

REPORT

ECOLOGICAL STUDY OF TINJIL ISLAND
WITH SPECIAL EMPHASIS ON LONG - TAILED MACAQUES,
BIRDS AND VEGETATION

by :

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FOREWORD

Field study about ecology of Tinjil island with observation aspects of : primates (long tailed macaques), birds and vegetation, was carried out because of cooperation between Bogor Agricultural University (IPB) and Consortium of Primates USA. The field study is importance as a basic information for consideration in managing Tinjil island. Beside that, the field study is considered is highly as advantageous for increasing field skill of field study participants and add more insight on wildlife and vegetation ecology in Tinjil island.

We extend our gratitude to the Rector of IPB (Prof. Dr. Sitanala Arsyad) who provided the opportunity to implement the field study and to Consortium of Primates USA which provided funds, so the field study can ran smoothly according to the plan. Beside that, we also extend our gratitude to Mr. Chuck L. Dharsono who have assisted the field study, to Prof. Dr. Gunarwan Soeratmo as Dean of Forestry Faculty (IPB), to Dr. Hadi S. Alikodra as coordinator of the field study, and to Mr. Yoyo Ontaryo as Head of Forest Resources Conservation Department who given oppurtinity to the students and staffs for participating the field study.

Our gartitude is also extended to Dr. John Mitani (Primate Expert) and Drs. Bas van Balen (Bird Expert) for their field assitance in the study.

It is our hope that for the future there will be more field study as follow up to the present study. We hope that this study will be usefull for those concerned.

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- Transect DS and ES 175 to ES 204

Census was conducted within 2 days with census period starting from 07.00 AM to 10.30 AM and repeated at 2.00 to 5.00 PM. The location of sampling area can be seen at appendix 8 and 9.

The recorded data were : time of encounter with the monkey, number of monkeys, age class/sex, distance of observer to the monkey, distance of strip path to the monkey, height of monkey's position in trees, activity, way of seeing, duration of seeing and location of observer.

Activity and behavior were observed in more detail by using method of scan sampling in which observation was conducted with observation time interval of 10 minutes or in every 10 minutes, all activities and behavior were recorded.

Beside activity and behavior, observation was also conducted on fruit species eaten by monkeys, and trees species frequently used by the monkeys.

Field exploration was conducted to know the monkeys distributions in Tinjil island and their

I. INTRODUCTION

Tinjil island, is one of small island located in South of Java island, namely the south of Muara Binuangeun. The island, as large as ± 600 ha., is at present designed as seminatural breeding site for long tailed macaques, under the cooperation among Bogor Agricultural University (IPB), State Forest Company (PERHUTANI), State Minister of Population and Environment. Up to now the monkeys which have been released to island, number to 361 monkeys.

Tinjil island is one research object which is interesting enough concerning vegetation, wildlife and environmental aspect or the aspect of breeding of long tailed macaque which have been released to the island. As a follow up of the abovementioned cooperation, a field study has been conducted concerning the ecology of Tinjil which comprises the aspect of the long tailed macaque, vegetation and birds (conducted from July 3 - July 24, 1989). Field study was participated in by 18 students of Forest Resources Conservation Department, Faculty of Forestry, IPB, 3 instructors (for primate, vegetation and bird study) and 2 experts (for primate and bird study)..

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II. GENERAL CONDITION OF THE FIELD STUDY LOCATION

Tinjil island, with area of ± 600 Ha. is almost totally covered by coastal type vegetation and lowland tropical rain forest. Northern coast vegetation of the island is dominated by *Barringtonia* and *Calophyllum* formation whereas the Southern coast is dominated by *Pandanus* sp.

Vegetation on the lowland tropical rain forest is dominated by binar (*Ochrocarpus ovalifolius*), melinjo (*Gnetum gnemon*) and *Dysoxylum* spp. Beside that, there is still sawo kecil (*Manilkara kauki*) species existing in the island, whereas this species is one of the rare flora of Indonesia.

Most of the soil in Tinjil island is sandy coral soils, mixed with forest humus. Tap roots of trees in the island are mostly shallow because of the soil type. In the Western side of the island there is some area containing red soils.

Most of the island coast contain coral rocks, mixed with white sand, except the Turtle beach, which is mostly white sand. Topography of most of the area is level. In rainy season, certain places are inundated by water here and there.

At present, in Tinjil island, strip paths have been

The objectives of the field study were as follow :

1. To develop common understanding of forestry students about the importance of crab eating monkeys breeding management as a tool for enhancing the economic value of wildlife resources. .
2. To train field observation techniquea and provide field experience for the students as the part of education program.
3. The increase field experience of academic staffs of the Department of Forest Resources Conservation, Faculty of Forestry IPB, especially in analyzing primates free ranging breeding management.
4. To gain preliminary information on ecology of Tinjil island, especially concerning the crab eating monkeys and birds ecology, including their habitat conditions.

made to make easier the exploration of the whole island. The name (sign) of the strip path and their layout is depicted in appendix 1. Along each strip paths there are number signs, placed at interval of 25 metres. From this number sign, one can know one's position in the field.

In Turtle beach, there are accomodations facility, consisting of 5 cottages, 2 guard cottages and 1 house for reseacher consisting of hall for discussion and several rooms. Beside that in several place in the coast there are several shelters and huts, used by fishermen who sometimes must stay overnight in the island during their fishing period.

Some sources of fresh water could be obtained for instance in Turtle Beach and Pondok Gede.

Wildlife existing in the island were among other things : birds, which consist of among other things : *Ducula bicolor*, *Ptilinopus melanosphilla*, *Oriolus chinensis*, *Pycnonothus goiavier* and *Halcyon chloris* and one bird species categorized as rare, namely : *Caleonas nicobarica*. Reptile species existing in Tinjil are biawak (*Varanus salvator*) and various kinds of lizard and snakes. Mammalia existing the island are for instance bats (*Pteropus vampyrus*) and mice which are easily found. At present, a number of long tailed

macaques have been introduced to be bred in the island.
Beside those, there are also land crabs which occur
abundantly.

III. RESEARCH METHOD

A. Study of Population of Long Tailed Macaques (*Macaca fascicularis*).

The materials in this study was the long tailed macaques (*Macaca fascicularis*) in Tinjil, whereas the equipment used were : binoculars, watch, camera and its film, counter, measurement tape, tally sheet and writing materials.

Population study of long tailed macaque in Tinjil island was conducted by direct observation. Detection of population condition (density, sex ratio and activity) was conducted using transect line method in two sampling area, namely :

- a. Sampling area as long as 4 km (ES 10 through ES 170). Period of observations was starting at 06.00 AM to 10.00 AM and then repeated at 12.00 PM to 4.00 PM within 7 days.
- b. Sampling area as long as 10.650 metres, with the following transects :
 - Transect KO and ES 7 to ES 26
 - Transect OS and ES 26 to ES 67
 - Transect JK and ES 67 to ES 85

- Transect SA and ES 85 to ES 110
- Transect HW and ES 110 to ES 175
- Transect DS and ES 175 to ES 204

Census was conducted within 2 days with census period starting from 07.00 AM to 10.30 AM and repeated at 2.00 to 5.00 PM. The location of sampling area can be seen at appendix 8 and 9.

The recorded data were : time of encounter with the monkey, number of monkeys, age class/sex, distance of observer to the monkey, distance of strip path to the monkey, height of monkey's position in trees, activity, way of seeing, duration of seeing and location of observer.

Activity and behavior were observed in more detail by using method of scan sampling in which observation was conducted with observation time interval of 10 minutes or in every 10 minutes, all activities and behavior were recorded.

Beside activity and behavior, observation was also conducted on fruit species eaten by monkeys, and trees species frequently used by the monkeys.

Field exploration was conducted to know the monkeys distributions in Tinjil island and their

movements. Habitat condition and sleeping place was studied using vegetation analysis by drawing the profile diagram of vegetation on the corresponding site.

Beside these, interview was conducted with the managers of monkey population in Tinjil island.

B. Study of Birds

In the observation of birds in Tinjil island, several methods were used as follows :

1. For obtaining data on bird's population and composition, the methods of transect with fixed width and Index Point of Abundance (IPA) were used.
2. For knowing the bird species distribution, exploration throughout the island was conducted. Based on frequency of encounter, it can be obtained some idea about bird distribution descriptively.
3. For knowing the forest strata utilization by birds, bird encounter frequency on each strata is analyzed and forest profile diagram is constructed.

Transect :

Observation with transect method was conducted to obtain rough idea on bird population. It was assumed that certain bird species were evenly distributed in the island, so that the bird population estimation was based on the size of sample plot (transect).

$$P = \frac{p}{a} \times A$$

whereas :

P = Total population of each bird species

p = Number of individuals of each species
in the transect

a = Area of the transect

A = Total area

1. Transect were placed on the existing strip paths with transect width of 50 metres.
2. Length of transect for each observer was 1 km.
3. Speed of walking was 1.5 km/hour.
4. Observation was conducted by working along the transect. Every bird species which was seen or heard along the transect was recorded concerning its species and number.

- Within each quarter, the species of one individual woody plant, located nearest to the point was recorded, namely one individual for each category of tree, pole, and sapling. Because of this, from each point, the recorded plant consist of 12 plant individuals (4 trees, 4 poles, and 4 saplings), as shown in figure 1.
- The total number of observation points throughout the island was 394 points.

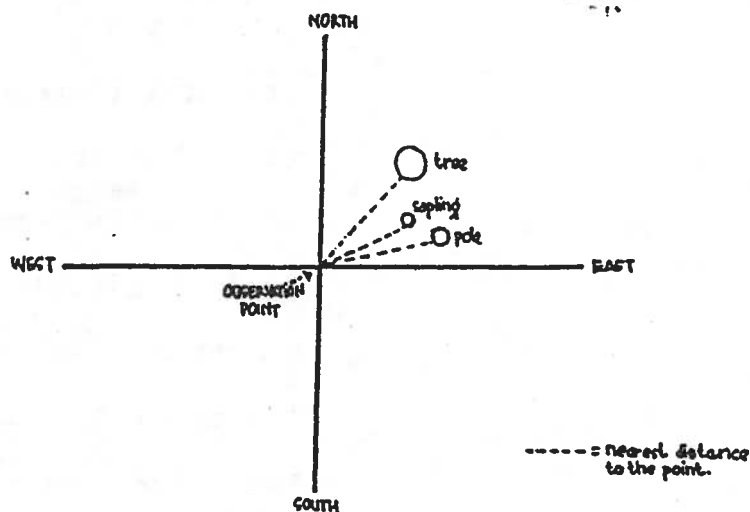


Figure 1 : Diagram of Observation Point with 4 quarters and the recorded woody plant individuals.

