Rat and Mice Species (Sub Family : Murinae) Diversity from East Lombok Indonesia

I Hadi1,*, Y Zamroni1, G Tresnani1, Y M Afrizal1, I W Suana1

1Department of Biology, Faculty of Mathematics and Natural Sciences, University of Mataram, Jalan Majapahit No.62 Mataram-Lombok Indonesia 83125

*Corresponding author: islamulh@unram.ac.id

Abstract. Field study on the murine biodiversity in Lombok Island in early 2020 has spent 581 traps-night efforts in five localities of East Lombok. They were Kembang Kuning, Aikmel, Wanasaba, and Kelayu Jorong. Fifty one individuals have been collected used live trap with dry-salty fish baits. Of those 51 individuals were collected, we successed to indentify five species of murines. They were Rattus argentiventer, R. rattus diardii, R. exulans, R. tanezumi, and Mus musculus castaneus, respectively. R. argentiventer and R Tanezumi were highly abundance and wide-spread species in East Lombok. Surprisingly, R. rattus diardii was only two individuals collected out 100 trap.nights efforts. Those two individuals of restricted to Kembang Kuning. Mus musculus castaneus was the only member of genus Mus collected in this study. This study would be drive our knowledge on the diversity of rat and mice in Lombok Island and their ecology. Furthermore, the preliminary results of this study will allow us for better understand on managing rat and mice population and their interaction with human being.

1. Introduction
Murines (sub-family : Murinae, family : Muridae) consisting old-world rats and mouse. The sub-family has huge number of species number, which was the largest number of species in rodent because of their ability to reproduce offspring is very high [1]. They dispersed widely out of their geographical ranges. Most of the member of murin were lived comensally with human.

Research on the murines species ( rats and mouse) have been intensified. For example their role in as pest in agricultural crops [2], reservoir of several diseases in human, pet and other animal as leptospirosis, leishmaniasis and salmonelasis [3,4]. However, beside their role on the diseases which may causes some disadvantages for other species, the murin also have ecological role as the seed dispersers in the forest areas. The previous research has reported the rat of Rattus exulans consummed fruits and the seeds were uningested and expelled in faecals [5]. These situation might helped the plant seeds dispersed follows the range of rats.

Because of the important roles of murines species in ecosytem, study on the species would be interesting in various way, for example their biodiversity and zoogeography and also their ecological role in ecosytem. The data of murines species from Lombok Island have been reported many years ago [6]. In this paper, we would like to describe the diversity of mice and rat species collected from East Lombok Regency during preliminary field works in March to June, 2020.
2. Methods
We conducted fieldwork to collect murine specimens on March to May 2020, intermittently in East Lombok District (figure 1). The localities of sample collection were Kembang Kuning (KK), Aikmel (AM), Wanasaba (WA), Pringgabaya (PB) and Kelayu Jorong (KJ). The localities were shown in map of figure 1. Due the situation of pandemic Covid-19, all the fieldwork activities were complied with the Indonesian Government Health Protocols [7].

We established single captured-live traps to collect murine specimens in the area those suspected to be inhabited by rats and or mouse. They were shelters in rice field and forest, rice barns, house storages, orchards. We attracted the murine species to the live trap by putting the bait inside the trap. During the field work, we used salty-dried fish as the bait. The traps those established in the field were keep for a night and inspected in the morning. The empty traps would be moved to other points. The number of captured effort was defined as number of trap established multiply by number of nights spents to keep the trap in the fields. The successfully number of trap (trapping success) was define as number of individuals caught in each localities. The percentage of successful efforts were defined as the number of individuals caught in each area was divided by their trap effort then multiply by hundred percents.

The murine individuals those captured in the trap then collected and administrated with cloroform for deep anesthetized. We took photographs of the anesthetized individuals then we inspected the morphological characters for identification purpose refer to [8, 9]. The morphological characters were presence of guardian hair, color pattern of neck, belly, dorsal and abdominal body part of murine specimens, respectively. We were also inspected number of nipples (mammamnæ) and presence of palmar pad in the legs. To collect the morphometrics data, we measured head body length and tail length refer to [8]. The specimens of murines those were collected then preserved in ethanol 96%. All the identification procedures refer to identification key provided by [6,8,9,10].

