LAPORAN KEGIATAN

SURVEY DAN MONITORING DALAM RANGKA PENGUMPULAN DATA DISTRIBUSI POPULASI BIAWAK KOMODO

DI LOH SELOKA DAN LOH LETUHO
TAHUN 2024

2024

BALAI TAMAN NASIONAL KOMODO
DIREKTORAT JENDERAL
KONSERVASI SUMBER DAYA ALAM EKOSISTEM
KEMENTERIAN LINGKUNGAN HIDUP DAN KEHUTANAN

ACTIVITY REPORT
SURVEY AND MONITORING IN ORDER TO COLLECT DATA ON THE POPULATION DISTRIBUTION OF KOMODO LIZARDS
IN LOH SELOKA AND LOH LETUHO 14
- 20 NOVEMBER 2024

By

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RESPONSIBILITIES

SURVEY AND PIONITORING IN ORDER TO COLLECT DATA ON THE DISTRIBUTION OF THE KOF1ODO MONITOR LIZARD POPULATION IN LOH SELOKA AND LOH LETUHO

DATE 14 - 20 NOVEf4BER 2024

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INTRODUCTION

Praise and gratitude to God Almighty for the completion of **Survey and Monitoring** Activities **in the Context of Collecting Data on the Population Distribution of Komodo Lizards in Loh Seloka and Loh Letuho**. This report is prepared as a form of accountability for activities that have been carried out on November 14-20, 2024.

Komodo Monitoring activities carried out with the Komodo Survival Foundation are part of the biodiversity protection program initiated by the Komodo National Park Office. This program aims to maintain and protect the condition of the ecosystem in the Komodo National Park area and the Komodo monitor lizard species that live in it. The preparation of this 2024 monitoring report was made possible by the collaboration between the IN-FLORES Project Management Technical Team of the Komodo National Park Office and the support of the Komodo Survival Program as the implementing partner.

This activity would not have been successful without the support and cooperation of various parties. Therefore, we would like to express our deepest gratitude to the Head of the Komodo National Park Office, the Head of the Administration Subdivision of the Komodo National Park Office, the Head of the PTN Region II Section of the Komodo National Park Office and the Komodo Survival Program (KSP) for all the direction and guidance given before, during and after this activity. In particular, we also express our high appreciation to all team members and field officers who have worked well and with dedication, so that this activity can run smoothly.

We realize that this report is far from perfect. Therefore, any criticism, suggestions, and input are highly appreciated for the improvement of this report in the future. Hopefully this report can provide benefits for all of us, especially in better Komodo conservation efforts in the future.

Labuan Bajo, November 2024 Compiler

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CHAPTER I
INTRODUCTION

A. Background

Komodo National Park Center is a Technical Implementation Unit of the Directorate General of Natural Resources and Ecosystem Conservation - Ministry of Environment and Forestry, which carries out the main tasks and functions of preserving komodo dragons (*Varanus komodoensis*) and their habitats and supporting ecosystems. These main tasks and functions are a more specific elaboration of the main functions of conservation areas, including protection functions, preservation functions, and natural resource utilization functions by taking into account the principles of sustainability. Komodo National Park was established through an announcement of the Minister of Agriculture of the Republic of Indonesia on March 6, 1980 and later confirmed by the Minister of Forestry Decree No. 306/Kpts-II/1992 dated February 29, 1992 with an area of 173,300 Ha. In 1977, Komodo National Park was designated as a *Man and Biosphere Reserve* and in 1991 was designated as a *World Heritage Site* by UNESCO. In addition, the area was also awarded the attribute as *The Real Wonder of the World* (*The Real WOW*) in 2011 and has officially become one of the *New 7 Wonders of Nature* on May 16, 2012.

Komodo National Park has 2 (two) main iconic species, namely *Komodo* monitor lizards *(Varanus komodoensis*) and yellow-crested cockatoos *(Cacatua sulphurea occidentalis*), which are included in the priority endangered species. Monitoring of the Komodo monitor lizard population has been conducted since the 1980s, while monitoring of the yellow-crested cockatoo population began in the 2000s. As an archipelago, these two endangered species are also found living on several islands in the Komodo National Park area. Komodo lizards are known to be found on Komodo Island, Rinca, Padar, Gili Motang, and Nusa Kode. The Komodo dragon population on Padar Island was recorded in 2013, and has not been seen since the late 1980s. Yellow-crested cockatoos are found on Komodo, Rinca and Bero islands. Bero Island is a small island between Rinca Island and Flores Island that has a mangrove forest ecosystem, so it is possible that this bird is also found on other small islands that have similar characteristics.

Based on intensive population surveys since 2000, komodo dragon populations on the larger islands within Komodo National Park have been stable, while populations on the smaller islands have continued to decline (Jessop et al., 2007b, BTNK 2019). The total population in 2014 was 2,448± 229 obtained through the *capture-mark-release-recapture* (CMRR) method in 10 large valleys on Komodo Island and Rinca Island and two small islands, Gili Motang and Nusa Kode (Purwandana et al., 2014). Subsequent monitoring of the Komodo dragon population since 2014 until now has been carried out using the camera trap installation method throughout the Komodo National Park area including two small islands, Gili Motang and Nusa Kode. From the results of the monitoring activities, it is known that the komodo dragon population on the big island tends to be stable. While the population on the small islands, Gili Motang and Nusa Kode, both with camera traps and direct capture, tends to show a decreasing population.

