



CHAPTER 1: INTRODUCTION

1.1. Background

Indonesia is known as one of the richest biodiversity countries in the world, with the most complex ecosystems (Petocz 1987). The country covers only 1.3% area of the globe, but it possesses about 10% species of flowering plants, 12% of mammals, 16% of reptiles and amphibians, 17% of birds and 35% of fishes from whole species in the world (BAPPENAS 2003).

New Guinea Island is the second largest island in the world and known as the largest between all tropical islands. This island is accounted amongst the richest biodiversity areas and has the most diverse assemblage of ecosystems on the earth. New Guinea consists of one big island with some small satellite islands, and administratively belongs to Papua-Indonesia and Papua New Guinea (mentioned further as PNG). Papua is biogeographically a part of Melanesia region and has already been stated as priority tropical forest area. Conservation International (1997) declared New Guinea as “Major Tropical Wilderness Area” (Supriatna 1997). Concerning bird diversity, New Guinea has approximately 831 species or represents around 8.6% of the birds in the world, while Papua, Indonesia has approximately 657 bird species or 6.8% of the total birds in the world (Mack and Dumbacher 2007), and 25% of the total bird species in Indonesia (Petocz 1987). In addition, Bird Life International has been identified about 140 Endemic Bird Area’s (EBA) worldwide, and eight of EBA sites were located in Papua (Sudjatnika *et al* 1995). Furthermore, Mack and Dumbacher (2007) stated that family Columbidae in Papua has the richest species rate, 42 species out of 309 species worldwide.

The percentage of endemic birds in Papua is higher than in other areas in Indonesia, and these birds are mainly dispersed into five nature conservation areas (Petocz, 1987). These conservation areas include Arfak Mountains with a total of 278 bird species, Tamrau Mountains 146 species, Lorentz Mountains 130 species, Mamberamo region 191 species, and Wasur areas 74 species.

Papua (formerly Irian Jaya) is the largest, but least-developed province of Indonesia. Although there is a great lack of biological data for Papua compared



with the other half-eastern part of New Guinea (PNG), it has been estimated that the province has around 50% of Indonesia's biodiversity (Supriatna 1997, 2008).

Until 1984 Papua-Indonesia had escaped the devastating extent of deforestation that strikes other part of Indonesia and South-East Asia (Anggraeni 2007). However, the forest area in Papua decreased in 1993-1997 from 90% to 80% of the total area of the Island (Supriatna 1997). Moreover, the rate of forest conversion increases constantly since Indonesia's recent economic crisis (Richards and Suryadi 2002). Nowadays, loss of habitats and forest fragmentations due to logging, plantation, transmigration, cultivation, mining, oil and gas extractions, and rapid development of settlements and roads result in threats on Papua's unique biological heritage (Richards and Suryadi 2002). Other development projects such as the expansion of oil palm plantations become a seriously menace to the existence of tropical lowland forest in Papua (Smolker *et al* 2008, Samuelson 2008).

Papua is also a home to more than 250 different ethnic groups, each with their own rich culture, tradition, language and sets of interrelationships with their environment (Petocz 1987, Supriatna 2008). Indigenous people have already a long history of subsistence in hunting, fishing and cultivation systems. Shifting cultivation system has occurred for about 5,000 years in Papua and hunting activity has known since 3,500 years ago (Hope 2007). People living in the lowlands and swamp areas traditionally rely heavily on sago, while highland people practice rotational cultivation system of bulb and root crops mainly on taro and sweet potatoes. Pigs are raised as source of protein, but additionally the people preferred hunting wild pigs, along with other wild animals from the forest (Petocz 1987, Boissière *et al* 2007).

Hunting is a major activity of indigenous people in Papua, yet there is no quantified studies undertaken on the impact of hunting on wild animal. Usually hunting is practiced in subsistence manner, and commercial hunting occurs only at a small scale or in the heavily capitalized region (Bennett and Robinson 2000^a). Hunting might also be carried out only for cultural occasion or recreational reasons. The meat from hunted animals could be distributed within the community or might be sold in local marketplace (Pangau-Adam and Noske 2010, Pangau-



Adam *et al* 2012). In many hunting studies, however, the distinctions between hunting for subsistence and for commercial purpose are rarely clear (Dwyer and Minegal 1991, Pangau-Adam and Noske 2010, Pangau-Adam *et al* 2012, Aiyadurai *et al* 2010, Aiyadurai 2011, Bennett and Robinson 2000^a, Lee 2000, O'Brien and Kinnaird 2000). Bennett and Robinson (2000^a) and Mansoben (2005) stated that it is essential to understand the cultural and socioeconomic context, and to collect accurate information on hunting and its effects, in order to determine the sustainability of this practice.

