# MARINE MAMMALS IN THE SAVU SEA (INDONESIA): INDIGENOUS KNOWLEDGE, THREAT ANALYSIS AND MANAGEMENT OPTIONS

**Thesis submitted by**

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**Declaration on Ethics**

The research presented and reported in this thesis was conducted within the guidelines for research ethics outlined in the *National Statement on Ethics Conduct in Research Involving Human* (1999), the *Joint NHMRC/AVCC Statement and Guidelines on Research Practice* (1997), the *James Cook University Policy on Experimentation Ethics, Standard Practices and Guidelines* (2001), and the *James Cook University Statement and Guidelines on Research Practice* (2001). The proposed research methodology received clearance from the James Cook University Experimentation Ethics Review Committee (approval number H1748).

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**ABSTRACT**

The Savu Sea in the Province of East Nusa Tenggara is an important area for marine mammals in Indonesia, supporting at least 19 cetacean species as well as the dugong. The deep inter-island channels of the Savu Sea are sites of upwellings and other oceanographic processes which benefit marine mammal populations. Two traditional communities (Lamalera village on Lembata Island and Lamakera village on Solor Island) hunt whales in the Savu Sea, a practice which impacts on marine mammal populations but which is poorly documented. Through this research, I examine the current status of the whale hunting cultures in the Savu Sea as well as the social construction or perception of several stakeholders concerning traditional hunting practices. I also analyse other anthropogenic activities that might adversely impact on marine mammals in the region, and provide management options for marine mammal conservation in the Savu Sea and Indonesia in general.

To gain preliminary information in a relatively short period of time, I used a RRA (Rapid Rural Appraisal) approach. I conducted my research between May and December 2004, interviewing 60 informants from various places in Solor, Lembata, Alor and Rote Islands, as well as in Kupang (the capital of East Nusa Tenggara), Jakarta and Bandung (West Java). The nature of my research question resulted in qualitative data that I examined using thematic analysis and social construction theory.

I conclude that the whale hunting traditions in Lamalera (Lembata Island) and Lamakera (Solor Island) are subsistence whaling according to the IWC (International Whaling Commission) definition. This tradition appears not to be important anymore for the villagers of Lamakera. However, it is still a very important part of the cultural and spiritual identity of the Lamalera villagers. Although recently the whale catch has been relatively low, the Lamalera fishermen have compensated by increasing the catch of small cetaceans and other marine megafauna such as whale sharks, sunfish, manta rays, etc., confirming their high

dependency on non-fish products. The preliminary nature of this research did not allow a calculation of the sustainable harvest level or PBR (Potential Biological Removal) of whale hunting in Lamalera thus this practice is still considered a threat to the local whale population. However, the research revealed that there are many other threats to marine mammals in the Savu Sea that should be considered when designing marine mammal management. These threats include IUU (illegal, unregulated and unreported) fishing, marine traffic, oil-gas exploration and exploitation, and commercial displays of marine mammals.

Several management options for marine mammals in Savu Sea are proposed. Further investigation is recommended to fully understand the magnitude of each threat to the marine mammal populations, which in the end will affect traditional whale hunting in Lamalera.

This research offers insights into issues that could be included in the recently proposed government plan to establish the Solor-Alor Marine Protected Area. Alternative livelihoods for whale hunters and destructive fishers should be appropriately designed. Alternative fisheries to reduce the dependency of Lamalera villagers on marine megafauna products might also be a feasible option.

I recommend that Indonesia consider becoming a signatory to the Convention on Migratory Species (CMS). As an international body that facilitates the management of migratory species, CMS can assist Indonesia in management of and research into marine mammals, especially the species targeted by whale hunters. So far, Indonesia is an MOU signatory to the CMS. By becoming a CMS signatory, Indonesia is more likely to engage further collaboration with Australia and other countries that have been conducting extensive research on marine mammals.

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# I. INTRODUCTION

This thesis examines the current status of whale hunting traditions in the Savu Sea (Indonesia), identifies activities (perceived by local people and based on observations), which are threats to marine mammal populations in the area, and suggests a process to progress to more effective management regimes. Although the focus of this thesis is marine mammal conservation, emphasis is placed on the predicament of traditional whale hunters and the initiatives required to conserve marine mammals while accommodating whaling traditions.

## 1.1. Marine mammals and humans in Indonesia

### *1.1.1. Marine mammal governance in Indonesia*

Although no marine mammal species is endemic to Indonesian waters, Indonesian waters are important for marine mammals, supporting at least 30 species of cetaceans (37% of the total of 81 species of cetaceans in the world) and one species of sirenian (the dugong) (Appendix 1). The great whales using Indonesian waters include the blue whale (*Balaenoptera musculus*), the sei whale (*B. borealis*) and the fin whale (*B. physalus*) – all are listed as endangered at a global scale; and the sperm whale (*Physeter macrocephalus*), listed as vulnerable on the IUCN Red Data List (IUCN 2003). The dugong (*Dugong dugon*) is also listed as vulnerable at a global scale and is the only sirenian occurring in the Indian and Pacific Oceans (Reeves et al. 2002). Overall, six species of Indonesian marine mammals are listed as threatened (endangered or vulnerable) by the IUCN (see Appendix 2). Many other species of cetaceans occurring in Indonesia are enlisted as 'data deficient', i.e. there are insufficient data to make an evaluation of the risk of extinction (Reeves et al. 2003). However, these data deficient listings should not be taken as an indication that these species are not under threat.

All the marine mammals which occur in Indonesian waters are listed in Appendices I and II of the Convention on International Trade in Endangered Species of Wild Flora and Fauna

(CITES), which was ratified by Indonesia in 1979 and the Convention on Migratory Species (CMS), of which Indonesia is an MOU signatory, but not yet a full party (CITES, 2003; CMS, 2005b). The United Nations Convention on the Law of the Sea (UNCLOS 1982) explicitly stresses the importance of marine mammal conservation for all ratifying countries, including Indonesia, which ratified this treaty in 1985. In addition, the IUCN 2002-2010 Conservation Action Plan for cetaceans lists Indonesia as a project site for research on the status of cetaceans (Reeves et al. 2003).

Indonesia currently consists of 32 provinces and 421 regencies (*kabupaten*), 16 of them are in the Province of East Nusa Tenggara (BPS 2005), including the four regencies where this research was conducted (East Flores, Lembata, Alor and Rote-Ndao Regencies). In Indonesia, regencies supervise districts (*kecamatan*). Regencies themselves are subordinate to provinces in Indonesia, while the provinces are subordinate to the central Jakarta government. Local autonomy has been established in Indonesia following the issuing of Local Autonomy Law No. 22/1999 in Jakarta on May 7, 1999. Based on my personal observations and discussions with Indonesian colleagues, this movement towards decentralisation has complicated some conservation processes in many administrative regions (see Chapter 6 Section 6.5). A further impediment to effective conservation management is the low level of food security of Indigenous communities, such as in Lamalera (Lembata island) (see Chapters 3, 4, 5, 7 and 8).

Kahn (2003c) explained that the Indonesian government, through the Ministry of Marine and Fisheries Affairs (MMAF), is currently designing an Indonesia Marine Mammal Management Area (IM3A) to encompass all Indonesian territorial waters. There is also a plan to establish the Solor-Alor Marine Protected Area (Kahn 2003c) that may affect the culture and livelihood of the local people in Lamalera (Lembata Island) and Lamakera (Solor Island), who have been hunting whales for centuries.

### *1.1.2. Marine mammals in Savu Sea, East Nusa Tenggara*

The Savu Sea in the province of East Nusa Tenggara in eastern Indonesia is an important habitat for marine mammals. At least 19 of the 30 species of the marine mammals listed in Appendix 1 of this thesis have a local name in the Lamaholot language, spoken by people living in the Solor-Alor Islands in the northern Savu Sea (Figure 1.1) (see Barnes, 1996; Rudolph et al., 1997). Thus, more than half of all Indonesian marine mammal species are found in this area.

The Savu Sea is a semi-enclosed sea approximately the size of Tasmania, bordered by Flores, Timor (West Timor and Timor Leste) and Sumba Islands (Figure 1.1). It is a deep sea; the deepest area reaches more than 3,500m and the channels in Solor-Alor Islands reach to 1,000 m. Ombai Strait is 3,250m deep, Sumba Strait is 1,000m, whilst the southern most part of Savu Sea is about 1,000m in depth.

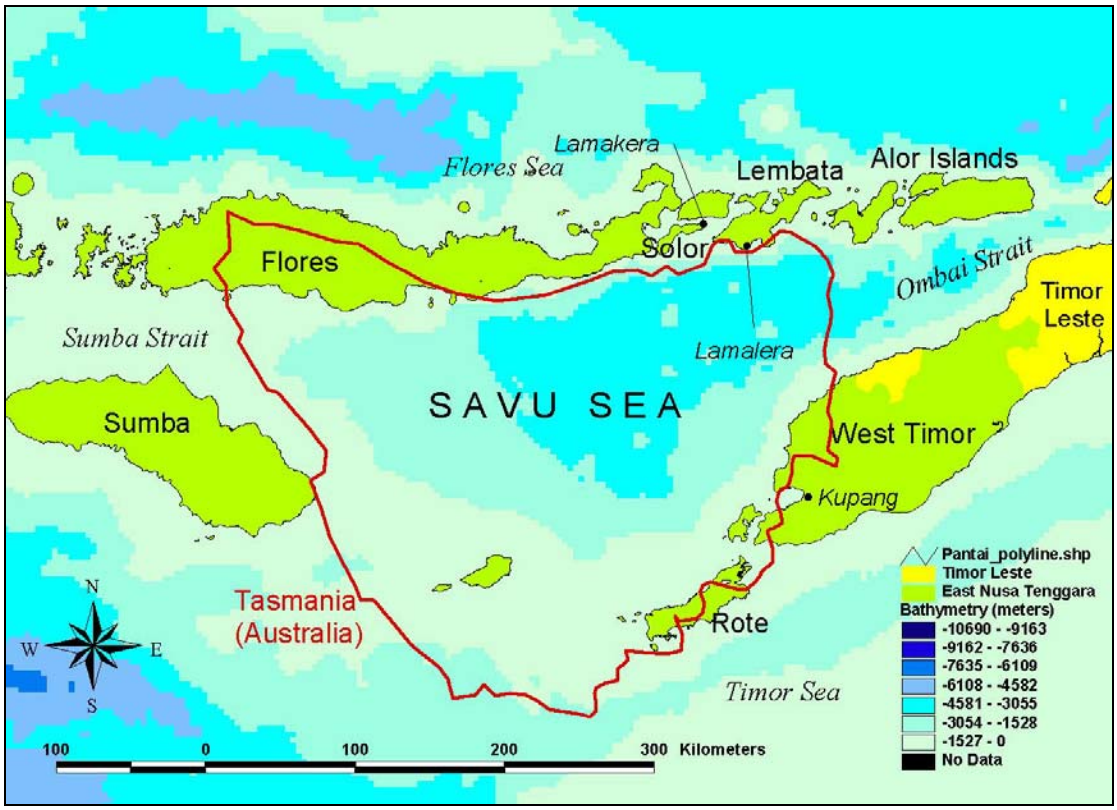


Figure 1.1. Savu Sea in the East Nusa Tenggara Province
The outline of Tasmania (Australia) is provided as a scale of the area

The Indonesian Throughflow or ITF ('the leakage of western tropical Pacific water into the southeastern tropical Indian Ocean through the Indonesian Seas (Sprintall et al. 2004, p. 369), passes through the Savu Sea via Ombai Strait (see Figure 1.2). The Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) (2004) recognized the importance of the ITF to Indonesia, Australia and Timor Leste. The ITF provides the physical environment that supports marine life and sustains seafood resources for the people of the three countries.

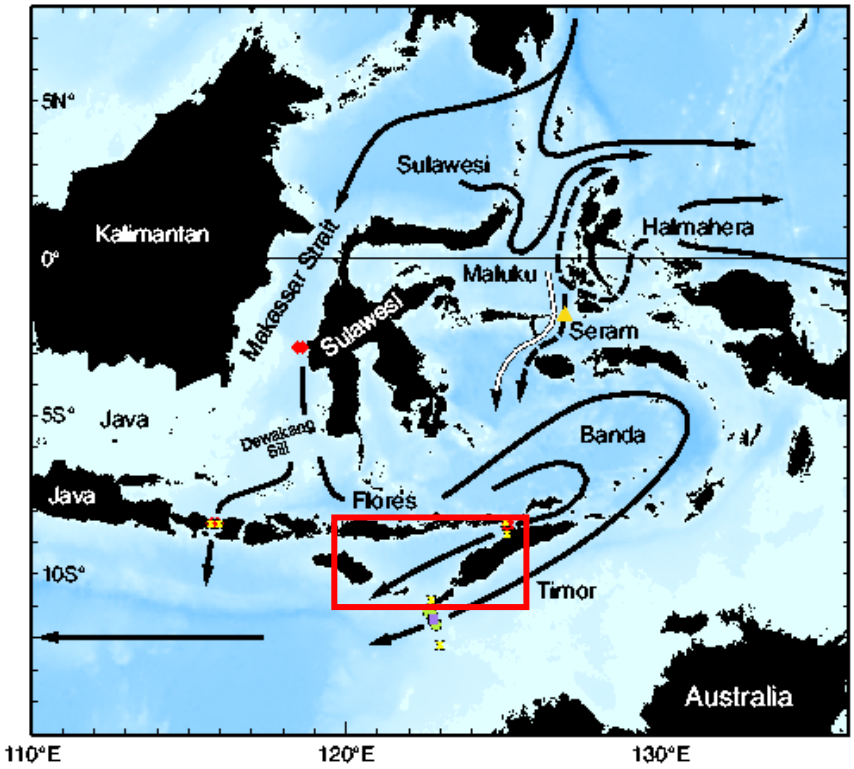


Figure 1.2. The Indonesian Throughflow leakage through the Savu Sea (red box) between the Pacific and Indian Oceans
(Courtesy of http://www.esr.org/instant/instant_intro.html )

In 2003, the INSTANT (International Stratification and Transport) program was established by five countries (Australia, Indonesia, France, the Netherlands and the United States) (Field 2003) to study the velocity, structure and other characteristics of the Indonesian Throughflow. From December 2003 to January 2004 an INSTANT research vessel sailed through the Savu Sea to deploy mooring arrays to record oceanographic parameters of the Throughflow.

Unfortunately, there are no data yet available from the INSTANT project to inform my research.

The small passages between the Solor-Alor Islands in the Savu Sea (Figure 1.1) are considered feeding grounds and corridors for cetacean migration (Kahn 2002; Kahn 2003c). Corridors are defined as 'geographical features that are used by mobile species for migration between core areas' (Heslenfeld et al. 1999, p. 5). Recent surveys by Kahn (2002) in the waters of the Alor Islands documented a high abundance of cetaceans, and identified significant habitats and migratory corridors for blue, sperm and killer whales. Recent satellite tagging by Kahn (2005) also revealed that a sperm whale (*Physeter macrocephalus*) and a pygmy blue whale (*Balaenoptera musculus brevicauda*) tagged in the Savu Sea migrated to the Indian Ocean and Banda Sea respectively within 40 to 60 days, confirming the importance of the Savu Sea channels as migratory corridors for cetaceans.

There is also anecdotal information about great whales passing through the western waters of Timor Island. While travelling in an aircraft from Oekusi to Dili (Timor Leste) in October 2003, I witnessed a great whale (species unidentified) passing southwestward of Timor Island. It is possible that great whales from the Solor-Alor Islands migrate southward to the Timor Sea through the Ombai Strait and Savu Sea, passing the waters of Rote Island (Figure 1.1).

In addition, Hutomo and Azkab (2003) report that dugongs are present in scattered locations in Indonesia, including East Nusa Tenggara (around Kupang Bay -West Timor) and the former Province of East Timor (now the Republic of Timor Leste). Quantitative data on dugong distribution and abundance are not available. The Indonesian Institute of Science (LIPI) currently proposes that a National Dugong Management Plan be developed as part of the Marine and Coastal Resources Management Plan (Hutomo & Azkab 2003). The plan will

involve dugong population and habitat management, as well as the promotion of public awareness of the dugong.

As stated above, there is a dearth of scientific information about dugong (*Dugong dugon*) populations in Indonesia (Marsh et al. 2002). Nonetheless, Barnes (1996) and Hutomo and Azkab (2003) noted that dugongs were occasionally sighted along the northern coasts of East Flores, Adonara and Lembata of the Savu Sea region (see Figure 1.1), where they are occasionally caught and eaten by the Bajao Laut (Sea Gypsies of South and South East Sulawesi).

Further evidence of the presence of dugongs, at least in the past, is obtained from the strong cultural beliefs of the people of Rote Island. According to James Fox (2003, *pers.comm.*) who has conducted anthropological research in Rote since the 1970s, the Rotenese considered the dugong to be a female human, so any dead dugongs (males and females) were treated as humans and buried formally in dugong cemeteries. The fishermen of Rote also often fish outside official Indonesian waters. There are several ancient burial lands for Rotenese on Ashmore Reef in Australia (Clark 2000).