Continuous monitoring of the komodo dragon population throughout Komodo National Park is very important to support the conservation of the species itself. Some permanent komodo dragon monitoring locations on Rinca Island are Gili Motang Island, Nusa Kode Island, Rinca Island (Loh Dasami, Loh Baru, Loh Tongker and Loh Buaya). Annual monitoring locations on Komodo Island

Komodo Island include Loh Sebita, Loh Lawi, Loh Warang, Loh Wau. Meanwhile, there is one Komodo dragon monitoring location on Padar Island. All ten locations are monitored using camera traps. Two locations, Loh Liang and Loh Buaya, were monitored using the CMRR method (*Capture Mark Release Recapture*| Capture-Mark-Recapture-Release).

Komodo National Park itself is an integral part of the implementation of the IN-FLORES project which is an important focus in project implementation because it is a habitat for various endangered species. Survey and Monitoring in the Context of Collecting Data on the Distribution of the Komodo Lizard Population in Komodo National Park conducted with the Komodo Survival Komodo Foundation is expected to provide supervision and information for the existence of komodo lizards, so as to create sustainability for komodo lizards. This program also aims to build networks and cooperation between Komodo National Park and Komodo Survival Program that can support the exchange of information, resources, and conservation strategies in the future. Thus, it is expected to create more effective and sustainable conservation efforts, as well as improve the welfare of local communities through responsible ecotourism. In this regard, the IN - FLORES project will contribute, participate and fund the Survey and Monitoring activities in order to collect data on the distribution of the Komodo monitor lizard population in Mr. Komodo with the Komodo Survival Komodo Foundation, which will be implemented to support one of the *outcomes* in Component 1, namely effective conservation of Komodo dragons and globally threatened terrestrial and marine species inside a n d outside conservation areas.

B. Objectives

The implementation plan of Komodo dragon monitoring activities in the National Park Management Section Region II (SPTN Wil. II), especially Loh Seloka and Loh Letuho in 2024 aims to:

1. Provide data on the estimated population of Komodo dragons in Loh Seloka and Loh Letuho through observations with camera traps;
2. Provide survey data on the distribution of Komodo dragons in Loh Seloka and Loh Letuho.

C. Expected Results

The expected results of the survey and monitoring in order to collect data on the distribution of the Komodo monitor lizard population in Komodo National Park with the Komodo Survival Program Foundation are as follows:

1. Implementation of survey and monitoring activities that produce data on the distribution of the Komodo monitor lizard population;
2. The fulfillment of survey and monitoring activities in Loh Seloka and Loh Letuho;
3. Implementation of survey and monitoring activities by providing activity reports;
4. Provide data on the distribution of Komodo lizards on Komodo Island through camera trap observations.

D. Basis Law

1. Law Number 5 of 1990 concerning Conservation of Natural Resources and Ecosystems;
2. Law No. 41 of 1999 on Forestry as amended by Law No. 19 of 2004 on the stipulation of Government regulations replacing Law No. 41 of 1999 on Forestry into Law; Law No. 19 of 2004 on the stipulation of Government regulations replacing Law No. 41 of 1999 on Forestry into Law.

Law;

3. Law No. 18 of 2013 on Prevention and Eradication of Forest Destruction (P3H);
4. Regulation of the Minister of Environment and Forestry No. 17 of 2022 Jo. Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number 22 of 2022 concerning amendments to the Regulation of the Minister of Environment and Forestry Number No. 17 of 2022 concerning the Organization and Work Procedures of the Technical Implementation Unit of the Directorate General of Conservation of Natural Resources and Ecosystems;
5. Foreign Grants Project IN - FLORES West Landscape - Seascape Management Unit Fiscal Year 2024;
6. Task Letter of the Head of Komodo National Park Number: ST.1367/T.17/TU/KSA.2.1/B/11/ 2024 dated, November 12, 2024.

E. Project Target IN - FLORES

The Survey and Monitoring activities in order to collect data on the distribution of the Komodo monitor lizard population in Komodo National Park with the Komodo Survival Komodo Foundation meet the indicators and milestones of the IN - FLORES project as follows:

i. Output 1.4

Under output 1.4, Strengthen monitoring and law enforcement capacity, systems, coverage, and partnerships to improve the knowledge base on population dynamics and variation of Komodo dragons and other species, enabling more informed decision-making in the West and North Flores landscapes-seascapes. There are indicative activities under output 1.4 Support Komodo National Park (TNK) and BBKSDA-NTT in updating and strengthening monitoring plans for Komodo dragons and other globally threatened species in the West and North Flores landscapes-seascapes.

