

## STUDY OF SPECIES RICHNESS OF GRASSHOPPER (ORDO ORTHOPTERA) IN BERIRI JARAK, LOMBOK ISLAND, INDONESIA

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**Abstract:** The number of species of grasshoppers (Orthoptera) in Indonesia is very large, but the successfully identified species still need improvement. It then causes many of the existing species to be identified. This study aimed to determine the grasshopper species (Orthoptera) types in the Hamlet of Otak Kebon, Berri Jarak Village. This exploratory, descriptive research uses a qualitative approach. Sampling was carried out in May 2022 in three habitat types: gardens, fields, and rice fields. Absolute and relative methods were carried out in sampling. The samples obtained were then identified using field guides and available literature to obtain existing species richness data. The results showed that there were 15 species, namely: *Valanga nigricornis*, *Conozoa hyaline*, *Oedaleus infernalis*, *Chorthippus brunneus*, *Trimerotropis pallidipennis*, *Chorthippus albomarginatus*, *Ceracris kiangsu*, *Melanoplus bispinosus*, *L. migratoria manilensis* Meyen, *Trimerotropis occulens*, *Locusta migratoria*, *Austracris guttulosa*, *Atractomorpha crenulate*, *Leptophyes punctatissima*, and *Gryllus bimaculatus*. The species found belong to two suborders, namely Caelifera and Ensifera. The species are divided into four families: Acrididae, Pyrgomorphidae, Tettigoniidae, and Gryllidae. The Acrididae family dominates the existing species. In addition, 13 species were also found that still needed to be recorded in previous studies, bringing the total to 43 species.

**Keywords:** *Species Richness, Orthoptera Order, Beriri Jarak, Lombok Island*

### INTRODUCTION

Indonesia is a country with very strategic climatic and geographical conditions. Indonesia's astronomical location is 6°North Latitude (N) to 11°South Latitude (S) and between 95°East Longitude (E) to 141°East Longitude (E). Meanwhile, its geographical location is between two oceans, namely the Indian and Pacific (Embassy of the Republic of Indonesia, 2018). It makes Indonesia very rich in biodiversity, including various species of insects. Conducive ecosystem conditions also support the diversity of insect species. One type of insect that is widely found in Indonesia is the grasshopper which is an insect of the Order Orthoptera [1].

As revealed by [2], taxonomically, grasshoppers are classified into two Suborders. These two are Caelifera and Ensifera. The suborder Caelifera consists of grasshoppers. Characteristic of having short antennae, shorter than the body. The suborder Ensifera includes grasshoppers, grasshoppers with long antennae, and crickets. Abiotic factors include humidity, pH, light intensity, temperature, and rainfall. The biotic factors all form creature life around the locust. Grasshoppers can be found in almost all terrestrial ecosystems [1].

Rentz stated that the number of grasshoppers (Orthoptera) species identified more than 2,000 species [3]. However, the research results show that the existence of species found is very small, usually only numbering dozens. It is evident from the results of research conducted by [4-6] East Lombok

Regency is one of the Level II Regions or districts in West Nusa Tenggara, Indonesia. The capital city of East Lombok is in the Selong district. This district has an area of 1,230.76 km<sup>2</sup>, with a population 2020 of 1,319,537 people [7]. East Lombok Regency has many sub-districts, including the Wanasaba District. Berri Jarak Village is one of the villages located in the northern part of the Wanasaba District. One of the hamlets in this village is the Otak Kebon Hamlet with the area boundary, Ambengan Hamlet Beside the south, Burne Hamlet to the east, Senganton Hamlet Beside the west, meanwhile to the north is directly adjacent to the core forest of Mount Rinjani. Kebon's brain is dominated by gardens and fields, while rice fields are only found in the eastern part due to the Aik Numpas river, which is used as a source of irrigation. Because the locust habitat can be dry and wet. There are many locusts in this area.