**1.2. Whale hunting in the Savu Sea**

While Townsend (1935) noted that American whalers caught whales along the north coasts of Flores and Alor in September 1858, some cetacean species also provide food for the traditional hunting communities in the villages of Lamalera in Lembata Island and Lamakera in Solor Island (see Figure 1.1) (Barnes 1996). The Dutch recognized these potential whale hunting regions by the mid 19$^{th}$ century, but an in-depth study was not carried out until the 1970s when Barnes (1996) visited Lamalera and conducted anthropological studies with the local people. From a Portuguese document, Barnes (1996) found evidence that the Lamalera villagers had been hunting whales since at least 1643, as well as collecting and trading sperm whale ambergris in Larantuka (Flores Island).

International focus on Indonesian whale hunting was heightened during the 54th Annual Meeting of the International Whaling Commission (IWC) in 2002 when Japan commented on whaling by non-member countries such as Indonesia (IWC 2003). With specific reference to the hunting of sperm whales in Indonesia, Japan suggested that 'all non-member countries taking whales should join the IWC as the body responsible for managing the whaling industry' (IWC 2003, p 24). Indonesia is now in a vulnerable international position because it is not known whether the traditional whale hunting practices in Indonesian waters are sustainable.

Based on the IWC (International Whaling Commission) definition, whale hunting in Lamalera and Lamakera is considered traditional whaling (see Chapter 3 Section 3.1.6). The assessment of whether the level of whale hunting in Lamalera and Lamakera is sustainable was beyond the scope of this research. However, traditional whale hunting (especially in Lamalera) is a major focus of this research, because of its relevance to the development of a national marine mammal conservation plan. Eventually, this research will also provide the foundation to conduct an assessment of the sustainability of whale hunting in the region.

Traditional whaling in Indonesia needs to be considered in any national marine mammal management plan. As I found no evidence on other traditional whale hunting in Indonesia, a study of Indigenous whaling in Lamalera and Lamakera from a conservation management perspective is required. This thesis aims to address this need and I examine the traditional whale hunting cultures in Lamalera (Lembata Island) with a brief comparison with Lamakera (Solor Island). In addition, I also investigate the situation in Alor Islands and Rote Island to obtain better understanding of dugong utilisation and possible migratory routes of marine mammals in those regions.

Different stakeholders have various perceptions or social constructions of the traditional whale hunting in Lamalera that will influence the establishment and progress of the national marine mammal conservation plan. Consequently, I use a social constructionist approach (Crotty 1998) to understand the perceptions of various stakeholders about the whale hunting culture in Lamalera (see Chapter 2 Section 2.1 and Chapter 4). I conducted research by interviewing the whale hunters, local and national government agencies in addition to research on the social construction of whale hunting by international organisations or agreements such as the International Whaling Committee (IWC), Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), Convention on Biological Diversity (CBD), United Nations Convention on the Law of the Sea (UNCLOS) and Convention on Migratory Species (CMS). Although Indonesia is not a member of the IWC, this research is heavily related to the IWC issues of traditional hunting, and hence I often use IWC references in the discussion sections of this thesis.

### 1.3. Aim and Objectives

Several questions arise in relation to traditional whale hunting and the proposed marine mammal management plan in Indonesia:

1. What is the current status of traditional whale hunting in Lamalera and Lamakera, and is it a threat to marine mammals?
2. What are the other potential anthropogenic threats (identified by the locals and through my observations) to marine mammals in the Savu Sea?
3. How could whale hunting traditions and other potential anthropogenic threats be integrated into a marine mammal conservation plan?

The overall aim of this study is to:

Provide options for a marine mammal management plan in Indonesia, particularly in the Savu Sea, that facilitates the inclusion of the existing traditional whale hunting.

This aim will be achieved by addressing the following objectives:

1. Documenting the cultural importance and perceptions of whale hunting cultures in Lamalera and Lamakera.
2. Analysing the potential threats to marine mammal populations in the Savu Sea, as perceived by the locals and based on my observations.
3. Identifying any potential conflicts among the stakeholders of the Savu Sea (including the whale hunters and other Indigenous groups) in relation to the establishment of a marine mammal management area in Indonesia.

The threats perceived by the communities that I interacted with are not necessarily the same as those I identified during my research as a student with an ecological background. Chapter 2 explains further the threat identification methods I used and whether the threats were identified by the communities or myself. By integrating the threat analysis and feedback from the communities, including their local knowledge and past experience, I aim to provide management options that achieve a balance between conservation goals, the needs of local whale hunters and other community needs in the region.

### 1.4. Location and dates of field study

I conducted my fieldwork from May to December 2004 in the Solor-Alor Islands and Rote Islands of the Savu Sea (Figure 1.1). The Solor-Alor Islands were chosen because of the documented existence of whale-hunting practices, while Rote was chosen because of its historical dugong burial traditions.

There are two whale-hunting villages in the Solor-Alor Islands (Chapter 3 Figure 3.1); both were surveyed in this research.

- Lamalera is the main hunting village, located on Lembata Island
- Lamakera on Solor Island is a minor whale-hunting village

The Ti region was the location for my research on Rote Island because of the local tradition of dugong burial (Chapter 3 Figure 3.15). In the Alor Islands, my research was conducted in Kalabahi (the capital town) and Kepa Island to understand the current status of marine tourism and marine conservation activities in the region (Chapter 3 Figure 3.14). In addition, I went to Jakarta and Bandung (West Java) to gather information from government officers and scientists.

The following Chapter 2 includes an outline of my research methodology including the methods I used for data collection and analysis as well as details of my fieldwork. Chapter 3 describes the villages and the whale hunting traditions of Lamalera (Lembata Island), Lamakera (Solor Island), Alor Island and Rote Island. Chapter 4 explains the social construction of whale hunting from the perspectives of several stakeholders. Chapter 5 analyses the threats to marine mammals and their relations to traditional hunting. Chapter 6 briefly depicts two existing management schemes in Savu Sea, i.e. Komodo National Park and Pantar Strait Marine Park. Chapter 7 and 8 provides several options for marine mammal management in Indonesia.

## II. RESEARCH METHODS

In this chapter I discuss the approach and methods that I used for my research in the Savu Sea, eastern Indonesia. I use a social constructionist perspective as explained below in Section 2.1. I describe the nature of my research and the way I perceived the role of informants in the Rapid Rural Appraisal (RRA) approach that I used (Section 2.2). The data collection methods are discussed in Section 2.3 of this chapter. The data I collected were qualitative, hence I analysed them using the appropriate techniques, which are discussed in Section 2.4.

### 2.1. Social constructions of whale hunting

Social construction is the way a certain person or group perceives an issue based on their language and concepts (Kuper and Kuper, 2004). The way a person/group views a particular topic/issue will be different from the view of another person or group that has not been raised or exposed to the same belief system or tradition as the first person/group. As perception is the result of one's understanding of the world, the truth for one tradition may not be the truth for another tradition (Berger and Luckmann, 1966; Denzin and Lincoln, 1994; Lewis-Beck et al., 2004).

Social constructionism (or the view of social construction) is the view that 'all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context' (Crotty, 1998, p. 42). There are two insights provided by social constructionism: 1) that only one interpretation is provided by the researcher, and 2) that the experience/phenomenon needs to be examined in the social context as well as from the researcher's perspective (Davidson, 2004). Some researchers question whether an 'objective' reality can be observed or reported (Lincoln and Guba, 1985). However, in this research I take the position that a researcher makes observations that can be construed as an assessment of a 'real' situation. Thus, the researcher would provide one

interpretation (per Davidson, 2004), which is as objective as possible, with minimum influence from his/her social construct.

Steinberg (2001) provides an interesting and amusing story to depict social constructionism in a simple example. In 1990, the container ship *Hansa Carrier* was exposed to heavy storms in Alaska, losing five containers of shoes produced by the Nike shoe company. As a result, 61,280 Nike shoes drifted away in the Atlantic on a two-year journey to the east coast of North America. Over the two years, more than 1,600 unmatched Nike shoes were found scattered on the beaches of British Columbia, Washington and Oregon. As these unmatched shoes were still wearable after being washed in warm water, several beachcombers swept the beaches to collect, match, clean and sell washed-up Nikes. By calibrating the shoe recovery data, the shoes also provided oceanographers with new information about the regional ocean currents. The 'shoes spill' also helped the Nike Corporation by providing the least expensive means of transporting Nike shoes to their costumers, although the Nike did not gain any profit. In the end, the customers also gained benefit from the spill, as they were able to buy relatively good shoes at a very low price.

The story above provides the social construction or perceptions of the ocean from several stakeholders/actors (Steinberg, 2001). For beachcombers, Nike costumers, and oceanographers, the ocean is a resource provider, i.e., providing them with cash, shoes and oceanographic data. For the Nike Corporation and the cargo company, the sea functions as a transport surface. The various views of how the ocean is perceived following a 'shoe spill' are basically social constructions of the ocean. The perspectives of the ocean from the Nike story are consistent with traditional perspectives of humans and the sea, i.e., the sea as resource provider, transport surface, in addition to battleground (Steinberg, 2001).

In this research, I use a social constructionist view to explore perspectives about traditional whaling in the Savu Sea region. Being the most apparent (but not necessarily the biggest)

issue for conserving marine mammals in the Savu Sea, traditional whaling will be discussed further in Chapters 3, 4, 5, 7 and 8. I will explore the way several groups perceive traditional whaling in Lamalera, by including the opinions of the villagers, government and other stakeholders that I obtained during my fieldwork. My initial concerns were about the impact of traditional whaling on marine mammal conservation. However, as will become apparent, my research resulted in a more comprehensive assessment of the impact of traditional whaling, as well as identifying other anthropogenic threats that may be of greater consequence. The different perceptions of traditional whale hunting of various stakeholders are important to understand, as they will influence possible management schemes for marine mammals in the region. Determining the breadth of the issues concerned with marine mammal conservation in Eastern Indonesia required a qualitative research approach, and hence I chose Rapid Rural Appraisal as explained below.

### 2.2. Rapid Rural Appraisal (RRA)

Previous studies of whale hunting in Lamalera and Lamakera have largely been from an anthropological rather than from a management perspective. There is little literature about the hunt apart from Barnes (1996 and 2005) and the account of the Lamakera Expedition Team (1996). There has been no research conducted in Lamalera and Lamakera regarding cooperative management or involving representatives of local communities in dialogue about natural resource management, especially with regard to marine mammals.

Because of this information gap, I decided to use RRA (Rapid Rural Appraisal) in this research. Developed in the early 1980s, RRA is conducted as the earliest scoping process for an area with inadequate information or work of any kind about a particular issue, in this case natural resource management. RRA is a method of understanding a certain rural condition in a cost-effective way, conducted in a relatively short period (Beebe, 1988; Chambers, 1988). It is a trade-off between the costs and accuracy of the information obtained (Chambers, 1988). RRA is an iterative process (Grandstaff and Grandstaff, 1988; Kashyap, 2005), necessary and

relevant in the initial phases of a project (i.e., project identification, preparation and appraisal), as well as in the later process of project implementation, monitoring and evaluation (Chambers, 1988). The process of RRA is equal to 'voyages to uncharted seas where direction and steering will change with new soundings and sightings' (Chambers, 1988, p. 34).

RRA is essentially a multi-disciplinary mixed methods approach (Beebe, 1988; Neuman, 2003; Kashyap, 2005) that accepts that there will be varying perspectives on an issue, i.e., RRA implicitly accepts that views on issues are socially constructed. During my fieldwork, I used three main characteristics of the RRA approach (Chambers, 1988; Grandstaff and Grandstaff, 1988; Kashyap, 2005):

1. *Triangulation*: Using many (usually at least three) information sources to validate the information obtained. I usually conducted triangulation to confirm certain information that I received from an informant, by asking two or more additional informants about the same subject, or by conducting stakeholder meetings.
2. *Rapid and progressive learning*: As a result of the 'exploratory and iterative nature of RRA', a better understanding of the issue usually leads to new questions and challenges which need to be explained. This iterative approach is also characteristic of the qualitative data I collected during my research, and will be further explained in Section 2.4.
3. *Learning from, and along with, local people*: Crosschecking with the locals is important to avoid misunderstanding. In addition, their involvement in such a project should increase their sense of ownership and acceptance. For instance, I conducted six village-level meetings to confirm my findings in Lamalera and Lamakera.

RRA also accepts Anthony Giddens' concept of 'human agency' (Rose and Scheepers, 2001), i.e., the ability of people to transform with or without the guidance of their governments or agencies. Humans always possess some capacity to change, however little this capacity is

(Rose and Scheepers, 2001). This notion is important for the success of community participation in conservation programs, which is a component of the aim of this research (Chapter 1 Section 1.3).

In the early 1990s, RRA evolved into PRA (Participatory Rural Appraisal), i.e., 'a growing family of approaches and methods to enable local people to share, enhance and analyse their knowledge of life and conditions, to plan and to act' (Chambers, 1994a, p.953). The participatory nature of PRA allows local people to take a greater part in the appraisal process, increases the chance of researchers/facilitators 'handing over the stick to the locals', and eventually let the locals take self-action. RRA also facilitates participation in data collection, although not in decision-making the way PRA does. Whilst the RRA approaches depend more on the outsiders (researchers), PRA emphasizes the process of empowering local communities to eventually take self-action. Therefore, the sense of ownership associated with RRA methodology is not as high as that produced by PRA.

However, as my research was a preliminary/scoping assessment, PRA was not the appropriate approach to use. I had no rapport with the locals, or access to a preliminary analysis of Indigenous knowledge of whale hunting and threat analysis as required for an appropriate PRA process and I could not offer the promise of influencing any proposed management plan. Nonetheless, I tried to be as participatory as possible during the RRA processes I conducted in the Savu Sea region of Eastern Indonesia.

As stated previously in Chapter 1, Japan proposed a motion at the 54$^{th}$ International Whaling Commission (IWC) Annual Meeting about the whaling activities conducted by non-IWC member nations such as Indonesia. Japan's opinion that 'all non-member countries taking whales should join IWC as the body responsible for managing the whaling industry' (IWC, 2003, p. 24) may put Lamalera's traditional whaling activities in question in the future. Hence, I hoped that this research would be a starting point of a participatory process in the

Savu Sea region to analyse threats to marine mammals for the benefit of the local marine mammals and Indigenous Peoples. I hope that in the future there will be enough research conducted to determine the sustainable level of whale hunting in Lamalera.

The final result of my research is a set of management options for marine mammals in the Savu Sea region. It will be up to the Islanders and other stakeholders involved either to accept, modify or reject these options. Should they decide to accept or modify my results, the use of a PRA approach would be appropriate to further develop marine mammal management plans for the Savu Sea in particular and Indonesia in general (see Chapter 7 and 8 for recommended follow up processes).

### *2.2.1. Preparation and process for RRA in Savu Sea*

I conducted RRA in Lamalera village and Lewoleba township in Lembata Island, Lamakera village in Solor Island, the town of Larantuka in the Regency of East Flores, the town of Kalabahi and Kepa Island in Alor, the southern Ti region in Rote Island, and Kupang in West Timor. To have a better understanding of the issues mentioned in Section 1.3 Chapter 1, I interviewed not only the villagers, but also the local governments in the local administrative regions I visited.

During my research I was accompanied by two members of the WWF (World Wide Fund for Nature) Indonesia, Mr. Widodo Prayitno and Mr. Zakarias Atapada, who assisted me as members of my team. As the Solor-Alor Islands is one of WWF's working sites, their role was to collect additional data on whale and manta ray hunting in Lamalera and Lamakera, as well as to observe the fieldwork and adopt the results for possible work in the future. Both WWF officers have worked for various community-based conservation initiatives since 1997, hence I am confident of the validity of the information they collected.

I did not contact any officials in Lembata Island or Solor Island prior to my arrival, but I obtained a letter of approval from the Indonesian MMAF (Ministry of Marine Affairs and Fisheries) in Jakarta. Upon my arrival, I gave copies of the letter to local government agencies and village leaders. Once I finish my thesis, I will provide the stakeholders mentioned with a summary of my results in Indonesian.

In an attempt to answer the research questions in Chapter 1, I formulated a series of open-ended questions (see Appendix 3 for example of questions) designed to lead to other questions during the data collection. I also asked several closed-ended questions (such as 'how many crew members are there in your hunting boat?', 'how many whales do you usually catch per year?', or 'what is the population of this village?'), to obtain relevant specific information. Although traditional whaling was the major starting point of this research, as the fieldwork continued, more potential anthropogenic threats were revealed, making the extent of traditional hunting as a major threat for marine mammals questionable. Chapters 4 and 5 will explain more about traditional whaling in Savu Sea and its possible impacts on marine mammals in the region.

The participants were selected purposively (Chambers, 1988; Neuman, 2003). That is, those people who were perceived to be knowledgeable about the issues concerned were consulted. The objective was to provide insights into and understanding of marine mammal issues. As my research objective requires descriptive answers, this study was based on qualitative data analysis following Ezzy (2002). The qualitative analytical approach I used is discussed further in Section 2.4. As qualitative analysis does not quantify the data obtained with statistical analyses, the number of respondents/interviewees in this research was not fixed. However, it was important for me to collect as much data as possible, both to represent different stakeholders/situations and to ensure data quality (See Section 2.4.3). The mixed methods approach used in RRA contributes to its validity and reliability (Beebe, 1988; Chambers, 1988; Neuman, 2003). I interviewed a total of 61 individual informants during my

fieldwork in Savu Sea, plus six key stakeholder informants in Jakarta and Bandung. Apart from two interviews in Lamalera (Lembata Island) and one interview in Lamakera (Solor Island), I did not need regular interpreters for my research, as most of my informants spoke the Indonesian national language (*Bahasa Indonesia*), which is my first language.