Ground-dwelling crowned pigeon (*Goura victoria*) is an endemic bird species which is declared as protected species by Indonesian Government (Law Act No. 301/1991). All three species of *Goura* (crowned pigeon) are on the status of Restricted Range Species and endemic to New Guinea and its satellite islands (Rand 1938, Beehler *et al* 1986, Andrew 1992). Furthermore, the entire genus *Goura* as the largest pigeon in the worlds has been verified by IUCN Red List as vulnerable species due to hunting problems (Collar *et al*, 1994; IUCN 2011), and also listed on Appendix II of CITES (Statterfields *et al*, 1998).

The workshop on Priority-Setting of Biodiversity Conservation in Papua held in 1997 has founded that the major threats on this bird were the large-scale forest conversion for logging, swidden agriculture and plantation, transmigration, settlement, hunting and illegal trading (Supriatna 1997). Hunting on wildlife especially bird species in Papua has been practiced by the local communities for subsistence, but in some regions it is recently moving towards the commercial activities (Pangau-Adam, 2010, Suryadi *et al* 2007, Mahuse 2006, Sada 2005). Because hunting is amongst the main threats to *Goura* spp, it is due importance to conduct the field study on the impact of hunting on *Goura victoria* in the tropical lowland rainforests of the northern Papua-Indonesia.

1.2. Objectives of the study

There are only three species in the genus *Goura* (crowned pigeons) and all are endemic to New Guinea. *Goura cristata* inhabits lowland area of the Bird's head and Bird's neck, *Goura scheepmakeri* inhabits southern lowlands, and *Goura*

victoria inhabits the lowland areas of the northern New Guinea (see the distribution map in figure 1.1) below.

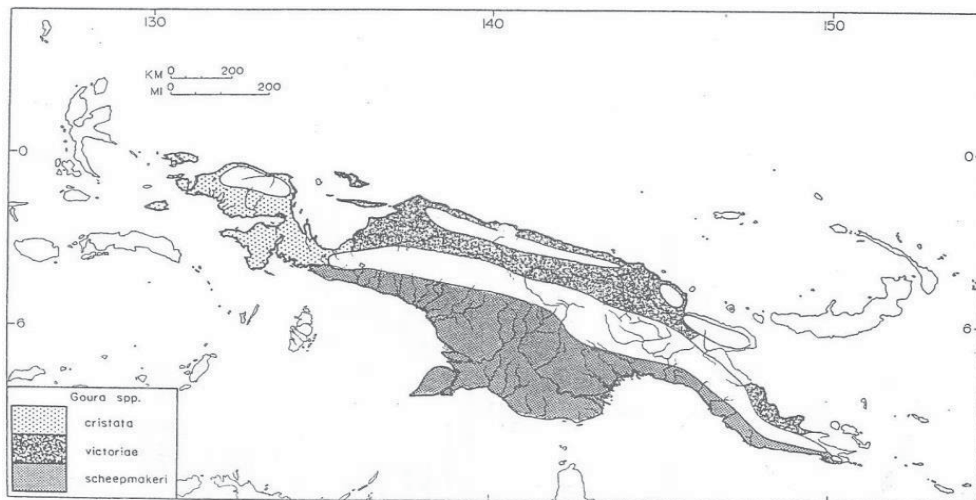


Figure 1.1 Distribution map of three species of Genus *Goura* in New Guinea (Source: Pratt 1982)

All *Goura* species play an important role in the traditions and daily life of the indigenous people in Papua. These birds are among the target animals of wildlife hunting. There is still very little published data on the hunting activity and its impact, as well as lack of data on *Goura* population in its natural habitat in the northern Papua. The only reports on *Goura* population are those from King and Nijboer (1994) and Bird Life International (2012). On the other hand, information on tree communities and vegetation structure of *Goura* habitat in this region is still very limited, although a rapid assessment had been conducted in Mamberamo area (Richards and Suryadi 2002). Based on these considerations, it is important to conduct such a research with focus on hunting practice, population of *G.victoria*, and forest structure in the northern Papua.

