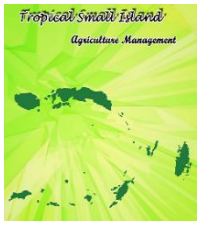

Tropical Small Island Agriculture Management (TSIAM)

Journal Homepage: https://ojs3.unpatti.ac.id/index.php/tsiam/index

Volume 1	Issue 1	June (2021)	DOI: 10.30598/tsiam.2021.1.1.38	Page: 38 – 56

Wildlife Bio-Geography on Mangrove Communities in Saparua Island, Maluku

Ernywati Badaruddin[1*], Manuel Kaya[1], Ivonne R. G. Kaya[2]

[1] Faculty of Agriculture, Pattimura University, Ambon
[2] Faculty of Agriculture, Musamus University, Merauke

***Email Corresponding Author:** **ernyforester81@gmail.com**

ARTICLE INFO

***Keywords*:** *Wildlife biogeografi Mangrove communities; Local Wisdom; Sasi ; Kewang ; Small islands*

Received : 25 February 2021
Revised : 28 May 2021
Accepted : 1 June 2021

ABSTRACT

On the island of Nusalaut, an orange crested white cockatoo (*Cacatua moluccensis*) was found. The interviews with several community leaders from the island of Nusalaut, including Raja Negeri Sila, reveal that there have been no *Cacatua moluccensis* birds in recent years worldwide Nusalaut. it is predicted that the *Cacatua moluccensis* bird has moved to Saparua island as the closest island. This bird is no longer found because of changes in the forest's structure and composition into agricultural land for cloves (*Eugenia aromatica*) because it does not need shade trees. The mangrove community along the coast of the island of Saparua for the last few years has experienced various pressures of development dynamics that have disrupted their lives. Therefore, at the same time, they impact the activities of wildlife that use them as habitat. This research was conducted by applying direct and indirect survey methods to determine the types and distribution of the mangrove community's wildlife inhabitants, both permanently and temporally. Seven species of mammals use the mangrove communities in Saparua Bay, Haria Bay and Tuhaha Bay, nine reptile species, and 18 species of birds.

Introduction

The development dynamics in the Saparua island region for the last three years have increased very well for each physical and non-physical development sector. This development is increased by dividing the area into two sub-districts, namely the Saparua sub-district and the East Saparua sub-district. The distribution of mangrove communities on the island of Saparua before 1980 was relatively evenly distributed. However, until 2020 this has experienced a pretty alarming reduction; even in some locations, it has completely disappeared, including in Siri Sori Serani, Tiouw, Paperu and Saparua. The government and communities have started to enter the mangrove forest area to be used as a residential area, constructing buildings and other uses due to limited land on the coastal land. This development

pressure will hurt wildlife habitat, including marine life, and mangroves' function as a buffer zone for coastal abrasion and wind barriers and a reduction in the economic value contained therein.

The mangrove community formed as a unit between the mangrove forest and the coastal forest is a protected habitat. The breeding of various types of wildlife will experience disturbances, so that their productivity will decrease. The mangrove community acts as a transit area for wildlife between one island and another, a source of food and breeding habitat for various living things. As a community, mangrove forests usually consist of many trees, generally from the *Rhyzophoraceae* family, associated with other trees and shrubs, growing in tidal zones (Alikodra, 2012). Saenger et al., 1981 in Noor et al. 1999 define *mangrove forest* as a plant with characteristics and formations that can protect coastal areas. Many researchers call it tidal forest and coastal forest.

Materials and Methods

The research was conducted on Saparua Island, Central Maluku Regency, Maluku Province in mangrove communities in three bays: Saparua Bay, Haria Bay, and Tuhaha Bay. The research was conducted to know the types and distribution of wildlife using mangrove communities, namely mangrove forests and coastal forest formations behind them as feed sources and protected and reproductive habitats. The location of the observation was determined through the purposive sampling method in the mangrove community, which is relatively dense in population. They are Saparua Bay (Waisisil beach, Waihenahia beach, Wai Atol), Haria Bay (Air Tanah Goyang, Urputih beach, Bogor beach), Tuhaha Bay (lhamahu beach, Mahu beach, Tuhaha beach, Pia beach, Kulur beach).

Data collection on wildlife species was carried out by applying the Survey Method, namely Direct Survey (Index Point Available Method) and Indirect Survey (Literature) and supported by interviews with community leaders in each village. The direct survey was carried out by making a transect line perpendicular to the coastline towards the sea with a length adjusted to the mangrove community's width plus 20 meters for the land area behind the mangrove. The observation line's width was 100 meters, and the distance between the midpoints of the line was 300 meters. Analysis and discussion were carried out by applying the descriptive method, namely the problem-solving procedure, which was investigated by describing the condition of the subject or object in the study in people, institutions, society, and others based on visible facts.

Results and Discussion

Distribution of mangrove communities on the Saparuaisland

The most mangrove communities in the island of Saparua were found on 3 bays, are Saparua Bay, on Waisisil Beach, Wai Atoll and Air Panas. Haria Bay, in Air tanah goyang, Urputih beach, and Bogor beach. Tuhaha bay on Ihamahu beach, Mahu beach, Tuhaha beach, Pia beach and Kulur beach Mangrove communities that are not in the bay area are located along the coastline at The southern part of Haria, namely Lainong beach to Batu Pintu beach in Dusung Haria Beach which consists of 2 types, namely *Sonneratia alba* and *Avicennia marina,* Molana Island contains only a few *Sonneratia alba* trees in reasonably poor condition because there is no more natural regeneration. There are no mangrove communities along the eastern coast between Itawaka and Ouw. This coastal area usually has powerful sea waves during the east season. This causes the coastal area to have high cliffs (some reaching more than 20 meters) with potential coastal abrasion. Specific mangrove communities are found in the *petuanan* of *negeri* Tiouw at the Air Panas location, 3 Km from Saparua Bay (Waisisil beach) and 2 Km from Haria Bay (Air Tanah Goyang beach). This mangrove community is not directly related to seawater. Therefore, extraordinary research is needed regarding entering seawater into this location so that brackish water is formed as a condition for mangrove plants' survival. The types that grow are *Rhizophora apiculata, Bruguiera gymnorhyza* and *Sonneratia alba.* Variations of species with a relatively high population density were found in negeri Tuhaha, negeri Ihamahu, negeri Mahu, Bogor beach in *negeri* Porto, Wai Atol in negeri Tiouw and Urputih beach in Haria. The coastal ecosystem behind the mangrove forest is quite varied, and residential settlements, seasonal crops, and annual crops are dominated by fruit trees and shrubs. Plants that grow naturally in this area are dominated by ketapang (*Terminalia catappa*), bintanggur (*Calophyllum inophyllum*), hutung (*Barringtonia asiatica*), gayam (*Inocarphus edulis*), Waru (*Hibiscus tiliaceus*), papaceda (*Scaefola frustescens*), mangga berabu (*Cerbera manghas*), pandan (*Pandanus tectorius*) and sayur putih (*Pisonia alba*).