### 2.3. Field data collection

I spent a total of 86 working days in data collection, including meetings with local and national government officers. The major phases of my data collection were as follows:

1. Phase one: April 29, 2004 until May 16, 2004; early data collections in Lamalera and Lamakera
2. Phase two: June 3-18, 2004; additional data collection in Lamalera and Lamakera, presentations of the results to the communities and local government agencies
3. Phase three: July 13 until August 2, 2004; visit to Alor and Rote
4. Phase four: August 12-21, 2004; additional data collection in Lamalera and accompanying the MMAF (Ministry of Marine Affairs and Fisheries) cetacean research team
5. Phase five: September 20-25, 2004; data collection in Jakarta, meeting with several government officers
6. Phase six: December 20-25, 2004; additional data collection in Lamalera, Jakarta and Bandung (West Java)

Despite my ability to speak the same national language as my informants, I still encountered some communication gaps. There were some occasions that required me to modify my questions, such as when I talked about threats to marine mammals in the region (see Chapter 4: Threat Analysis). The concept of 'threat' was often beyond the comprehension of the people with whom I talked. When I asked questions such as 'In your opinion, what are the threats for whales in your hunting areas?' - the fishermen would refer to conditions that put

their lives in danger; such as when the whale dragged the *paledang* (traditional paddled boat of Lamalera), causing it to sink, or when a whale fluke slapped the *paledang*, etc.

Prior to my arrival in the field, I didn't expect to encounter such perception bias. Thus I had not thought of another way of approaching the 'threat' problem, until I realised that the villagers perceived 'threat' differently to me. I then tried to rephrase the questions to other formats, such as 'Are there any kind of long line fisheries operating nearby? Do you have any problems with them?' Such probing questions had the potential to limit the answers to the specifics of my questions. Thus, some of the threats I identified were not those perceived by fishermen/hunters, but based on my observations. There were no threats identified by the villagers that I did not also recognise. The methods I used to collect the field data are observation, individual and group interviews, all part of the RRA research approach (Chambers, 1988; Neuman, 2003). These methods are discussed below.

### *2.3.1. Observation*

During my fieldwork, my team conducted many direct observations. Observation is a method for obtaining first hand information by exploring, watching and recording the local conditions (Beebe, 1988; Chambers, 1988; Bunce et al., 2002). My team and I carried out observations during our first days in the field as well as throughout our interactions with the locals. Our direct observations verified the information we obtained from informants as well as providing information additional to that provided by informants (such as the meat drying processes or non-whaling livelihood, e.g., weaving or carving). In the process of conducting the observations, I also became more acquainted with the local people in the villages. The villagers offered to allow me to participate in their hunting activities by joining the *paledang* (traditional boat). However, the accident rate of *paledangs* during whale hunting is high. For the safety of the non-waterproof field equipment and myself, I chose to hire a *jonson* and observed the *paledang* from a safe distance. The decision also helped me obtain better photographs of the fishermen and *paledang* in action.

I conducted observations during the early days of my fieldwork to gain impressions and direct information about the local environment. For this purpose, I used a small but safe fisherman's boat (*jonson*, or motorised boat, named after the 'Johnson' outboard motor), a camera, a GPS and binoculars. For identification of marine mammal species, I used the *Guide to Marine Mammals of the World* by Reeves et al. (2002) as well as the *Smithsonian Handbook of Whales, Dolphins and Porpoises* by Carwardine (2002).

I observed three whale hunts during my stay in Lamalera (5 May 2004, 12 June 2004 and 16 August 2004). All occurred when the sea was calm and the fishermen were not going to the church or engaged in cultural-related ceremonies (such as marriage or funerals). However, I did not witness whales being hunted or killed, so I cannot report direct observations on whale hunting processes. My observations were mostly of the hunting procedures and ceremonies. I also learned that marine mammals are the most important food source for the villagers (they did not attempt to catch fish at all during the hunts, even though there were no whales caught).

### *2.3.2. Semi-structured interviews*

Semi-structured interviews were the main data collection method used for this research. The semi-structured interview is an interview conducted following a series of open-ended questions or discussion points (Grandstaff and Grandstaff, 1988; Bunce et al., 2002; Ezzy, 2002), as opposed to a fully structured formal interview with a pre-defined questionnaire format (Grandstaff and Grandstaff, 1988). Semi-structured interviews are also one of the two methods of in-depth interview (the other one is unstructured interview, Yates, 2004). In-depth interviews focus on obtaining an elaborate and accurate understanding of the perceptions and opinions of the informants.

Occasionally, I found that the qualitative information obtained from semi-structured interviews led to other questions I had not yet identified. This on-going process is also noted by Grandstaff and Grandstaff (1988), as interviewers in semi-structured interviews often do not design and phrase an exhaustive list of questions prior to the interview. Such information expanded my focus of interest, giving more depth to my research.

Nonetheless, the semi-structured interviews have their weaknesses. The data obtained cannot be analysed statistically with confidence. In addition, the method is also time-consuming, requiring commitment from informants and patience from interviewers (Chambers, 1988; Bunce et al., 2002). I was also aware that the data I collected might not represent the opinions of the majority, and that my informants might only give me information they thought I wanted to hear, hence resulting in bias. For instance, it occurred to me that the Lamalera villagers might only say that they supported conservation (hence taking only as many whales as they need to survive), whereas actually they do not give whale conservation any priority. However, I eventually concluded that the Lamalera informants do care about nature conservation (including whales), as long as they are allowed to continue their subsistence whaling (see Chapter 4 for further discussion about whale hunting and conservation).

Variants of semi-structured interviews include key informant interviews, group interviews and household interviews (Beebe, 1988; Chambers, 1988; Grandstaff and Grandstaff, 1988; Bunce et al., 2002). For the purposes of my project, I used the first two variants. Key informant interviews are interviews conducted with individuals, usually elders and leaders, considered to be able to give more in-depth information as a result of their social position, experience or knowledge (Beebe, 1988). As these interviews were individually based, the data derived from a key informant were not always representative of the perceptions of the whole community. To remedy this deficiency, I also conducted group interviews.

Group interviews are interviews carried out with a specific type of informant, such as fishermen, housewives or elders (Beebe, 1988; Chambers, 1988; Morgan, 1988). The main advantage of this method is better access to a larger body of knowledge and variability of opinions, mutual checking among the participants, as well as avoiding social conflicts in a society which forbids individual members from telling a blunt truth (Beebe, 1988; Chambers, 1988). Group interviews should be separated from focus groups, as they have different goals. Although focus groups also comprise various individuals of homogenous or heterogenous groups, they are more facilitative than group interviews (Brown, 1999). Focus groups allow more interactions and group dynamics among participants that eventually lead to more information than group interviews. In focus groups, researchers usually take the role of facilitators in contrast to acting as interviewers for group interviews. Usually focus groups are done in the PRA (Participatory Rural Appraisal) context, to obtain knowledge of participants' aspirations and opinions on certain issues that will contribute to the whole assessment and decision-making processes.

As my research was an early scoping process, I used group interviews rather than focus groups. On several occasions, my individual interviews transformed into group interviews as some neighbours joined the conversation between the informant and myself. Samart (1988) noted that this commonly happens during interviews. I also conducted two group interviews with fishermen (during their leisure time on the beach) and housewives during the weekly market in Wulandoni. Later, I validated the data in village meetings, another form of group interview.

Usually, I did not tape my interviews with key informants, as I feared it would distance me from them. Based on my previous conservation work involving communities in Indonesia from 1997 to 2003, I was concerned that informants would think that the interview was such a formal occasion that they had to be careful with the answers. In addition, when people who are not used to taped-interviews are being interviewed, they have a tendency to think about

their answers too long, to be too careful and not relaxed enough. Those aspects might also hinder the interview process. Hence I just talked with my informants while taking detailed notes. I conducted taped interviews only with village leaders and government officers who were more comfortable with this more formal interview format. I also taped the meetings with the villagers and government representatives (local and national level). I received consent from all my informants to use their names in this thesis as per the requirements of the JCU Human Ethics Approval No. H1748.

From the interviews I was able to understand the social construction of marine mammal management in the Savu Sea, i.e., what do particular stakeholders (villagers, government, etc) think of whale hunting in Lamalera. I will discuss this further in Chapters 3, 4, 7 and 8. I was also able to gain information about early settlements in Lamalera and Lamakera, the taboos associated with baleen whales (for Lamalera), and other historical information. Most of these stories were told by elders who were not fluent in the Indonesian language, thus I asked other locals to act as translators. I refrained from asking difficult questions of such informants such as the questions about threat identification, thus I encountered no problems or loss of key information during the translation processes.

## 2.4. Qualitative research, sampling and analytical methods

### *2.4.1. Qualitative research*

As explained above, my research in the Savu Sea was a scoping and early assessment project, an attempt to understand the basic and essential knowledge of the villages that will be useful for further participatory research. Hence, most of the data obtained were qualitative rather than quantitative, in order to ascertain the breadth of the social construction of the issues under consideration. There are two major branches of social studies: qualitative and quantitative (Neuman, 2003). Whilst quantitative approaches emphasize quantifiable data and standardised analyses, qualitative approaches explore data hidden in words, actions, symbols, or images. Qualitative approaches tend to be more iterative, and often do not follow a straight

or precise line of logic, as I found during my fieldwork. My sequences of analysis often changed over time, depending on the field conditions. I learned a lot during the data collection and modified my original ideas accordingly. Qualitative data analysis is also an 'interpretive task' (Ezzy, 2002). Thus, the analysis in this thesis is my interpretation, not the perception of the whole community with which I interacted. However, I also conducted several validation techniques to ensure data integrity (see Section 2.4.3.). I started the qualitative analysis as early as possible; in this case after the collection of my first data/interview from the fieldwork in May 2004.

The validity of qualitative research cannot be measured using the standards of quantitative research (Goodrick, 2005), e.g., by quantifying the correlations between each research component. Instead, it is directly related to the sampling methods and data integrity. During my fieldwork, I had to make sure that my sampling method was appropriate and that the data I obtained had minimal bias as explained below.

### *2.4.2. Sampling methods*

Qualitative analysis research focuses on elaborating the breadth of the issue rather than how many people see an issue in a particular way. Thus, I used purposive non-random sampling following Bunce et al. (2002), Ezzy (2002) and Neuman (2003). The point about purposive sampling is to sample people who are familiar about the phenomenon in question, i.e., traditional whaling. I tried to produce a great range of information by sampling knowledgeable informants with different opinions and points of views about traditional whaling and marine mammals. The great variety of informants is an essential component of RRA (Beebe, 1988). I used snowball sampling and sampling to redundancy during my fieldwork.

#### *2.4.2.1. Snowball*

Following Bunce et al. (2002) and Neuman (2003), I asked people who had been interviewed for the names of additional potential interviewees. In the end, my samples resembled an interconnected network. This sampling method is particularly useful in small communities like Lamalera (Lembata Island) and Lamakera (Solor Island) where most people know each other.

However, people tend to recommend names of people with similar views to themselves. In Lamalera for instance, my team detected underlying socio-political differences. Thus I was aware of the possible information bias that I received. So I did not ask directly for the names of people from different views. Instead, my team and I listened to various informal conversations in the village to determine the socio-political divisions in Lamalera. From that informal assessment, we then met people of different views separately, and thus avoided the possibility of confronting and perhaps exacerbating the existing social fractures.

*2.4.2.2. Sampling to redundancy/Saturation*

Morse (1995) defines saturation as 'data adequacy', and stresses that in qualitative research, the richness or variation of information is more important than the frequency of information. In other words, 'saturated data are rich, full and complete. The resulting theory makes sense and does not have gaps' (Morse, 1995, p. 149). The rule of thumb of this technique is to keep interviewing people until there is no new information obtained, or the data are saturated (Kuzel, 1999). This point is when the researcher should stop the data collection.

Ezzy (2002) noted that the cost of this technique is in the larger sample size and types of sampling units (e.g., family, fishing groups, etc), and, of course, considerable time is usually required before saturation is reached. However, saturation was relatively easy to reach in Lamalera (1,700 people – see Chapter 3 Section 3.1) and Lamakera (737 people – see Chapter 3 Section 3.2). To illustrate this saturation, I individually interviewed at least 31 people in Lamalera and 6 people in Lamakera in approximately 40 days, all who are knowledgeable on

the issue of traditional hunting and marine mammals. These sample sizes are very small proportions of the populations of the villages (1.82% for Lamalera and 0.81% for Lamakera). However, the number of informants is not the major component in qualitative research as long as the informant is selected purposively (Patton, 1990) and the data represent the community's perception (Kuzel, 1999), as happened in Lamalera and Lamakera based on the village meetings and other triangulations I conducted. In addition, the villagers of Lamalera had been exposed to many researchers before (mostly sociologists or anthropologists). I encountered no obvious resistance to my research.

### *2.4.3. Data integrity*

Checking data integrity is very important to ensure data quality (Ezzy, 2002; Bunce et al., 2002). I usually checked my interpretations with my informants and the communities (during the six village meetings) to ensure that my interpretation was not distorted. I also conducted peer reviews with my team members in the field to ensure data quality. I explain the techniques I used for data checking below i.e., triangulation as well as field data analysis and community workshop.

#### *2.4.3.1. Triangulation*

Triangulation is a process which provides a better understanding of an issue by looking at it from several points of view (Neuman, 2003). I used triangulation of measures, i.e., combined several methodologies to cross check the information I gathered from interviews (semi-structured interviews, oral histories) with field observations, research and consultations with community, government and other stakeholders. This approach is built into the RRA process as mentioned by Chambers (1988) and Grandstaff and Grandstaff (1988).

I also considered the informant's veracity, i.e., whether he/she was telling the truth or not. A good informant should be able to say 'I don't know' if he/she did not know the answer to a question. One way of determining informant veracity is to ask two types of questions. The

first question I asked was common knowledge, such as ‘”What does the dugong/whale eat?” or “Can you tell me the difference between a dolphin and a dugong?” The answers to such questions could be derived from traditional ecological knowledge, a result of years of observation. However, I also asked several questions that would be hard to answer without western scientific knowledge, such as “How long is the gestation period of a dugong?” or “How old is a sperm whale when it dies?” The veracity of informants that pretended they had an answer to the second type of question was questionable. However, I did not tell such people that they might not be appropriate informants. I simply did not use the detailed information that they gave me. For instance, there was one case when an informant told me that killer whales fed on plankton. As that information was not scientifically correct, I did triangulation with other informants about other information he gave me (I did not give out his identity) to find out if he was knowledgeable in other areas. My triangulation proved that this specific informant only lacked of detailed bio-ecological knowledge, but was knowledgeable about other matters, such as the whale hunting tradition. After other triangulations, I then disregarded all his information about traditional ecological knowledge, but used his non-biological information in my research.

Another example of the importance of triangulation was when I received information about a possible oil/gas source in southern Lembata. The villagers in Lamalera informed me that a few years back some university researchers went to southern Lembata to conduct an analysis for possible oil/gas exploration. The villagers pointed out a possible deposit of natural gas off Lembata Island. Later on I did research in Jakarta and Bandung (West Java) to investigate the issue from the perspective of several people in the Indonesian Oil and Gas Company (*Pertamina*) and the Bandung Institute of Technology (ITB – *Institut Teknologi Bandung*). It turned out that the gas was not natural gas, but a hydrothermal deposit. I also asked if the government planned to utilise the hydrothermal source, but the respondents said no as the quantity was insufficient. Thus, I have not included the exploitation of this hydrothermal deposit as an activity to be discussed in Chapter 4 as a possible threat to marine mammals.

This bias of information was not necessarily misperception on the part of the villagers. Misinformation (or no information exchange at all) between government officers and villagers often occurs in remote areas in Indonesia, and may have occurred in this case.

*2.4.3.2. Field data analysis and community workshop*

It was crucial for me to conduct verification during my data collection to reduce bias in my research. I carried out regular checks with other informants and direct observations to maintain data quality. I also asked the opinions of local people about my interpretations. This activity was very important, not only to reduce bias, but also to gain a sense of belonging and to maintain future relationships with local people.

Following Ezzy (2002), I started qualitative analysis as early as possible; in this case after the collection of my first data/interview in May 2004. Such analysis was important to review the processes I used and make my research an adaptive learning process. I conducted data entry, review and coding as soon as possible after each interview finished (further information about coding is available at Section 2.4.4.2). I also established routine meetings with my team and local partners to discuss up-to date findings.

I conducted stakeholder workshops to verify the data obtained in the middle of the process as follows: two community workshops each in the villages of Lamalera A and Lamalera B, plus two community workshops in the village of Lamakera. My aim was to present my preliminary results and to gain further comments and input for the final data analysis. I included the analysis of threat, potential conflicts, map of the hunting grounds and several management options in my presentations. The community involvement process described above is also called ‘Consultation and Public Participation or CPP’ (Bisset, 2000). Many countries require the use of CPP in their laws and regulations for natural resource management because of

several driving factors, including the decentralization movements and influences of NGOs and multi/bilateral agencies. The fact that good CPP usually improves the chance of subsequent actions succeeding was also a consideration.