Its diverse habitat causes locusts to be observed in the surrounding environment. Diversity has yet to be much known. The people, especially in Beriri Jarak, only know him by locust. Even though they are composed of various populations, this research needs to be done. The goal is to list the species of grasshoppers that belong to the order Orthoptera. This data can be used as basic data in investigating other biodiversity parameters of the Orthoptera order in Beririjarak, Lombok Island, Indonesia. This data is also useful for educating farmers, making them more familiar with locusts. Although they can become pests because they eat the leaves of plants [8-9], locusts function as predators

for various types of plant pests, so they are very useful for increasing agricultural yields. For the sake of learning, the data from this research can be used to learn science in primary and secondary schools. This learning resource is also contextual because grasshoppers are animals easily found in the surrounding environment.

## RESEARCH METHODS

### Time and Place of Research

By nomenclature, this research is a type of descriptive exploratory study that uses a qualitative approach. Descriptive research is a form of research that is basically shown to describe or describe existing phenomena, both natural phenomena and human engineering [10]. The exploration was carried out at three predetermined sampling points to obtain more knowledge (about the situation), especially the types of grasshoppers found in the research location.

Sampling in this study was carried out at three points in the area, namely the garden path, the field path, and the paddy field path, with an area of 225 m each.<sup>2</sup> (15m x 15m). The collection of research samples was carried out in May 2022 in the Otak Kebon Hamlet, Berri Jarak Village. A grasshopper sampling was conducted in the morning from 07.30 to 09.00 WITA and in the afternoon from 15.30 to 17.30 WITA. Sampling was done by a relative method. The relative method is carried out by using a tool in the form of a net (fly net) which is used to catch grasshoppers that have long flight distances so that they are difficult to catch.

### Tools and materials

During this research, several tools and materials were used, the tools and materials used and their functions during sample collection are presented in table 1.