People cut trees to meet their daily needs, such as firewood, garden and yard fences, making "*Sero tanam*" (traditional fishing gear), building bridges, beach house poles, constructing houses and jetty. The types of cut-down types are different according to the purpose for which they are intended. Due to limited land for housing, people in several villages have started building houses to enter areas behind the mangroves, such as in Tuhaha village, Pia village, and Haria village. Development activities have damaged the mangrove community. The damage is such as the reclamation carried out in the Negeri Tiouw, namely Wai Atol, to construct cold storage. On the coast of negeri Ihamahu, the construction of the talud is carried out, and sand dredging is carried out around the mangrove plants to be transported for storage

in the talud. This will directly destroy the natural regeneration that occurs so that mangrove regeneration can not take place.

The government and non-government organizations have rehabilitated mangroves at several locations in Saparua Bay but with no success. This is predicted to be caused by the species not following the habitus. The plants' age is still relatively new in the nursery. The planting time does not adjust to the sea wave season and the planting technique.

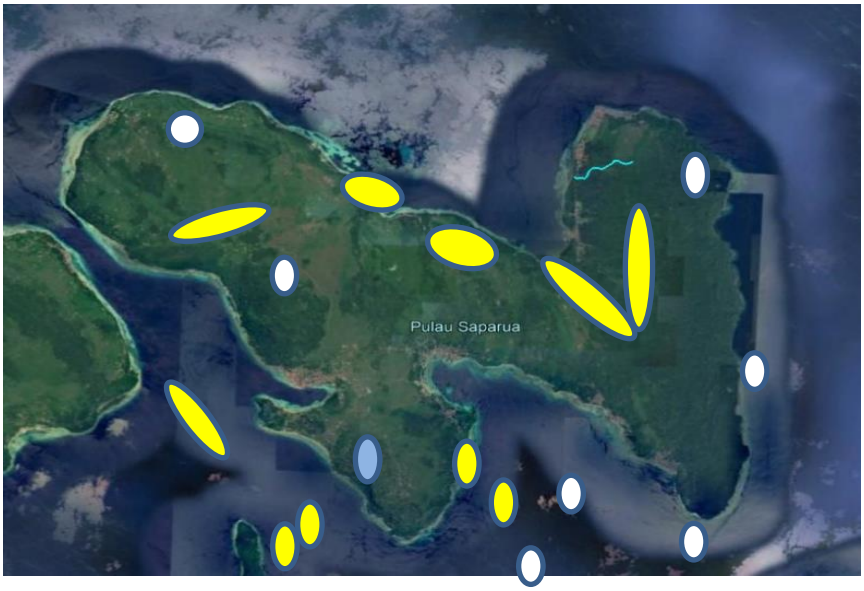

Figure 1. Distribution of mangrove communities on the island of Saparua

Yellow circle shows a densely populated mangrove community, white circle shows mangrove communities that are sparsely populated, and purple circle shows mangrove community in the middle of the island.

Types of wildlife in the mangrove community

The results showed that there are 36 species of wild animals that use mangrove communities as primary or temporary habitat on the Saparua island, consisting of 3 groups, namely 8 types of mammals, 9 species of reptiles, and 19 species of birds as listed in Table 1.

Table 1. Species of wildlife in the mangrove community ecosystem on the island of Saparua

No	Local name	Latin name	Family	Status
A.	**Mammals**			
1.	Deer	*Cervus timorensis*	Curvidae	Protected
2.	Kususiha	*Phalanger orientalis*	Phalangeridae	Protected
3.	Kusupotar	*Spilococus maculatus*	Phalangeridae	Protected
4.	Tinggalong	*Paradoxurus hermaproditus*	Viveridae	--
5.	Wild Boar	*Sus scrofa*	Suidae	--