Mueller - Dombois (1974), but with modification. The modification is that, from this analysis the parameter which can be obtained is only the frequency/distribution of several species which can be recognized directly in the field. These special species, whose frequency or distribution is obtained by this method are listed in table 8.

The implementation of this method were as follow :

- Straight lines were made in the field, in which the axis of all of the existing strip paths were adopted as the line.
 - At each interval of 25 m. along the lines, a point of observation was established.
 - At each point of observation, imaginary
-
- two lines crossing each other were established. The line cross was in North - South and East - West direction, so that around each point there were 4 quarters (figure 1).

IVI = Importance Value Index

= RD + RC + RF , for tree and pole

= RD + RF , for sapling and seedling

b. Calculation of Index of Dominance

$$ID = \sum \left(\frac{N_i}{N} \right)^2$$

whereas : ID = Index of Dominance

N_i = IVI of each species

N = The sum of IVI for all species

c. Calculation of Vegetation Diversity Index,
based on Shannon Index of General Diversity,
namely :

$$H = - \sum \left(\frac{N_i}{N} , \log \frac{N_i}{N} \right)$$

whereas : H = General Diversity Index

N_i = IVI for each species

N = The sum of IVI for all species

All of the calculation was done within each vegetation stage.

2. Vegetation Analysis using Point Centered Quarter Method

The method used, was similar with the point centered quarter method explained in

through herbarium sample by Department of Botany, Forest Research Agency, Bogor.

From the recorded data, the following parameter were calculated :

a. Calculation of Importance Value Index.

$$D = \text{Density} = \frac{\text{Number of individuals of a species}}{\text{Area of sample plots}}$$

$$\begin{aligned} RD &= \text{Relative Density} \\ &= \frac{\text{Density of a species}}{\text{The sum of density for all species}} \times 100 \% \end{aligned}$$

$$C = \text{Coverage} = \frac{\text{The sum of Basal area of a species}}{\text{Area of sample plots}}$$

$$\begin{aligned} RC &= \text{Relative Coverage} \\ &= \frac{\text{Coverage of a species}}{\text{The sum of coverage for all species}} \times 100 \% \end{aligned}$$

$$\begin{aligned} F &= \text{Frequency} \\ &= \frac{\text{The number of plots in which a species was found}}{\text{Total number of plots}} \times 100 \% \end{aligned}$$

$$\begin{aligned} RF &= \text{Relative frequency} \\ &= \frac{\text{Frequency of a species}}{\text{The sum of frequency for all species}} \times 100 \% \end{aligned}$$

vegetation analysis of tree stage (woody species with diameter at breast height, more than 20 cm.). Within each of the plot, smaller plot were made for vegetation in pole stage (diameter between 10 - 20 cm), vegetation in sapling stage (height more than 1.5 m and maximum diameter 10 cm), and vegetation in seedling stage (height between 0 - 1.5 m). Plot size for each vegetation stage, pole, sapling and seedling were consecutively 10 x 10 m², 5 x 5 m² and 2 x 2 m².

Vegetation which were categorized as tree, pole, sapling and seedling were woody. Whereas non woody vegetation such as herbs are observed only qualitatively.

On each observation was conducted on species and diameter at breast height (130 cm above ground) of each individual plant. Diameter measurement was done only on tree and pole stages. Species which could not be identified in the field were identified

Distribution

For obtaining rough idea about bird species distribution, the analysis is based on encounters with birds species. This method was implemented by exploring the whole area of Tinjil island.

C. Study of Vegetation

For vegetation study, the following activities were conducted.

1. Vegetation analysis using multiple plots

The purpose of this study is to get an idea about species composition, dominance, abundance/density, frequency/distribution, importance value of each species found in sample plots and diversity of vegetation.

In this study, sample plots were made with the size $20 \times 20 \text{ m}^2$, as many as 40 plots, distributed throughout the island. The placement of sample plot in field was in the scheme of purposive sampling, to gain more representativeness the type of vegetation. The placement lay out of the sample plot can be seen in appendix 2.

The $20 \times 20 \text{ m}^2$ plots were used for

Forest Strata Utilization

Analysis of forest strata utilization by birds, is based on the frequency of encounter of the bird, occupying forest strata. Forest profile was categorized into the following :

Strata 0 : Forest strata which is used by bird species, frequently encountered in the ground.

Strata 1 : Forest strata which is used by bird species, frequently encountered at height of 0 - 5 m.

Strata m_c : Forest strata which is used by bird species, frequently encountered at height of 5 - 15 m. (intermediate canopy level of the forest).

Strata T_c : Forest strata which is used by bird species, frequently encountered in the uppermost canopy of the forest (height more than 15 m.).

For description of forest strata, 3 sample plots, each measuring $50 \times 20 \text{ m}^2$, were constructed and are drawn in forest profile diagram.

5. Observation was conducted in the morning (6.00 - 8.00 AM Western Indonesia Time), simultaneously by each observer.

Index Point of Abundance (IPA)

This method is used for obtaining idea about species composition and relative abundance of bird species.

1. Sample plot was in the form of circle with radius of 25 m.
 2. Sample plots numbered to 30, and were placed evenly distributed on habitat which have relatively uniform vegetation condition, namely coastal forest type.
 3. Observation on each plot was conducted for 15 minutes. During that period each bird species and the number of its individuals, either seen or heard were recorded.
 4. Observation was conducted simultaneously in the morning (6.00 - 8.00 AM) and the afternoon (4.00 - 6.00 PM) Western Indonesia Time.
- Placement of the sample plots can be seen in appendix.7.

IV. RESULT AND DISCUSSIONS

A. Study of Long Tailed Macaques (*Macaca fascicularis*)

1. Population

1.1. Population density, based on the line transect method.

From seven times of observation or 14 times of census in 1 transect as long as 4 km or 56 km census area, it was found as many as 70 monkeys within 22 groups. Population density can be calculated based on transect width, distance between observer and monkey individuals, and distance between strip path and monkey individuals.

a. From transect width based on distance between observer and monkey individuals, population density can be calculated as follows :

- Average transect width (Average distance between observer and monkey) = 17.61 m

Size of sample area =

$$56000 \text{ m} \times (2 \times 17.61) = 1.92 \text{ km}^2$$

Population density of monkeys =

$$70/1.97 = 36 \text{ individuals/km}^2$$

Calculation of frequency of a species within a certain vegetation stage were conducted as follow :

$$F = \frac{\text{The number of points from which a species was recorded}}{\text{The total number of points observed}} \times 100 \%$$

3. Observation on Supporting Data

Result of this observation were among other things consist of description on vegetation zonation, condition of abiotic factors (for instance soils), structure and stratification of forest and other specific features of vegetation.

Group density =

$$22/1.97 = 11 \text{ groups/km}^2$$

- Minimum transect width (Minimum distance between observer and monkeys) = 4 m.

Size of sample area =

$$56000 \text{ m} \times 8 \text{ m} = 0.45 \text{ km}^2$$

Population density of monkeys =

$$70/0.45 = 156 \text{ individuals/km}^2$$

Group density =

$$22/0.45 = 49 \text{ groups/km}^2$$

- Maximum transect width (maximum distance between observer and monkey individuals) = 33 m.

Size of sample area =

$$56000 \text{ m} \times 66 \text{ m} = 3.696 \text{ km}^2$$

Population density of monkeys =

$$70/3.696 = 19 \text{ individuals/km}^2$$

Group density =

$$22/3.696 = 6 \text{ groups/km}^2$$

- Transect width based on middle value (median) = 20 m

Size of sample area =

$$56000 \text{ m} \times 40 \text{ m} = 2.26 \text{ km}^2$$

Population density of monkeys =

$$70/2.26 = 31 \text{ individuals/km}^2$$

Group density =

$$22/2.26 = 10 \text{ groups/km}^2$$

Frequency of encounters with the monkeys and the corresponding distance between observer and monkey individuals can be seen on Figure 2.

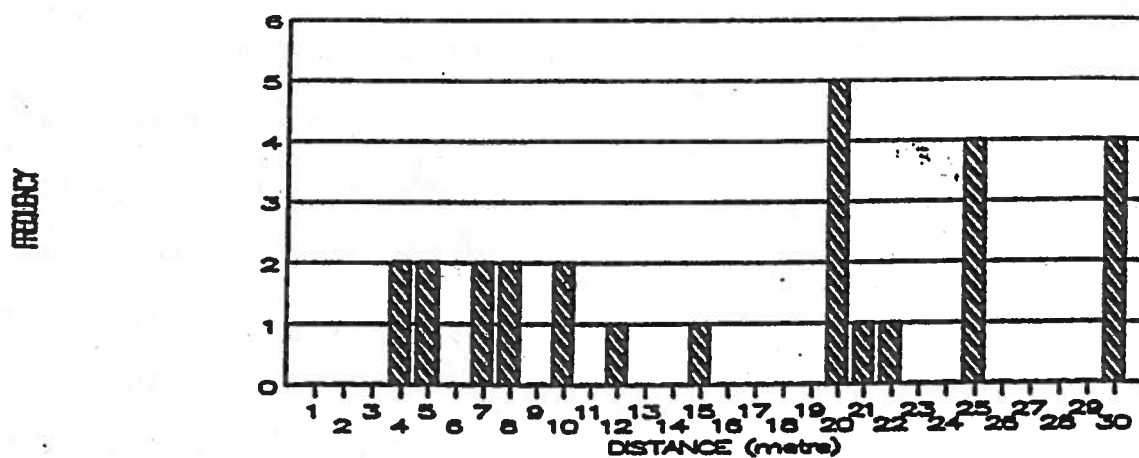


Figure 2. Frequency of encounters with the monkeys and the corresponding distance between observer and monkey individuals.

- b. From transect width based on distance between strip path and monkey individuals, monkey population density can be calculated as follows :

- Average transect width = 11.78 m.

Size of sample area =

$$56000 \text{ m} \times 23.98 \text{ m} = 1.32 \text{ km}^2$$

Population density of monkeys =

$$70/1.32 = 53 \text{ individuals/km}^2$$

Group density =

$$22/1.32 = 17 \text{ groups/km}$$

- Minimum transect width = 0.98 m

Size of sample area =

$$56000 \text{ m} \times 1.96 \text{ m} = 0.11 \text{ km}^2$$

Population density of monkeys =

$$70/0.11 = 636 \text{ individuals/km}^2$$

Group density =

$$0.2/0.11 = 200 \text{ groups/km}^2$$

- Maximum transect width = 34 m.