### *2.4.4. Analytical methods*

#### *2.4.4.1. Data analysis*

Neuman (2003, p. 411) described data analysis as 'a search for patterns in data – recurrent behaviours, objects, or a body of knowledge'. As a result of the nature of my data and the research objectives, I used thematic analysis to analyse the data obtained in this research.

Thematic analysis is a type of analysis that 'allows categories to emerge from the data' (Ezzy, 2002, p. 83) as the result of coding. In thematic analysis, coding is 'the process of identifying themes or concepts that are in the data' (Ezzy, 2002, p. 86). Thus, I sought themes within the data and analysed them. I did not determine the themes prior to my research or data analysis; they emerged during the analysis process.

#### *2.4.4.2. Coding system*

An appropriate coding system is very useful to reduce and categorise themes to make data more manageable (Neuman, 2003). The coding process helped me obtain information faster rather than examining and reading through the raw data. Coding is a 'process of identifying themes or concepts that are in the data' and can be 'as simple as writing notes in the margins of books and articles' (Ezzy, 2002). Based on Ezzy (2002) and Neuman (2003), I followed three steps in coding: open, axial and selective as described below. Appendix 4 explains all the codes I developed based on the manual coding and Nud*ist VIVO (Nvivo) version 1.1, software specifically developed for qualitative data analysis. I did not always use all the codes explicitly in the passages, but I used them as reminders of aspects to discuss in this thesis.

2.4.4.2.1. Open coding

I conducted the open coding as soon as I obtained my first data from interviews in the field. I used open coding to identify and name each line/paragraph with certain codes, decided after the interview was complete. As Neuman (2003) stated, this process retrieved themes hidden in the data and gave me insights into the ideas behind my data. I first typed all the interview transcripts and notes, then printed them out and made notes at the page margins. Those notes were my first open codes. Examples of open codes are 'electricity, water, road, phone', 'barter tradition', 'commercial display', 'artisanal fisheries', 'commercial hunting', 'quota' and 'alternative livelihood' (see Appendix 4 for all the 114 open codes).

2.4.4.2.2. Axial coding

The second phase of analysis inside the data began as I started reading through the open coding notes and began to see the interconnections among the themes I identified. I further categorized all existing themes into several major themes that interacted with one another (see Appendix 4 for all the twelve axial codes). My main focus was to find major themes and their interconnections. In my research, the axial codes are among others 'Lamalera' (from open codes 'electricity, water, road, phone' and 'barter tradition'), 'threats' (from open codes 'commercial display', 'artisanal fisheries' and 'commercial hunting') and 'management options' (from open codes 'quota' and 'alternative livelihood').

2.4.4.2.3. Selective coding

I examined all the major themes identified to find several central themes. The coding processes finished as it reached saturation, i.e., there were no new codes or themes retrieved from the data (Ezzy, 2002). I reached this phase in preparing the presentations and reports I made for the communities, government officers, other Indonesian stakeholders and funding agencies. My involvement in several conferences also helped refine the major themes and central themes of this thesis. Later I confirmed the themes using Nvivo software (results in Appendix 4) and used them for discussions in the rest of the chapters. The three central

themes of my research are ‘marine mammals and people in Savu Sea’, ‘threats’ and ‘management options’. I use the first central theme mainly in Chapter 3, the second theme in Chapter 4, and the last theme in Chapters 5, 6, 7 and 8.

### 2.5. Summary of methods

To summarise, this research was informed by a social constructionist approach. Because there were few data available concerning cultural values and hunting of marine mammals, RRA (Rapid Rural Appraisal) was used as an early scoping stage to identify Indigenous knowledge and threats to marine mammals. Data collection was conducted using semi-structured interviews and observations. As the data are qualitative, I used triangulation to ensure data validity. I also conducted thematic analyses and coding to analyse the qualitative data. I use all the themes that emerged as topics to discuss threat analyses and management options in the next chapters explicitly as well as implicitly. I will also discuss the social constructions or perceptions of whale hunting culture by several stakeholders (villagers, governments, NGOs, etc) that are important to the development of an Indonesian marine mammal conservation plan. In the next chapter, I will focus on the situation of traditional whaling in the Savu Sea region. Chapter 4 will identify more clearly the different social constructions of whaling and marine mammal conservation issues in the region.

# III. THE SOCIAL CONTEXT FOR MARINE MAMMAL HUNTING IN SAVU SEA

In this chapter, I discuss the four major locations of my research: Lamalera village (Lembata Island), Lamakera village (Solor Island), Alor Islands and Rote Island. The focus will be the social context for marine mammal and human interactions in those areas, especially the whale hunting culture in Lamalera.

## 3.1. Lamalera, the whaling village

### *3.1.1. The village, the people and the whale*

#### *3.1.1.1. Lamalera and its villagers*

The island of Lembata is approximately 190 km north of Kupang, the capital of East Nusa Tenggara Province, located in West Timor (Figure 3.1). It is approximately 80 km long and 25 km at its widest and has an area of 1,358 $km^2$. Lamalera is a small village on the island. Since before Indonesian independence in 1945, Lamalera has been divided into two sub villages, called Lamalera A (A = *atas*, Upper Lamalera) and Lamalera B (B = *bawah*, Lower Lamalera). The village is administered as part of the Wulandoni District of Lembata Regency, in the East Nusa Tenggara Province of Indonesia. About 1,700 people inhabited this village in 2004 (Lamalera A = 898 people, Lamalera B = 798 people).

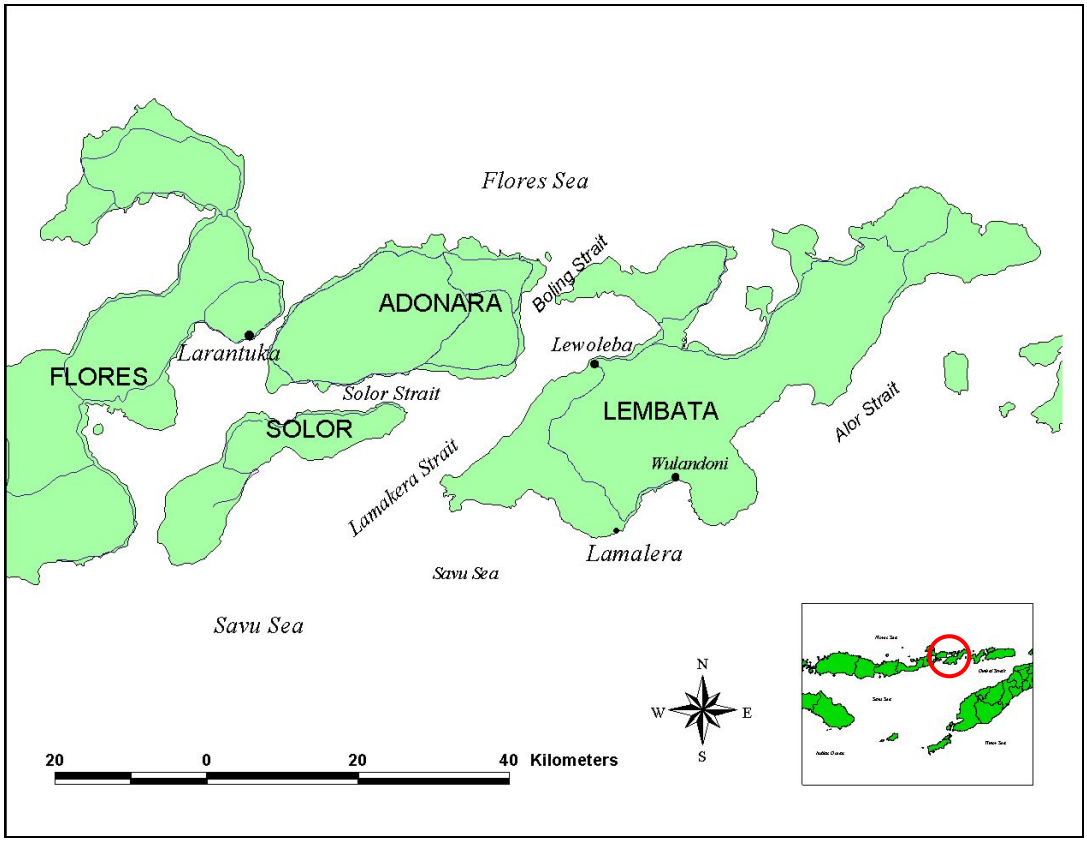


Figure 3.1. Lembata Island

Most people in Lamalera came from outside Lembata (Barnes 1996). They arrived in several phases. Most of the ancestors came from the Kingdom of Luwuk (now in the Province of South Sulawesi) during the reign of the Java-centered Majapahit Kingdom in the XV century (Figure 3.2). Apparently following the Indonesian Throughflow (see Figure 1.2.), and after visiting Maluku Islands, these people settled in two small islands north east of Lembata called Lapan and Batan. When these islands were temporarily affected by a high tide (possibly a tsunami), the inhabitants were forced to migrate to southern Lembata.

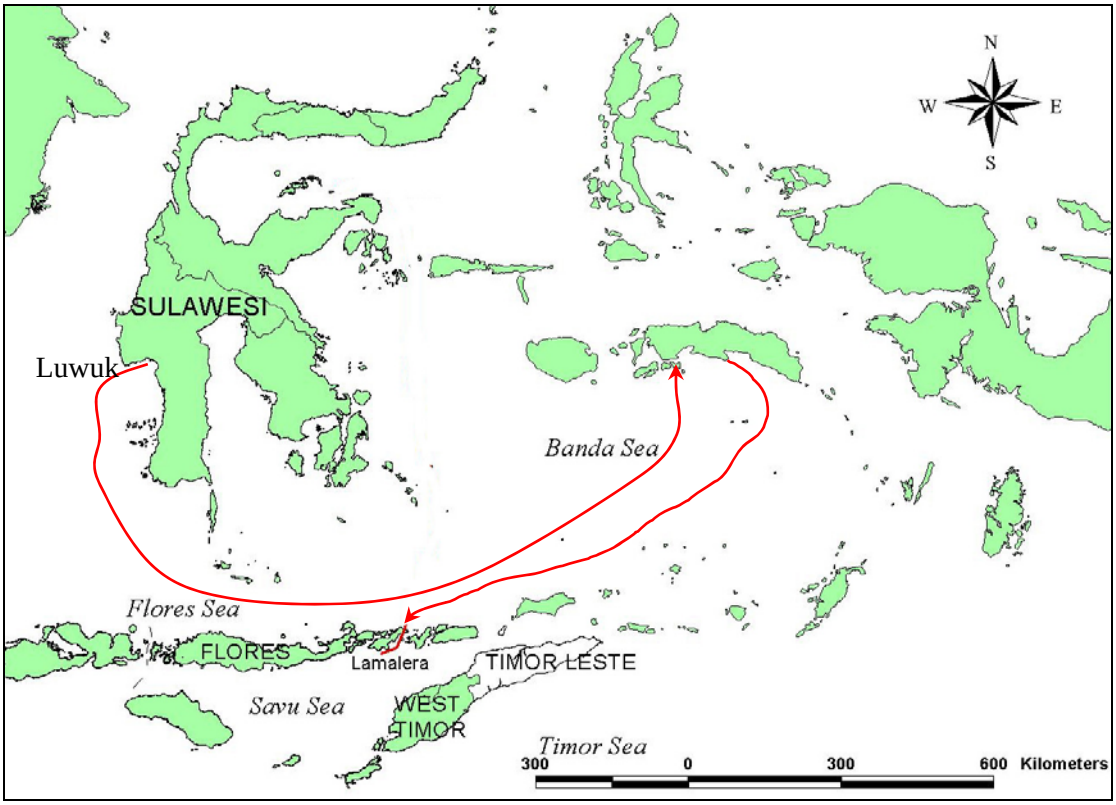


Figure 3.2. Migration map of early settlers in Lembata
as told by Mr. Petrus Hidang from Lamalera

Even though the whole village practises Catholicism brought by Dutch missionaries in 1886, the Lamaholot (the name the people of Lamalera call themselves) also practise their ancestral customs. Fifteen clans inhabit Lamalera A and B. Each clan has its own customary house (*rumah adat*), boat house (*najeng*) and main rope for hunting (*tale leo*). I explain the importance of these customary symbols in Section 3.1.2.

The Regency of Lembata is a newly established regency under the authority of East Nusa Tenggara Province, Indonesia. It was established in 2001 as a result of the emerging spirit of local autonomy. Before this, Lembata was governed by the East Flores government, based in the old town of Larantuka (Figure 3.1).

As this regency is still developing, infrastructure such as electricity, fresh water and road networks are still being established. In 2004, electricity was only available for 4 hours per day

(6 pm – 10 pm) in Lamalera. This supply was initiated and funded by local villagers. There were no electricity or phone lines to the village from the capital of Lembata (Lewoleba) in 2004. However, Purnomo (2005, *pers.comm*.) reported that the Lamalera village had enjoyed continuous supply of electricity in mid 2005. In 2004, there was a satellite telephone for public use, but it was often inoperable. Fresh water is available from the mountains, pumped down with separate pipes for each village. Nonetheless, the water supply is inadequate for the whole population. Lamalera A has a better water system. Thus its fresh water supply is more adequate than that of Lamalera B.

Three vehicles supply daily transport between Lamalera and Lewoleba; they leave Lamalera at 5:00am and arrive in Lewoleba at 9:00am. The same vehicles return to Lamalera at 12:00pm on the same day, arriving at 4:00pm. The 35km road is mostly unfinished, rocky and sandy. In the past, people had to walk for the whole day to travel from Lewoleba to Lamalera. In 1989, Father Dupont of the Catholic missionaries bought a 4WD station wagon car that remained one of the main means of public transportation for Lamalera.

The Lamalera economy is based on irregular income from tourism (souvenirs, home stays, boat rent for tourists) and seasonal work in Lewoleba (construction workforce). Like other East Nusa Tenggara women, Lamalera women are specialised in making *ikat* woven fabrics with whale hunting themes (e.g., whales, traditional paledang, etc). These designs are unique to Lamalera and cannot be found outside the village (see also Barnes (1996)). Once, I even asked a lady to make me a dugong-themed long sash based on a scientific picture, and she copied the image exactly. Sashes are sold from AUD$ 10 to AUD$ 20 per piece while the woven fabrics are usually sold from AUD$ 40 to AUD$ 70 each. However, such income is not regular enough to secure their livelihood.

Although there are small shops that provide instant noodles, batteries, mineral water, snacks, and personal amenities, the people of Lamalera do not have a market in their village.

To obtain their daily grocery needs, they have to go to Lewoleba (daily market) or to Wulandoni (weekly market – Figure 3.1). Water-based transportation is available to the Wulandoni market (approximately 10km northeast of Lamalera) during the weekly market day every Saturday (Figure 3.1). It takes one hour to reach the market by boat. Previously, the trip to the market took 1.5-2 hours on foot. People still walk nowadays, especially when the sea is rough. Every Wednesday, a boat travels directly from Lamalera to Larantuka (Flores Island).

The arid and rocky land of Lamalera prevents the villagers from growing many crops apart from cassava and '*kelor'* (*Moringa oleivera*), a native tree with very small edible leaves. The villagers obtain most of their vegetables during their weekly visit to Wulandoni market in the capital of Wulandoni district (Figure 3.1). The inlanders often go to Lamalera on Sundays to sell their vegetables and fruits. The people of Lamalera can also travel to Lewoleba in the morning to buy vegetables and other daily needs, and return in the evening.

Sperm whales (*Physeter macrocephalus*) and manta rays (*Manta birostris*) are the main source of protein for the people of Lamalera. In addition, they catch various small cetaceans (including the killer whale (*Orcinus orca*), short-finned pilot whale (*Globicephala macrorhynchus*), spinner dolphins (*Stenella longirostris*)) and very occasionally dugongs (*Dugong dugon*). Small rays other than manta rays and flying fish (*Cypselurus heterurus*) are an additional source of protein. The villagers rarely catch other fish species because they do not have access to appropriate gear, and because of their reluctance to change their fishing practices. I will discuss this further in Chapter 7. In addition, the villagers raise chickens and pigs for special occasions. Dog meat is sometimes served as an additional source of food.

Overall, Lamalera is an isolated village. Food security is a big issue, mainly because of the villagers' high dependency on whale meat and the lack of sustainable alternative food

sources. Both issues – food security and isolation – need to be considered when designing management options for whale hunting.

*3.1.1.2. The sperm whale*

Lamalera's main hunting target, the sperm whale (*Physeter macrochepalus*) is the largest odontocete (toothed whale) in the world. Sperm whales have been one of the main targets for modern commercial whaling that started in the 19$^{th}$ century. The over-exploitation of the sperm whale has resulted in this species being classified as vulnerable to extinction (IUCN 2003). The latest estimation of the global sperm whale population is 355,200 in 1999 (Whitehead 2002). The sperm whale is listed in Appendix I CITES, which means that commercial international trade in specimens of sperm whales is prohibited (CITES 2004). Trade may be authorised under exceptional cases, e.g., for scientific research, and hence requires export/import permits.

The sustainable harvesting level or PBR (Potential Biological Removal) is "the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population" (Wade and Angliss 1997). The PBR is estimated as the product of the minimum population estimate ($N_{min}$), half the maximum net productivity rate (0.5 $R_{max}$), and a recovery factor ($F_r$). Although it is known that the maximum productivity rate for a sperm whale population with stable age structure is 0.9 % p.a. (Whitehead 2003) and the recommended recovery factor is 0.1 (threatened stocks) (Wade and Angliss 1997), the lack of an estimate of population size makes it impossible to estimate the PBR for sperm whales in the Savu Sea and adjacent waters.