No	Local name	Latin name	Family	Status
6.	Marsegu	*Pteropusoccularis*	Pteropodidae	--
7.	Paniki	*Pteropustemmincki*	Pteropodidae	--
8.	Bush Rat	*Rattus spp*	Muridae	--
B.	**Reptiles**			
	Local Name	**Latin Name**	**Family**	**Status**
1.	Soa-soa air	*Hydrozaurusamboinensis*	Varanidae	Protected
2.	Soa-soa	*Varanus indiacus*	Varanidae	Protected
3.	Panana Lizard	*Tiliquagigas*	Varanidae	--
4.	Tupepel	*Cuoraamboinensis*	Geoemydidae	Endemic
5.	Patola Snake	*Phyton reticulatus*	Pythonidae	--
6.	Chameleon lizard	*Bronchocelajubata*	Agamidae	--
7.	Green lizard	*Dasia olivacea*	Scincidae	--
8.	Blue tail lizard	*Criptoblepharusegeriae*	Scincidae	--
9.	Bingkarung	*E multifasciata*	Scincidae	--
C.	**Birds**			
	Local Name	**Latin Name**	**Family**	**Status**
1.	Arikal	*Porphyrioporphyrio*	Gruiformes	Endemic
2.	Nuri merah	*Eos bornea*	Psitacidae	Protected
3.	Porkici	*Trichoglosushaematodus*	Psitacidae	Protected
4.	Bayan	*Eclectusroratus*	Psitacidae	Protected
5.	Raja udang	*Halcyon chloris*	Alcedodinae	Protected
6.	Raja udang pita	*Tanysiptera galatea*	Alcedodinae	Protected
7.	Cui	*Antreptesmalacensis*	Nectaridae	Protected
8.	Srigunting	*Dicrurusdensus*	Dicrurides	--
9.	Paikole	*Rhypidurajavanica*	Rhypiduridae	--
10.	Siang	*Phyllemonsubcorniculatus*	Oriolidae	--
11.	Tekukur	*Streptopheliachinensis*	Columbidae	--
12.	Mata merah	*Aploniametalica*	Apodidae	--
13.	Lawa-lawa	*Colocalia esculenta*	Apodidae	--
14.	Mandar Maluku	*Gymnocorexplumbeiventris*	Gruiformes	--
15.	Eagle	*Haliasturindus*	Accipitridae	Protected
16.	Masariku	*Galinagogalinago*	Scolopacidae	--
17.	Kuntulkarang	*Egretha sacra*	Ardeidae	--
18.	White stork	*Egretha alba*	Ardeidae	Protected
19.	Gulls	*Sterna spp*	Laridae	--

This shows that the diversity of wildlife species in this mangrove community is relatively high. Therefore, the regional government authorized for this sector must implement development activities to defend mangrove communities from damage to extinction. Several government activities in Maluku at the provincial and district/city levels in carrying out mangrove communities' rehabilitation activities have failed. The fact shows that the percentage of offspring mortality is more than the alive percentage. Some even fail. The location of

mangrove community rehabilitation that can be successful is Poka village, Ambon Bay. However, it has gone through repeated planting stages. In Saparua Bay, rehabilitation efforts have been carried out several times. The example of rehabilitation is behind the Saparua Sector Police Station and on the Waisisil beach in Tiouw, but none of the plants is alive. This failure occurred because the planting time and the type planted were not under the habitus conditions. In general, the *Rhizophora* and *Bruiguiera* species planted in the habitus condition are barely muddy. These types of plants are unable to adapt. Planting does not take into account the wave season but follows the government's budget realisation time, which must be completed in a relatively short time interval. People on the island of Saparua must be given socialization about mangrove communities' functions and roles for human and wildlife life. They will pay more attention to the life of the mangrove plants around them. The interviews with several community leaders indicated that the indigenous people of Saparua Island did not use firewood from specific mangrove tree species. This will cause the cooking utensils to break quickly (with holes at the base). In general, in the last few years, the people who use firewood from the mangrove community for cooking are immigrants because they do not have land in the forest to collect firewood. Besides, by shifting the community to use fuel oil in the form of stoves and gas, firewood is decreasing, as well as reducing forest damage (mangroves). The existence of Kewang Ihamahu, which received the first Adipura award in Maluku in 1983, shows that the people on the island of Saparua have traditionally carried out conservation of mangrove communities local wisdom they have since their ancestors. The Regional Government of Central Maluku Regency, especially the Environmental Service Office, should cooperate with Kewang Ihamahu to motivate people in other villages to preserve mangrove communities from actions that damage their ecosystem. Moreover, the fact shows that some forms of traditional conservation of living natural resources and their ecosystems are decreasing and some are no longer enforced."Sasi" is a prohibition to take or harvest specific natural resources for a specified period. It will be open for several days to be harvested, then will be protected again. There are 15 species (46%) of the 36 species of wildlife that the government has protected through the Decree of the Minister of Environment and Forestry number P-106/Setjen/MenLHK/VI/2018 dated December 2029 concerning protected plant and animal species. The existence of protected species using mangrove communities as their habitat indicates that the mangrove community's ecosystem condition can be used as a food source, breeding, and protection from various natural and human disturbances. Seabirds always use the vegetation in the mangrove community from the weaning level to the tree level as a shelter and food source. Large birds such as the white stork (*Egretha alba*) and the kuntul karang (*Egretha python*) usually perch on the tallest tree (*Sonneratia alba*) to monitor the feed to be eaten, namely various types of reef fish that swim at high tide as well as breeding grounds. Besides consuming fruit from various types of lianas and insects on trees, the mata

merah bird (*Aplonia metalica*) turns to the forest floor at low tide to prey on crabs. If the results of this study are compared to the results of research by Latumahina (2016) where the results found 22 species of birds in the village of Tuhaha (Table 3), it can be said that the birds found by Latumahina et al (2016) and also found in 8 species of mangrove communities are the bondol eagle (*Haliastur indus*), nuri bayan (*Eclectus roratus*), wallet sapi (*Colocalia esculenta*), raja udang suci (*Halcyon sancta*), srigunting lencana (*Dicrurus bracteatus*), perling ungu (*Aplonia metalica*), Madu hitam (*Nectarinia aspasia*), Madu Sriganti (*Nectarinia jugularis*). 14 bird species are not found in the mangrove community, namely Cabai kelabu (*Dicaeum vulneratum),* Pergam mata putih (*Ducula perspicilata),* Walik dada lembayung (*Ptilinopus viridis),* Nuri pipi merah (*Geoffreyus geofroyii),* Wiwik rimba (*Cocomantis variolus)* Kepodang sungu (*Coracina tenulrastris),* Kutilang emas (*Ixos affinis),* Sikatan burik (*Muscica pagriseisticta),* Sikatan kelabu (*Myagro galeata),* Kehicap pulau (*Monarcha cinerascens),* Kehicap kacamata (*Monarcha trivirgatus),* Kipasan dada lurik (*Rhipidura rufiventris),* Perling Maluku (*Aplonis myogenesis), dan* Myzomela Seram (*Myzomela biasii).* The birds found in the mangrove community but not found by Latumahina et al. (2016) are pergam mata putih (*Ducula perpiciata*), walik dada lembayung (*Ptilinopus virindis*), nuri pipi merah (*Geofreyus geofroyii*), wiwik rimba (*Cocomantis variolus*), kepodang sungu (*Coracina fenulrastris*), kutilang emas (*Ixos affinis*), sikatan burik (*Muscica pagriseisficta*), sikatan kelabu (*Myagro galeata*), kehicap pulau (*Monarcha cinerascens*). In general, the birds that were not found in these two studies were predicted to be caused by the research time was different so that the availability of feed sources was also different because it affects the daily movement of birds to get a feed source,he research sample blocks' location was not the same, so the habitat conditions were also different and affected the presence of bird species.