Size of sample area =

$$56000 \text{ m} \times 68 \text{ m} = 3.808 \text{ km}^2$$

Population density of monkeys =

$$70/3.808 = 18 \text{ individuals/km}^2$$

Group density =

$$22/3.808 = 6 \text{ groups/km}^2$$

- Transect width based on middle values (median) = 10 m

Size of sample area =

$$56000 \text{ m} \times 20 \text{ m} = 1.12 \text{ km}^2$$

Population density of monkeys =

$$70/1.12 = 63 \text{ individuals/km}^2$$

Group density =

$$22/1.12 = 20 \text{ groups/km}^2$$

Frequency of encounter with monkey population and the corresponding distance between strip path and monkey individuals in the observation transect, can be seen in Figure 3.

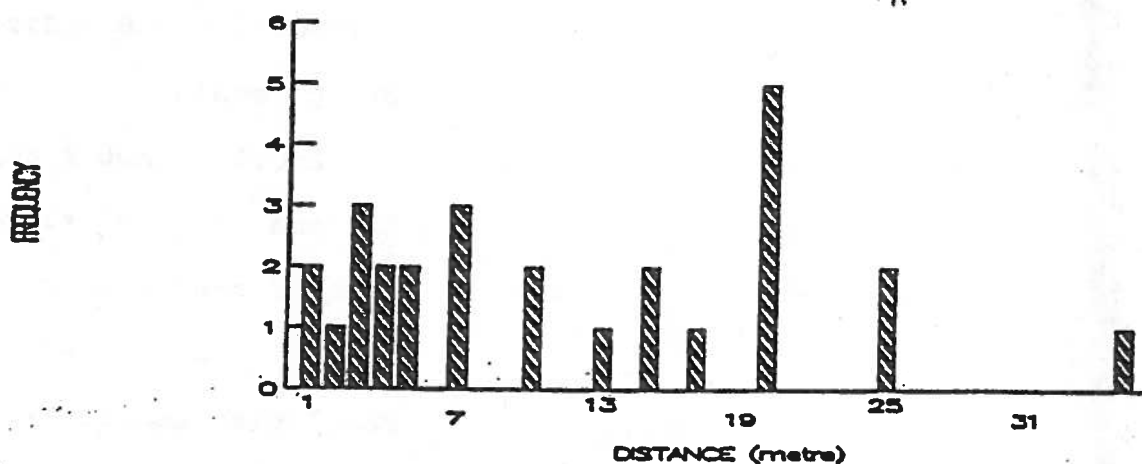


Figure 3. Frequency of encounter with the monkeys and the corresponding distance between strip path and monkey individuals.

1.2. Population density based on line transect method with 6 transects.

From two days observation or 4 times of census in 6 transects as long as 10650 m or 42600 m of census area, it was found that there were 98 monkeys individuals, consisting of 84 adults and 14 youngs. The member of groups = 11 groups. Population density can be calculated based on transect width, namely based on distance between observer and monkeys and distance between strip path and monkeys.

a. From transect width based on distance between observer and monkey individuals, population density can be calculated as follows :

- Average transect width = 18.05 m.

Size of sample area =

$$42600 \text{ m} \times 36.1 \text{ m} = 1.54 \text{ km}^2$$

Total population density =

$$98/1.54 = 64 \text{ individuals/km}^2$$

Population density (adult) =

$$84/1.54 = 55 \text{ individuals/km}^2$$

Population density (youngs) =

$$14/1.54 = 9 \text{ individuals/km}^2$$

- Minimum transect width = 3 m.

Size of sample area =

$$42600 \text{ m} \times 6 \text{ m} = 0.256 \text{ km}^2$$

Total population density =

$$98/0.256 = 383 \text{ individuals/km}^2$$

Population density (adult) =

$$84/0.256 = 328 \text{ individuals/km}^2$$

Population density (young) =

$$14/0.256 = 55 \text{ individuals/km}^2$$

- Maximum transect width = 30 m.

Size of sample area =

$$42600 \text{ m} \times 60 \text{ m} = 2.56 \text{ km}^2$$

Total population density =

$$98/2.56 = 38 \text{ individuals/km}^2$$

Population density (adult) =

$$84/2.56 = 33 \text{ individuals/km}^2$$

Population density (young) =

$$14/2.56 = 5 \text{ individuals/km}^2$$

- Transect width based on middle values (median) = 17 m.

Size of sample area =

$$42600 \text{ m} \times 34 \text{ m} = 1.45 \text{ km}^2$$

Total population density =

$$98/1.45 = 68 \text{ individuals/km}^2$$

Population density (adult) =

$$84/1.45 = 58 \text{ individuals/km}^2$$

Population density (adult) =

$$84/1.45 = 58 \text{ individuals/km}^2$$

Population density (young) =

$$14/1.45 = 10 \text{ individuals/km}^2$$

Frequency of encounters with monkeys population and the corresponding distance between observer and monkey individuals in the observation transect, can be seen in Figure 4.

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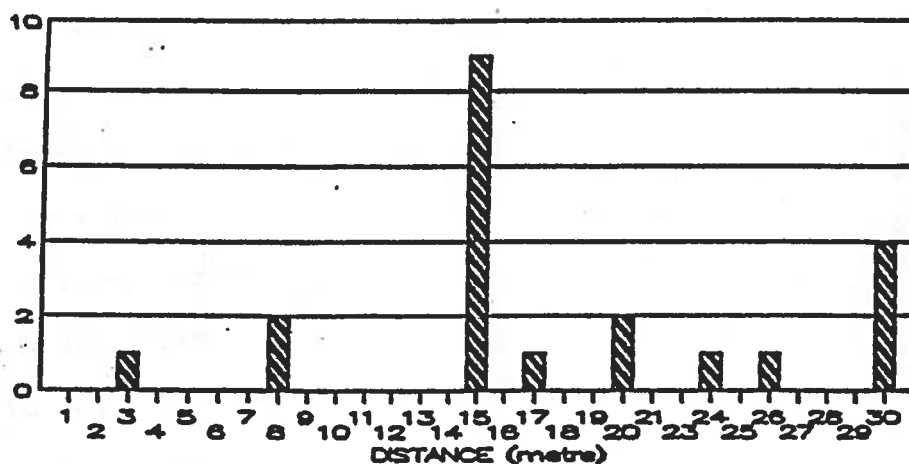


Figure 4. Frequency of encounters with the monkeys and the corresponding distance between observer and monkey individuals.

b. From transect width based on the distance between strip path and monkeys individuals, the population density can be calculated as follow:

- Average transect width = 11 m.

Size of sample area =

$$42600 \text{ m} \times 22 \text{ m} = 0.937 \text{ km}^2$$

Total population density =

$$98/0.937 = 105 \text{ individuals/km}^2$$

Population density (adult) =

$$84/0.937 = 90 \text{ individuals/km}^2$$

Population density (young) =

$$14/0.937 = 15 \text{ individuals/km}^2$$

- Minimum transect width = 1 m.

Size of sample area =

$$42600 \text{ m} \times 2 \text{ m} = 0.085 \text{ km}^2$$

Total population density =

$$98/0.085 = 1153 \text{ individuals/km}^2$$

Population density (adult) =

$$84/0.085 = 988 \text{ individuals/km}^2$$

Population density (young) =

$$14/0.085 = 165 \text{ individuals/km}^2$$

- Maximum transect width = 28 m

Size of sample area =

$$42600 \text{ m} \times 56 \text{ m} = 2.39 \text{ km}^2$$

Total population density =

$$98/2.39 = 41 \text{ individuals/km}^2$$

Population density (adult) =

$$84/2.39 = 35 \text{ individuals/km}^2$$

Population density (youngs) =

$$14/2.39 = 6 \text{ individuals/km}^2$$

- Transect width based on middle values (median) = 7.5 m.

Size of sample area =

$$42600 \text{ m} \times 15 \text{ m} = 0.639 \text{ km}^2$$

Total population density =

$$98/0.639 = 153 \text{ individuals/km}^2$$

Population density (adult) =

$$84/0.639 = 131 \text{ individuals/km}^2$$

Population density (youngs) =

$$14/0.639 = 22 \text{ individuals/km}^2$$

Frequency of encounter with monkey population and the corresponding distance between monkey individuals and the strip path, can be seen in Figure 5.

FREQUENCY

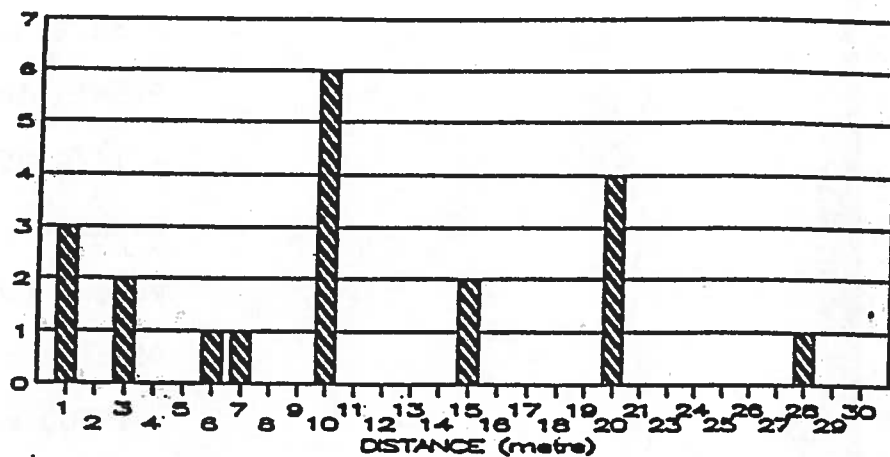


Figure 5. Frequency of encounters with the monkeys and the corresponding distance between monkeys individuals and the strip path.

Based on the above census result, either by using one transect or 6 observation transect, it is estimated that the present population of Tinjil island is 384 individuals which consist of 330 adult monkeys and 54 youngs. The ideal transect width for population census is ± 18 m or 20 m from the strip path.

2. Activities.

The observation result of activity of long tailed macaque within 7 days (14 times censusing) along one transect (ES 10 to ES 170) indicates that : 45 % of all monkey's activity was walking, 21 % making voice, 9 % feeding, 6 % resting (sleeping, grooming) and 18 % was other activities (mating, fighting, urinating). Activity frequency of long tailed macaques can be seen in Figure 6.