The main aim of the study is to assess the impact of hunting on the population of *G.victoria* in the lowland rainforests in Papua. The current research is intended to contribute into conservation action of *G.victoria* in the future.

The specific aims of this study include (1) To investigate the forest structure in four different areas inhabited by *G.victoria*; (2) To estimate the population size and density of *G.victoria* in four different forest areas in northern Papua; (3) To compare the population size of *G.victoria* in four different forest areas; (4) To describe the activity of the bird's hunters and their impact on the population of



G.victoria in four different areas and (5) To create and increase awareness of the Papuan people to conserve *G.victoria*.

In the last two decades, the increase of forest degradation in the northern Papua occurred due to the people activities such as illegal logging, illegal wildlife hunting, collecting and trading forest products (Jepson *et al* 2011, Suryadi *et al* 2007). The Special Autonomy Laws ratified in 2001 has lead the natural utilization to increased forest conversion into various development purposes, such as new districts, regencies, roads, resettlements, and the establishment of vast area for oil-palm plantations (Smolker *et al*, 2008; Samuelson, 2008). Furthermore, illegal logging and other forest conversion may facilitate hunters to reach the remote forest areas (Wilkie 1989, Kinnaird *et al* 2003, Miranda *et al* 2003, Suryadi *et al* 2007, Frazier 2007)

Studies about wildlife hunting have been carried out in some tropical regions in the world. In African forest for instance, individual hunter primarily hunt the wild animals to eat and sell the captured animals (van Vlieth and Nasi 2008). Mammals have become the main source of bushmeat protein throughout Africa (Fa and Brown 2009), for example hunting on duikers in Guinea, West-Central Africa (Pailler *et al* 2009). Moreover birds are also hunted in other parts of Africa for sport, cash or subsistence (Waltert *et al* 2010, Thiollay 2005, Hart and Upoki 1997). In the Neotropic regions, hunters commonly harvest many species of wildlife animal like tapir, brocket deer, armadillos, agoutis and several species of birds (Bodmer *et al* 1995 and 1997, Peres 2000, Mena *et al* 2000). The Amazonian hunters also hunted birds, especially the big-size birds such as Great Tinamous, Great Curassow and Crested Guan (Smith 2005, Peres 2000, Mena *et al* 2000, Begazo and Bodmer 1998). In Indonesia, hunting of wildlife animals has been widely noted, for instance hunting on Bornean peacock-pheasant in Borneo (O'Brien *et al* 1998) and large birds and mammals in the North Sulawesi (O'Brien and Kinnaird 1996 and 2000, Lee 2000, Alvard 2000). Related to sustainable hunting, current subsistence hunting and commercial hunting in different tropical regions are tend to be unsustainable (Noss 2000, Begazo and Bodmer 1998, O'Brien and Kinnaird 2000, Lee 2000, Alvard 2000, Robinson and Redford 1994).



Deforestation along with hunting practice raised some critical questions related to the sustainability: how is the current population of *G.victoria* in lowland forest of the northern Papua? Can *G.victoria* survive in different habitats? Does the traditional hunting for wild meat consumption lead to reduce *Goura* population? In order to answer these questions, it is very important to study the population density, forest habitat condition and hunting on the *G.victoria*.

The first question about the population of *G.victoria* emphasizes that we have insufficient data and information on the current population size of this species. The data on population status of *Goura* is very limited, and the only record stated that there are about 2,500 to 9,999 individuals inhabit the lowland forest in the northern Papua, with decreasing population trend (Bird Life International 2012). Headed for answering the question and obtaining preliminary data about population density, the research on measuring *Goura* population become the right choice.

Second question is with regards to the habitat condition of *G.victoria*. This bird species needs undisturbed habitat for nesting, foraging and breeding, but currently habitat disturbance and forest clearing for human needs are threatening the persistence of *G.victoria*. Reduction in forest area is leading to the decline and degradation of habitat area, and undoubtedly affects the population of the bird. These activities should be concerned whether it might have a negative impact on *Goura*'s population size or not.