ii. West LSMU Milestones

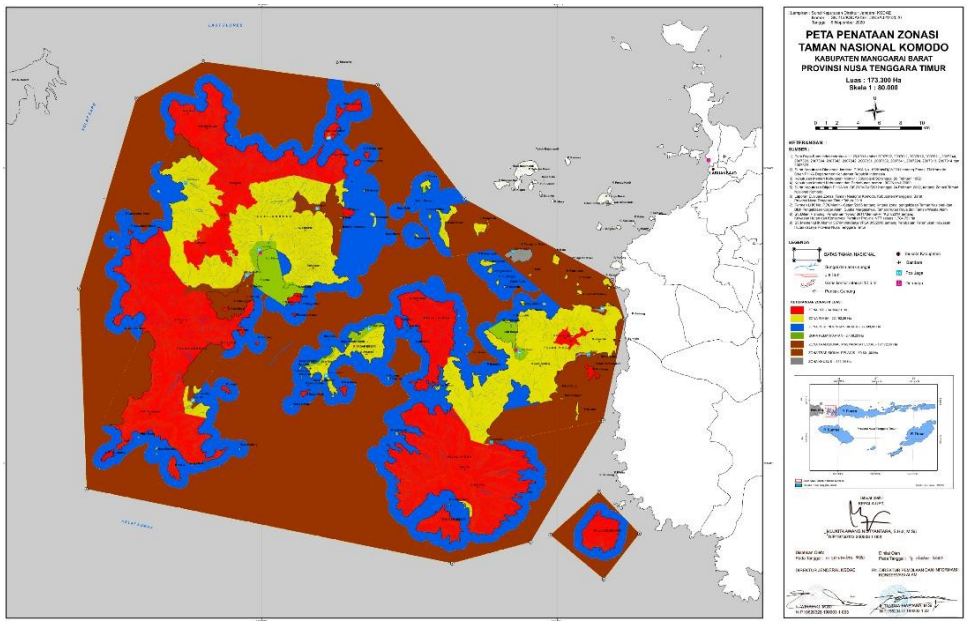
Of course, this is also in line with the West Landscape - Seascape Management Unit milestone related to Strengthening the Protection of the Komodo National Park Area. That in the West LSMU milestone of the IN - FLORES project, the activity has actualized the activity input, namely knowing the distribution of the Komodo monitor lizard population through the installation of camera traps.

CHAPTER II
LITERATURE REVIEW

A. Overview of Komodo National Park

1. Location

Astronomically, Komodo National Park is located between 119009'00"-119055'00" East and 8020'00"- 8053'00" LS. Geographically, the park is located on the western border of East Nusa Tenggara province with West Nusa Tenggara province, namely between Sumbawa Island (NTB) and Flores Island (NTT). Administratively, the Komodo National Park area is part of Komodo District, West Manggarai Regency, East Nusa Tenggara.



Map of National Park Zoning Arrangement

2. History of Komodo Protection

Since its discovery in 1912, efforts have been made to protect the Komodo dragon. Padar Island and Rinca Island were first designated as Wildlife Sanctuaries in 1938. After 27 years, Komodo Island was only designated as Komodo Island Wildlife Sanctuary in 1965. With the 1980 Minister of Forestry Decree, the three Komodo Island Wildlife Sanctuaries were merged into one conservation area management in the form of a national park. The total area of Komodo National Park is 173,300 ha, consisting of 114,801 ha of water area and 58,499 ha of land area. The Komodo National Park area is divided into 7 (Seven) zones with different utilization details (Decree of the Directorate General of KSDAE No.212/KSDAE/SET.3/KSA.0/11/2020).

3. Climate

Komodo National Park is located in the driest area in Indonesia where it is classified as climate F or very dry with Q = 1.97 and annual rainfall between 200-1500 mm. December to March is the rainy season, while the other eight months are the dry season (Dirjen PHKA, 2000). Most rivers are dry throughout the year, with only a few permanent water sources (Auffenberg, 1981).

4. Geology and Topography

The small islands within Komodo National Park were formed by volcanic uplift, with areas formed from conglomerate rocks, volcanic dust and uplifted corals (Sumardja, 1981, Monk 2000). Western Komodo Island was probably formed during the Jurassic era around 130 million years ago. East Komodo, Rinca and Padar probably formed around 49 million years ago in the Eocene era. Around 18,000 years ago, the water level was 85 meters lower, which is where the migration of Komodo dragons between Flores and Komodo may have occurred. Almost all of this area consists of hills and mountains, with Mount Satalibo being the highest peak on Komodo Island (735 m). On Rinca and Padar islands, the highest peaks are Doro Ora (667m) and Pyramid (269m) respectively (Directorate General of PHKA, 2000). Nusa Kode Island is dominated by steep hills, only 20% of the coastal forest area has a gentle topography. The highest peak of the island is only 400m above sea level (Imansyah 2006, Jessop et al., 2006). Padar Island is one of the three major islands in Komodo National Park. The total area of Padar Island is 14.09 km2. As much as 93.48% of its area is covered by forested savanna and grass savanna vegetation, making it the island with the largest savanna compared to the other two large islands, Komodo Island and Rinca Island (Jessop et al., 2007b). There are four habitat types on Padar Island: mangrove forest, monsoon forest, coastal forest and grassland savanna (Mustari et al., 2010).

5. Terrestrial Flora and Fauna

Komodo Island is the largest island in Komodo National Park with savanna forest characteristics. The vegetation community consists of savanna, mangrove, coastal forest, open deciduous forest. Plants that can be found in the open deciduous forest ecosystem include *tamarind* (*Tamarindus indica*), banyan (*Ficus sp*) indigo (*Grewia eriocarpa*), kemuning (*Murraya paniculata*), paci (Zizyphus timorensis), kukun (*Schoutenia ovata*), nara (*Pterocarpus sp*) and kesambi (*Schleicheraoleosa*). While in the forest savanna ecosystem, *tamarind* (*Tamarindus indica*) and kukun (*Schoutenia ovata*) can be found. There are at least three vegetation formations that can be found in Komodo National Park, namely tropical deciduous *forest* (*monsoon forest*), savanna and quasiciawan forest. The dominant forest cover on small islands is open deciduous forest, which is around
79.96% (Gili Motang Island) and 84.33% (Nusa Kode Island) (Jessop et al., 2007b, Imansyah 2006). The open deciduous forest is dominated by the wali kukun (*Schoutenia ovate*). In contrast to other islands where the dominant cover is savanna, Nusa Kode island only has a small savanna habitat on the eastern part of the island.