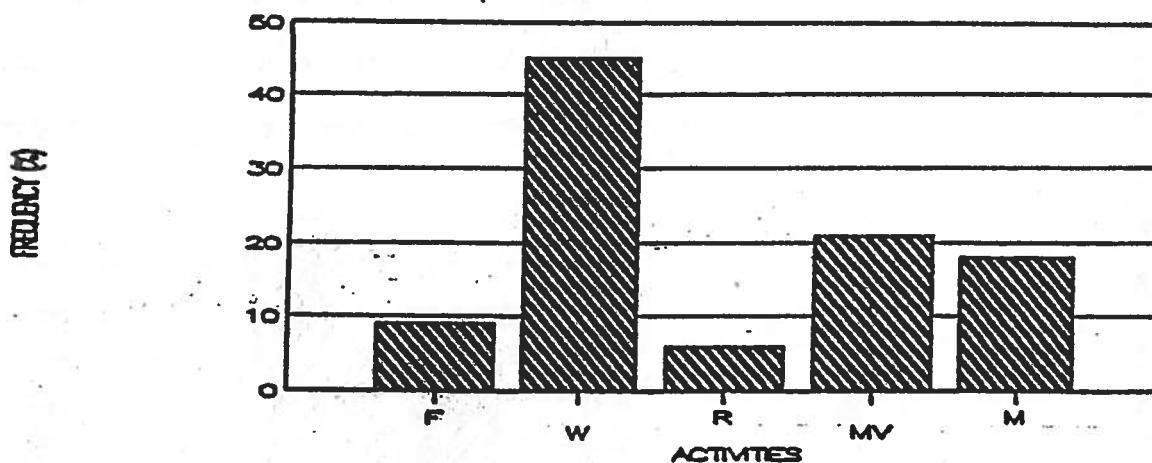


Figure 6. Activity frequency of long tailed macaques population in sample area in the form of one transect.

The data indicates that monkey population in Tinjil island is very sensitive to the presence of human beings. This can be noticed from the proportion of monkey activity, in which 45 % is used for walking, running or jumping. From the point of view of population management, the presence of human being is annoying enough for the life of monkey population.

Beside that, observation of monkey activities during two days observation (4 times of censusing) in 6 observation^s transect indicates that 36.67 % feeding, 20 % making voice, 10 % miscellaneous (mating, fighting and urinating) and 6.67 % resting. The activity frequency can be seen in figure 7.

FREQUENCY (%)

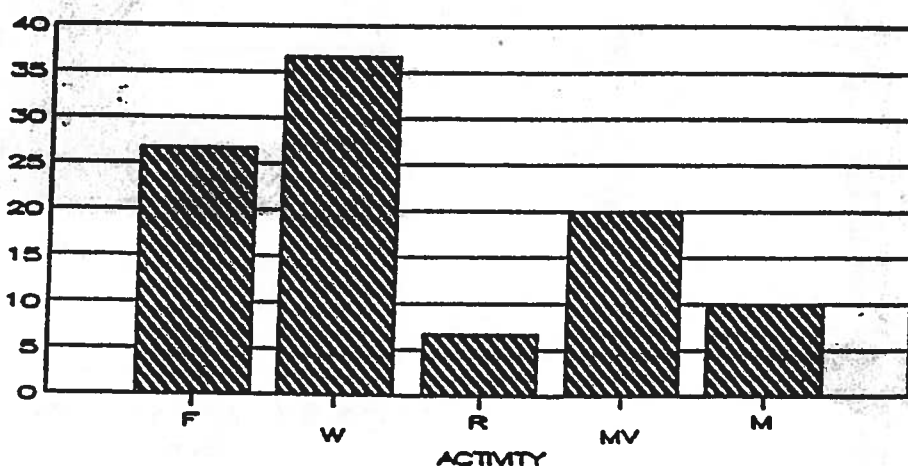


Figure 7. Activity frequency of long tailed macaques population in sample area of 6 transects.

The figure indicated that resting frequency is the smallest, namely 6.67 % whereas frequency of walking, running and jumping was the highest, namely 36.67 %. This phenomena gives more indication that monkey population in Tinjil island is sensitive enough and for the sake of monkey population, measures need to be taken to limit visitor or human activities in Tinjil island.

Based on observation result of male and female monkeys in one group, it appears that :

- a. In the morning (06.20 - 07.10 AM), most of the monkey activities were morning. This is possibly related with activity to search food source.
- b. In the afternoon (02.00 - 04.00 PM), activity of female and male monkeys in the group of Si Gendut indicates that moving activities were still dominant followed by feeding activities.
- c. In the evening (04.00 - 06.00 PM) activity of female and male monkeys in the group of Si Gendut are different to each other, in which the activities of female monkeys were dominated mostly by resting (sitting), followed by activity of walking

and feeding. In male monkeys, moving activities were still dominant, followed by resting activities (sitting) and feeding.

For more clear information, can be seen in appendix 17, 18 and 19.

Observation of female and male monkey activities on other group (group KO) indicates at 2.00 PM to 5.30 PM, most of the male and female monkey activities were resting, which followed by activity of feeding and walking (for female) and activity of walking and feeding (for male), (appendix 20).

3. Distribution and Movement.

Although monkey population in Tinjil island is sensitive enough, the monkeys are frequently found in ground surface, namely each morning and evening when they were fed by local workers. On the forest vegetation, monkey population were frequently found at height 10 - 20 meters and occurring in branches/twigs of trees (Figure 8 and figure 9).

FREQUENCY (%)

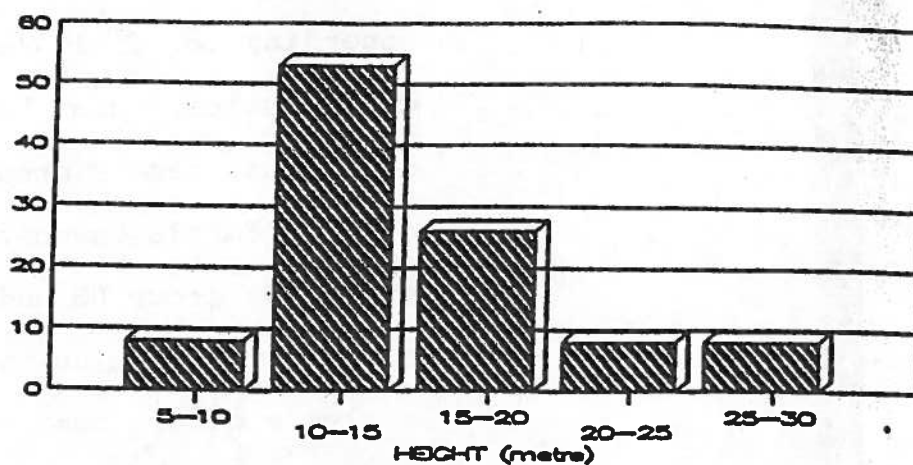


Figure 8. Frequency of encounters with monkey population in various heights in the trees.

FREQUENCY (%)

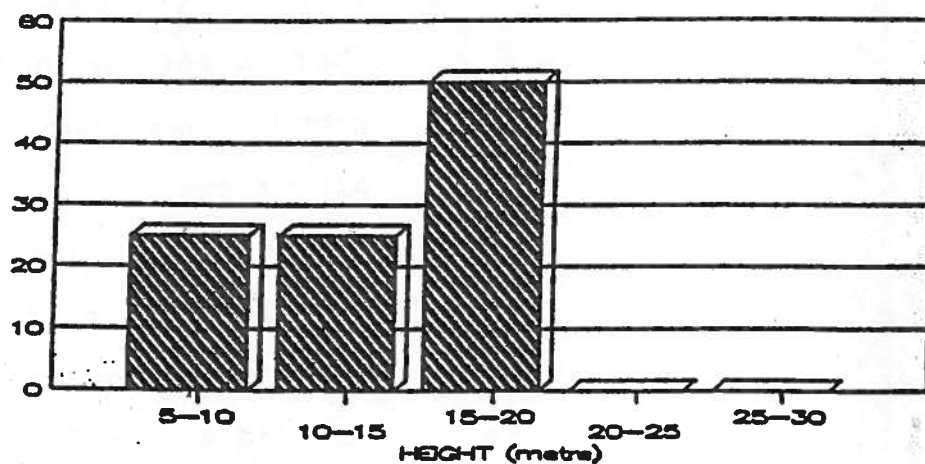


Figure 8. Frequency of encounters with monkey population in various heights in the trees.

According to field exploration, the monkey distribution, can be categorized into 6 locations, namely group KO, group *pelabuhan penyu* (Turtle beach), group JK, group SA, group HW, group DS and group ES 193.

- a. Group KO which numbered 8 individuals, were never come to cage/ration feeding place, they move from KO - ES 6 until ES 23. The group KO had ever been noticed to unite with the group "pelabuhan penyu".
- b. Group *pelabuhan penyu* consisted of 3 sub groups, namely sub group *jalan nelayan* (around fishermen path near fishermen shelter between Turtle beach and JK), sub group OS and sub group "ration feeding place/cage".

The number of individuals in these sub groups had ever been counted to be 23 individuals, consisting of 4 adult males, 12 adult females and 7 youngs. The movement of this group covered ES 21 - ES 54 and from OS 0 to OS 10.

- c. Group JK, frequently encountered in JK 0 - JK 10, the number reached 14 individuals. This group was easy to be encountered in

the morning (06.00 AM - 07.00 AM) and afternoon (04.30 PM - 06.00 PM).

- d. Group SA, frequently encountered in the intersection between strip path SA and ES. This group contained youngs and the number of group members was more than 10 individuals or ± 15 individuals. This group moved along strip path SA and ES, from ES 79 to ES 95.
- e. Group HW, frequently encountered in ES 100-110 and in Pondok Gede. This group had ever been found in large number ± 11 individuals and occurred in ground surface around building of Pondok Gede. This group had also ever been found in western coast of Pondok Gede or ± 400 m from Pondok Gede.
- f. Group DS, frequently encountered in the intersection of strip path DS and ES until ES 193. This group was very sensitive and difficult to be approached. The number of members was not more than 10 individuals.

From the six locations of monkey distribution, the one that was easiest to be approached was group *pelabuhan penyu*. Distribution and movement of monkey population

were never encountered in southern coast, eastern coast and western coast of Tinjil island. This phenomena was probably due to the fact that vegetation condition in the Southern and Eastern part of. Tinjil island were dominated by *Pandanus tectorius* and binar (*Ochrocarpus ovalifolius*).

4. Sleeping place.

From three locations of monkey sleeping place, it can be noticed that the trees which were used as sleeping place had height of 20 m - 30 m and had many branches. In utilizing parts of tree crown, the monkey occupied the tips of twigs and branch of the trees while they were sleeping. Tree species which were frequently used for sleeping were Kepuh (*Sterculia foetida*), Merbau (*Intsia bijuga*) and *Ficus* sp. Vegetation profile diagram of sleeping place can be seen in appendix 11, appendix 12, and appendix 13. In appendix 11, tree species used for sleeping place was Kepuh (*Sterculia foetida*) in appendix 12, the corresponding tree was *Ficus* sp and in appendix 13, the corresponding tree was *Intsia amboinensis*.

5.. Food.

From 27 observations with scan sampling methods (5 minutes interval) it can be noticed that in 59.3 % of occasions, the monkeys were in *Ficus* sp trees and in 40.7 % they were in non *Ficus* spp trees. According to Chinnners (1974), *Ficus* sp is the most important food for monkeys and apes, because this species occurs in the forest and can bear young leaves for the whole year or 2 to 3 times a year.