One of the reasons the sperm whale has such a low maximum productivity rate (see Whitehead 2003), is that it is slow to mature. According to Whitehead (2003), the sperm whale's calving interval is every 3-6 years, after a gestation period of 14-15 months. Lactation

takes approximately 18 months, although some calves suckle until they are 2 to 13 years old. The mother and calf can travel up to 35,000 km per annum during their migration. None of the Lamalera fishermen knew these facts. Although they understand that whales are not fish, their lack of knowledge of the whale's reproductive cycle often leads them to perceive whales as ordinary fish with frequent reproductive cycles and rapid recovery rates. Thus, the villagers have little understanding that even low levels of hunting may contribute to a local population decline. This situation is understandable, given their lack of access to western scientific knowledge.

### *3.1.2. The hunting tradition*

#### *3.1.2.1. The beginning*

The people of Lamalera have allegedly hunted sperm whales since their arrival in the village. The first European record of Lamalera was a Portuguese document dated 1643 (Barnes, 1996). This document is evidence that the whaling tradition has been practised for at least 460 years. Although the British and American whaling fleets roamed the area around the early 19$^{th}$ century and often visited Timor (Kupang and Dili), Barnes (1996) did not find any records of notable contacts with the Lamalera people. The only physical evidence that the Lamalera had of western whaling in their area was the two harpoons found in the dead body of an enormous whale back in the 19$^{th}$ century.

Mr. Agustinus D. Kedang, the Head of Wulandoni District suggested to me that the ancestors of Lamalera from the Luwuk Kingdom were sea hunters skilled in using harpoons to hunt fish. When they arrived at the Lapan and Batan Islands northeast of Lembata, these hunters saw another more interesting hunting target: the whales. Thus they started to learn how to hunt whales with harpoons using the skills they brought to Lamalera, a tradition that has persisted until the present time.

I asked the fishermen why they preferred to catch whales rather than the more usual fishing targets (such as reef and pelagic fishes). They advised that one whale would be sufficient to feed the whole village for more than a month, whilst fishes would feed only their family in one day. The fact that their whale catch record was declining did not reduce the fishers' interest in hunting whales. They prefer to wait for a big whale to hunt once a month than to go out fishing on a daily basis. They also prefer to buy fish from Wulandoni fishermen that often go to Lamalera to sell fish rather than catching fish themselves. The money for buying fish also depends on Lamalera's income from whale meat; hence increasing Lamalera's dependency on whales.

*3.1.2.2. Traditional ecological knowledge of the marine mammals*

Berkes (1993) described Traditional Ecological Knowledge (TEK) as "a cumulative body of knowledge and beliefs, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment". Modern scientists often use TEK to help understand the biology of species of importance to traditional cultures, such as bowhead whales (Freeman et al., 1998; Freeman, 2003) and beluga whales (Huntington 2000) in Alaska.

However, my research in Lamalera uncovered little TEK that is relevant to marine mammal management. When I showed the villagers pictures of marine mammals, most of them recognized that sperm whale (*Koteklema*), killer whale (*seguni*), pilot whale (*temu bela/lumba-lumba besar*), dolphins (*temu*) and baleen whales (blue whales/*lelangaji* and other rorquals/*kelaru*) are found within their sea country. Dugongs (*juru*) are rarely seen, except occasionally in the southwestern and southeastern parts of Lembata Island, where seagrass beds occur. In addition, fishermen occasionally spot dugongs in the northern part of the island where seagrasses are abundant.

When I asked about their ability to sex marine mammals, the fishermen admitted that such identification was difficult. They can only differentiate between males and females after they have caught the target species – on the basis of the presence or absence of female mammary slits. The killer whale is the only species that the fishers can sex prior to capture, based on the straight tall dorsal fin of the male and the lower curved dorsal fin of the female. Modern scientists also use this method for identifying the sex of *Orcinus orca* (see Reeves et al. 2002).

The Lamalera fishermen identify the sperm whale by its angled blow and a baleen whale by its straight blow. Sperm whales have a tendency to struggle and dive deep during the fight with the hunters. This behaviour alarms the Lamalera traditional hunters, as on many occasions their boats have sunk during their battles against sperm whales.

Although the people of Lamalera know that sperm whales are available all year round, they do not know the geographic origins or destinations of the whales. They observe that sperm whales often go east-west or west-east, and 'play around' a bit in the bay before continuing their journey, a habit which makes it easier for the fishermen to find the pods the day after the sperm whales are spotted. The villagers claimed that they were certain to see another whale once they saw a whale. This situation is not true for killer whales, as they travel straight east-west or west-east without hanging around in the bay. This behaviour makes killer whales more difficult to catch than sperm whales.

In addition, in recent years the people of Lamalera have been interacting with many tourists (mostly foreigners who understand biology and environmental issues). The villagers may have learned information from the tourists that has shaped their knowledge about whales and issues related to commercial whaling in other countries. Although the traditional ecological knowledge of Lamalera about whales is not very advanced, continuous interactions with tourists have made the Lamalera villagers well informed with basic issues of commercial

whaling and concerns about whaling versus animal welfare (i.e., some of the tourists voicing their objection on the 'bloody' whale hunting practice).

*3.1.2.3. Indigenous knowledge of hunting*

The people of Lamalera name two seasons of the year. They call the dry season (May-September) *lefa*; the wet season (October-April) *baleo.* The primary whale-hunting season is in *lefa*. Yet, if they spotted whales during the wet season, they bring (*ba*) the boat rope (*leo*) into the boat and chase the whales. They often shout '*baleo*!' for whale sightings during the wet season, and thus the wet season is named after this cry.

The principal Lamalera hunting ground is in Lobala Bay in front of their village (Figure 3.3). Every August they hunt as far west as Lewotobi in East Flores for dolphins and manta rays (where they meet the people of Lamakera from Solor island), and every October they go east to Pantar Island for dolphins. Nowadays however, the younger generation considers Pantar too far from their village. Thus they rarely go to Pantar anymore for hunting, even though they have *jonson* motorised boats. Figure 3.3 also depicts potential areas of conflict between Lamalera and Lamakera as is discussed in Section 3.2.2.1.

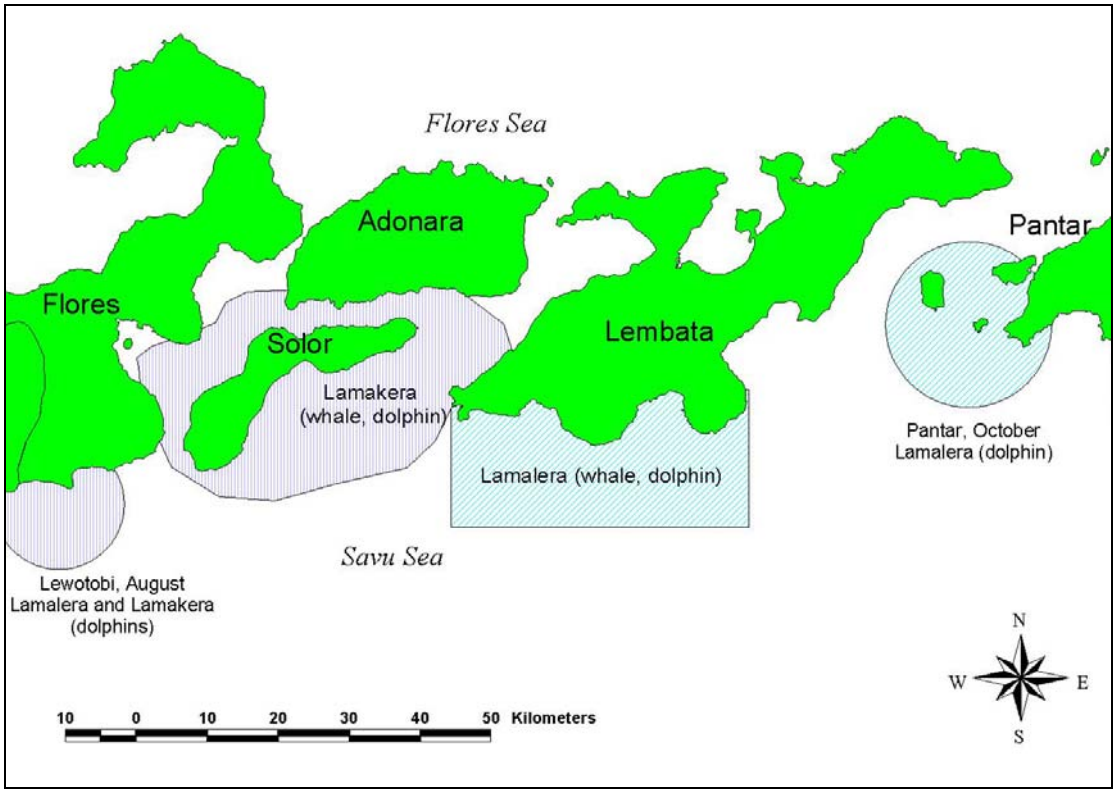


Figure 3.3. The traditional marine mammal hunting grounds of Lamalera and Lamakera as confirmed by the communities in both villages

In the narrow sandy beach of Lamalera (only 2 km stretching east-west), there lie many *paledang* (traditional boats with sails and paddles and no engines) and *jonson*, each owned by a certain clan. I counted a total of 20 *paledang* (A = 8 and B = 12) and 18 *jonson* (A=12, B = 6), for both Lamalera A and B. In addition, the villagers of Lamalera A had 26 smaller boats, while those from Lamalera B had 10, plus one small speed boat that seemed not to have been used for a while when I was there in 2004. All clans in Lamalera have several *paledangs* of their own (although certain individuals own the *paledangs* rather than the whole clan). The clan called *Ebaona* is the exception to this pattern. According to Mr. Arnoldus Guma Ebang, the ancestors of this clan arrived in Lamalera with a *sampan* (small wooden boat), and have never owned any *paledang* since that time.

The fishers of Lamalera only use *paledang* to hunt whales. They can only catch whales with *paledang* and do not hunt whales outside the southern waters of Lembata. The *paledang* is a

sacred boat; if it is damaged during the hunting, the hunters are forbidden from fixing the boat outside their village. Thus they do not hunt far from southern Lembata, in case the boat is damaged during the hunting. An exception to this practice occurs when the boats are dragged away from Lembata by the whale being hunted. Thus, they can either choose to continue hunting outside their ancestral waters, or return to Lamalera for safety purposes.

The Lamalera fishermen catch dolphins, rays and other marine life using *jonson*. There are no restrictions about repairing *jonson*. They can repair these boats anywhere outside the village. Hence the fishermen use *jonson* to go to Pantar and Lewotobi for dolphin and manta ray hunting.

a.

b.

Figure 3.4a. Paledang of Lamalera (traditional sailing boat without an engine)
Figure 3.4b. Jonson in Lamalera (with outboard engine, without sail)

The people of Lamalera adhere closely to their customs (*adat*). In addition to the *paledang*, their other sacred places are the boat-house (*najeng*) and customary house (*rumah adat*). Both these places are used to discuss the success/failure of the previous hunting season and the possible reasons, the faith of an ill person (whether God will take his life or not), as well as many other *adat* issues.

Every May 1st the Lamalera villagers hold a mass on the beach, to celebrate the opening of the *lefa* season. The ceremony is called '*Buka Lefa'* (*Buka* means 'to open'), and the mass is referred to as *Misa Lefa*.

The sequence for Buka Lefa is outlined below:

- April 29: All clans gather together to discuss the result of the previous season and the prospects for the coming season.
- April 30: The villagers conduct mass on the beach at night commemorating those who were killed during hunting activities in the previous whaling seasons. This ceremony is called Misa Arwah (*arwah* means 'soul').
- May 1: The beginning of *Lefa* season. At the morning mass on the beach, the priest blesses the main hunting rope (*tale leo*) and sprinkles holy water on all *paledang.* The main boat (*Doni Nusa Lela*) goes sailing first to seek guidance from the ancestors at sea. If the boat spots any whale, other boats will follow directly. If not, others will wait until the following day to start hunting.
- May 1 afternoon: a gathering of fishermen, who have snacks and drinks to forgive and ask for forgiveness from each other for any mistakes made during previous years. They have a rule: no hunting before all problems and disputes are settled.

Every night before the first hunting takes place, land owners, elders and boatmen of any specified clan gather to pray to Mother Mary. They pray in front of the Mother Mary statue, *tale leo* and harpoon. This is an example of an evangelisation that Pope John Paul II (1985) called 'inculturation', i.e., 'the incarnation of the Gospel in native cultures and also the introduction of these cultures into the life of the Church'. Such practices happen in many Christianised cultures today.

The basic equipment on a paledang is a harpoon (*tempuling*), long bamboo pole to hold the harpoon, the main rope (*tale leo*) and hunting rope (*leo*). The harpoon for whale hunting is bigger than the ones used to hunt dolphins or rays. Each *paledang* is operated by a harpooner (*lama fa*), captain (*nahkoda*) and crew (*matros*). A *paledang* can take 10 to 15 adults per sailing trip.

The hunting sequence is outlined below based on my interview with Mr. Hendrik Keraf, the village leader of Lamalera A.

1. At the time to go hunting, all the fishermen walk out of the boat house and pray.
2. The boat sails out to the sea. All the crews begin to search for whales, by looking for blows, fins or other signs.
3. If any crew member sees a whale, the men put down the sail and pole (for safety in case the *paledang* is dragged by the whale). Then they start to chase the whale by paddling.
4. As they approach the whale (approximately 50 m), the fishermen say another prayer. Anyone can lead the prayer, but the harpooner is the one who should splash the harpoon with holy water (from the church). This inculturation practice only occurs during whale hunting. For non-whale hunting, it is not necessary to conduct this ritual.
5. About 10m from the whale, the *lama fa* gets the harpoon, puts it in the long bamboo pole, and jumps into the water to stab the whale. Often the whale will fight back, swim away or dive, thus dragging the entire *paledang* with it.

During the hunting, the crew hold the main rope at the *paledang*'s bow. As they get closer to the whale, they move the rope to the stern. The main rope is just symbolic and not suitable for whale hunting, as it is too small.

There are some taboos practised during sailing and hunting. Bad language is forbidden, and as stated above, problems and disputes should be solved before going to sea, otherwise they are

believed to affect the result. The hunters cannot mention names of places or people while chasing a whale. Barnes (1996) noted that the people of Lamalera changed certain words to conform to the taboo rules, such as changing the name of the sperm whale or their own names. The fishermen do not hunt on Sundays as Sunday is God's day. Thus for *lefa* 2004 the people waited until Monday, the first working day after May 1 (Saturday).

The people of Lamalera are not allowed to waste any meat from their catch. Thus they consider the behaviour of commercial fishers (who throw parts of the catch not considered valuable into the sea – see Zainudin (2005)) is a humiliation and will cause misfortune to the villagers.

Women used to be prohibited from participating in hunting and in hunting-related meetings. However, women visitors are now allowed to join the hunting, though no local women participate in such activities. Women interested in the hunting are mostly foreign tourists who want to experience the hunting first hand.

### *3.1.3. The importance of whale hunting to Lamalera*

#### *3.1.3.1. Spiritual and cultural aspects*

The people of Lamalera perceive whales as gifts from God. During the *Lefa* mass, the priest often cites parts of the Bible showing the relationship between Jesus Christ and the fishermen, and how He granted them sea with plenty of fish. The local people appreciate the whales as a gift for them to eat.

However, most Lamalera people do not consider most whales (and other marine mammals) as sacred or holy animals, i.e., they are not utilised or preserved for worship purposes. Baleen whales (*kelaru*) are an exception. Both Mr. Arnoldus Ebang and Mr. Petrus Hidang informed me separately that the ancestors of the Ebaona clan had trouble with their boat during their escape to Lamalera. A heavy storm struck their boat and threatened them with drowning.

Suddenly a baleen whale emerged by the boat. They held on to the whale until they reached Lamalera. To show their deepest gratitude, all the clans in Lamalera have pledged not to eat baleen whales ever since.

However, things have started to change in Lamalera. In July 2005, a research team from the Indonesian MMAF (Ministry of Marine Affairs and Fisheries) visited the village during a whale survey. They found out that in July 2005 the villagers caught a baleen whale (Purnomo, 2005, *pers.comm*.). Apparently the sperm whale catch for 2005 has been low, thus the villagers hunted baleen whales as well, despite the previous taboo on baleen whale hunting.

Sperm whale hunting is very important to life in Lamalera. When I explained that all whales are protected under the national law and thus commercial trade is banned, the people seemed to understand. But traditional hunting is another matter for them. In fact, it is almost a matter of life and death for them, as stated:

*"If the government forbid us to hunt the whales, we would rather die!"*

*(Hendrik Keraf, village leader of Lamalera A, 7 June 2005)*

*3.1.3.2. Socio-economic aspects*

Whale hunting plays a major role in the social and economic life of Lamalera. A successful hunting day calls for an unofficial celebration. As the dead whale is dragged to the shore, people start to divide the meat between everyone in the village. The biggest share goes to the boat owner as well as to the landlords. Now living in the mountains, the landlords are the leaders and traditional owners of Lamalera village. They lived in Lamalera before the majority of the clans arrived there. When the present Lamalera clans are believed to have arrived in Lamalera around the XV century, they met the landlords in the mountains and asked them to grant a piece of land (currently the Lamalera villages) for living. The landlords agreed, and in return the Lamalera villagers promised to give the landlords part of the whale head as well as the eyes and meat around the eyes (see Barnes, 1996).