Komodo Island has four forest formations: mangrove forest, coastal forest, monsoon forest and savanna forest (Ardha et al., 2012). Grassy savanna and wooded savanna are the largest forest formations compared to savanna and other forest types on the other two large islands. Open deciduous forest is only about 0.92 km2, much smaller than savanna forest (13.17 km2) (Jessop et al., 2007b). The savannas found on the island are generally *Ziziphus mauritiana* savanna forests, with no palm savannas found.

Auffenberg's (1981) study noted that the only large mammals living on the island are deer. The herpetofauna inhabiting Komodo island accounts for 50% of the reptile species data for the entire Komodo National Park area and 45% are Nusa Tenggara reptile species. One of the snake species, Naja sputatrix, is listed in the *CITES Appendix II* category, which means that the species has a high probability of extinction so that all forms of trade are strictly regulated (Wahyuni, 2012).

The Komodo monitor lizard is the most unique animal in the region and the reason Komodo National Park was established. However, other animals of importance are the toe-birds.

(*Megapodius reinwardt*), rinca rat (*Komodomys rintjanus*), and timor deer (*Rusa timorensis*). Reptiles commonly found in the park include the flaming cobra (*Naja naja sputatrix*), russel snake (*Viperia russeli*) and green venomous tree snake (*Trimeresurus insularis*). Komodo National Park is also home to many resident and visitor bird species such as the yellow-crested cockatoo (*Cacatuasulphurea occidentalis*), the florescent eagle (*Spizaetus floris*) and various seabirds.

B. Bio-Ecology and Conservation Komodo Dragons

1. Taxonomy

There are at least 73 species (including 21 subspecies) of the Varanidae family worldwide. The *Varanidae* family includes large lizard species, including *Varanus komodoensis* (Koch et al., 2010). The following is the taxonomy of Komodo dragons as recorded in the *World Conservation Monitoring Center* (1996).

Kingdom: Animalia
Filum : Chordata
Class : Reptilia
Order : Squamata
Family : Varanidae
Genus : Varanus
Species : *Varanus komodoensis* (Ouwens, 1912).

2. Morphology

Komodo dragons are the largest lizards in the world today. The average SVL (*Snout-Vent Length* or snout to cloaca length) of adult Komodo dragons on large Komodo islands can reach 94 cm, compared to smaller islands such as Gili Motang Island (75 cm) (Jessop et al., 2006). Specimens from West Flores reached 304 cm (Auffenberg, 1981). On average, adult Komodo dragons weigh up to 25 kg on large islands, while on smaller islands they only reach 7-8 kg. Size and weight differences between islands are influenced by the density of the Komodo dragon's main prey (Jessop et al., 2006). There are no notable differences between males and females except for differences in size. The first type collected by JP Owens from Komodo Island had a total length of 290 cm. However, there are ontogenic differences in the shape of Komodo dragons in terms of major life stages. Juveniles are slimmer, more agile with a light body suitable for survival in the trees. The long tail of juveniles turns into a long and heavy tail in adult Komodo dragons which is used as an effective defense weapon. In addition, there is a change in the proportion of posterior head width in adult Komodo dragons which may be food related. Coloration changes ontogenically from a variety of colors, mottled young to clay-colored adults (Auffenberg, 1981).

3. Behavior

Komodo dragons are generally active throughout the season. Body size is not related to their seasonal activity. In addition, there is no season-specific habitat selection. However, Komodo dragons' foraging behavior is linked to seasonal changes, with higher frequency at the end of the dry season when many prey animals die due to lack of water and food (Auffenberg, 1981).

Based on telemetry data, the average daily movement of adult Komodo dragons hardly ever leaves the valley where they live.

The average daily movement of adult Komodo dragons almost never leaves the valley where they live, with an average daily movement of 573 meters, with the farthest movement during the mating season reaching 3 km (Jessop, et al. 2018). Komodo dragon movement activities include scavenging, foraging and core areas. The size and shape of these areas varies between individual Komodo dragons depending on the individual's social status, size and sex. Very young Komodo dragons do not have scavenging areas as they rarely feed on carrion (Auffenberg, 1981). The displacement distance of Komodo dragon hatchlings is smaller than that of pups. Hatchlings are arboreal while pups are terrestrial (Imansyah, 2006).

4. Distribution and Habitat

Phylogeographic studies of komodo lizards suggest that they originated in mainland Australia during the Pliocene (5.3 - 2.8 million years ago) and reached Flores and Komodo islands in the early Pleistocene (2.5 million - 11,700 years ago). Currently, the geographic distribution of Komodo dragons is limited to Komodo Island, Rinca Island, Padar Island, Gili Motang Island, Nusa Kode Island and northern and western Flores (Hocknull et al., 2009).

Most Komodo dragons are found at low elevations, generally below 700 meters above sea level. On Komodo Island, tropical savannas and open deciduous forests are favored by Komodo dragons. However, the ecotone habitat between the two habitat types is the most important for Komodo dragons. These habitats are important because they are nesting sites for several bird species, *basking* grounds for Komodo dragons and the main activity sites for many reptile species, especially arboreal species. Komodo dragons often visit ecotone areas and hunt prey on the many animal trails found in this habitat (Auffenberg, 1980).