According to Goulin et al (1980) the composition and nutrition value of *Ficus* spp is as described in the following table table 1.

Table 1. Nutrition composition of *Ficus* spp (%).

NO	MATERIALS	PROTEIN	FAT	REDUCED SUGAR	CELLULOSE
1	Mature fruit	5.3	3.9	25.7	15.7
2	Young fruit	6.6	4.2	8.8	8.6
3.	Leaves	10.7	1.7		15.2

Sumber : Gaulin et al, 1980.

According to Wilson and Wilson (1975) tree cutting of *Ficus* spp in the forest in selective manner in the number of 8 - 12 trees/ha. do not harm primate population, but this activity will stimulate the growth of low tree crown and various *Ficus* as primate food source.

During the observation of monkey population in Tinjil island, fruit species eaten by the monkeys can be seen in figure 10, 11, 12, and 13.

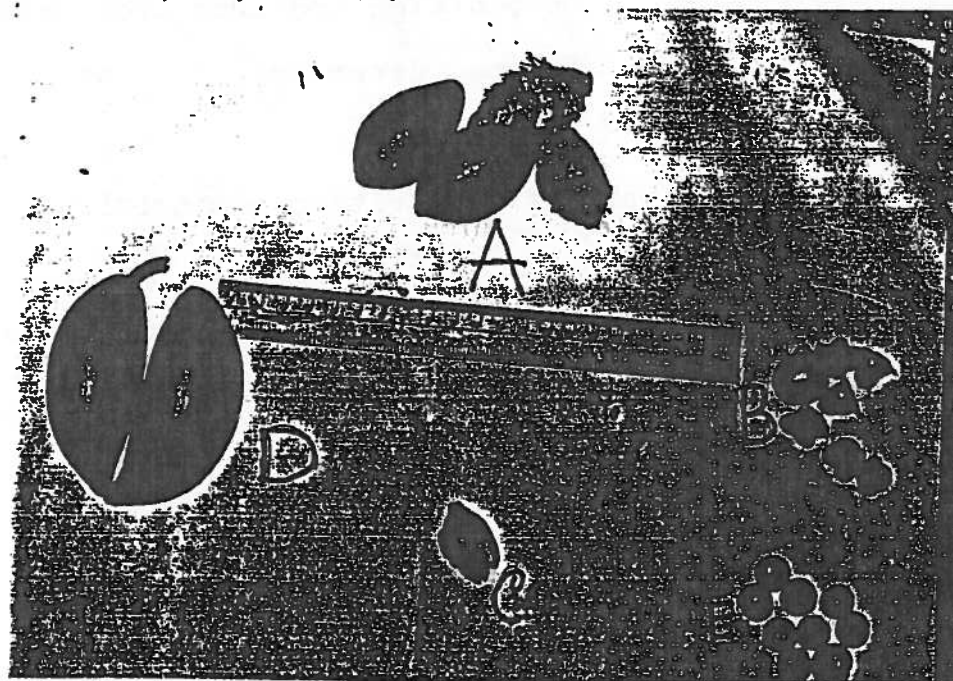


Figure 10. Various kinds of fruits eaten by long-tailed macaque in Tinjil island.

Explanation : A = Ketapang fruit (*Terminalia catappa*)
 B = Jambu klampok fruit.
 C = Sawo kecil fruit (*Manilkara kauki*).
 D = Binar fruit (*Ochrocarpus ovalifolius*).
 E = Kopeng fruit (*Ficus* spp).

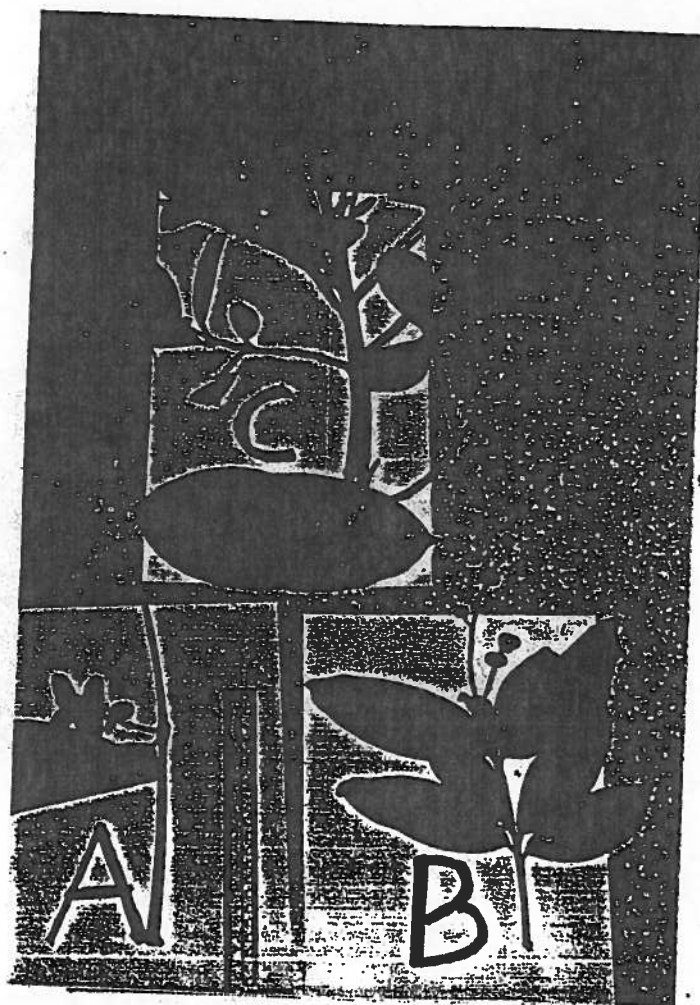


Figure 11. Fruit species eaten by long-tailed macaque in Tinjil island.

Explanation : A = Melinjo (*Genetum gnemon*)
 B = Hanjuang (*Dracaena elliptica*)
 C = Kiara (*Ficus* sp)

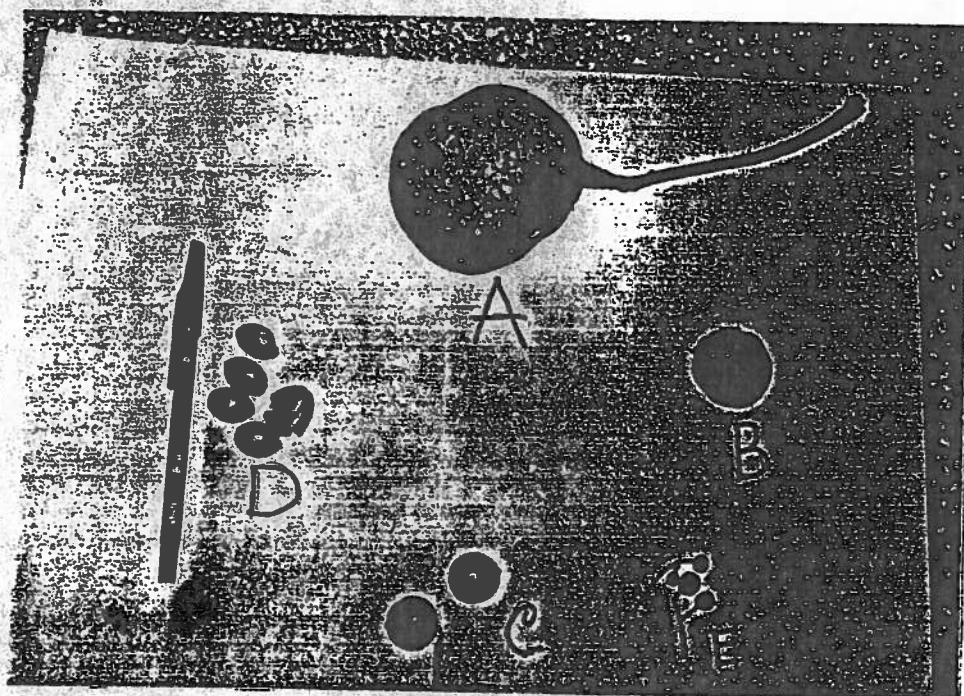


Figure 12. Fruit species eaten by long-tailed macaque in Tinjil island.

Explanation : A = Kepuh fruit (*Sterculia foetida*)
 B = Poa fruit (*Ficus* sp)
 C = Unknown species
 D = Tanjung fruit
 E = Huni hutan fruit

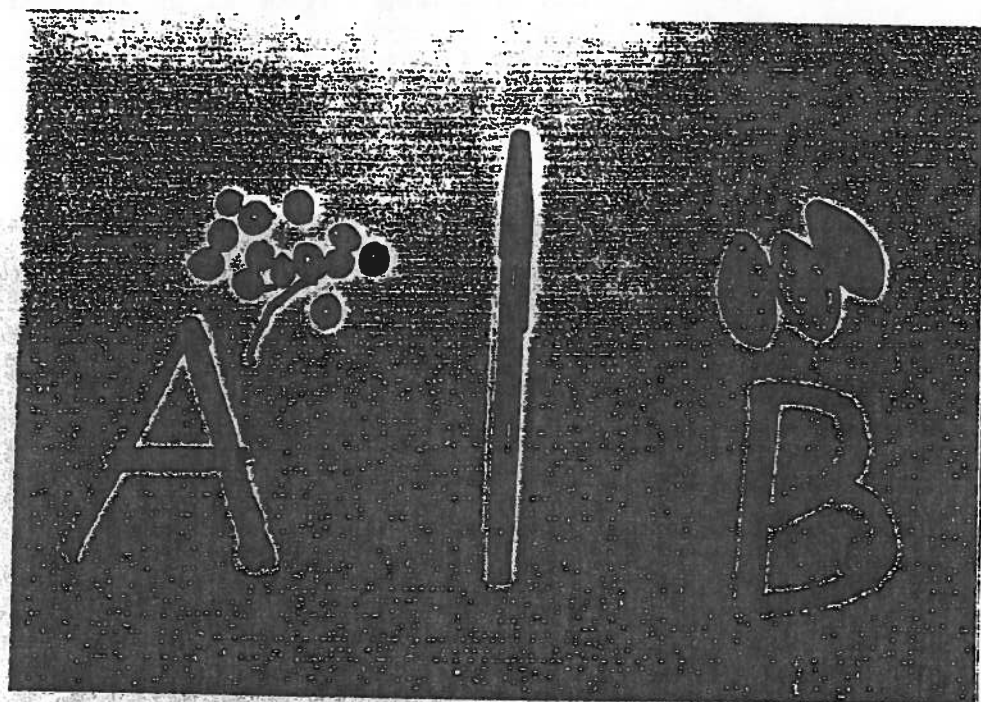


Figure 13. Fruit species eaten by long-tailed macaque in Tinjil island.