Table 2.Types of birds in Tuhaha Village, Saparua Island

No	Local name	Latin name
1.	Elang Bondol	*Haliastur indus*
2.	Nuri bayan	*Eclectus roratus*
3.	Waletsapi	*Colocalia esculenta*
4.	Raja udang suci	*Halcyon sancta*
5.	Srigunting lencana	*Dicrurus bracteatus*
6.	Perling ungu	*Aplonis metalica*
7.	Madu hitam	*Nectarinia aspasia*
8.	Madu sriganti	*Nectarinia jugularis*
9.	Cabai kelabu	*Dicaeum vulneratum*
10.	Pergam mata putih	*Ducula perspicilata*
11.	Walik dada lembayung	*Ptilinopus viridis*
12.	Nuri pipi merah	*Geoffreyus geofroyii*

No	Local name	Latin name
13.	Wiwik rimba	*Cocomantis variolus*
14.	Kepodang sungu	*Coracina tenulrastris*
15.	Kutilang emas	*Ixos affinis*
16.	Sikatanburik	*Muscica pagriseisticta*
17.	Sikatan kelabu	*Myagro galeata*
18.	Kehicap pulau	*Monarcha cinerascens*
19.	Kehicap kacamata	*Monarcha trivirgatus*
20.	Kipasan dada lurik	*Rhipidura rufiventris*
21.	Perling Maluku	*Aplonis mysolensis*
22.	Myzomela Seram	*Myzomela biasii*

Source: (Latumahina et al, 2020)

Distribution of wildlife in mangrove communities

The wild animals that use the mangrove community as their habitat on the island of Saparua are not evenly distributed because these factors are the structure and composition of the vegetation that makes up the mangrove community because it affects the source of food and shelter for wildlife, the structure and composition of the coastal forest vegetation behind the mangrove forest, and humans with various activities along the coast, such as fishermen, agriculture and tourists. The people of Saparua island are "coastal farmers", meaning farmers who work daytime in the garden (forest) while at night they catch fish in the sea. In general, farmers will make their gardens closer to their settlements. After the land is no longer productive, then they will move further into the forest. The mangrove area is a good location because they can access it from the village by the sea by boat. In recent years, the local community's awareness on the island of Saparua has increasingly realized the importance of conducting tourism activities to refresh from working hard for six days. This has led to coastal areas' development as marine tourism areas, including mangrove communities for tourist activities, especially on Sundays and distance of residential settlements from mangrove communities. Human settlements are one of the factors that cause damage and even the disappearance of mangrove communities in an area. The community tends to cut mangrove plants close to the settlement because there is a lot of muddy sediment that disturbs their activities, a distinctive odour from the mangrove community due to the presence of mud and garbage, which has undergone a process of decay (weathering), garbage carried by ocean currents and waves and floods from rivers will accumulate at the roots of the mangrove community, several types of insects, especially mosquitoes, really like mangrove communities to nest and reproduce and people whose houses are close to the mangrove community will cut mangrove plants because they are disturbing their view of the open sea. Furthermore, wildlife will also feel uncomfortable if the mangrove community is close to the settlement due

to direct and indirect disturbances. This will make it even more difficult for animals who use mangrove communities to sleep at night due to the light's influence from the settlements.

Table 3. Horizontal distribution of wildlife species in mangrove ecosystems on the island of Saparua

No	Location	Types of wildlife		
		Mammals	Reptiles	Bird
1.	**Saparua Bay**			
a.	WaiSisil	6, 7	9, 16, 17	18,19, 20. 21, 23, 26, 27, 31
b.	Wai Atol	3, 4, 6, 7	9, 10, 12, 15	18,19, 20. 21, 23, 26, 27, 30
	Total	4	4	8
2.	**Haria Bay**			
a.	Tanah Goyang	7, 8	--	18. 21, 23, 27, 34
b.	Urputih	7	9, 12, 16, 14	18, 21, 23, 27, 29, 35
c.	Bogor	2, 3, 4, 5, 6, 7	9, 10, 11, 12,	18, 19, 24, 26, 28, 27, 29, 30
	Total	6	5	12
3.	**Tuhaha Bay**			
a.	Ihamahu	3, 4, 6, 7	9, 11, 12, 13	19, 23, 24, 26, 27, 32, 34
b.	Mahu	6, 7,8	12, 17	19, 20, 22, 23, 24, 26, 27, 33
c.	Tuhaha	3, 4, 5, 6, 7, 8	9, 11, 12, 13	18, 21, 23, 26, 27, 35, 36
d.	Pia	3, 4, 5, 6, 7	9, 10, 11, 12	18, 19, 20, 21, 23, 27, 28
e.	Kulur	1, 2, 3, 4, 5, 6, 7	9, 10, 17	18, 19, 20, 21, 24, 27, 29, 30, 31, 36
	Total	8	9	19

Note :

1.	Deer	2.	Kususiha	3.	Kusupotar	4.	Tinggalong	5.	Wild Boar
6.	Marsegu	7.	Paniki	8.	Bush rat	9.	Soa-soa air	10	Soa-soa
11	Panana Lizard	12	Tupepel	13	Patola Snake	14	Kadalbunglon	15	Kadalhijau
16	Blue tail lizard	17	Bingkarung	18	Arikal	19	Nuri merah	20	Porkici
21	Bayan	22	Raja udang	23	Rudang pita	24	Cui	25	Srigunting
26	Paikole	27	Burungsiang	28	Tekukur	29	Mata merah	30	Lawa-lawa
31	Mandar Maluku	32	Eagle	33	Masariku	34	Kuntulkarang	35	White stork
36	Gulls								

Vertical distribution of wildlife species in mangrove communities

The wild animal carries out life activities every day from sunrise to sunset, then continued by the Noctural group of wildlife that has activities from sunset to dawn. In the mangrove community, there is no division of tree height based on canopy stratification. The mangrove community does not recognize canopy stratification because the tree height's final growth is the same.