5. Population and Conservation Status

Komodo monitor lizards cannot be traded based on their status as one of the animals in *Appendix I of* the CITES (*Convention on International Trade in Endangered Species of Wild Fauna and Flora*) ratification (CITES, 2012). The population of this animal in nature is classified as *Endangered* or threatened based on the IUCN (*International Union for the Conservation of Nature and Natural Resources*) assessment in Figure 2. This means that population conditions will decrease if habitat and food conditions are disturbed (*World Conservation Monitoring Center*, 1996). The 1994-2004 study found that over a 10-year period, komodo lizards declined in body mass, body condition and relative density on Gili Motang. On Rinca Island, the condition was relatively stable (Jessop et al., 2007c). Likewise, the results of annual monitoring by BTNK show that komodo dragon populations on large islands are stable, but populations on small islands are declining. The total estimated population in Komodo National Park until 2019 is
±2,897 individuals (Komodo; 1727, Rinca; 1049, Gili Motang; 58, Nusa Kode; 57) (BTNK, 2018). Meanwhile, the Komodo dragon population on Padar Island is 6 individuals.

Based on the latest Komodo population information, the conservation status of Komodo dragons in the IUCN redlist book is endangered.

C. Data Retrieval Methods

The use of camera traps has been widely applied in studies including animal observation and hunting, nest ecology, rare animal detection, estimation of population size and species richness, habitat use and human occupancy. Compared to other population survey methods, some of the advantages of camera trapping are that it can record animals without having to capture the target animal and researchers do not have to be at the sampling site. In addition, the data obtained can be reviewed by other researchers. The disadvantage of using camera traps is that they are prone to equipment errors resulting in data loss. Camera traps placed in natural habitats sometimes record other animals or vegetation movements that can eventually fulfill the storage capacity of the camera trap (Swann et al., 2011).

Camera traps are widely applied in observing large mammals. Studies on other taxa, especially large reptiles, have yet to be conducted. Ariefandy et al. (2013) started population observations on *V. komodoensis* with camera traps and tested their effectiveness with direct capture using cage traps. The study proved that overall, camera traps produced similar population estimates to detection data and occupancy patterns as cage traps. Although some data such as demographics, population growth and possible dispersal could not be captured by camera trapping, the use of cameras can increase the efficiency of funds and manpower and can cover a wider monitoring area.

CHAPTER III
IMPLEMENTATION ACTIVITIES

A. Basis Implementation

1. Foreign Grant Budget of IN - FLORES West Landscape - Seascape Management Unit Project Fiscal Year 2024;
2. Letter Task Head Center Park National Park Komodo Number: ST.1367/T.17/TU/KSA.2.1/B/11/2024 dated November 12, 2024.

B. Implementation

The activity implementation team consists of 14 (fourteen) people, namely 12 (twelve) Komodo National Park officers, 1 (one) Komodo Survival Program Foundation staff and 1 (one) IN - FLORES West Landscape - Seascape Management Unit staff. The list of names is attached in the following table:

Table 1. Table of names of the implementation team of Komodo monitor lizard population survey and monitoring activities

No	Name	NIP / NI PPPK	Rank/Goal	Position	Ket
1	2	3	4	5	6
1	Ande Kefi, S.ST	19800804 200112 1 003	Junior Organizer Tk. I/ IIIb	PEH Executive Advanced	
2	Maksimianus Pamur	19850529202321000	PPPK	Beginner PEH	
3	Fajra Farhan Ekadj, S.Sos, M.Si.	-	-	West Landscape Seascape Coordinator	
4	Rusdin	-	-	Energy Forest Security	
5	Stephen Jalak	-	-	Energy Forest Guard	
6	Rafael F.A. Putra	-	-	Forest Guard	
7	Emanuel Jedho	-	-	Energy Forest Guard	
8	Fajrul Hag	-	-	Energy Forest Guard	
9	Benyamin Panus	-	-	Energy Forest Guard	
10	Nasmawi	-	-	Captain King Fisher	
11	Kamal	-	-	King Fisher crew member	
12	Muhammad Anshory	-	-	King Fisher crew	
13	Mardi Triyanto	-	-	King Fisher crew member	
14	Jabir	-	-	Foundation Komodo Survival Program	

CHAPTER IV
METHODS
OBSERVATIONS

A. Location and Time

The survey and monitoring of the Komodo dragon (*Varanus komodoensis*) population in Loh Seloka and Loh Letuho, National Park Management Section Region II, Komodo National Park was carried out on November 14-20, 2024. There were 7 sampling points used for monitoring and 6 sampling points used for population survey of Komodo dragons in Loh Seloka and Loh Letuho. Camera traps were placed in locations with the highest chance of seeing komodo dragons, in this case open deciduous forest valleys and savannas which are the main habitat of komodo dragons on Komodo Island. Sampling points of population and *site occupancy* surveys with camera traps were made with the help of *Google earth* (spatial program) as shown in the following figure:

Map of camera trap locations for population survey and monitoring of Komodo dragons.