Explanation : A = Poh-pohan fruit (*Melanorrhoea wallichii*)
B = Unknown species

Hanjuang (*Dracaena elliptica*) and Melinjo (*Gnetum gnemon*) were very abundant and were categorized as dominant species, as described in the result of vegetation study.

Beside fruit species which occur abundantly enough as food for monkey population, there were also potential food for monkeys population in Tinjil, namely Umang-umang (some kind of snails) and land crabs (Figure 14 and figure 15).

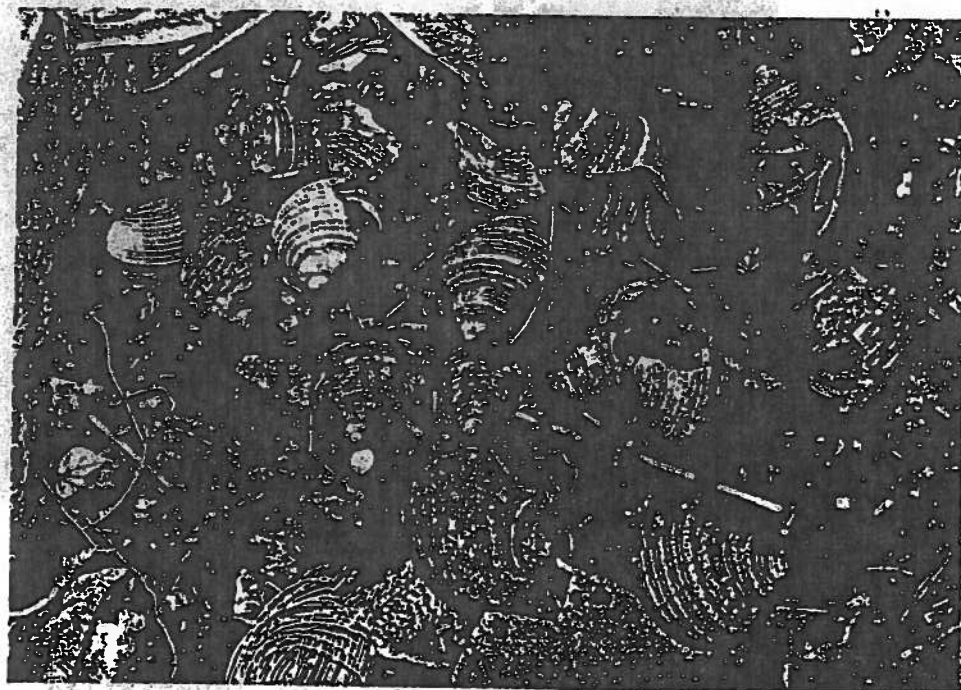


Figure 14.. Umang-umang as potential food for monkey population in Tinjil island.

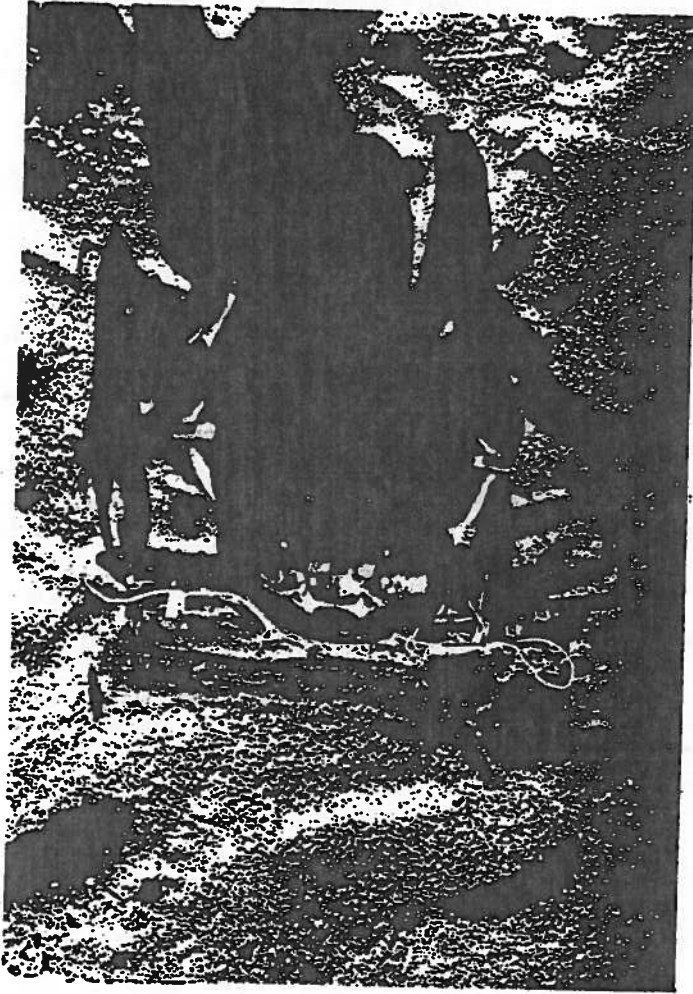


Figure 15. Land crabs as potential food for monkey population in Tinjil island.

During the observation in Tinjil island it has never been seen that monkeys eat umang-umang or land crabs. Although umang-umang are not eaten by monkeys, their existence in Tinjil island need to be protected from poaching by people from village around Muara Binuangeun.

Beside that, the existence of melinjo (*Gnetum gnemon* species) which were abundant enough, need to be protected, because melinjo fruit has high economic value and the fruit often be poached by people by cutting the trees (Figure 18). If this phenomena can not be prevented, prbably in the future the abundance of melinjo will be decreasing.

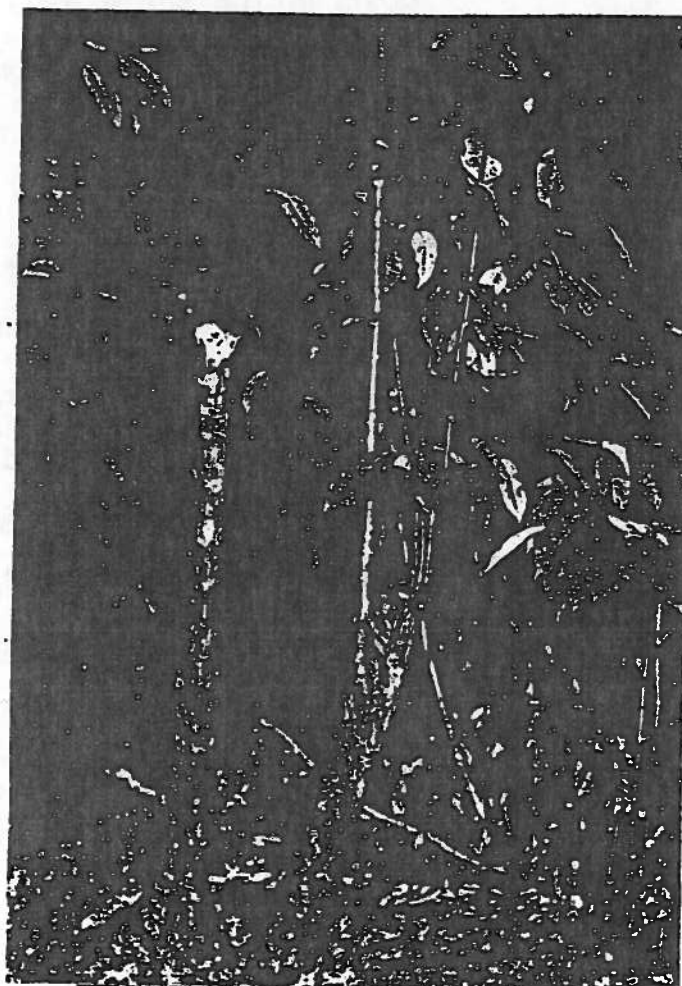


Figure 16. Melinjo trees (*Gnetum gnemon*) which were cut by people.

6. Management.

In general, the management of monkey population in Tinjil island is good enough, this can be seen from the condition of monkey population which is healthy enough and during observation there have never been found any sick monkey or dead monkey.

Beside that, the availability of management facilities such as base camp, worker's house, monkey cage and drinking place for monkey are enough to support the survival of monkey population in Tinjil island.

Kinds of food ration given to the monkey by the worker were : bananas, sweet potato, mature papaya, papaya leaves, dogfood, kidney beans and corn. In each day there are 2 times of food ration administering, namely at 7.00 AM in the morning (50 kg) and in the afternoon at 3.00 PM (50 kg).

According to available records, monkey population introduced to Tinjil island was 261 individuals. At present the population is estimated to be 384 individuals, which consist of 330 adults and 54 youngs. If this estimation is considered correct, it means

that monkey population management in Tinjil island is successful enough. However, the population condition need to be monitored continuously to ensure that the population can grow optimally.

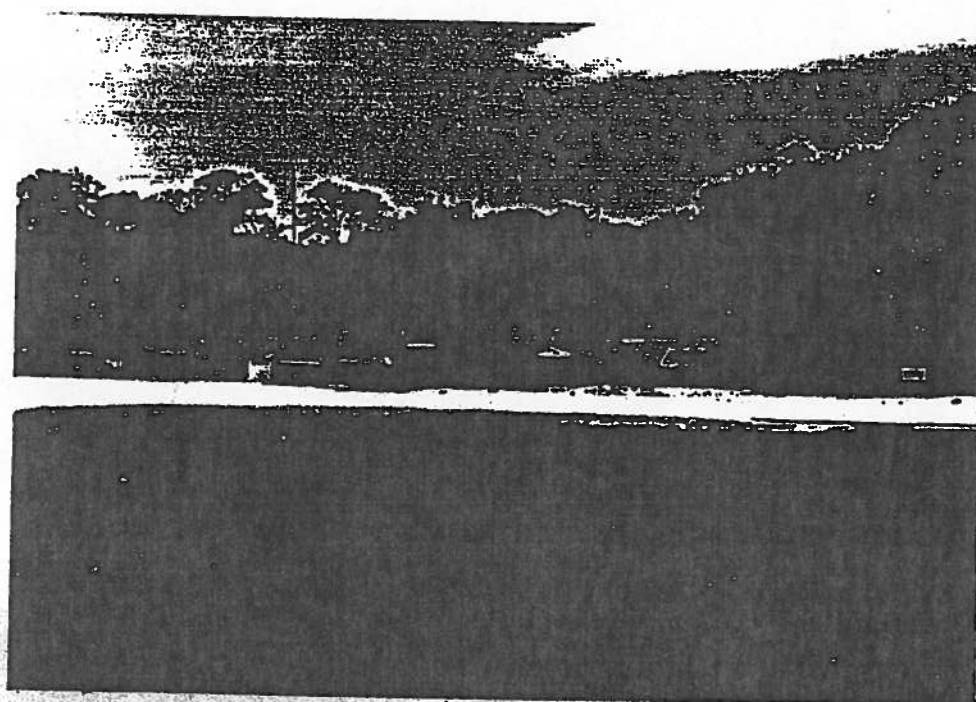


Figure 17. Base camp and guard house in Turtle beach (pelabuhan Penyu) in Tinjil island.