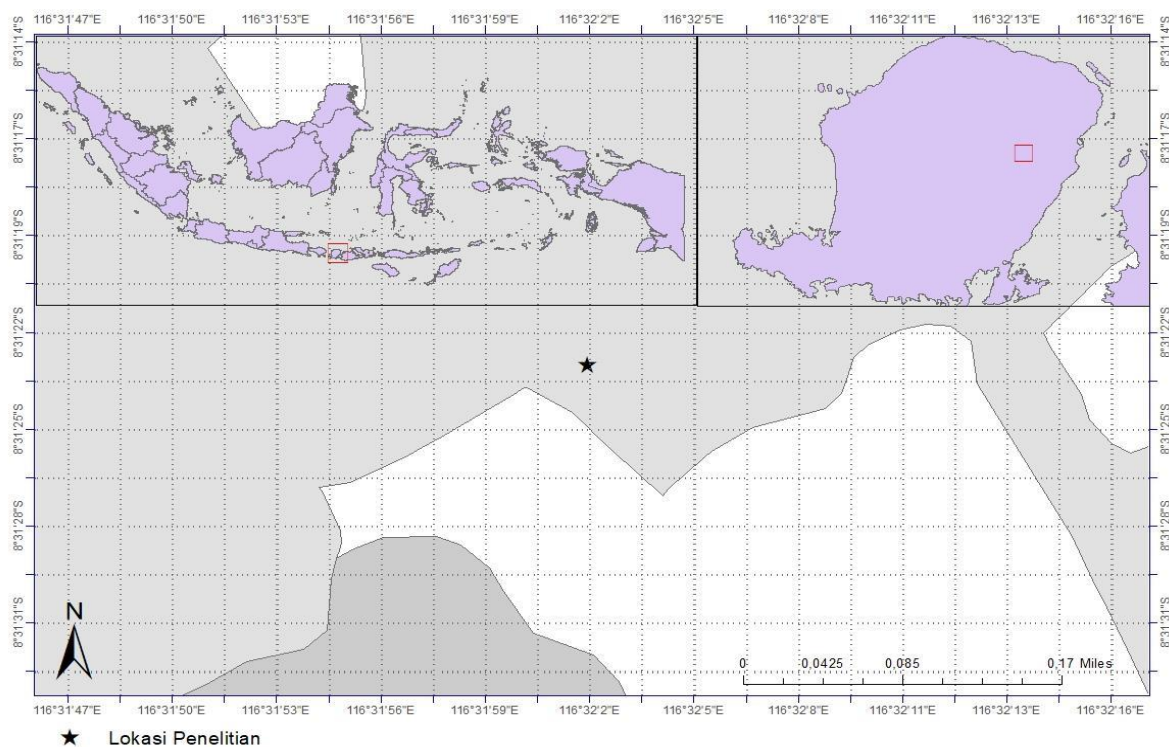


Figure 1. Map of research locations

Table 1. List of tools and materials used during the research

No	Names of tools and materials	Its use in research
<b>Tools list</b>		
1	Assembled nets (rope, wooden handles, used nets)	Catching grasshoppers that will be sampled
2	Camera	HP camera
3	Stationery	Record the types of grasshoppers that have been caught
4	The glass used mineral water	Keeping the grasshoppers that have been caught
5	Field guide	Identify the types of grasshoppers that have been found
6	Bamboo pegs	Delimiter mark of the sample capture point area
<b>Ingredients list</b>		
7	Label	Mark the locusts found on each path

### Research procedure

The research was conducted through three stages. The first stage is planning. Stage Planning includes activities, namely site surveys, collection of grasshopper samples, and collection of tools and materials needed during the research. The second stage is sample collection. This stage was carried out in Beriri jarak, Lombok Island, Indonesia. The sample collection itself carried out three repetitions/replications. The distance between each repetition is one day. Sample collection was carried out by using the roaming method at a predetermined location and then directly catching the locusts found by hand or with insect nets. Documentation using a camera against grasshoppers that cannot be captured directly.

The process of collecting data in this study used the method of catching grasshoppers following a predetermined transect line based on observations. The transect line used consists of three lines. Each lane in the garden habitat type (Point 1), fields (Point 2), and paddy fields (Point 3). The third stage is data collection. The PGSD Science Laboratory carried out this stage at the University of Mataram. All of the grasshopper samples that had been collected were identified for their morphological characteristics. Grasshoppers are identified up to the species taxon by using references in the form of identification books, articles in journals, and websites, by comparing and matching the morphological characteristics of each sample with the characteristics in the book identification available literature. The eye can see the

morphological characteristics identified directly, such as antenna variations, body size, and body color. Several identification books used in this study include Triplehorn & Johnson (2004), Bailey (2007), Tan (2012, 2017), and Iorio et al. (2019). The article used is the result of research from Leksono et al. (2022) and articles from the results of research conducted in Suranadi by Ilhamdi et al. (2022). The results of matching the morphological characteristics with the species characteristics in the identification books and articles were then confirmed on the web by the *Global Biodiversity Information Facility*.

### RESULTS AND DISCUSSION

The results of research conducted at three points in Otak Kebon Hamlet, Berri Jarak Village, showed that 15 species were found, namely, *Valanga nigricornis*, *Conozoa hyaline*, *Oedaleus infernalis*, *Chorthippus brunneus*, *Trimerotropis pallidipennis*, *Chorthippus albomarginatus*, *Ceracris kiangsu*, *Melanoplus bispinosus*, *L. migratoria manilensis licorice*, *Trimerotropis occulens*, *Locusta migratoria*, *Austracris guttulosa*, *Atractomorpha crenulata*, *Leptophyes punctatissima*, and *Gryllus bimaculatus*. All the species found belong to two suborders, namely Caelifera (short-antenna grasshoppers) and Ensifera (long-antenna grasshoppers). The fifteen species found were divided into four families: Acrididae, Pyrgomorphidae, Tettigoniidae, and Gryllidae. The distribution of the species found can be observed in Table 2.

Table 2. The species richness of grasshoppers (Orthoptera) in Otak Kebon Hamlet, Berri Jarak Village

Suborder	Family	Species	Habitat Type		
			Garden	Farm	Rice Field
Caelifera	Acrididae	1. <i>Avalanche blackhorn</i>	+	+	-
		2. <i>Hyaline conozoa</i>	+	+	-
		3. <i>The infernal Oedalus</i>	+	+	+
		4. <i>Chorthippus brunneus</i>	-	+	-
		5. <i>Trimerotropis pallidipennis</i>	+	-	-
		6. <i>Chorthippus albomarginatus</i>	-	-	+
		7. <i>Ceracris kiangsu</i>	-	-	+
		8. <i>Melanoplus bispinosus</i>	+	+	-
		9. <i>L. migratoria manilensislicorice</i>	-	+	-
		10. <i>Trimerotrope blinding</i>	+	+	+
		11. <i>The migratory locust</i>	-	+	-
		12. <i>Austracris guttulosa</i>	+	+	-
	Pyrgomorphidae	13. <i>Atractomorpha crenulata</i>	+	+	+
ensifera	Tettigoniidae	14. <i>Leptophyes punctatissima</i>	+	-	+
	Gryllidae	15. <i>Gryllus bimaculatus</i>	+	+	+

