in land use change [10]. *Ploceus philippinus* is a type of bird that also disturbs paddy at the first site, (Kampung Baru). This species was observed perched on a rice panicle. They were recorded to use rice leaves as a material to build their nest [11].

3.1 Diversity, richness, density, and dominance species of bird pest in paddy field in Kuantan Singingi

From the total of species and population numbers observed at three site observations, the species diversity index value was 0.667 the species richness index was 0.288, and a fairly high density index 0.616 and a sufficient dominance value 0.527. These values indicate that the diversity of pest birds is quite low at the observation site as well as species richness which only consists of three bird species. However, the density is quite high due to the high dominance of several species at this study site.

Population is a unit that will always change [11]. The composition and persistence of birds do not only depend on the size and structure of the habitat landscape but also the surrounding landscape [11].

3.2 Frequency of bird pest attack on paddy field in Kuantan Singingi

The total frequency of presence and attack was 41 times in the Kampung Baru site. 37 times in Sangau site and 42 times in Koto Kari sites. The frequency and presence of attacks of bird pests most often was from *Lonchura striata*, 71 times. Followed by *Lonchura maja* 48 times and *ploceus philippinus* only once. Meanwhile, the morning was the time when the highest frequency of attacks was observed, 83 times. Then in the afternoon 24 times and during the day only 13 times.

Table 2. Frequency of bird pest attacks on paddy field in Kuantan Singingi.

Site	Species	Time			Total
		Morning	Afternoon	Evening	
Kampung Baru	<i>Lonchura striata</i>	15	5	6	26
	<i>Lonchura maja</i>	9	2	3	14
	<i>Ploceus philippinus</i>	1	0	0	1
Total in Kampung Baru Site		25	7	9	41
Sangau	<i>Lonchura striata</i>	16	1	5	22
	<i>Lonchura maja</i>	11	1	3	15
	<i>Ploceus philippinus</i>	0	0	0	0
Total in Sangau Site		27	2	8	37
Koto Kari	<i>Lonchura striata</i>	17	2	4	23
	<i>Lonchura maja</i>	14	2	3	19
	<i>Ploceus philippinus</i>	0	0	0	0
Total in Koto Kari Site		21	4	7	42
TOTAL		83	13	24	120

3.3 Panicle damage by bird pests in paddy fields in Kuantan Singingi

The highest level of panicle damage by *Lonchura maja* (46.09%) followed by *Lonchura striata* (40.07%) and *Ploceus philippinus* (20%).

Table 3. Percentage of panicle damage caused by pest bird attack on paddy field in Kuantan Singingi.

Jenis Burung	Kerusakan (%)			Rata Rata
	Kampung Baru	Sangau	Koto Kari	
<i>Lonchura striata</i>	63.92	60.60	55.26	59.92
<i>Lonchura maja</i>	56	54.84	59.26	56.7
<i>Ploceus philippinus</i>	40	0	0	13.3
Rata-Rata				

The family of Ploceidae is a group of birds that generally eat seeds. One of the species observed from this family is the genus *Ploceus* which can also be found in Africa and Asia [12]. Some species attack the panicle and seeds. Loss of rice production due to this attack can reach 30-50% of production. This bird pest attacks a paddy plant that is 70-80 days old when the grain of rice has started to fill. The large loss due to attack by these pests is also due to their habit of living in groups and actively looking for food in the morning and evening.

This bird pest attack causes the seeds to become empty, the rice grains to dry out and many seeds are lost. The bird species most often causing serious losses to rice to rice crops are *Lonchura striata* and *Lonchur maja*. The peak of the daily activity of this bird pest is in the morning. In general, bird pest have adapted their development to the paddy stage.

3.4 Rice weight loss due to bird pest attack by species in Kuantan Singingi

The average level of weight damage by bird pests occurs by *Lonchura striata* at 42.54%, followed by *Lonchura maja* at 41.96% and *Ploceus philippinus* at 6.72%. Based on the observation site, Koto Kari has a higher damage value and attack carried out by *Lonchura maja*, 49.86%.

Table 4. Rice weight loss due to attacks by bird pests on-site research local.

No	Jenis	Kehilangan Bobot			Rata-Rata
		Kampung Baru	Sangau	Koto Kari	
1	<i>Lonchura striata</i>	36.68	46.35	44.60	42.54
2	<i>Lonchura maja</i>	30.93	45.09	49.86	41.96
3	<i>Ploceus philippinus</i>	20.16	0	0	

4 Conclusion

From the research results it can be concluded that there were 1,045 individual birds found attacking paddy fields in Kuantan Singingi and they were classified into 3 types and were dominated by *Lonchura striata* (635 individual), *lonchura maja* (388 individuals) and the species that attacked the least was *Ploceus philippinus* (2 individuals). The species diversity index is 0.677; the species richness index is 0.288; the density index is 0.616 and the dominance value 0.527. For the *Lonchura striata* type, the frequency of attacks was recorded at 71 visits, 48 times for *Lonchura maja*, and 1 time for *Ploceus philippinus*. While the highest visit time in the morning is as much as 83 times.

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