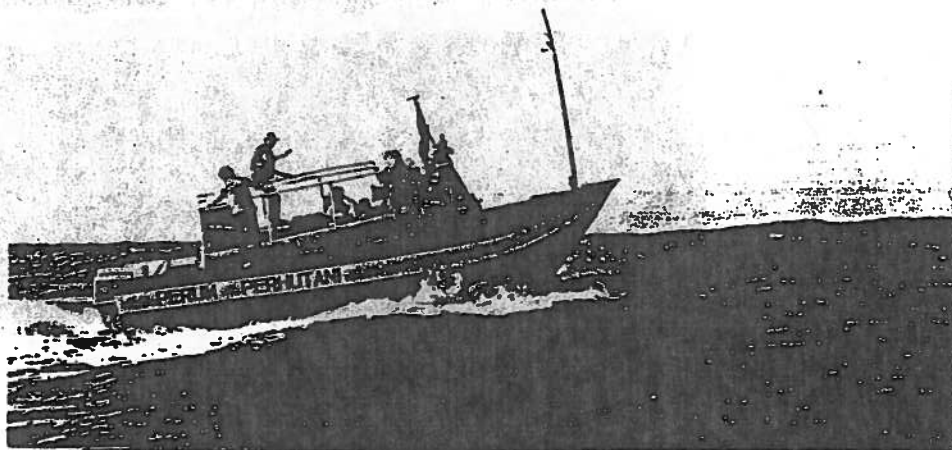


Figure 18. Transportation facility of monkey population management in Tinjil island.

B. Bird Study

1. Composition and abundance of bird species.

From the result of field observation, it was found that there were 22 species of birds which were supposed to be resident or frequently occurs in Tinjil island. The composition of this can be seen in table 2. Bird group which is outstanding in composition is the member of *Columbidae* family which comprise 6 species, namely, *Treron vernan*, *Ducula bicolor*, *Macropygia phasianella*, *Ptilinopus malanosphilla* and *Caloenas nicobarica*.

Among the bird species occurring in Tinjil there were 7 species which are protected by Indonesian government namely, *Egretta sacra*, *Heliaeetus leucogaster*, *Esacus magnirostris*, *Caloenas nicobarica*, *Halcyon chloris*, *Anthreptes malacensis*, and *Nectarinia jugularis*. Among these birds, the species which were abundant enough were *Anthreptes malacensis* and *Halyon chloris*.

Relative abundance of species, based on IPA values, can be seen in table 3. Among the bird species which have outstanding abundance are *Ducula bicolor*, *Ptilinopus*

melanosphilla, *Pycnonotus goiavier*, *Oriolus chinensis*, *Gerygone sulphurea*, *Pachycephala cinerea* and *Anthreptes malaccensis*.

Table 2. Bird species observed in Tinjil Island by IPB Team (July, 1989).

Common Name	Species
Resident	
1. Reef Egret	<i>Egreta sacra</i>
2. White See Eagle	<i>Haliaeetus leucogaster</i>
3. White-breasted Waterhen	<i>Amaurornis phoenicurus</i>
4. Beach Thick-knee	<i>Esacus magnirostris</i>
5. Pink-necked Green Pigeon	<i>Treron vernan</i>
6. Thick-billed Green Pigeon	<i>Treron curvirostra</i>
7. Pied Imperial Pigeon	<i>Ducula bicolor</i>
8. Brown Cuckoo Dove	<i>Macropygia phasianella</i>
9. Black-naped Fruit Dove	<i>Ptilinopus melanosphila</i>
10. Nicobar Pigeon	<i>Caloenas nicobarica</i>
11. Koel	<i>Eudynamys scolopacea</i>
12. Black Nest Swiftlet	<i>Collocalia maxima</i>
13. Collored Kingfisher	<i>Halcyon chloris</i>
14. Brownd Capped Pygmy Woodpecker	<i>Dendrocopos moluccensis</i>
15. Yellow Vanted Bulbul	<i>Pycnonotus goiavier</i>
16. Black Napped Oriole	<i>Oriolus chinensis</i>
17. Chesnut-capped Thrush	<i>Zoothera interpres</i>
18. Flyeater	<i>Gerygone sulphurea</i>
19. Mangrove Whistler	<i>Pachycephala cinerea</i>
20. White-breasted Wood Swallow	<i>Artamus leucorhynchus</i>
21. Brown Throated Sunbird	<i>Anthreptes malacensis</i>
22. Olive-backed Sunbird	<i>Nectarinia jugularis</i>

Bird species which were categorized as low in abundance were : *Haliaeetus leucogaster*, *Treron vernan*, *Treron curvirostra*, *Amaurornis phoenicurus*, *Caloenas nicobarica*, *Zoothera interpres*, *Artamus leucorhynchus* and *Nectarinia jugularis*. For the following species namely *Egreta sacra*, *Esacus magnirostris*, *Eudynamys scolopacea*, *Collocalia maxima* and *Dendrocopos moluccensis*, it was estimated that their abundance are also relatively low.

Bird species abundance is closely related with certain habitat condition, especially the availability of bird food and the amount of habitat disturbance which they can tolerate. If the habitat condition is well enough for supporting their life, usually their abundance will also increase.

2. Local distribution.

Distribution of bird species is very closely related with their habitat condition especially the availability of trees, cover, water, and place for resting and nesting. Based on frequency of encounter with the bird species, local distribution of bird can be seen at table 4. Some species of birds

Table 4. Estimation of local distribution of bird species in Tinjil island.

COMMON NAME	SPECIES	LOCAL DISTRIBUTION
Resident		
1. Reef Egret	<u>Egretta sacra</u>	Not evenly distributed, only in coralled (20 individuals)
2. White Sea Eagle	<u>Haliaeetus leucogaster</u>	Only in certain locations (6 individuals)
3. White-breasted Waterhen	<u>Anasornis phoenicurus</u>	Only in certain locations and are limited
4. Beach Thick-knee	<u>Esacus nigrostris</u>	In the coast, number of individuals 6, not evenly distributed
5. Pink-necked Green Pigeon	<u>Treron vernan</u>	Not evenly distributed
6. Thick-billed Green Pigeon	<u>Treron curvirostra</u>	Not evenly distributed
7. Pied Papiral Pigeon	<u>Ducula bicolor</u>	Evenly distributed except in location with Pandanus sp vegetation
8. Brown Cuckoo Dove	<u>Macropygia phasianella</u>	Evenly distributed except in location with Pandanus sp vegetation
9. Black-naped Fruit Dove	<u>Ptilinopus melanosphila</u>	Evenly distributed except in location with Pandanus sp vegetation
10. Nicobar pigeon	<u>Caloenas nicobarica</u>	Not evenly distributed
11. Koel	<u>Eudynamis scolopacea</u>	Not evenly distributed
12. Black Nest Swiftlet	<u>Collocalia maxina</u>	Not evenly distributed
13. Colored Kingfisher	<u>Halcyon chloris</u>	Evenly distributed in the coast
14. Browned Capped Pygmy Woodpecker	<u>Dendrocopus noluccensis</u>	Only and one encounter
15. Yellow Vented Bulbul	<u>Pycnonotus goiavier</u>	Evenly distributed except in location with Pandanus sp location
16. Black Napped Oriole	<u>Oriolus chinensis</u>	Evenly distributed except in location with Pandanus sp location
17. Chestnut-capped Thrush	<u>Zosterops interpres</u>	Not evenly distributed
18. Flycatcher	<u>Gerygone sulphurea</u>	Evenly distributed except in location with Pandanus sp location
19. Mangrove Whistler	<u>Pachycephala cinerea</u>	Evenly distributed except in location with Pandanus sp location
20. White-breasted Wood Swallow	<u>Artamus leucorhynchus</u>	Not evenly distributed, only in certain locations
21. Brown Throated Sunbird	<u>Antheptes malacensis</u>	Not so evenly distributed
22. Olive-backed Sunbird	<u>Nectarinia jugularis</u>	Not evenly distributed

posses sufficiently even distribution in the intermediate coastal vegetation (\pm 300 m from the beach, inward), namely *Ducula bicolor*, *Pycnonotus goiavier*, *Ptilinopus melanosphylla*, *Oriolus chinensis*, *Gerygone sulphurea*, *Anthreptes malacensis* and *Pachycephala cinerea*.

Among the bird species occurring in Tinjil, the one that was rarest to be encountered was *Dendrocopus moluccensis*. Bird species which were not evenly distributed or only in certain location were among other things *Amaurornis phoenicurus*, *Treron curvirostra*, *Treron vernan*, *Artamus leucorhyncus*, *Collocalia maxima*, *Esacus magnirostis*, *Haliaeetus leucogaster*, *Zoothera interpres* and *Nectarinia jugularis*.

3. Population.

It seems that it is difficult to estimate population of each species, especially those species that were not evenly distributed or difficult to encounter with.

For several species, estimation of population were obtained as presented in table 5. The area of transect, which was

Table 3. Composition and relative abundance of bird species based on IPA in sample plots.