The 7 coordinate points (camera trap locations) of the implementation of Komodo dragon (*Varanus komodoensis)* population survey activities on Komodo Island are shown below:

Table 2. Coordinate point table of camera trap placement for Komodo animal surveys

Point Name	Y	X
KB01	8:34:08	119:25:11
KB02	8:34:35	119:25:08
KB03	8:34:44	119:24:45
KB04	8:36:12	119:24:08
KB05	8:36:23	119:24:39
KB06	8:36:50	119:24:49
KB07	8:37:50	119:24:34

B. Materials and Equipment

Materials and equipment used in the monitoring of komodo dragons (*Varanus komodoensis*) in Loh Seloka and Loh Letuho, SPTN Wil. II, Komodo National Park is as follows:

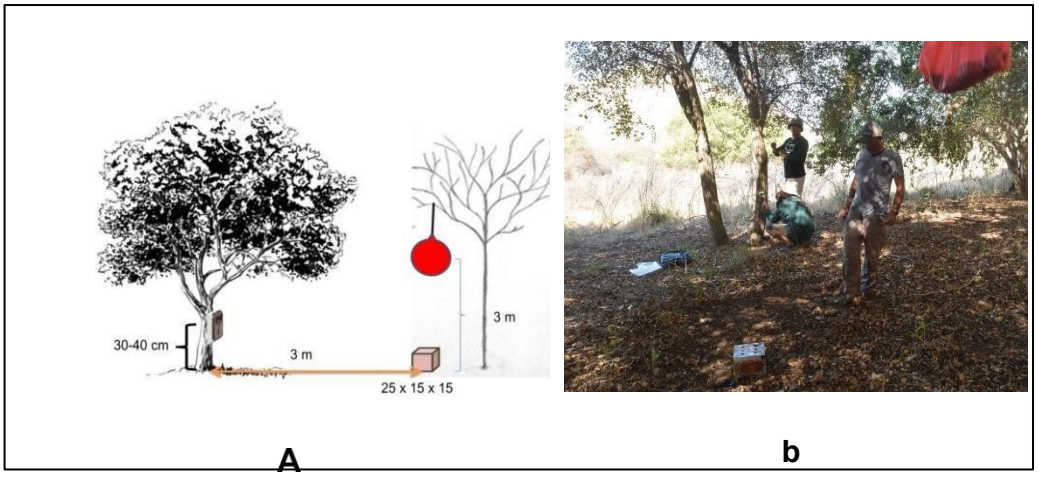
Table 3. Materials, Equipment, and Their Functions.

No	Materials and Equipment	Function
1	Bushnell Camera Trap HD Max 8MP 119678C, 8 12-volt batteries per camera.	Records images of individual Komodo dragons
2	Canon EOS 70D camera, stationery	Habitat conditions and encounters Komodo dragons in person
3	Goat meat, aluminum box (boxumpan), plastic, nylon rope	Attracting Komodo dragons to the camera
4	GPS, work map	Marking of placement location points Camera

C. Data retrieval method

The placement of camera traps in the observation plot refers to the placement of sampling areas with a griding system measuring 500 m x 500m per grid on a map using the Google Earth program. The sampling area is the polygon area formed by connecting the outermost points of the boundary layer area (500 m diameter) in each observation plot (Purwandana et al., 2014).

The camera used was Bushnell Camera Trap HD Max 8MP 119678C, which is a camera equipped with passive infrared (PIR=Passive Infra Red). The camera was installed at a tree height between 30-40 cm from the ground to increase the chances of the camera capturing komodo dragons. The camera trap only records objects during the day, from 06:00 to 18:00. This is based on the behavior of Komodo dragons which are more active during the day. When detecting an object, the camera will record three images sequentially until the object moves away. At each camera installation point, two types of bait were used to attract dragons. The first bait is a hanging bait containing 2.5 kg pieces of mutton. The bait was installed at a height of approximately 3 m from the ground. The smell of the meat serves to attract komodo lizards within a radius of 200-300 m around the bait. The second bait of 0.5 kg goat meat was placed in an aluminum box on the ground at a distance of 3 m from the camera. The duration of camera trap installation at each point was three days. Camera trap data recording in a day was divided into two times; morning (06.00 - 12.00) and afternoon (12.00-16.00).



Camera trap installation method at the activity site (a) baiting method;
(b) overview of CT installation sites in Seloka and Loh Letuho

D. Data Analysis

An image is considered an individual based on the difference in age class and time captured by the camera. Age class categories can be divided into juveniles, juveniles, and adults based on size and weight as detailed in the table (Table 5). However, since precise determination of size and sex could not be accomplished, the age classification of dragons was divided into three categories: adult, juvenile and child. The installation of an aluminum box in the direction of the camera is a comparison to determine the estimated size of the recorded dragons into these three categories. In addition to size, physical characteristics are one of the ways used to determine individual differences.

Table 4. Age classifications of Komodo monitor lizards based on SVL length and body weight.

Age Class	Category	SVL (cm)	Weight (Kg)
Hatchlings-Child	Child	16,0 - 81,0	0,04 - 10,00
Adolescents	Teenagers	81,0 - 110,0	10,00 - 20,00
Females	Adult	96,0 - 110,0	20,30 - 32,50
Males	Adult	> 115,0	> 33,00

Individual dragons are also considered different or the same based on differences in recording time. Two dragons of similar size can be considered different individuals if they were recorded simultaneously at two different camera stations within< 6 hours, while two dragons of similar size can be considered the same individual if they were recorded at adjacent camera stations within > 12 hours. This individual determination technique was used because dragons are not easily distinguishable from each other (adopted from Mace et al., 1994). These two ways of determining individuals were used when the first and second ways could not distinguish individuals with the same characteristics. The data obtained were collected into a tally sheet table consisting of 3 types of data.