Figure 2. Mining of coral reefs as a destroyer of mangrove ecosystems (Photo: Manuel Kaya)

Table 4. Vertical distribution of wildlife species in mangrove communities on the island of Saparua

No	Local name	Vertical position in the community				
		Forest floor	Tree trunk	Below the canopy	Middle of canopy	Top of the Canopy
A.	**Mammals**					
1.	Deer	🐅	--	--	--	--
2.	Kususiha	--	🐅	--	🐅	🐅
3.	Kusupotar	--	🐅	--	🐅	🐅
4.	Tinggalong	🐅	--	--	--	--
5.	Wild Boar	🐅	--	--	--	--
6.	Marsegu	--	--	--	--	🕊
7.	Paniki	--	--	--	🕊	🕊
8.	Bush rat	🐅	--	--	--	--
B.	**Reptiles**					
9.	Soa-soa Water	🐅	--	--	--	--
10.	Soa-soa	🐅	🐅	--	--	--
11.	Panana	🐅	--	--	--	--
12.	Tupepel	🐅	--	--	--	--
13.	Patola Snake	🐅	--	--	--	--
14.	Chameleon lizard	🐅	🐅	--	--	--
15.	Green Lizard	🐅	🐅	--	--	--
16.	Blue tail lizard	🐅	🐅	--	--	--
17.	Bingkarung	🐅	🐅	--	--	--
C.	**Bird**					
18	Arikal	🕊	--	--	--	--
19	Nuri merah	--	--	--	--	🕊
20	Porkici	--	--	--	--	🕊
21	Bayan	--	--	--	--	🕊
22	Raja udang	🕊	🕊	🕊	🕊	🕊
23	Rudang pita					
24	Cui	--	--	--	--	🕊
25	Sri gunting	--	--	--	--	🕊
26	Paikole	--	--	🕊	🕊	🕊
27	Siang	--	--	🕊	🕊	🕊
28	Tekukur	--	--	--	🕊	🕊
29	Mata merah	--	--	--	--	🕊
30	Lawa-lawa	--	--	--	--	🕊
31	Mandar maluk	--	--	🕊	🕊	🕊
32	Eagle	--	--	--	--	🕊
33	Masariku	🕊	--	--	--	--
34	Kuntulkarang	🕊	--	🕊	--	--
35	White stork	🕊	--	🕊	--	--

36	Gulls	--	--	--	--	

Based on the data contained in Table 2, it can be explained that bird as wildlife moves from one place to another in search of food, nests, and breeding. These are done mainly by flying using a tool, namely their wings. This movement causes birds to fly up to the top of the highest trees and even to the air, known as the "boundary layer". The results showed that the birds in the mangrove community on the island of Saparua were scattered from the forest floor (ground) to the top of the tree, with the following classification:

1. The forest floor. Birds that generally have more activity on the forest floor are arikal (*Porphyrio porphyria*), Masariku (*Galinago galinago*) and mata merah (*Aplonia metalica*). Arikal bird (*Porphyrio porphyria*) is active on the forest floor because of its low flying ability. Its size is relatively large, almost resembling a native chicken. Its behaviour in foraging is to scavenge the soil where there is a source of food such as earthworms, insects and carcasses of rotting animals. The nest is made by the male and female together using grass and twigs to form a pile. The Masariku bird (*Galinago galinago*) is a seabird that forages along coastlines, tidal water and often in the forest behind mangroves to consume various insects.
2. Tree trunks. Birds that use tree trunks as their habitat to look for food because they consume stem-boring insects, and woodworms are srigunting birds (*Dicrurus macrocercus*) and raja udang (*Halcyon chloris*).
3. These two types of birds usually drill tree trunks in holes that insects have drilled to eat them. Often, birds also wait until the insect or caterpillar comes out of the trunk of a new tree to be eaten.
4. Below the canopy. Large, dark-coloured birds and insectivores usually indicate birds that are active under the tree canopy.
5. Middle of the canopy. Insectivore, Herbivore and some *Nectarivore* birds often use the middle of the tree canopy for their activities. This section can be the "transition zone" between the top of the canopy and the bottom of the canopy.

Honey-sucking birds usually do activities in the "Outside the canopy" because the flowering process occurs more. Besides, its relatively small body size makes it easy for it to perch on soft branches.Top of the canopy. Bird animals that are active at the top of the canopy are generally dominated by species are predators are birds that prey on “Prey” species including fish, namely white stork (*Egretha alba*), kuntul karang (*Egretha sakra*), eagle (*Haliastur indus*), raja udang (*Halcyon chloris*). Parrots, namely orange crested white cockatoo (*Cacatua moluccensis*), nuri bayan (*Eclectus roratus*), nuri Maluku (*Eos bornea*), and rainbow porkici (*Trichoglosus haematodus*) usually dominate the top of the canopy and the center of the canopy according to the distribution of ripe fruit in a tree.

The type of bird whose distribution is not concentrated in one part of the tree is the lawa-lawa (*Colocalia esculenta*) because it always flies in the air to prey on insects that fly out of a tree after sucking honey or ripe fruit juice.

The Influence of Human Activities on the Distribution of Wildlife

Wild animals that use the mangrove community as their habitat on the island of Saparua are strongly influenced by human activities, namely

1. **Agricultural land use patterns**

   The rapid development of areas, including on the island of Saparua, has resulted in the mangrove community's area, coastal forests and shrubs, which have been turned into agricultural land for annual crops, seasonal crops and settlements. As happened in the negeri Ihamahu, negeri Tuhaha, negeri Pia, dan negeri Haria. This causes pressure on the mangrove community's ecosystem in the form of cutting down mangrove trees for various needs in building materials and firewood.