Barnes (1996) also described an elaborate meat division system among the people of Lamalera. Basically, the whale is divided into three main sections: (1) the head, (2) the fore torso before the dorsal fin, and (3) the back torso including the tail. The head is for the harpooner (*lama fa*), the landlords and the boat crew as well as the villagers. The middle section of the whale goes to the boat crew, while the tail section goes to the corporation/clan.

Figure 3.5. Whale meat division system in Lamalera (picture by Benjamin Ebang)

As explained above, the Ebaona clan is the only clan without a paledang in Lamalera. Thus every *lefa* season the members of the Ebaona clan get their share of whale meat from their relatives who are married into other clans.

The people of Lamalera usually fry fresh whale meat and dry the rest of the meat using sunlight (see Figure 3.6). It takes more than one month for a block of meat (approximately 20 cm x 20 cm x 2 cm) to dry. The oil from the meat is collected and used for cooking and – in the past – lighting. The teeth are arranged as jewels and talismans. The whalebone is carved for souvenirs. The people of Lamalera also collect oil from the whale heart by frying it in a pan. This heart oil is different from whale meat oil in terms of usage and smell. The heart oil is less smelly and useful to treat ailments such as burns.

Figure 3.6. Drying meat and the whale oil (in the bucket)

The people of Lamalera and the adjacent villages are one of the few remaining barter communities in Indonesia. Barter traditions also occur in Bali, i.e., the barter practices in Nusa Ceningan, Sibetan and Plaga villages for material supplies (Kurnianingsih, 2004, *pers.comm*.) and barter for services that used to exist among the makers of *gamelan* (traditional Balinese musical instrument) in the town of Tabanan in Bali (Geertz 1963). In southern Lembata, the whale has played a major role in barter since ancestral times, when the people of Lamalera decided to barter their whale products for vegetables, fruits and other products from inland villages.

Not all whale meat is bartered with inlanders. In fact, the women of Lamalera keep whale meat as their food stock in case of harvest failure. The villagers of Lamalera barter whale meat and other marine products (salty dried flying fish, dolphin meat, manta ray meat) for banana, corn and other vegetables in the market of the Wulandoni district. The Wulandoni market is one of three barter markets still existing in Lembata Island (the other two are Labala and Atadei markets). The barter starts every Saturday at 10:30 am. Before this time, the villagers allow themselves to shop for other products with cash. Nowadays though, they sometimes sell one block of meat (typically but not always 20cm x 20 cm x 2 cm) for Rp

5,000 (less than 1 AUD). The need for cash income has triggered the commercialism of whale hunting.

I found another indication of commercial whale hunting during my first visit to Lamalera in May 2004. Apparently in February 2004, a Korean living in Jakarta (the capital of Indonesia) offered to buy whale meat for export purposes. He offered to buy the dried internal organs of sperm whales for Rp 5,000/kg (less than AUD 1) and dried meat for Rp 8,000/kg (slightly more than AUD 1). I will discuss this incident later in Chapter 5 (Threat Analysis).

Another example of the importance of whale hunting in the socio-economic live of Lamalera is the insertion of whale hunting themes in the village's weaving tradition as already stated in section 3.1.1.1. In addition to the irregular income this activity provides, the whale-hunting pattern has made Lamalera weaving unique among other weaving traditions in East Nusa Tenggara (see also Barnes (1996)).

Figure 3.7. A woman is weaving a whale-hunting patterned sash.
The design is unique only to Lamalera village

### *3.1.4. Dolphin and dugong hunting*

Although the sperm whale is the major target of hunting in Lamalera, smaller marine mammals are often targeted as well. The villagers also hunt pilot whales, killer whales, various dolphins, and very rarely dugongs. There is no specific hunting ceremony or meat

division system for marine mammals other than sperm whales. The Lamalera hunters use different harpoons and ropes to hunt small cetaceans, and such hunting is usually done from *jonson* (small outboard powered dinghies), instead of the traditional *paledang*. Dugongs however are rarely caught intentionally. Dugongs caught incidentally in fishermen's nets are eaten. I found no evidence that the dugong body parts were sold as ornaments or for traditional Chinese medicine in Lamalera.

### *3.1.5. Hunting catch records of Lamalera*

Figure 3.8 depicts the hunting catch record of sperm whales from 1959. Barnes (1996) compiled the sperm whale data from 1959-1995. Mrs. Udis Keraf and Mr. Franscisco Keraf (Lamalera school teachers), and Mr. Gorys Tapaona (fisherman) compiled the data from 1996 up to date.

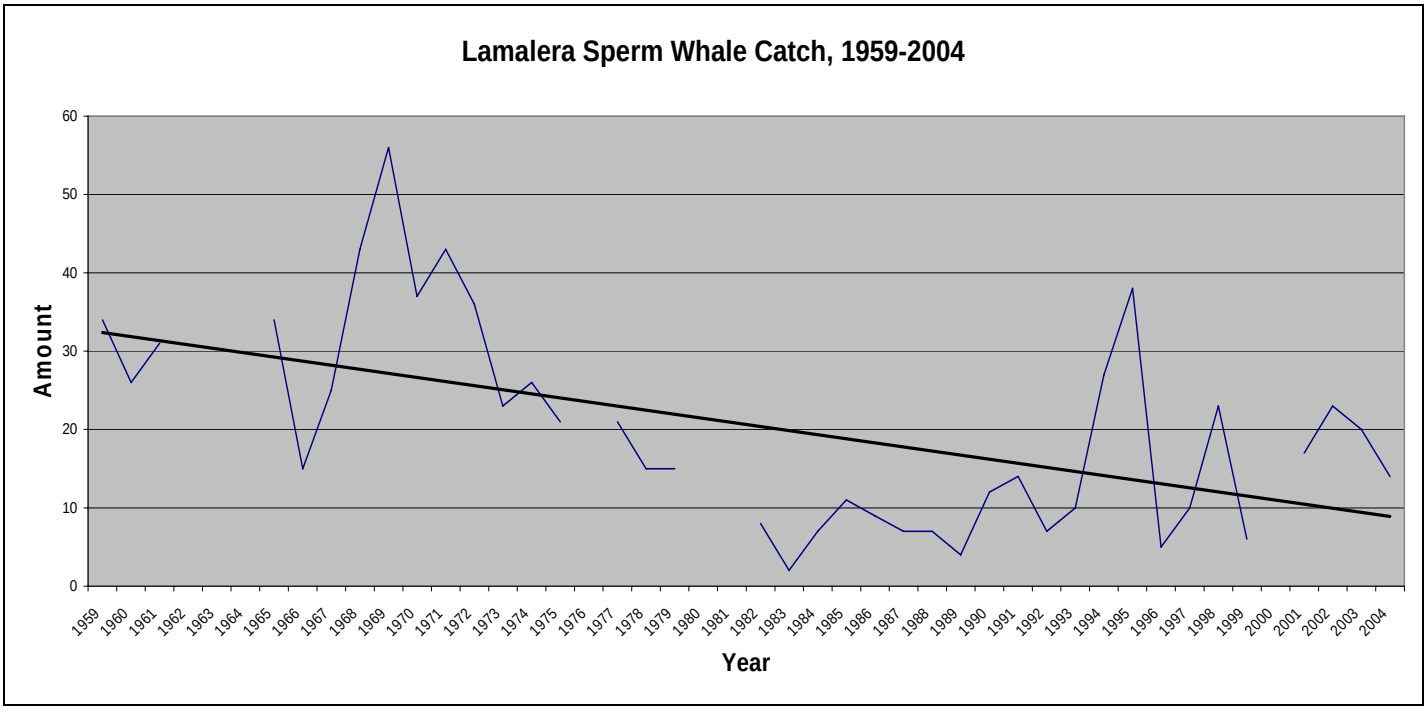


Figure 3.8. Lamalera Sperm Whale Catch 1959-2004
Source: Barnes (1996), Mrs. Udis Keraf, Mr. Franscisco Keraf (2004, *pers.comm.*) and Mr. Gorys Tapaona (2004, *pers.comm.*)

Figure 3.8 above shows that the annual sperm whale catch rate in Lamalera has declined from a peak of 59 whales killed in 1969. The fishers are aware of this decline. They do not know the cause of the decline, whether it is because of a change in effort, overharvest or other external factors. The villagers reported a change in the catch rate between the *lefa* and the *baleo* seasons. They used to harvest more whales during the *lefa* season, but in the last five years, more whales have been caught in the *baleo* season (Francisco Keraf, 2004, *pers.comm*.). However, seasonal catch data are not available to confirm this observation. The only seasonal data are for 2004, when only four sperm whales were caught in the *lefa* season (May-September 2004), compared with 11 sperm whales in the *baleo* season (January-February and December 2004).

From 1973-1974, the fishermen reported a substantial increase in the sperm whale catch in Lamalera because of the establishment of a FAO (Food and Agriculture Organization) program. In 1973, the FAO introduced alternative fishing methods in Lamalera, especially gillnets to catch fish and machine spear guns to catch sperm whales (discussion in Chapter 4). The introduction of the machine spear gun in Lamalera increased the sperm whale catch. The result was so overwhelming that "there was no more place in the beach to harbour the whales and cut them" (Beding, *pers.comm*. 2004). However, I found no catch records from the FAO whaling program.

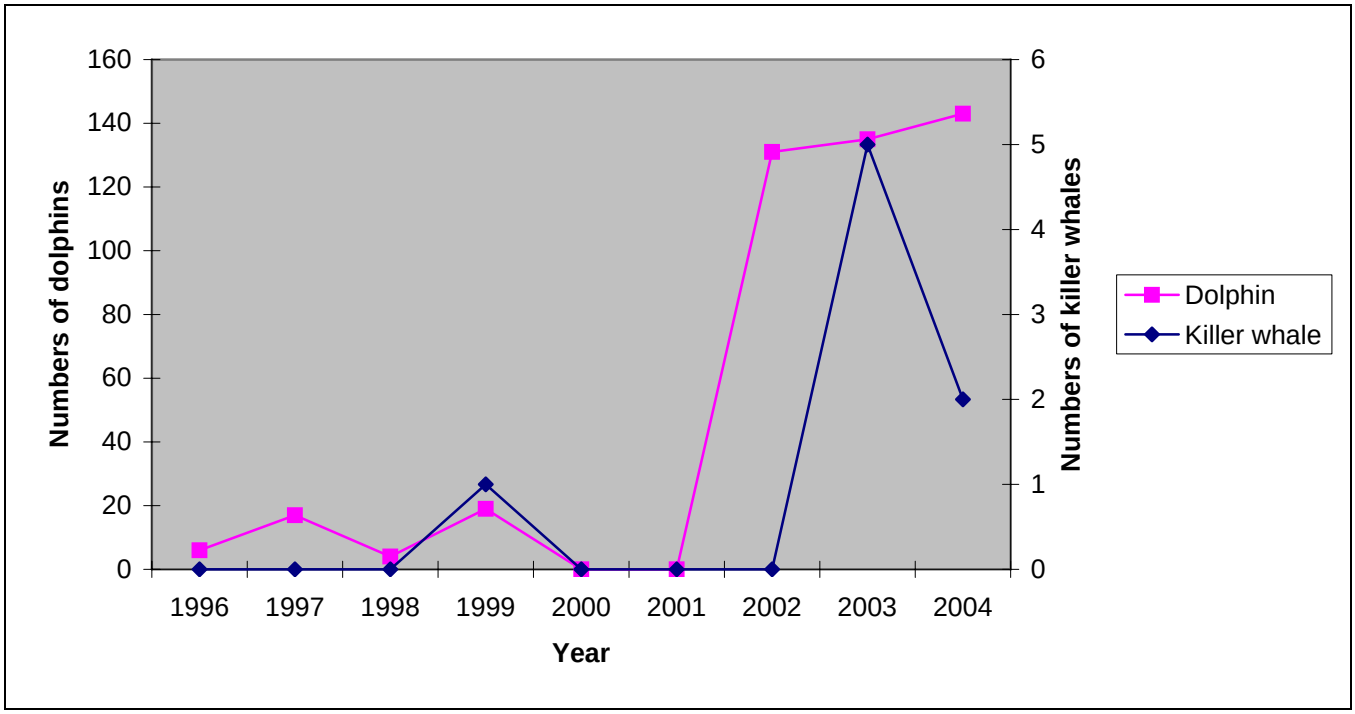


Figure 3.9. Lamalera Catch for Small Cetaceans 1996-2004
Source: Mrs. Udis Keraf, Mr. Franscisco Keraf
and Mr. Gorys Tapaona (personal communications)

I could only find records of the Lamalera people targeting marine mammals other than sperm whales since 1996 (see Figure 3.9 above). In the records I compiled from Mrs. Udis Keraf, Mr. Franscisco Keraf and Mr. Gorys Tapaona, small cetacean species are not differentiated, except for the killer whale (*seguni*). All other cetaceans including pilot whales are recorded as '*temu*' (dolphins). I did not find any records of dugong hunting, perhaps because dugongs are rarely seen, and thus any catch was limited to artisanal by-catch rather than direct take.

The catch rate of dolphins in Lamalera between 1996 and 2002 was quite low, with a maximum of 20 dolphins per year. The catch rate has increased substantially since 2002 with more than 130 dolphins being caught per year. Although the fishermen admitted that this increase was due to the 'low catch' for whales in those years, the whale catch rates after 1995 were actually higher than those reported in the 1980s. There are no data on the small cetacean catch prior to 1996, thus it is hard to see the trend over the years or the cause of the apparent sudden increase in the small cetacean catch. Nonetheless, the increase in catch effort

illustrates the importance of marine mammals in the food of Lamalera people; they still prefer to catch small cetaceans than reef fishes.

It is also possible that the increase in dolphin catch correlates the increase in Lamalera's human population, in addition to the decreasing sighting of great whales. Although Barnes (1996) said that there was no significant increase on Lamalera human population, there was a 42.02% increase in 25 years from 1,197 people (1979) to 1,700 (people (2004), or an average of 1.68% increment per annum. The number is higher that the annual population growth of Lembata (1.64%) and Indonesia's current population growth of 1.49%, both from the 2000 Indonesia Census (BPS 2001).

In addition, Februanty Purnomo (2005, pers.comm.) reported that the Lamalera fishermen killed two killer whales in February and June 2005, as well as a false killer whale (Pseudorca crassidens) in June 2005 and a short finned pilot whales (Globicephala macrorhynchus) in July 2005. Again, this data emphasizes the importance of marine mammals for the villagers of Lamalera.

In 2003, the villagers began to record the sex of the whales and dolphins they caught. So far there is no resistance to such recording efforts. The villagers themselves initiated the recording; a mechanism that will be useful in the long-term management of marine mammals in Lamalera. The data are accessible to all interested stakeholders.

### *3.1.6. Issues to be considered in Lamalera*

Whale hunting in Lamalera can be classified as 'subsistence hunting'. Subsistence in this case has the same meaning as in subsistence fisheries, where 'the fish caught are shared and consumed directly by the families and kin of the fishers rather than being bought by middle-(wo)men and sold at the next larger market' (FAO 2005). Although the Lamalera women sell whale meat to the Wulandoni market, their priority is the immediate food supply for their family.

A more specific definition of 'subsistence/aboriginal whaling' is that of the International Whaling Commission (IWC), i.e., 'whaling, for purpose of local aboriginal consumption carried out by or on behalf of aboriginal, indigenous or native peoples who share strong community, familial, social and cultural ties related to a continuing traditional dependence on whaling and on the use of whales' (Donovan 1983). The primary reason for subsistence whaling is to 'meet immediate nutritional and cultural needs'. According to this definition, Lamalera whale hunting falls under the category of subsistence whaling. The IWC would like to ensure that 'the risks of extinction to individual stocks (of whales) are not seriously increased by subsistence whaling' (Donovan 1983). This issue is not covered in my research because of the lack of a PBR estimate as explained in Section 3.1.1.2. Thus more elaborate research on the sustainability of whaling by the people of Lamalera is needed.

During my visits to Lamalera from May until August 2004, I perceived three major issues in Lamalera, in addition to whaling: (1) food security; (2) physical isolation; (3) low adaptability. The recent years have been difficult for the villagers of Lamalera, as they experienced a decline in their whale harvest. Their physical isolation and low ability to convert to more sustainable fishing resources has made them prone to malnutrition and even starvation. In March 2005, Lembata Island was exposed to a drought that brought famine to 31 villages (including Lamalera and Wulandoni) (Cal 2005). The drought reinforced the importance of food security in Lamalera. The villages of East Flores (from where the village of Lamakera is governed) (see Section 3.2), Alor (Section 3.3) and Rote (Section 3.4) also suffered the same drought (Fortuna 2005).

The people of Lamalera also have a low capacity for self-organisation that makes change difficult to implement. Although they strictly adhere to ancient rituals (such as in the whale

hunting tradition), they lack the ability to adapt to change, such as the recent reduction in whale sightings by reducing their whale hunting rate. They understand that they need an alternative food source, but do little to address the issue. They admitted this deficiency themselves during the meetings with GEF-SGP (Global Environment Facility – Small Grant Programme) in mid August 2004, which I attended as an observer. This capacity deficit needs to be considered when making the overall marine mammal management plan for the Savu Sea.