Data on the presence of dragons at each camera trap placement point was obtained by creating a presence/absence table with 6 repetition times. This data was then combined with presence/absence data from other locations to determine the abundance and population of Komodo dragons on all islands and throughout Komodo National Park. The abundance and site occupancy data of Komodo dragons on an island were analyzed using the Presence 2.13.18 program.

Presence 2.13.18 program.

CHAPTER V
RESULTS AND DISCUSSION

Camera traps were installed at 7 sampling points to survey the komodo dragon population, and it was found that all points had the presence of komodo dragons. These results indicate that the distribution of komodo dragons is in every valley in Loh Seloka and Loh Letuho. In 2018, it is known that there are still location points on western Komodo Island where there is no presence of Komodo dragons (*Varanus komodoensis*), which may be influenced by several things, but the main factor is that Komodo dragons (*Varanus komodoensis*) on the western Komodo Island island still tend to be dynamic in their status so that the behavior of these animals is thought to be still moving in search of preferred habitats or looking for resources for the animal's life needs (food, water, females) which are not necessarily present in every valley. In addition, the observation of the presence of Komodo dragons in the western part of Komodo Island is only used as data to complete the distribution of populations on the island.

This population survey was conducted at different elevations and vegetation types, with the aim of sampling the presence of Komodo dragons at these elevations and vegetation types. The result of this population survey is to strengthen the analysis of *site* occupancy/monitoring of Komodo dragons. The map below shows the locations where komodo dragons are present.

For the Komodo dragon monitoring activity itself, from the 7 camera traps used and analyzed, there are estimated individuals at 7 location points in Loh Seloka and Loh Letuho as many as 14 individuals that may be different. Of the 14 individuals, there are three age categories based on the appearance of the size of the Komodo dragon, namely adult, juvenile and child Komodo dragons. Adult Komodo dragons have been identified as 2 adults, 4 juveniles and 8 children. The results of observations of the Komodo dragon population using camera traps in Loh Seloka and Loh Letuho in detail are presented in Table 6 as follows:

Table 5. Results of komodo dragon encounters in Loh Seloka and Loh Letuho

Bait Point /Camera	Number of Individuals			
	Total	Adults	Juveniles	Children
BK01	1	0	1	0
BK02	3	1	1	1
BK03	2	1	0	1
BK04	1	0	0	1
BK05	1	0	0	1
BK06	4	1	1	2
BK07	3	0	1	2
Total Number	**14**	**2**	**4**	**8**

The data above shows that the condition of Komodo dragons (*Varanus komodoensis*) in Loh Seloka and Loh Letuho has a child and adult age class category that tends to be dominant than the adolescent age class. The percentages are 57.14% juvenile age class, 28.57% juvenile age class, and 14.29% adult. The number of adult and juvenile individuals is very likely due to the breeding of Komodo dragons (*Varanus komodoensis)* in Loh Seloka and Loh Letuho, this is reinforced by the results of the last monitoring conducted in 2018 where potentially active nests were found. Age class is one of the important factors in

knowing the dynamics of the population, Sumarto S, & Roni K, (2016), the division of age classes forms a pyramid of population structure, the population structure can reflect birth (natalitas), death (mortality) and migration (*in / out*) which then shows 4 population growth models namely (1) Stationary, (2) regressive, (3) progressive, (4) Population experiencing disasters (epidemics / natural disasters).

The description of the age class categories caught in the camera trap is presented in the following figure:

Figure 5. Komodo dragons (Varanus komodoensis) captured by camera traps. (a) adult Komodo dragon at site KB02; (b) juvenile Komodo dragon at site KB01.

The last Komodo dragon monitoring activity was carried out in 2018, but due to security factors due to poaching activities, the activity was stopped. Until finally the Komodo National Park Office managed to reduce the level of deer poaching by securing the area routinely and consistently and the deer population improved enough and in 2024 the BTNK team began monitoring komodo dragons again. Currently, its presence is a concern that needs to be studied consistently. The existence of natural or *introduced* breeding is a note that the komodo dragon (*Varanus komodoensis)* population in Loh Seloka and Loh Letuho is still fairly dynamic.

Estimates of individuals caught in camera traps can be used to estimate population density and population estimates in a location, of course by adding various supporting factors and comprehensive data, it will be used as a whole piece of data that can be used as a basis for estimating the population of Komodo dragons in Loh Seloka and Loh Letuho. The estimated population value of Komodo dragons can only be presented comprehensively by presenting the data as a whole. In this case, the estimated population value is known using the *site occupancy* method with data on the presence of dragons in each camera trap/observation location and then extrapolated into a unit area of the observation sample (study area). The provisional results of the *site occupancy* analysis showed that the estimated population of Komodo dragons in the study area is 14 individuals.

To date, the Komodo dragon population throughout Komodo National Park is still within a stable range. Population values are said to be stable when the number of monitored populations is within the range of 2000 - 3000 dragons throughout the Komodo National Park area. This range of individuals is derived from the results of studies using the CMRR (*Capture-Mark-Release-Recapture*) method from 2003 - 2006 and 2009 - 2013 at 10 monitoring locations throughout Komodo National Park (The estimated population value is 2448± 229 (2067-2922) dragons). The CMRR method is by far

CMRR method is by far the most accurate method to determine wildlife population because it is done by capturing and tagging every individual caught with a very long study period.