Figure 1. Localities of sample collection of murine species in East Lombok March-May 2020. The blue dots were the each localities to established the trap during field works.
3. Results
During field work on the murine specimens collection in East Lombok District during March to May 2020, we spent 865 trap.nights to collect 51 individuals of murines. The details of efforts and result of field works were shown in table 1.

| No | Localities     | # Trapping Efforts (trap.nights) | # Trapping success (individuals) | % successful efforts |
|----|----------------|----------------------------------|----------------------------------|---------------------|
| 1  | Kembang Kuning | 100                              | 4                                | 4                   |
| 2  | Wanasaba       | 265                              | 23                               | 8.6                 |
| 3  | Aikmel         | 250                              | 8                                | 3.2                 |
| 4  | Kelayu Jorong  | 100                              | 11                               | 11                  |
| 5  | Pringgabaya    | 150                              | 5                                | 3                   |
|    | **Total**      | **865**                          | **51**                           | **30**              |

Based on data in table 1, the number of individuals caught in the trap in Wanasaba was the highest and Kembang Kuning was the lowest. However, number of individuals caught was not reflect the successful rate of trapping. In Kelayu Jorong, in this fieldwork, the number of individuals caught was lower than those in Wanasaba. However, the rate of trapping success was higher in Kelayu Jorong than those in Wanasaba. During the field works, Aikmel was the localities where the percentage of successful effort was the lowest.

After identification of specimens collected from East Lombok 2020, we could identified five species of murines. They were member of two genera, Rattus and Mus. Four species out of five were member of genus Rattus and the other was member of genus Mus. The species identified and number of individuals and distribution localities were shown in table 2, and photographs of each species were shown in figure 2,3.

| No | Identified Species | #Indiv | HBL (mm) | TL (mm) | Localities |
|----|--------------------|--------|----------|---------|------------|
| 1  | Rattus exulans     | 6      | 109.4-139.3 | 136.8-166.8 | KJ, WA    |
| 2  | R. argentiventer   | 21     | 82.7-191.2  | 75.3-180.1  | KJ, WA, AM, PB, KK |
| 3  | R. rattus diardii  | 2      | 102.7-117.5  | 101.1-117.8  | KK       |
| 4  | R. tanezumi        | 18     | 84.2-182.3  | 84.2-183.2  | KJ, WA, AM, PB |
| 5  | Mus musculus castaneus | 4   | 58.2-69.08  | 60.9-70.1  | KJ, WA, AM |

Note: Indiv = individuals, HBL= head to body length, TL= tail length

![Figure 2](image-url)
4th International Conference on Bioscience and Biotechnology
IOP Conf. Series: Earth and Environmental Science 913 (2021) 012045
doi:10.1088/1755-1315/913/1/012045

Figure 3. Member of genus Rattus collected from East Lombok during fieldwork March-May 2020.

4. Discussion
Research on the murine species in East Lombok during March to May 2020 have revealed five species murines (mouse and rats) in two genus of Mus and Rattus, respectively. Member of genus Rattus were dominantly distributed in the localities of samples collection. They were Rattus argentiventer, R. exulans, R. r. diardii, R. tanezumi. From genus Mus, only Mus musculus castaneus were collected and identified. The previous study in Lombok Island, five species of murine consisted of three species from genus Rattus and two species of genus Mus reported, respectively [6]. We could compared in the previous study R tanezumi were absent from the report, however, Mus domesticus humorous were absent in the present study. Study on rodent in Java reported five species have been described [8]. Of those five species, three species were also found in East Lombok.

The present study recorded the murine species in Lombok occupied various areas. They were found in human settlements, rice barn, forest, orchard, rice field. We were also record those more than a species could occupied the same area. For example, R. tanezumi, R.exulans, R. argentiventer, M. m. castaneus could share the same area in Kelayu Jorong based on the data on their localities where the traps established. Those species collected from the same traps point in the different trap session.