In addition, more research should be conducted on the migratory routes of marine mammals (especially great whales) in the sea country of Lamalera, as well as the probable genetic links with the stocks from neighbouring countries (Timor Leste and Australia). Such findings are important to determine the sustainable level of whale hunting in Lamalera. Anecdotal information from fishermen suggests that the whales migrate across the borders of Indonesia and Timor Leste (see Chapter 1).

### 3.2. Lamakera, the other whaling village

#### *3.2.1. The village and the people*

Lamakera is a village on Solor Island, between East Flores and Lembata Island, East Nusa Tenggara Province. It is governed as part of the East Flores Regency. Like Lamalera, Lamakera is divided into two sub-villages i.e., Motonwutun and Watobuku, Lamakera. Motonwutun is the only sub-village that hunts marine mammals and other marine megafauna such as sharks, manta rays and whale sharks. Watobuku is a typical fishing village, the inhabitants of which catch reef fish for their livelihood.

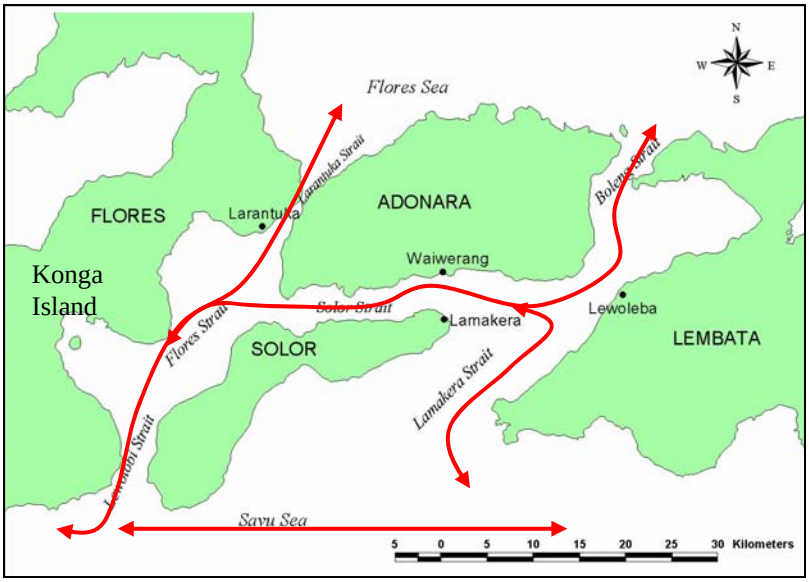


Figure 3.10. Migratory routes of baleen whales
as reported by the villagers of Lamakera

Most people in Lamakera originated outside of Solor Island, from the Sikka and Maumere regencies in Flores Island (Himawati et al. 1996). In 2004, Lamakera was inhabited by 737 people, all Moslems. There are seven clans in Motonwutun, however, they do not have customary houses or customary boat houses as in Lamalera. The people of Lamakera sold their last *paledang* (traditional paddled boat) to a Dutch buyer in the 1990s.

The infrastructure in Lamakera is basic. The ferry is used for inter-island transportation to Adonara, Flores and Lembata (Figure 3.10). The roads on Solor Island are mostly designed for motorcycles. Electricity is available for only 4 hours per day (6 pm – 10 pm). The supply was initiated and funded by local villagers. The government has installed electricity equipment in Solor Island. This equipment was not yet functioning during my visits in 2004. Public telephones are available. Fresh water is supplied from Adonara Island for drinking purposes. The water reserves on the island are brackish and used for bathing and cooking only.

### *3.2.2. Hunting tradition*

#### *3.2.2.1. Hunting targets and hunting ground*

There is no official record of when the people of Lamakera started hunting whales. However, the locals date their whale hunting from before the Dutch occupation in the early 17th century, suggesting that whaling might have originated about the same time as it did in Lamalera.

The Lamakera's main whale hunting target is the baleen whale (*keraru*) of the suborder Mysteceti, characterised by the baleen plates made of keratin growing from the outer edges of the palate in lieu of teeth. Baleen whales of the family Balaenopteridae - minke whale (*Balaenoptera acutorostrata*), Bryde's whale (*Balaenoptera edeni*), humpback whale (*Megaptera novangliae*), sei whale (*Balaenoptera borealis*), fin whale (*Balaenoptera physalus*), blue whale (*Balaenoptera musculus*) - are also called 'rorquals' (Carwardine 2002).

I was not able to ascertain the target species of the Lamakera villagers. The fishermen of Lamakera usually hunt smaller baleen whales, i.e., less than 10 m. Whales larger than 10 m are considered too dangerous to catch. I therefore doubt that the villagers hunt the blue whale (*Balaenoptera musculus* - lelangaji) because of its enormous size (blue whales can grow up to 27 m – Carwardine (2002)). It is also unlikely that they hunt humpback whales (*Megaptera novangliae*), which are rarely sighted in Indonesia. However, as the hunting target is not identified to species, it is possible that the fishermen occasionally hunt young baleen whales of larger species. The Lamakera fishers do not hunt sperm whales either because these whales are too large to tow with their boats (the body length of an adult sperm whale is more than 10 m – Carwardine, 2002). In addition, the Lamakera consider that baleen whales taste better than sperm whales.

The people of Lamakera also recognise sperm whales (*Lengali*), killer whales (*seguni*), dolphins (*lumba-lumba*) and dugong (*jurung*). The Lamakera villagers I interviewed often

expressed disappointment that the only recognized Indonesian whale hunting tradition is the Lamalera whale hunting.

Baleen whales are usually sighted during August and December, as 'the water gets cool', and this is the hunting season of Lamakera. The villagers pointed out areas where baleen whales are often sighted (Lewotobi Strait and Lamakera Strait – see Figure 3.10), that are currently crowded with inter-island ferry routes. The waters of Konga Island south of Larantuka (East Flores) apparently used to be a travel route for baleen whales. It seems, however, that the whales are seen less often now. The locals attributed this decline to the establishment of a pearl farm industry in Konga Island.

Like the people of Lamalera, the villagers of Lamakera have established hunting grounds for marine animals, including baleen whales. Figure 3.3 (Section 3.1.2.3.) shows the hunting grounds of Lamalera and Lamakera, including the overlapping area in Lewotobi (East Flores) where both groups go dolphin and manta ray hunting. This overlap sometimes causes disputes between the two groups of fishermen, as the people of Lamakera and Lamalera have different perspectives on hunting rights. The people of Lamalera do not target animals that have been sighted by other fishermen, while the people of Lamakera are more aggressive, chasing a target until they get it, regardless of whether they sighted it first. The villagers in Lamakera admitted that such competition seems less frequent now than in the past. It was not clear whether this reduction in confrontation is the result of more tolerance, or other causes.

*3.2.2.2. Traditional ecological knowledge of the marine mammals*

The fishermen of Lamakera have limited ecological knowledge of marine mammals. They asserted that they estimate the duration of a whale's dive and anticipate where it will surface to breathe; however they are unaware of the migratory routes of baleen whales, outside of the straits in the Solor Islands (Figure 3.10). The villagers also admitted that they could not differentiate the sex of baleen whales from a distance.

*3.2.2.3. Indigenous knowledge of hunting*

I found no evidence of any stories or beliefs about baleen whales or other cetaceans in Lamakera. However, there is a clan (Wudipukang) that forbids its members to consume dugongs. The ancestor of the Wudipukang is believed to have had an affair with a dugong; thus his descendants are forbidden to eat the meat. Anyone who dares to eat a dugong is believed to get an abscess in the stomach and die. This restriction is not applied to other clans in Lamakera. These clans are free to consume dugongs without consequences.

The fishermen of Lamakera do not maintain the traditions of marine mammal hunting like the fishermen of Lamalera. There is no sacred whale-hunting place left in Lamakera. Although the fishermen still use harpoons and ropes to catch a whale, modernized boats have replaced the traditional *paledang*. There is no ceremony conducted to open a hunting season, and no hunting rituals either. Lamakera fishermen used to place an offering in front of a harpooned whale, which had just been landed on the beach, but this ceremony has been discontinued. Marine mammals (baleen whales, dugongs, dolphins) are regarded as food sources, although the main food source is the manta ray. There are no hunting taboos apart from the Wudipukang clan's forbidding dugong hunting.

### *3.2.3. The importance of whale hunting in Lamakera*

*3.2.3.1. Spiritual and cultural aspects*

The spiritual and cultural aspects of whale hunting in Lamakera (Solor Island) are not as important as they are in Lamalera (Lembata Island). The discontinuation of ceremonies for marine mammal hunting has reduced the spiritual significance of the hunting.

Ambarwati Kurnianingsih (2004, *pers.comm*.) suggested that this changed practice results from the different beliefs and traditions of the peoples of Lamalera and Lamakera. The people of Lamalera had early contacts with Catholic missionaries back in 1886 (Barnes 1996) that

still allowed the continuation of certain mystical practices (i.e., inculturation – Paul II (1995)). On the other hand, the people in Lamakera had contacts with Muslim priests that discouraged mystical practices such as offerings and prayers for whale hunting. This situation resembles those on Central Java (Kurnianingsih, 2004, *pers.comm*.), South Sulawesi and Seribu Islands (north of Jakarta) (Hodjiah, 2005, *pers. comm*.). Many pagan rituals and practices have ceased to exist due to the influence of strong Muslim traditions, i.e., old pagan rituals and superstitions are considered *musryik* / *syirik* or blasphemy to the Almighty (Beatty 2001).

*3.2.3.2. Socio-economic aspects*

The villagers of Lamakera depend more on manta ray and shark products than they do on marine mammals. Whales and dolphins (and very occasionally dugongs) are supplementary catches only. Marine mammal products are mostly for local consumption. Generally, the whales are not sold to outsiders. On some occasions, however, outsiders can purchase the meat for between Rp 1,000 – Rp 5,000 (AUD 0.15-0.75) per piece (20 cm x 20 cm x 2 cm) and Rp 2,000,000 (AUD 300) per block (share-block as shown in Figure 3.11). The villagers also use the oil of baleen whales for medicine and cooking.

Whale meat is usually shared among the boat crew and the boat owner as well as villagers. Their system for sharing meat is less complicated than that of the Lamalera people, as shown below in Figure 3.11.

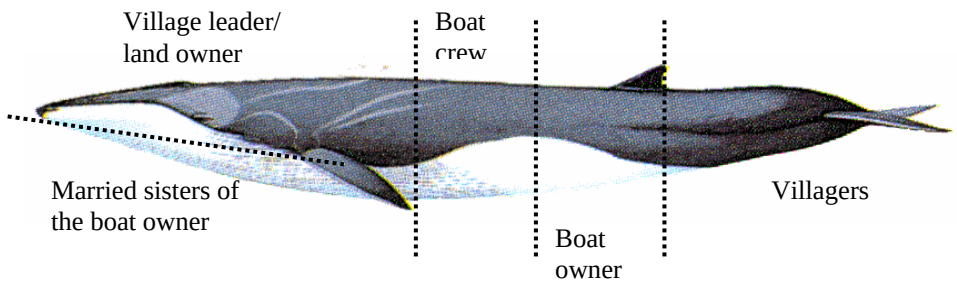


Figure 3.11. Whale meat sharing in Lamakera (Solor island) as depicted during the interviews and village meetings (whale picture taken from Carwardine (2002))

As the meat of baleen whale is not suitable for drying, the villagers usually eat the whale as soon as it is caught. The low quality of dried baleen whale meat is the reason for their low level of harvesting, despite the high enthusiasm for baleen whale consumption in the community.

### *3.2.4. Dolphin and dugong hunting*

Dolphins are sighted throughout the year in waters adjacent to Lamakera. Dolphin hunting takes place in all seasons of the year without sufficient information on species identification. The people of Lamakera eat dugong and dolphin meat (see Figure 3.11 for dolphin meat). They use dugong tears to cast spells or to hypnotise a person and make souvenirs out of dugong bones (Figure 3.13). They also collect killer whale teeth to make talismans (Figure 3.14).

Figure 3.12. Dolphin meat, taken in the village of Lamakera

Figure 3.13. Dugong bones (*Dugong dugon*), found in Lamakera

Figure 3.14. Teeth of killer whales (*Orcinus orca*), found in Lamakera

### *3.2.5. Hunting catch record of Lamakera*

The recording of baleen whale and manta ray catches started in 2002 when a group of scientists from WWF Indonesia and The Nature Conservancy came to Lamakera and asked village elder Mr. Muhammad Songge to record any catch for future analysis. The recording of the dolphin catch started in July 2004 after some WWF field officers and I revisited Lamakera for more information. These catch records are insufficient for further analysis. However, I understand that less than three whales are caught per year. Only one or two animals were caught in 2004. Although the villagers also caught dolphins in 2004, there was no record of the dolphin harvest, as the recording had just started. The manta ray catch in Lamakera was

high; a total of 415 manta rays were caught in 2003, confirming that hunting in Lamakera targets manta rays rather than marine mammals. However, I suggested to the villagers that the recording of marine mammal catch be continued, especially in anticipation of the increasing trend of dolphin hunting in Lamalera (Section 3.1.5).

## 3.3. Alor Island

### *3.3.1. The island, the people and the marine mammals*

*3.3.1.1. The island and the people*

The Alor Islands are located east of Lembata Island (Figure 3.14). Alor is a separate administrative regency (the Regency of Alor) from Lembata, consists of Alor Island, Pantar Island and the small islands in between. The Alor Islands are the easternmost islands of East Nusa Tenggara and share Ombai Strait with Timor Leste. Kalabahi is the capital of Alor.

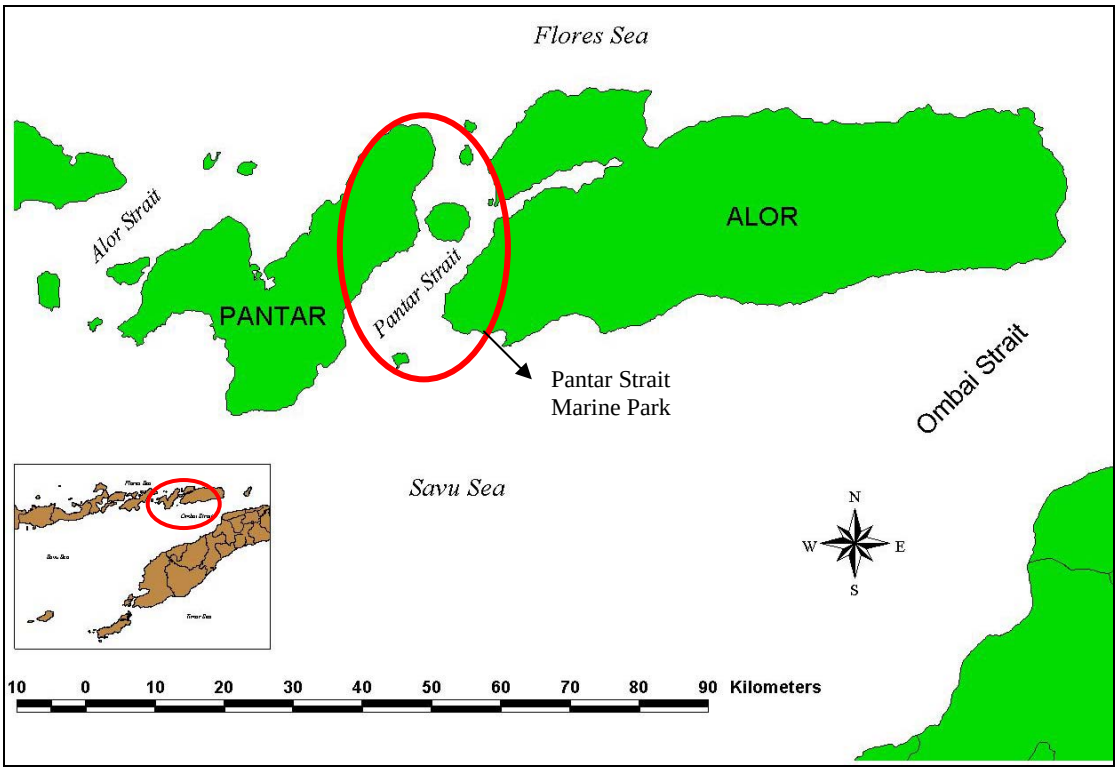


Figure 3.15. Alor Islands (Pantar Strait Marine Park is circled in red)

There were approximately 166,000 people in the Alor Regency in 2004 (KPU 2004). There was a 63.7% increase in the arrival of foreign tourists in Alor between 2001 and 2002, from 284 to 465 visitors (BPS-NTT 2005). Although this number is actually still small compared with other destinations in East Nusa Tenggara such as Manggarai in Flores (13,285 visitors in 2001; 13,625 visitors in 2002), the increase is very significant for an island considered remote prior to the independence of Timor Leste in 1999.

Increasing development in Timor Leste and Kupang has triggered further development in Alor. The Local Planning Board has planned a transboundary program with Timor Leste. It is not clear yet whether transboundary marine tourism is included in the program. However, the Local Tourism Agency has an interest in further development of marine tourism in Alor, especially for the diving and cruising industries.