Table 6. Komodo dragon population estimation in Komodo National Park from 2018-2022

No	Monitoring Site	Data Population					Method
		2018	2019	2020	2021	2022	
1	P. Komodo, P. Rinca, P. Padar, P. Gili Motang and P. Nusa Code	2897	3022	3163	3303	3156	Camera Trap

However, the protection of the Komodo dragon population must still be done considering the impact of tourism and human activities is increasing in the locations of the Komodo dragon population enclave. The narrow area and the presence of tourist sites make the komodo dragon population needs to be studied more deeply, in addition to the need for increased guarding and supervision in areas where there are tourist activities.

CHAPTER VI CONCLUSION

A. Conclusion

The monitoring of Komodo dragon population in Loh Seloka and Loh Letuho based on the identification of camera traps found the estimated number of individuals is 14 individuals, however, to determine the estimated number of Komodo dragons more comprehensively in Loh Seloka and Loh Letuho, it is necessary to use the *presence* 2.13.18 application. The availability and distribution of prey, as well as favorable habitat conditions for komodo dragons, have allowed them to survive and breed. This is evidenced by several camera trap captures of prey animals in the Loh Seloka and Loh Letuho valleys. As for the survey of the distribution of dragons in Loh Seloka and Loh Letuho, from 7 sampling points, all sampling points show the presence of dragons in that location.

B. Suggestion

Komodo dragon monitoring activities on western Komodo Island, especially Loh Seloka and Loh Letuho, are strongly recommended to be carried out on an annual basis. This needs to be done so that in the future it can provide complete individual data to determine the dynamics of the Komodo dragon population (*Varanus komodoensis*) on Komodo Island in future years more fully.

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APPENDIX

Appendix 2: Activity Documentation

Night briefing prior to survey and monitoring activities

Installation of camera traps at Loh Seloka

Camera trap at point KB05

Traveling to the camera trap installation point in Loh Seloka

Data entry and analysis process of data collection results

Figure 11. Wild boar (*Sus scrofa*) caught by camera at point KB01

Figure 12. Deer timor *(Rusa timorensis)* caught by camera trap at point KB07

CAMERA TRAP DATA TALLY SHEET

Location: **LOH SELOKA DANLOH LETUHO**

Year: **2024**

FORM 1: DATA DATA (filled in completely with hours)

No	ID Camera	Date Install	Date Retrieve	16-Nov-24		17-Nov-24		18-Nov-24	
				morning	afternoon	morning	afternoon	morning	afternoon
1	BK01	15-Nov-24	19-Nov-24	0	0	0	16.44	0	0
2	BK02	15-Nov-24	19-Nov-24	0	0	0	15.29, 17.58	06.24, 07.17, 10.03	0
3	BK03	15-Nov-24	19-Nov-24	0	0	10.38, 11.47	12.03	0	0
4	BK04	15-Nov-24	19-Nov-24	0	0	09.16	0	07.56, 08.12, 09.02	0
5	BK05	15-Nov-24	19-Nov-24	07.37, 8.42	0	06.39, 09.04	0	0	0
6	BK06	15-Nov-24	19-Nov-24	09.58, 10.18, 11.27	0	08.33	0	08.19, 10.55	13.23, 17.26
7	BK07	15-Nov-24	19-Nov-24	07.43, 08.03, 11.59	12.06	0	12.14, 13.50, 14.03	08.30	14.55, 15.14

CAMERA TRAP DATA TALLY SHEET

Location : **LOH SELOKA AND LOH LETUHO**

Year: 2024

FORM 2: INDIVIDUAL ESTIMATION

(filled in sequence with alphabetical code, A, B etc.)

No	ID Camera	Date Install	Date Retrieve	16-Nov-24		17-Nov-24		18-Nov-24	
				morning	afternoon	morning	afternoon	morning	afternoon
1	BK01	15-Nov-24	19-Nov-24	0	0	0	A2	0	0
2	BK02	15-Nov-24	19-Nov-24	0	0	0	B1,A3	A3,C2	0
3	BK03	15-Nov-24	19-Nov-24	0	0	D3,E1	E1	0	0
4	BK04	15-Nov-24	19-Nov-24	0	0	F1	0	F1	0
5	BK05	15-Nov-24	19-Nov-24	G1	0	G1	0	0	0
6	BK06	15-Nov-24	19-Nov-24	H2,I1	0	J3	0	H2,K1	0
7	BK07	15-Nov-24	19-Nov-24	L2,M1	0	0	L2	0	N1

CAMERA TRAP DATA TALLY SHEET

Location: **LOH SELOKA AND LOH LETUHO** **Year:** **2024**

FORM 3: OCUPANCY DATA

(Fill in data on the presence of Komodo dragons, 0 = absent, 1 = present.)

No	ID Camera	16-Nov-24		17-Nov-24		18-Nov-24		Wild Boar	Wild Chicken	Deer	Musang
		morning	afternoon	pagi	afternoon	pagi	sore				
1	BK01	0	0	0	1	0	0	1	1	0	0
2	BK02	0	0	0	1	1	0	1	0	0	0
3	BK03	0	0	1	1	0	0	1	1	1	0
4	BK04	0	0	0	1	1	0	1	0	0	0
5	BK05	1	0	1	0	0	0	1	0	0	1
6	BK06	1	0	1	0	1	1	1	1	0	1
7	BK07	1	0	0	1	1	0	1	0	1	0