The number of locust species found in Otak Kebon Hamlet, Beriri Jarak Village, is higher than in Manusak village, East Kupang district, which only totaled seven species from 3 families [4] as well as the number of species found in Kalisidi village,

Java. Middle, namely, nine species [11]. The species richness of locusts found in Beriri Jarak is also greater than that found in the vegetable fields in Suranadi [12]. However, these species are less than those found in Malang, East Java, which totaled 30

species [13]. The difference in the number of species present indicates differences in the conditions of the environmental carrying capacity of the five habitats that are the research locations. In general, the environment's carrying capacity is directly proportional or positively correlated with the number of species present. The more numerous and varied the environment's carrying capacity, the greater the species richness tends to be. The environment's carrying capacity refers to the availability of resources and conditions suitable for each species. So the more resources and appropriate environmental conditions, the more species will likely be found.

The number of species found is not evenly distributed based on the environmental carrying capacity factor. Table 2 shows more species in the field habitat type (point 2). It is because locust-eating birds are found in the paddy field habitat types, namely the long-tailed shrike or the long-tailed shrike. *Lanius chess* is a species of bird from the family Laniidae. These birds eat many insect species, such as grasshoppers, cicadas, crickets, and various other types of insects. In the paddy field lanes, other predators were also found, namely the Eurasia king prawn bird (*Alcedo Atthis*). This type of bird usually preys on fish and several types of insects [14-16]. Meanwhile, in the garden path, only shrews were found (*Lanius chess*).

The type of grasshopper from the Acrididae family is the most common type found and spread over three different habitats. This is because the Acrididae is the dominant family in the Orthoptera order. This is also because they are very easy to adapt to the environment they stay in [17]. This family is a type of herbivorous grasshopper that is active during the day, lives in the grass, and likes dry and hot places [18]. This then causes quite a lot of distribution in the garden and field paths. The existence of plant species can also affect the types of grasshoppers that exist. For example, the *Ceracris Kiangsu* species is found in many rice fields because of its characteristics. Morphology in accordance with existing plants, namely rice. Likewise with plants that are in the field path, for example, sitting (*Melastoma sp.*), Mimosa (*Mimosa pudica L.*), weeds (*Imperata cylindrica L.*), fern (*Stenochama polushis L.*) in plain sight [19-20].

## CONCLUSION

Based on the results of this study, several conclusions can be drawn, namely: The species of grasshoppers (Orthoptera) that were identified in the Otak Kebon Hamlet, Beriri jarak Village, totaled 14 species which were found in three different points, namely rice fields, gardens, and fields. The locusts found were divided into four families (Acrididae, Pyrgomorphidae, Tettigoniidae, and Gryllidae). The Acrididae family dominated the species of which. In addition, 13 species were also found that had yet to

be recorded in previous studies, bringing the total to 43 species.