The four species of genus Rattus those found in East Lombok were four of sixty-five species described in the world [9]. All the species in present study belong to world-wide distribution species[9]. However, R. r. diardii were restricted to found in Kembang Kuning in small number individual compared tho other four species. It was contrary with those previous study in urban area of City of Mataram, R.r. diardii was distributed widely and dominated the area [11]. The presence of
murine species in Lombok Island were suggested not related to the geological history, however, the migration of human on the various activities would contributed dominantly.

In related to human-animal interaction, the existences of mouse and rats (member of sub-family Murinae) mostly as pests [12,13] and also sources of deseases [4] which may harm to human being. However, murines species have ecological role as seed disperser in the nature which may help the ecosystem to regenerate their vegetation. The better understand on the species of murines on their diversity and ecology will help us to manage the population and their disadvantages on human-animal interaction.

Future Direction
Since the present study was preliminary, number of data collected on the murines in East Lombok were insufficient. We need to collect more data in the species account number by adding more efforts to collect speciement in the wider area. We also need to collect more data on their ecology and behavior. Those collaborative data will give us more view on the number of species of murine in Lombok Island and their role in the ecosystem.

Acknowledgements
We acknowledge FMIPA University of Mataram for the research grant to IH and team under scheme of PNBP 2020 Fund. We would like indebted Head of Gunung Rinjani National Park Office for the permission to collect murine specimen inside the national park. We also gratefully to thank to local people of Kelayu Jorong, Wanasaba, Aikmel, Pringgabaya, Kembang Kuning who helped us for establishment and handled the live trap.

References
[1] Anderson PK. 1991. *J. Mammalogy* 72 (1), 218-220
[2] Widodo P, Wijaya IMAS and Budisanjaya IPG. 2018 Beta 6 (2), 90-97
[3] Nurwidayati A and Siahaan HA. 2009. Jenis tikus dan potensi penularan penyakit zoonosis di daerah endemic schitosomiasiis Napu, Kabupaten Poso, Provinsi Sulawesi Tengah. In*Su-Isu Strategis sains, Lingkungan, dan Inovasi Pembelajaran*, Prosiding Seminar Nasional Pendidikan Biologi dan Saintek Ke-IV, edited by A. Asngad et al, Universitas Mauhammadiyiah Surakarta), pp. 47-52
[4] Isnaini T. 2016. *J. Ekol Kesehatan* 5(2), 107-114
[5] Xiao Z and Krebs CJ. 2013. *J Ecology* 101, 1256–1264
[6] Kitchener DJ., Bocadi, Charlton L., Maharadatunkamsi. 2002. *Mamalia Pulau Lombok.* (Pustlitbang Biologi- LIPI, Bogor), pp 1-168
[7] Kementerian Kesehatan Republik Indonesia. 2020. *Pedoman Pencegahan dan Pengendalian Corona Virus Disease (Covid-19)* ( Direktorat Jenderal Pencegahan dan Pengendalian Penyakit, Jakarta)
[8] Suyanto A. 2006. *Rodent di Jawa.* (Pustlitbang Biologi- LIPI, Bogor), pp 45-90
[9] Pimsai U., Pearch MJ., Satasook C., Bumrungsri S. and Bates PJJ. 2014. *Bonn Zool Bulletin* 63(1), 15-114
[10] Musser GG. and Carleton MD. 2005. “Family Muridae” in *Mammals Species of the World: A Taxonomic and Geographic reference, 3rd edition*, edited by D.E. Wilson and D.M. Reader, John Hopkins University Press, Baltimore, Maryland) pp 894-1531
[11] Tresnani G, Hadi I and Suana IW. 2016. *J Vet Parasitology* 30, 35-38
[12] Pusparini IM and Suratha IK. 2018. *J. Pend. Geog. Undiksha* 6(2), 54-63
[13] Solihin and Purnomo.2008. *J. HPT Tropika* 8(1), 23-30