The third question is food gathering and hunting activities in the lowland forest. These are two activities that have been common for the traditional forest-dwellers in Papua. *Goura victoria* has become one favorable source of wild meat for the nutrition of hunter family (King and Nijboer 1994). Additionally local people also use the feathers of *G.victoria* as a head decoration for traditional Papuan dancer (King and Nijboer 1994, Pattiselano and Mentansang 2010).

The entire questions and facts mentioned above are leading to the important issue concerning urgent conservation efforts for the endemic bird species, *G.victoria*, in lowland forest of the northern Papua. Forest degradation might frequently occur in the lowland forest, and also towards the forest reserves and wildlife sanctuaries containing lowland forest. Habitat degradation and



unsustainable bird hunting may threaten the existence and persistence of population of *G.victoria*. It is expected that the information on population density, combined with an analysis on habitat that utilized by this species, and the information on traditional hunting activities can lead to the comprehensive output about conservation status of *G.victoria* in Papua.



CHAPTER 2: GENERAL REVIEW ON *Goura victoria*

2.1. Biology of Genus *Goura*

2.1.1. Systematics of the Genus *Goura*

Order of Columbiformes is composed by three families: the sandgrouse (Pteroclididae), the dodos (Rhapidae), and the pigeons (Columbidae), but Family Rhapinae was already extinct during the 17-18th centuries (Harrison *in* Nijboer & Damen 2000). Family Columbidae consists of 5 subfamilies with 42 genera, 749 taxa and about 309 species totally (Baptista *et al* 1997). Gibbs *et al* (2001) discovered that Columbidae consists of 5 families with 42 genera and around 316 species, slightly different from Beehler *et al* (1986) which stated that Columbidae consists of around 299 species.

The species of Columbidae are distributed widely and can be found all over the world except in polar and sub-polar regions, in extremely hot and cold regions, and in some oceanic islands. The term of Columbidae sometimes is used to characterize the birds based on the similarity of their size, typology and ecology, but it is inconsistently used and not based on any real biological dissimilarity (Goodwin 1983 and Beehler *et al* 1986). Gibbs *et al* (2001) classified pigeon and dove based on the size. Pigeon generally refers to the larger species while dove to the smaller and more elegant species. Additionally, the term pigeon and dove are somewhat interchangeable. Both groups are unique among other birds in Columbidae due to their production of “crop milk” that is secreted by sloughing of fluid-filled cells from their crop layer (Perrins 2009, Baptista *et al* 1997). In these groups, both male and female can produce this highly nutritious substance to feed their juveniles (Beehler *et al* 1986: Baptista *et al* 1997).

The Gourinae is one of the subfamilies in Columbidae that contains only the three species of Crowned Pigeons. The other subfamilies are Columbinae (the typical seed-eating pigeons), Treroninae (the fruit-eating pigeons and fruit-eating doves), Otidiphabinae (the pheasant pigeon), and Didunculinae (the tooth-billed pigeon) as the largest subfamily among the order of Columbiformes (Goodwin, 1983, Baptista *et al* 1997 and Gibbs *et al* 2001). Sub-family Gourinae consist of one genera, and genus *Goura* comprises three species, *Goura cristata*, *Goura*

scheepmakeri and *Goura victoria* (Beehler *et al* 1986, Baptitsta *et al* 1997, Nijboer and Damen 2000, Gibbs *et al* 2001). Every species consists of two subspecies, *Goura cristata cristata*, Pallas 1764; *Goura cristata minor*, Schlegel 1864; *Goura scheepmakeri scheepmakeri*, Finch 1876; *Goura scheepmakeri sclaterii*, Salvadori 1876; *Goura victoria victoria*, Fraser 1876 and *Goura victoria beccarii*, Salvadori 1876.

2.1.2. The Distribution of Genus *Goura*

All species of Crowned Pigeons are similar and geographically interchangeable each other (Figure 2.1). The three species are also very closely related, and inhabit only in New Guinea and its satellite islands (Peckover and Filewood 1976; Beehler *et al* 1986). Their distribution is mainly allopatric, but two of this species (*G.cristata* and *G.victoria*) usually meet and hybridize naturally in the Siriwo River at the tip of Cenderawasih Bay on the north-west of New Guinea (figure 2.1 and figure 2.2, Beehler *et al* 1986; Goodwin, 1977; Baptista *et al* 1997). In regard to the distribution and evolution, there is a theory stated that many rainforest birds was the product from isolation of forest refugees during the Pleistocene and post-Pleistocene era (Haffer 1969 and 1974 *in* Pratt 1982). This theory also emphasized that the isolation in remnant forest tracts had divided the widespread population of forest birds into discrete fragmentary populations (Haffer 1969 and 1974 *in* Pratt 1982). Some of these populations were then be able to differentiate as new subspecies or species (Mayr 1963 *in* Pratt 1982).