2. **Agricultural land use patterns**

   The rapid development of areas, including on the island of Saparua, has resulted in areas behind mangrove forests in coastal forests and shrubs being converted into agricultural land for annual crops and seasonal crops and residential areas.This causes pressure on the mangrove community's ecosystem in the form of cutting down mangroves for various needs in the form of building materials and firewood. The derivative impact is that the mangrove community's condition, which is used as a wildlife habitat, becomes disturbed due to the cutting of trees to reduce food sources and protected habitat.

The results showed that the indigenous people on the island of Saparua did not use firewood from the mangrove community because their cooking utensils became damaged. Thus, it can be concluded that those who use firewood and tree species in the mangrove community are members of the community who are not native to the island of Saparua. This is different from the people in Sawai and Saleman, where they do not want to boil drinking water using wood from the forest on the mainland but have to use firewood from the mangrove forest. The fact shows that the mangrove forests on the coast of Sawai and Saleman are only trees with a diameter of less than 10 cm. The impact also continues for mangrove communities on Marsegu Island and the island of Nusalau in front of it. However it is traditionally protected, but its mangrove forests have been damaged due to logging for firewood. The direct impact is the Marsegu wildlife (*Pteropus occularis*), whose number of thousands has started to decrease drastically because the community has cut down the habitat for shelter (sleeping).

Mangrove communities on small islands that are used by wildlife groups, especially birds in large numbers in Maluku, are found in :

1. Marsegu island in Kotania Bay, Kotania District, West Seram Regency for Marsegu (*Pteropus occularis*),
2. Marsegu island (Raja Island) in the land of Sawai, North Seram District, Central Maluku Regency for Marsegu (*Pteropus occularis*),
3. Angwarmase Island in the Tanimbar Islands Regency for white Pombo (*Ducula bicolor*) and gray Pombo (*Ducula concina*), and
4. Kenari Island in Aru Tengah District, Aru Islands Regency for white Pombo (*Ducula bicolor*) and mata merah birds (*Aplonia metalica*).

Besides, the mangrove forest on the island of Saparua is also not logged because their ancestors had been taught that mangrove forests are a place for fish to protect and breed. Negeri Ihamahu carries out stringent supervision by traditional customary institutions whose task is to manage the preservation of natural resources and ecosystems, namely "Kewang". This institution is against activities that can damage the mangrove ecosystem. This led to Kewang Ihamahu as the recipient of the first Kalpataru award in Maluku in 1983. Unfortunately, the attention of the Maluku Regional Government to increase the institutional capacity of this Kewang is very low, so that its activities are only traditional and only rely on local wisdom they have.

a. Housing Building Developments

The density of settlements has caused residents to start building settlements in the area behind the mangroves. Previously, it was rarely done because of mangroves' impact, namely smells, mosquitoes and generally far from other settlements. The areas behind the mangroves that have started to be entered for settlements are the negeri Tuhaha, negeri Haria, negeri Portho, and the village of Pia. In the negeri Tiouw of Wae Atoll near the Waisisil beach in Saparua Bay, there is the construction of Coldstorage which logs large numbers of mangroves and is carried out reclamation and allegedly without conducting an EIA study (Environmental Impact Analysis). Development activities like this that the government carries out should follow the prevailing laws and regulations to become an example for the general public and especially investors. If the government program does not comply with the regulations, the government can not take proper action against investors as business actors who also employ people to overcome unemployment and improve living standards.

b. Beach Reclamation

The dynamics of the development of human settlements or other public buildings is increasing. The mangrove community area has begun to be used for development through logging and reclamation. The construction of talud to prevent abrasion is also the cause of the

death of mangroves. The waves that hit the talud with high strength will wash away the silt so that it disturbs the life of mangrove plants.

Figure 3. Kusu potar caught in a mangrove community in Ihamahu
(Photo: Manuel Kaya)

c. Hunt

Hunting activities by the people on the island of Saparua are classified as low because they do not have any particular means of hunting as their main livelihood. Wildlife is hunted only as a side activity or when found. Hunting is only carried out regularly if the wildlife disturbs them as a pest. Generally, hunting is only done traditionally because possession of air guns is very limited. The hunting equipment used were "Dodeso" (snares using plastic thread, rope or wire), traps made from woven bamboo, adhesives made from tree sap, arrows and valves.

The animals that are often hunted for consumption are *Sus scrofa, Phalanger orientalis, Phalanger maculatus, Pteropus occularis, Varanus indiacus, Coura amboinensis* and *Cervus timorensis*. People rarely hunt birds because their body size is relatively small for consumption. A bird that is often caught in large numbers is the mata merah bird (*Aplonia metalica*). Catching is carried out by cutting down the branches of the nesting trees so that the chicks and the mothers who do not have time to fly are caught. The goal is to take the chicks that are just starting to grow feathers to be specially cooked for the men to increase their vitality and cure specific ailments. Catching in this way is very easy for *Aplonia metalica* birds because they usually make nests during the breeding season in groups in one tree in numbers that can reach hundreds of birds.

Figure 4. Construction of talud and jetty accelerated mangrove extinction
(Photo: Manuel Kaya)

Hunting is also carried out in large numbers for Tupepel or tortoise (*Coura amboinensis*) for meat consumption, especially by ethnic Chinese. It is believed to increase the endurance of the body and the heart's ability. The arrests are usually carried out at night using petromax lights to lure these animals out. Catching can be done directly by hand because the motion is slow*. Coura amboinensis* is an aquatic animal that lives in river estuaries or puddles in mangrove communities. The animals that are caught will be kept for about 14 days to naturally remove the mud in their stomachs through the faeces, then cut them for consumption.