## REFERENCES

- [1] Prakoso, B., & Kurniawan, F. A. (2021). Inventory of Locust Species in Zea Mays L. Agroecosystem, Karanggayam District. *Jurnal READ (Research of Empowerment and Development)*, 2, 1-6.
- [2] Mawardi, M., Yolanda, R., & Purnama, A. (2016). Types of Locusts in the Hamlet of East Tambusai Village, Tambusai District. *Scientific Journal of Biology Education Students*, 2(1), 1-7.
- [3] Wiguna, R., Purnama, A. A., & Lestari, R. (2019). Types of grasshoppers (Orthoptera: Ensifera) in the Tourist Attraction Area of Sauman Hot Springs, Rambah Tengah Hulu Village, Rokan Hulu Regency. *Sainstek : Science And Technology Journal*, 10(1), 24. <https://doi.org/10.31958/js.v10i1.1216>
- [4] Semiun, C. G., & Mamulak, Y. I. (2019). Diversity of Grasshopper Types (OrdoOrthoptera) in Green Bean Farms (*Vigna radiata L.*) Manusak Village, Kupang Regency. *STIGMA: Unipa Journal of Mathematics and Natural Sciences*, 12(02), 66-70. <https://doi.org/10.36456/stigma.12.02.2047.66-70>
- [5] Sugiarto, A. (2018). Inventory of Locusts (Orthoptera: Acrididae) in Plantation and Rice Fields in Serdang Menang Village, Sirah Pulau Padang District, Ogan Komering Ilir District. *Insect Village Article Group*, 1(1), 1-25.
- [6] Afdilah, A. N., Kanedi, M., & Nukmal, N. (2020). The diversity of grasshoppers in Liwa Botanical Garden Based on time capture. *Scientific Journal of Experimental Biology and Biodiversity*, 7(1): 18-24.
- [7] Ministry of Interior. (2020). *Population Data Visualization*. [www.Dukcapil.Kemendagri.Go.Id](http://www.Dukcapil.Kemendagri.Go.Id).
- [8] Anas, H., Haryanto, H., & Muthahanas, I. (2021). Diversity of insect pests of peppers (*capsicum annum l*) in the medium plains of North Lombok district 31(3), 175-184.
- [9] Sarumaha, M., & Pracaya, M. (2020). Identification of insect pests on rice plants in Bawolowalani village. *Jurnal Education and Development*, 8(3), 86-91.
- [10] Nana, S. S. (2013). *Educational Research Methods*. Jakarta: Rosdakarya Youth.
- [11] Sandi, F. K., Nugroho, A. S., & Dewi, L. R. (2021). The Diversity of Grasshopper Species in the Curug Lawe Area, Kalisidi Village, West Ungaran District. *Journal, September*, 1-6.

- [12] Ilhamdi, M. L., Al Idrus, A., Santoso, D., & Raksun, A. (2022). Diversity of grasshopper in Lingsar Vegetable Field, West Lombok. *MIPA Incandescent Journal*, 17(5), 701-705.
- [13] Leksono, A. S., Yanuwadi, B., Afandhi, A., Farhan, M., & Zairina, A. (2020). The abundance and diversity of grasshopper communities in relation to elevation and land use in Malang, Indonesia. *Biodiversity*, 21(12), 5614–5620. <https://doi.org/10.13057/biodiv/d211206>
- [14] Boer, C. (2020). Observation of bird species in valuable areas. *Integrated Agricultural Journal*, 8(2), 154–163.
- [15] F.X. WAGIMAN1, NUGROHO SUSETYO PUTRO, F. L., & HOSANG, M. L. A. (2016). The Introduction of predatory bird *Lanius schach* from Yogyakarta to Salibabu Island for controlling *sexava* spp. on coconut palm. *Palma Bulletin*, 15(2), 115–119.
- [16] LALA, F. (2017). The Establishment of the Gray Bentet Bird (*Lanius schach*) from Yogyakarta in Lalinabu Island. *Palma Bulletin*, 17(1), 25. <https://doi.org/10.21082/bp.v17n1.2016.25-34>
- [17] Irwanto, R., & Gusnia, T. M. (2021). Diversity of Grasshoppers (Orthoptera: Acrididae) in the Paddy Field Ecosystem in Banyuasin Village, Riau Silip District, Bangka Regency. *Biosaintropis (Bioscience-Tropic)*, 6(2), 78–85. <https://doi.org/10.33474/e-jbst.v6i2.381>
- [18] aparudin Saroni, W. S. G. (2021). Grasshoppers, Diversity of Rice Fields, D I Arah, Lubuk Village, District District, Pinang. *Education Vol. April 1, 30, 2021 (Volume 2)*, 1(April), 31–40.
- [19] Ilhamdi, M. L., Al Idrus, A., Santoso, D., & Raksun, A. (2022). Diversity of grasshopper in Lingsar Vegetable Field, West Lombok. *Jurnal Pijar Mipa*, 17(5), 701-705.
- [20] Kemp, W. P., Harvey, S. J., & O'Neill, K. M. (1990). Patterns of vegetation and grasshopper community composition. *Oecologia*, 83, 299-308.