	Common name	Species	Number of individuals	%
1.	White Sea Eagle	<i>Haliaeetus leucogaster</i>	2	0.38
2.	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	4	0.78
3.	Pink-necked Green Pigeon	<i>Treron vernan</i>	2	0.38
4.	Thick-billed Green Pigeon	<i>Treron curvirostra</i>	2	0.38
5.	Pied Emperial Pigeon	<i>Ducula bicolor</i>	96	18.94
6.	Brown Cuckoo Dove	<i>Macropygia phasianella</i>	20	3.95
7.	Black-naped Fruit Dove	<i>Ptilinopus melanosphila</i>	43	8.48
8.	Nicobar Pigeon	<i>Caloenas nicobarica</i>	4	0.78
9.	Koel	<i>Eudynamys scolopacea</i>	9	1.78
10.	Collored Kingfisher	<i>Halcyon chloris</i>	17	3.35
11.	Yellow Vented Bulbul	<i>Pycnonotus goiavier</i>	82	16.17
12.	Black Naped Oriole	<i>Oriolus chinensis</i>	62	12.23
13.	Chesnut-capped Thrush	<i>Zoothera interpres</i>	5	0.97
14.	Flyeater	<i>Gerygone sulphurea</i>	46	9.07
15.	Mangrove Whistler	<i>Pachycephala cinerea</i>	36	7.10
16.	White-breasted Wood Swallow	<i>Artamus leucorhynchus</i>	8	1.58
17.	Brown Throated Sunbird	<i>Anthreptes malacensis</i>	63	12.43
18.	Olive-backed Sunbird	<i>Nectarinia jugularis</i>	6	1.18

Table 5.. Population estimation of birds species occurring in Tinjil island

COMMON NAME	SPECIES	NUMBER OF INDIVIDUALS
Resident		
1. Reef Egret	<u>Egretta sacra</u>	±20. known from exploring the coast
2. White Sea Eagle	<u>Haliaeetus leucogaster</u>	4-6. known from nesting place
3. White-breasted Waterhen	<u>Anaethetus phoenicurus</u>	6-8. location of distribution is known
4. Beach Thick-knee	<u>Esacus agnistrostris</u>	4-6. from exploring the coast
5. Pink-naked Green Pigeon	<u>Treron vernan</u>	difficult, distribution is not even
6. Thick-billed Green Pigeon	<u>Treron curvirostra</u>	difficult, distribution is not even
7. Pied Empirial Pigeon	<u>Ducula bicolor</u>	1968
8. Brown Cuckoo Dove	<u>Macropygia phasianella</u>	256
9. Black-naped Fruit Dove	<u>Ptilinopus melanosphila</u>	656
10. Nicobar pigeon	<u>Caloenas nicobarica</u>	difficult, distribution is not even
11. Koel	<u>Eudynamis scolopacea</u>	difficult, distribution is not even
12. Black Nest Swiftlet	<u>Collocalia maxima</u>	difficult, only in certain location
13. Colored Kingfisher	<u>Halcyon chloris</u>	288
14. Browned Capped Pygmy Woodpecker	<u>Dendrocopus noluccensis</u>	difficult, only encountered once
15. Yellow Vented Bulbul	<u>Pycnonotus goiavier</u>	1472
16. Black Napped Oriole	<u>Oriolus chinensis</u>	924
17. Chesnut-capped Thrush	<u>Zoothera interpres</u>	96
18. Flyeater	<u>Gerygone sulphurea</u>	768
19. Mangrove Whistler	<u>Pachycephala cinerea</u>	528
20. White-breasted Wood Swallow	<u>Artamus leucorhynchus</u>	difficult, only in certain location
21. Brown Throated Sunbird	<u>Anthreptes malacensis</u>	1032
22. Olive-backed Sunbird	<u>Nectarinia jugularis</u>	difficult, distribution is not even

used to estimate population was 30Ha, whereas the area, whose population was estimated, was 400 Ha which was considered as having uniform low land forest. Bird species population which were considerably high were *Ducula bicolor*, *Pycnonotus goiavier*, and *Oriolus chinensis*.

For certain bird species, their bird population estimate is based on the already known distribution (the location is definite) and observation by exploring the whole area. Such bird species were : *Egretta sacra*, *Haliaeetus leucogaster*, *Amaurornis phoenicurus* and *Esacus magnirostris*.

4. Forest strata utilization.

Based on forest strata categorization and frequency of bird encounter, forest strata utilization by birds can be known in table 5. Forest strata utilization by birds is very closely related to the kinds of bird food and bird's life necessities such as site for resting, nesting, and perching or sleeping.

For member of Columbidae family, most of them utilize the upper strata, except for *Caloenas nicobarica*.

Table 6. Forest strata utilisation by bird in Tinjil island

COMMON NAME	SPECIES	STRATA			
		O	L	uc	Tc
1. White Sea Eagle	<u>Haliaeetus leucogaster</u>	-	-	-	100 x
2. White-breasted Waterhen	<u>Anas ornis phoenicurus</u>	90 x	10 x	-	-
3. Pink-necked Green Pigeon	<u>Treron vernan</u>	-	-	20 x	80 x
4. Thick-billed Green Pigeon	<u>Treron curvirostra</u>	-	-	20 x	80 x
5. Pied Imperial Pigeon	<u>Ducula bicolor</u>	-	-	25 x	75 x
6. Brown Cuckoo Dove	<u>Macropygia phasianella</u>	-	-	20 x	80 x
7. Black-necked Fruit Dove	<u>Ptilinopus melanosphila</u>	-	5 x	20 x	75 x
8. Nicobar Pigeon	<u>Caloenas nicobarica</u>	80 x	-	10 x	10 x
9. Koel	<u>Eudynamis scolopacea</u>	-	-	20 x	80 x
10. Colored King Fisher	<u>Halcyon chloris</u>	30 x	40 x	30 x	-
11. Yellow Vented Bulbul	<u>Pycnonotus goiavier</u>	-	20 x	70 x	10 x
12. Black Raped Oriole	<u>Oriolus chinensis</u>	-	-	30 x	70 x
13. Chestnut-capped Thrush	<u>Zosterops interpres</u>	40 x	60 x	-	-
14. Flycatcher	<u>Gerygone sulphurea</u>	-	50 x	50 x	-
15. Mangrove Whistler	<u>Pachycephala cinerea</u>	-	40 x	60 x	-
16. White-breasted Wood Swallow	<u>Artamus leucorhynchus</u>	-	-	-	100 x
17. Brown Throated Sunbird	<u>Antheptes malacensis</u>	-	25 x	60 x	15 x
18. Olive-backed Sunbird	<u>Nectarinia jugularis</u>	-	20 x	70 x	10 x

rattan and gebang (*Corypha utan*) were found sporadically.

Table 8. Frequency (distribution) of several species from two methods
(Point Centered Quarter Method and Multiple Plot Method)

NO.	S P E C I E S	TREE (%)		POLE (%)		SAPLING (%)	
		PCQ	MP	PCQ	MP	PCQ	MP
1	Helinjo (<i>Gnetum gnemon</i>)	24.37	32.50	38.83	25.00	23.85	32.50
2	Binar (<i>Ochrocarpus ovalifolius</i>)	8.37	25.00	7.61	12.50	9.90	7.50
3	Ki Langir (<i>Dysoxylum anoploides</i>)	26.68	37.50	16.75	20.00	13.96	32.50
4	Bayur (<i>Pterospermum javanicum</i>)	7.11	5.00	6.09	2.50	1.78	0.00
5	Kepuh (<i>Sterculia foetida</i>)	0.50	0.00	0.00	0.00	0.00	0.00
6	Savo kecil (<i>Manilkara kauki</i>)	0.00	0.00	0.00	0.00	0.00	0.00
7	Kara (<i>Macaranga</i> sp.)	14.21	10.00	10.15	5.00	1.26	0.00
8	Hanjuang (<i>Dracaena elliptica</i>)	0.00	0.00	0.00	0.00	44.41	47.50
9	Kampis (<i>Hernandia peltata</i>)	8.88	15.00	5.58	0.00	2.54	2.50
10	Waru laut (<i>Thespesia macrophylla</i>)	0.25	10.00	0.00	5.00	0.00	0.00
11	Waru darat (<i>Hibiscus tiliaceus</i>)	5.83	10.00	6.09	2.50	2.28	5.00
12	Nyamplung (<i>Calophyllum</i> sp.)	5.58	0.00	4.56	0.00	5.84	7.50
13	Herbau (<i>Intsia amboinensis</i>)	15.48	20.00	10.66	2.50	1.78	2.50
14	Terap (<i>Artocarpus elasticus</i>)	2.53	2.50	4.82	0.00	2.03	0.00
15	Butun (<i>Barringtonia asiatica</i>)	4.06	10.00	1.01	0.00	0.76	2.50
16	Ketapang (<i>Terminalia cattapa</i>)	3.55	5.00	1.01	0.00	1.01	2.50
17	Kalapari (<i>Pongamia pinnata</i>)	5.83	2.50	2.03	2.50	1.27	50.00
18	Ki Cau (<i>Dolichandrone sepapthaceae</i>)	8.88	20.00	23.35	20.00	9.64	15.00
19	Ciciap (<i>Ficus septica</i>)	1.52	5.00	3.81	2.50	2.53	0.00

Explanation :

PCQ = Point Center Quarter Method
MP = Multiple Plot Method

V. CONCLUSIONS

1. Population density of *Macaca fascicularis* in Tinjil island is estimated to be 64 individuals/km² and it is estimated that at present there are 384 monkey individuals which consist of 330 adults and 54 youngs.
2. Optimal width of transect for population census by line transect method is \pm 20 m from strip path.
3. Monkey population in Tinjil island was sensitive enough toward the presence of human being, this phenomena can be noticed from the activity frequency which were mostly "moving" (running/walking).
4. The monkeys were frequently found in trees at height 10 m - 20 m from ground surface. Tree species which were frequently used as activity site were *Ficus* sp.
5. Food of monkeys in Tinjil island were among other things, the fruits of *Terminalia catappa*, Jambu klampok, *Manilkara kauki*, *Ochrocarpus ovalifolius*, *Ficus* sp (loa), huni hutan, *Melanoorhea wallichii*, *Dracaena elliptica* and Kiara (*Ficus* sp). Sapling
7. Bird species which were encountered during this field study numbered to 22 species which were supposed to be resident in Tinjil island. From

this number of bird species, those which have outstanding abundance were : *Ducula bicolor*, *Ptilinopus melanosphilla*, *Pycnonotus goiavier*, *Oriolus chinensis*, *Gerygone sulphurea*, *Pachycephala cinerea* and *Anthreptes malacensis*.

8. Bird species which were categorized as rarely encountered in other places, but were found in Tinjil island were : *Caleonas nicobarica*, *Esacus magnirostris*, *Zoothera interpres* and *Treron curvirostra*. *Caleonas nicobarica* for instance can only breed in forested small island in Tropical region, but in Tinjil island it was rather easy to be encountered.
9. Land birds which were found abundantly enough in Tinjil island were *Pycnonotus goiavier* and *Anthreptes malacensis*. In big island these bird are usually found in secondary forest on villages, but in Tinjil island, they were evenly distributed throughout the island.
10. In sample plots of vegetation analysis using multiple plots methods there were found : 52 species of tree stage vegetation, 29 species for pole stage vegetation, 41 species for sapling stage and 39 species for seedling stage.
11. The dominant species for tree stage were : *Dysoxylum amooroides*, *Gnetum gnemon* (melinjo) and

Ochrocarpus ovalifolius (binar). The dominant species for pole stage were : *Gnetum gnemon*, *Ochrocarpus ovalifolius*, *Dolichandrone spathaceae* and *Dysoxylum amooroides*. The dominant species for sapling stage were : *Dracaena elliptica*, *Morinda citrifolia*, *Dysoxylum amooroides* and *Antidesma* sp. The dominant species for seedling were : *Dracaena elliptica*, *Drypetes neglecta*, *Dysoxylum amooroides* and *Leea indica*.