Figure 5. Damage in mangrove communities due to abrasion in Haria village
(Photo: Manuel Kaya)

d. Fruit Season

Fruit season greatly influences wildlife in a habitat, not only by herbivores but also by carnivores and insectivores. This is because the food chain will be interdependent. The results showed that fruit-eating birds such as *Ducula bicolor, Aplonia metalica, Streptop elia chinensis* also found insectivorous species namely *Rhypidura javanica, Halcyon chloris, Nectarinea jugularis* honey sucker and meat eater, *Haliastur. indus*. In the same tree at night, there are nocturnal species, namely *Phalanger orientalis* and *Pteropus occularis.* Thus, in this banyan tree, an interdependent food chain is formed. Some herbivores are active during the day and some at night. Several farmer community leaders in Tuhaha bay, in an interview, said that

during the flowering season of the *Erythrina variegatha* tree, the maneuvering attraction of the arrival of *Eos bornea* and *Trichoglosus haematodus* birds can be seen in the morning in the number of tens per group from Seram Island and will return in the afternoon.

Arnoldus Titaheluw (Alm) from the negeri lhamahu stated that he had witnessed the capture of Maluku parrots (*Eos bornea*) and rainbow lorikeets (*Trichoglosus haematodus*) in a mangrove forest area at the mouth of the Ruata river, negeri Makariki in 1985. Hundreds of birds were caught per day. This occurs when the trees are in bloom (October - November), namely *Avicennia marina* and *Bruguiera gynorhyza*. Besides, the attraction of the daily migration of *Cacatua molucensis* birds will occur, especially in Kulur village, when the maize season approaches the harvest season, which comes in groups from Seram Island. Usually, they do not come back right away but stay temporarily in the forest area until the corn is harvested. This causes the people of negeri Kulur and negeri Hulaliuw on the island of Haruku to classify it as a corn plant pest. The head of Soa for negeri lhamahu, Mr Agus Kemon (71 years), in the interview, said that there was an attack of the *Eclectus roratus* bird pest that came from Seram Island for the fruit of the *Lancium domesticum* plant on a large scale in 2020 between October and December and was very detrimental to the farming community in negeri Itawaka, Noloth, Ihamahu, Mahu and Tuhaha. Community to suffer losses because what was eaten was ripe fruit and young fruit from October to December, the fruit consumed by *Eclectus roratus* on the southern part of Seram Island (Amahai, Waipia, and Elpaputih sub-district) is minimal, so this bird has to make daily migrations to find food on Saparua Island. The availability of fruit on the island of Saparua is also limited. This bird, which usually consumes ripe fruit, was also forced to consume young fruit because the number of bird populations that come is relatively large compared to the amount of feed available. Usually, these birds will return in the afternoon around 17.00 - 18.00 to Seram Island in groups consisting of 5 to a dozen tails. This phenomenon can be used as a natural attraction for the benefit of ecotourism.

Ecotourism Value

The daily migration of wildlife between the southern part of Seram Island and the northern part of Saparua Island, if the data is periodically well, can be used as a unique natural phenomenon attraction for the development of ecotourism, including:

1. The results of interviews with several community members, including Mr ArnoldusTitaheluw (late) and Mr Jusuf Lilipaly (late) from negeri Ihamahu said that they, as fishers, often found deer (*Cervus timorensis*) crossing between Seram Island and Saparua Island. The location of this crossing usually occurs in mangrove communities in negeri Kulur and. It is projected that deer cross from Tanjung Latu or Tanjung Elpaputih and vice versa. The crossing is usually carried out at night, with the crossing starting taking into account the direction of the current that is currently taking place. It

is done from the mangrove community in Pia village if it is done from Tuhaha Bay during the East season. The ocean currents move from east to west, so he only swims slowly while accelerating with the ocean currents towards the coast between the village of Elpaputih and the village of Latu on the island of Seram.

2. The people of negeri Kulur and negeri Hulaliuw in the eastern part of Haruku Island have experienced since their ancestors that during the corn harvest season (*Zea mays*) in November - December, orange crested white cockatoos (*Cacatua moluccensis*) and parrots (*Eclectus roratus*) will arrivein hundredsto eat corn. Not all birds will return to Seram Island every day because some will stay until the maize season. This can be ascertained because these birds perch in the trees around the corn farm at night.

The results of Tuhulele's (1996) research show that on Haruku Island and Saparua Island, there are orange crested white cockatoos (*Cacatua moluccensis*) with population dynamics that are decreasing from year to year. Parrots that migrate from Seram Island to Saparua Island, especially in Tuhaha Bay, in the mangrove community and the coastal forest behind Ambon parrots (*Eos bornea*) and rainbow porkici (*Trichoglosus haematodus*). The indicator for these birds' arrival is usually during the flowering season of the galala tree (*Erythrina variegate*), which generally grows in coastal forests behind mangroves. Usually, they also consume nectar from the flowers of *Sonneratia alba* and *Bruiguiera gymnorhiza* and several types of lianas.

The daily movement (*diurnal migration*) of bird animals between Seram Island and Saparua Island, and Haruku Island, if the data is periodically collected, the cycle can be seen. It can be used as a tourist attraction object as a natural phenomenon challenging to find in other places. Thus, the local government must motivate the people of Saparua Island and Haruku Island to maintain mangrove communities and certain tree species including galala (*Eryhtrina variegatha*) so that the continuous migration of this bird animal continues.

This is in line with Silver (1997), who states that the primary key to developing this potential is a database with adequate information on ecotourism opportunities and effective ways to disseminate information to “potential tourists”.

Figure 6. Mangrove mortality due to the construction of the Pulau Osi bridge in Kotania Bay (Photo: Manuel Kaya)

Conclusion

Based on the results of research and discussion, it can be concluded that are the ecosystem of mangrove communities on Saparua Island in Saparua Bay,Tuhaha Bay and Haria Bay has since the last few years started to experience damage caused by natural factors (waves, currents) and human activities such as logging, construction of talud and reclamation. Wildlife that uses the mangrove community area on the island of Saparua as their habitat consists of 5 types of mammals (*Cervus timorensis, Phalanger dendrolagus, Phalanger maculatus, Pteropus occularis, Pteropus sp*), 5 types of Reptiles (*Varanus indiacus, Hydrozaurus amboinensis, Python reticulatus, Coura amboinensis , Mabouya sp*,) and Aves 19 species (*Haliastur indus, Eos bornea, Trichoglosus haematodus*) . Mangrove communities are used by wildlife to source food, shelter, breeding habitats and transit points between Saparua and Seram islands.The seasonal movement pattern of wildlife between the southern part of Seram Island and Saparua Islad can be used as a natural phenomenon to be developed into Special Interest Ecotourism.