Figure 2.1 *Goura cristata*, *Goura victoria* and *Goura scheepmakeri* (Note: from left to the right, source: Coates and Peckover, 2001)

Additionally, in the case of Crowned pigeon, the distribution might become evidence of the distribution of allopatric and parapatric species, and also as the result of ecological compatibility and geographic isolation, though their range might be similar to the case of parapatric species (Haffer 1969 and 1974 *in* Pratt 1982).

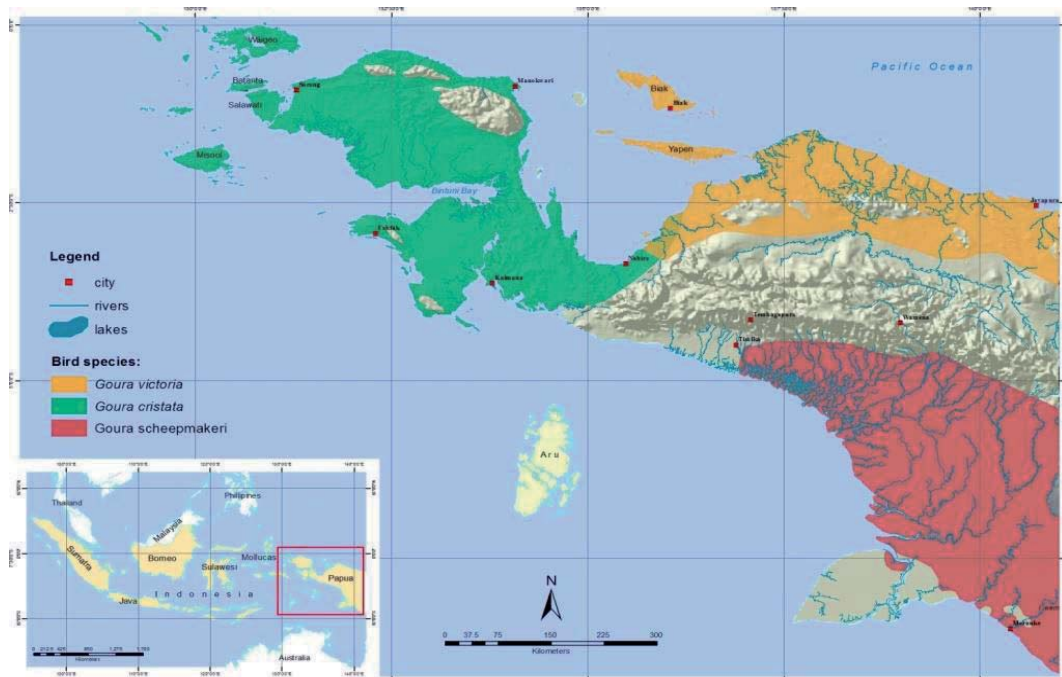


Figure 2.2 Distribution map of three species of genus *Goura* in Papua-Indonesia (Created by H. Suhendy base on Birdlife 2001)

In particular, *G. cristata* inhabits flat lowland forest, usually in undisturbed alluvial forests (Beehler *et al* 1986). These area including the marshes and seasonal flooded area from the north western of New Guinea, until the Etna Bay (on the west of New Guinea' south coast) to the point where the Siriwo Rivers flow into the Geelvink Bay (at the coast in the north of New Guinea) (Rand and Giliard 1967). This part is called the Vogelkop or formerly called Arfak or Berau Peninsula (Gyldenstolpe 1956 *in* Nijboer and Damen 2000), and also Onin Peninsula. This was the area where *G. cristata* was detected hybridized with the *G. victoria* (Beehler *et al* 1986). Furthermore, *G. cristata* also is recorded at some islands close to the coast, like Misool, Salawati, Batanta and Waigeo Island (Rand and Gilliard, 1967; Beehler *et al* 1986; King and Nijboer 1994) and Seram Islands, Moluccas where it could probably be imported (Kitchener *et al* 1993).