In accordance with the results of the research that has been carried out, it can be suggested to the Central Maluku Regency Government to conduct socialization and increase the capacity of the Kewang institution on the island of Saparua to play an active role in sustainable management of natural resources in the mangrove community as a unit of the environmental ecosystem for improving community welfare.

References

Alikodra, H. S. 2012. Konservasi sumberdaya alam dan lingkungan. Pendekatan ecosophy bagi penyelamatan bumi [Conservation of natural resources and the environment. Ecosophy approach to saving the earth].

Badaruddin Ernywati, 2001. *Keragaman dan habitat satwa burung di Taman Wisata Alam Plawangan Turgo [The diversity and habitat of birds in the Plawangan Turgo Nature Park], Yogyakarta*. Program PascaSarjana, Universitas Gadjah Mada Yogyakarta. Thesis.

Badaruddin Ernywati, 2007. Distribusi jenis burung di dusun Seri, Kecamatan Sirimau [Distribution of bird species in Seri Hamlet, Sirimau Sub-District]. Jurnal Agroforestri. Vol II, No. 4. Hal. 254 – 262.

Badarddin Ernywati, 2007. Keragaman dan habitat satwa burung di Taman Wisata Alam Plawangan Turgo – Yogyakarta [The diversity and habitat of birds in the Plawangan Turgo Nature Park – Yogyakarta]. Jurnal Agroforestri. Vol I, No. 2. Hal. 27 - 35.

Dahuri Rokhmin, JacubRais, S.Ginting, dan M J Sitepu. 2008. *Pengelolaan sumberdaya wilayah pesisir dan lautan secara terpadu [Management of coastal and marine resources in an integrated manner].* Penerbit PT. Pradnya Paramita. Jakarta.

Gufran Kordi. 2012. *Ekosistem mangrove, potensi, fungsi dan pengelolaan [Mangrove ecosystem, potential, function and management].* Penerbit Rineka Cipta. Jakarta.

Gunawan Myra. 1997. *Planning sustainable tourism.* Penerbit Institut Teknologi Bandung. Bandung.

Kaya Ivonne R. G, Manuel Kaya, V. de Lima, dan J. M. Matinahoru. 2020. *Manajemen ekosistem pesisir pulau-pulau kecil untuk ekowisata berkelanjutan di pulau Saparua, Kabupaten Maluku Tengah [Management of small islands coastal ecosystem for sustainable ecotourism on Saparua Island, Central Maluku Regency]* Jurnal Makila, Vol 14, No 1 Thn 2020. 15 - 25

Kaya Ivonne R. G. Hutabarat J, Bambang A. N. 2016. *Back to nature local wisdom is an solution to attain sustainable seaweed aquaculture (Koppaphycusalvarezii) in West Seram Regency*. Journal of environmental and ecology. 2016 ; 6 (2) : 38 – 47.

Kaya Ivonne R. G, Hutabarat J, Bambang A. N. 2018. *"Sasi", a new path to sustain seaweed farming from up-stream to down-stream in Kotania Bay, Moluccas.* International journal of Social ecology and sustainable development, 2018, 9 (2) : 28 – 36.

Kaya Manuel. 1999. *The Dusung agroforestry in Central Maluku and its role in maintenance trees species diversity.* Thesis. Institut fur Waldbau, Waldbau der Tropen, Universitat Gottingen, Germany. Thesis.

Kaya Manuel, L.Kammesheidt, and H. J. Weidelt. 2002. *The forest garden system of Saparua island, Central Maluku, Indonesia, and its role in maintaining tree species diversity.* Agroforestry systems, 54 : 225 - 234. 2002. Kliwer Academic Publishers. Printed in the Netherlands.

Kaya Manuel, I. R. G. Kaya, and E. Badaruddin. 2020. *Dusung system as Forest Garden system in Saparua island*. Journal :Plant cell biotechnology and molecular biology. 21 (51 & 52) 118 – 126. 2020.

Kusmana C, Sri Wilarso, dan Iwan Hilman. 2003. *Teknik rehabilitasi mangrove [Mangrove rehabilitation techniques].* Fakultas Kehutanan, Institut Pertanian Bogor. Bogor. Diktat.

Latumahina F. R, J. F. Sahusilawane, dan S. G. Mardiatmoko. 2020. Penyebaran burung pada pulau-pulau kecil di Maluku [Distribution of birds on small islands in Maluku]. Deepublish. Yogyakarta.

Lewerisa Y. A, dan M. Sangadji. 2018. *Pengelolaan mangrove berdasarkan tipe substrat di perairan negeri lhamahu, pulau Saparua [Mangrove management based on the type of substrate in ihamahu domestic waters, Saparua Island]*. Triton Jurnal. 14 (1) 1 – 9.

Pantolosang E, Manuel Kaya dan E. Badarddin. 2021. *Jenis dan sebaran satwa liar di sekitar Suaka Alam Gunung Daab bagian selatan, Kabupaten Maluku Tenggara [Types and distribution of wild animals around the Dan Mountain Nature Reserve in the southern part of Southeast Maluku Regency]*. Jurnal Makila, Volume 14, Nomor 2, Tahun 2020. Hal. 114 – 125.

Soemarwoto Otto. 2004. *Ekologi lingkungan hidup dan pembangunan [Environmental ecology and development].* PenerbitJambatan. Jakarta.

Silver Christofer. 1997. *Ekowisata berbasis kota di Indonesia [Urban-based ecotourism in Indonesia]*. Prosiding pelatihan dan lokakarya.