There are regular ferries and daily flights to and from Kupang (West Timor) as well as speedboats to Dili (Timor Leste) to serve the increasing demand for easy travel to and from Alor. Two diving companies (the Grant Komodo of Komodo Islands and *Asmara Duyung Mas* or the Love of the Golden Dugong of Kupang) have established regular diving schedules in Alor in addition to other cruising companies such as the Jakarta-based Song Line Cruises. However, a recent earthquake in Alor (November 2004) devastated most of inland Alor and halted the diving and cruising activities for the foreseeable future.

Despite the language spoken by the Alorese being from the same linguistic family (Lamaholot) as the language spoken by the people in Lamalera, the Alorese do not have a marine mammal hunting tradition. Occasionally some people from Pantar Island hunt dolphins but not on regular basis (Van der Oord, *pers.comm.*, 2004). Most of the fishermen hunt more usual fishing targets such as reef and pelagic fishes. In addition, the local villagers have started to cultivate seaweed and pearl (GTZ-Promis 2005). Although the fishing industry is not yet the main income of Alor, future trade with Timor Leste may boost Alor fisheries.

*3.3.1.2. Marine mammals in Alor*

Alor is an important migratory route for marine mammals. Local divers have reported killer whales (*Orcinus orca*) in Pantar Strait (Figure 3.15) (Whitford, 2004, *pers.comm.*). Kahn (2003a) has witnessed several killer whales attacking a baby sperm whale (*Physeter macrocephalus*) in the waters south of Alor. Kahn (2003a) also noted the presence of endangered blue whales (*Balaenoptera musculus*) south of Alor. During my visit to Alor in July 2004, I observed groups of spinner dolphin (*Stenella longirostris*) in Pantar Strait between Kepa Island and Pantar Island (Figure 3.15). When I joined the research team of the Ministry of Marine Affairs and Fisheries (MMAF) in an Alor survey in the end of December 2005, I saw several more sperm whales, short-finned pilot whales (*Globicephala macrorhynchus*), false killer whales (*Pseudorca crassidens*), melon headed whales (*Peponocephala electra*), and Fraser's dolphin (*Lagenodelphis hosei*) in Alor waters.

Dolphins are usually abundant in Alor during the '*fura keluang'* (cold water) phenomenon that occurs in August annually in Pantar Strait (Figure 3.15) between Kepa Island and the village of Alor Kecil. This phenomenon is an annual upwelling that brings many fish schools to the surface, and thus attracts many dolphins as well as benefiting local fishermen.

An INSTANT (International Nusantara Stratification and Transport) survey conducted in December 2003 and January 2004 encountered several cetacean species in Ombai Strait (Sunuddin 2004), including killer whales (*Orcinus orca*), false killer whales (*Pseudorca crassidence*) and sperm whales (*Physeter marcocephalus*) (see Chapter 1 for information about INSTANT).

### *3.3.2. The importance of Alor*

The straits of Alor serve as migratory corridors for marine mammals. There are anecdotal reports of sperm whales and killer whales on the western coasts of Timor Leste (Teixeira,

2005, *pers.comm*.). These animals may be from the same groups as those occurring in Alor. In addition, Dr. Jamie Seymour (2003, *pers.comm*.) noticed many herds of dugongs from the air along the north coast of Timor Leste, an area that shares the Ombai Strait with Alor and Wetar Islands in Indonesia (Figure 3.15). Although there is no hard evidence of the linkage between the marine mammal populations in Alor and Timor Leste, I suggest that both the Indonesian and Timor Leste governments consider establishing a co-managed conservation effort based on the precautionary principle. The Ministry of Environment and Tourism of Timor Leste is interested in developing marine tourism and research (Teixeira, 2005, *pers.comm*.). Consequently, Alor could use this opportunity to establish the first transboundary conservation program with Timor Leste.

Currently there are two regulations, which directly benefit marine mammals in Alor. The Regent's Decree No. 5/2002 on the 'Establishment of Pantar Strait and Adjacent Waters as Marine Park' protects Pantar Strait (Figure 3.15) and its adjacent waters from destructive activities that will threaten the marine ecosystem, including marine mammals. In 2004 the marine park was expanded to the *Kawasan Konservasi Laut Daerah* (KKLD or the Regional Marine Conservation Area). However, local governments still have to work hard to ensure the implementation of both decrees for marine conservation.

## 3.4. Rote Island

### *3.4.1. The island, the people and the marine mammals*

#### *3.4.1.1. The island and the people*

Rote is the southernmost island in the Indonesian Archipelago, located southwards of Timor Island (Figure 3.16). The Rotenese are a different tribe from the people of Lamalera, Lamakera or Alor and have established their own kingdoms, which are distinct from the kingdoms of West Timor. Ba'a has been the capital, since the government declared Rote-Ndao as a separate regency from the Kupang Regency in 2003.

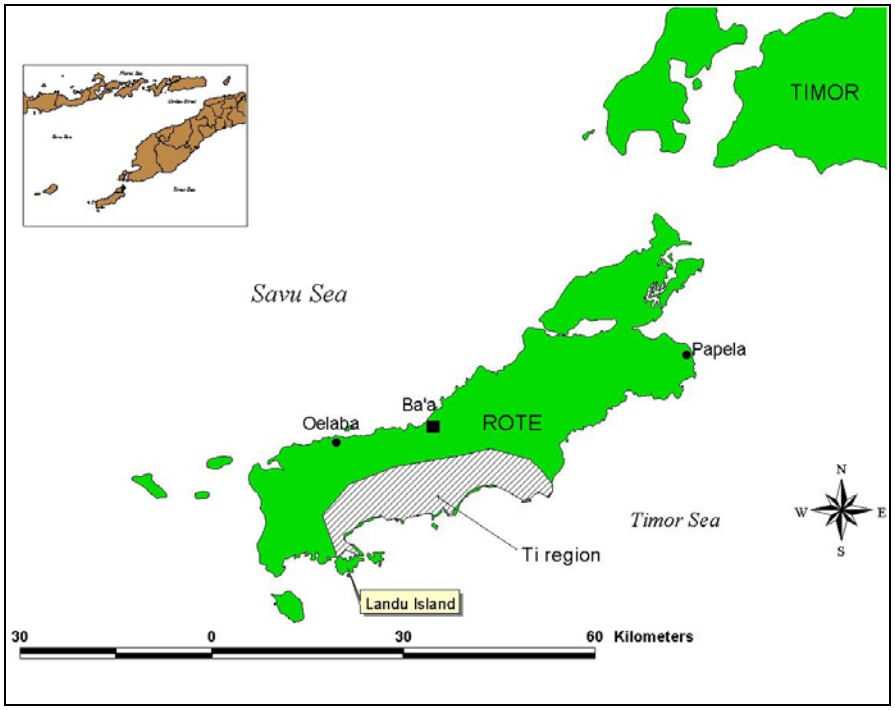


Figure 3.16. Rote Island

Twice daily ferries move people between Ba'a and Kupang. In addition, several minibuses travel daily to places on the islands. However, local transportation is still difficult in many remote areas.

Of the approximately 101,500 people living in Rote, approximately 83% are farmers (Monk et al., 1997; Muller, 1997; KPU, 2004). Rote is self-sufficient in rice production and exports rice to Kupang and adjacent areas. As the Rotenese depend mostly on agriculture, fishing is not the main source of income in Rote. Fishing is conducted by only a small number of artisanal fishermen in coastal areas.

Some of the Rote fishermen often sail across the Timor Sea to Ashmore Reef in search of sea cucumber, trochus shells and other marine products (Dwyer 2000). Recently archaeological researchers have studied several ancient graves in all three islands of the Ashmore Reef (Clark 2000). Those graves possibly belonged to Indonesian fishermen (including fishers from Rote) that frequently visited Ashmore Reef prior to European settlement in Australia.

Although most fishermen came from the Papela and Oelaba villages in northern Rote (Dwyer 2000), some of them also came from Ti region in the southern part of the island (Figure 3.16).

*3.4.1.2. Marine mammals in Rote*

The waters of Rote are not major marine mammal habitat. There is anecdotal information about dugongs around Rote (Fox, *pers.comm*. 2004) as well as in Kupang Bay, Timor (Hendrokusumo et al., 1979; Iongh, 1997). In the mid 1970s, the Jaya Ancol Oceanarium caught dugongs in the waters southeast of Rote in addition to some other places in Indonesia such as South Sulawesi and Bangka (Sumatra) (Hendrokusumo et al. 1979). Overall, the dugong population is considered sparse and patchy (Iongh 1997), although information is scarce.

To trace the remnants of the cultural beliefs about dugong, I visited Landu Island, a small island in Ti region (Figure 3.16), inhabited by 495 people in 2004. Formerly a separate kingdom, Ti is now part of the district called Southwest Rote. Fox (*pers.comm*. 2004) informed me that Ti is the only place where I would be able to trace the dugong legend. I finally obtained information that led me to Oebou Village (population 1508 people) and Landu Island (Figure 3.16).

In Oebou village, I talked to elders Musa Pande and Jonas Mui, the only people who still remember the details of the dugong legend. The legend started when two young women were embarrassed because of an improper affair with two young men who suffered a skin disease on their feet. To end their embarrassment, the women threw themselves into the sea and disappeared. A few days afterwards the villagers found two strange animals (dugong and sea turtle) and believed that those animals were the two young women. This legend is the basis of the ban on eating dugongs and sea turtles, as well as the legend of dugong cemeteries in Rote. However, I found no remnants of dugong cemeteries in the region.

The fishermen of Rote (including Landu) often visited Ashmore Reef and collected *Trochus sp* and other sedentary marine life. The collecting of sedentary marine life by traditional Indonesian fishermen was not included in the 1974 MOU between the Australian and Indonesian governments regarding the trespassing of Indonesian traditional fishermen into Australia (Reid 1992). As a consequence, the Australian navy often arrests fishermen on Ashmore Reef because of their illegal entry and trochus harvesting in what are now Australian waters. I found no reports of Rotenese cultural beliefs about dugong in relation to Ashmore Reef, even though dugongs occur there (see Marsh et al., 2002).

During their journey to and from Australia, the Landu fishermen often see whales 'coming back and forth between Indonesia and Australia' (Mesa and Sau, 2004 *pers. comm*.). Another cross-boundary fisherman whom I met in Larantuka supported this anecdotal information (Sanyakit, 2004, *pers. comm*). It is important to follow up the information with comprehensive research on whale migration between Indonesia and Australia in the future.

### *3.4.2. The importance of Rote*

Rote lies at the gate of Savu Sea and Timor Sea (Figure 3.16). Both Indonesian and Australian territories in the western side of Timor Sea were surveyed for marine mammals in 2002 and 2003 (Porter and Chilvers 2004). The survey concluded that the Indonesian parts of Timor Sea (including waters around Rote) were marginal habitats for cetacean population, particularly oceanic cetaceans such as the spotted dolphins (*Stenella attenuata*), spinner dolphins (*Stenella longirostris*), pygmy/dwarf sperm whales (*Kogia spp*.) and melon headed whales (*Peponocephala electra*). In contrast, the Australian parts of Timor Sea were dominated by coastal cetaceans such as the Indo-Pacific humpback dolphins (*Sousa chinensis*) and the Australian Snubfin dolphins (*Orcaella heinsohnii*). Bottlenose dolphins (*Tursiops aduncus*) were found in both Indonesian and Australian territorial seas. The difference between the marine mammal populations in the waters of the two countries mainly results from the different topographic conditions on their respective continental shelves; the

Indonesian continental shelf is narrow and with little shallow water habitat, whilst the Australian continental shelf is relatively wide with larger shallow areas.

In addition, information gathered during this research suggests that unknown species of great whales use the waters off Rote Island as a migratory route between Indonesia and Australia. I suggest that Indonesia and Australia conduct joint research on whale migratory routes in the future. More research is also needed to trace back the dugong population in Rote to understand the possible cause of the past dugong population decline. Collaborations with commercial fishing industries as well as artisanal fishermen need to be established to understand possible by-catch around the southern edge of Savu Sea that might cause further decline to the marine mammal populations.

### 3.5. Chapter summary

In this chapter, I have discussed the people and conditions of Lamalera, Lamakera, Alor and Rote, as well as where marine mammals are found in the region. The information I obtained is the basis of the social construction overview of whale hunting in the region (Chapter 4) and the threat analysis (Chapter 5).

# IV. THE SOCIAL CONSTRUCTION OF WHALE HUNTING IN THE CONTEXT OF MARINE MAMMAL CONSERVATION IN THE SAVU SEA

In this chapter, I discuss the social construction of traditional hunting from the points of view of several stakeholders. Traditional hunting is discussed because it is superficially the most obvious activity in the Savu Sea that might adversely impact on marine mammal populations in the region. Although mostly focused on Lamalera, I also briefly discuss the traditional whaling conducted by the villagers of Lamakera, despite the facts that: (1) they no longer actively hunt whales and (2) whaling is not such an important issue for the people of Lamakera compared with the Lamalera case. As mentioned in Chapter 2 Section 2.1, social construction is the product of one group/individual's background concept or culture (Kuper & Kuper 2004), and thus would differ from one culture to another (Berger and Luckmann, 1966; Denzin and Lincoln, 1994; Lewis-Beck at al., 2004). An understanding of various social constructions of traditional whale hunting in the Savu Sea would assist in the design of hunting management.

## 4.1. Social construction of traditional whale hunting by international conservation groups

As previously mentioned in Chapter 1 Section 1.2, one of the major triggers for this research was Japan's motion on Indonesia's traditional whaling during the 54$^{th}$ IWC (International Whaling Commission) annual meeting. To date, the IWC is the only international forum focusing on species management that specifically addresses traditional whaling (Chapter 3, Section 3.1.6). Based on the IWC definition of subsistence hunting (Donovan 1983), whale hunting practices in Lamalera and Lamakera are considered subsistence hunting.

So far, the IWC has not issued any specific resolutions on small cetacean hunting. However, assuming that the criteria for subsistence whaling also apply to small cetaceans, the Lamalera dolphin hunting may not fall into the category of subsistence whaling. As shown in Figure 3.9

(Chapter 3, Section 3.1.5), the maximum small cetacean catch in Lamalera from 1996-2000 was approximately 20 individuals per year. Nevertheless, the frequency of small cetacean hunting in Lamalera sharply increased after the year 2000 and surpassed 120 dolphins from 2001. Despite the fact that the dolphin meat was consumed locally, there is no evidence that the small cetacean catch has been important for Lamalera since ancestral times. Hence, this practice might not fall under the IWC definition of subsistence hunting.

The IWC is a global organisation that was established with the initial purpose of regulating whale hunting. Its member countries are divided into two polarised groups of pro-whaling and anti-whaling nations. Several IWC members and experts have objected to IWC's policy of applying a quota system to the practice of traditional whaling that has been conducted by ethnic groups, such as the Inuits living above the Arctic circle (Freeman et al. 1998), or the 'scientific whaling' practiced by Japan (Hirata 2005), which the Japanese claim as a traditional activity and thus, a cultural right.

Freeman et al. (1998) criticised the objections to whaling stemming from the notion that whales are sentient like humans are, and thus should be treated differently from other animals (e.g., cows, chicken, fish, etc). In addition, Freeman et al. (1998) pointed out that whale meat is an integral part of the Inuit diet, something that most city dwellers do not comprehend. In 1995, William Cronon advanced the controversial argument, that the major supporters of nature and wilderness are urban people who no longer interact or depend directly on nature, and thus perceive wilderness as a romantic ideal (Proctor 1998).

Despite Japan's protest (IWC 2003), the IWC does not currently formally object to the practice of traditional whale hunting in Indonesia. However, although Indonesia is not a member country of IWC, the uncertainty about whether the dolphin hunting by the people of Lamalera is sustainable might still lead to international concerns that will need to be addressed in the future. Any proposal for Indonesia to join the IWC would increase the

complexity of the situation surrounding the traditional whale hunters in Savu Sea, especially with the uncertainty about the sustainability of their activities, the low food security in the region and the increasing use of modernised whaling techniques (e.g., using motorised boats instead of traditional *paledangs*). Hence, I do not suggest that Indonesia join the IWC. Instead, I suggest that Indonesia upgrade its status from the MOU signatory of the Convention on Migratory Species (CMS), to become the full member of the CMS, as explained later in Chapter 8 Section 8.7.

Apart from the IWC, other international conventions concerning species conservation do not specifically address traditional whale hunting. The Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES – www.cites.org) does not have a position on traditional whaling, because CITES manages international commercial trade rather than subsistence hunting. The Convention on Migratory Species (CMS - www.cms.int) does not manage traditional hunting either. Although the United Nations Convention on the Law of the Sea (UNCLOS) encourages international cooperation on marine mammal conservation, this convention does not address traditional hunting of marine mammals (UNCLOS 1982). As explained above, Indonesia is a signatory of both CITES and UNCLOS. Indonesia is also an MOU signatory to the CMS, but is not yet a full member. If Indonesia is interested in becoming a member of the CMS, Indonesia can ratify and adopt the convention into national legislation. This precedent has been established with CITES, UNCLOS, and CBD (see also Chapter 8 Section 8.4).

The CBD (Convention on Biological Diversity – www.biodiv.org) acknowledges 'the close and traditional dependence of many Indigenous and local communities embodying traditional lifestyles on biological resources'. In addition, each member country is required to 'respect, preserve and maintain knowledge, innovations and practices of Indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity'. This statement implies that the CBD would recognise the

traditional whale hunting in Lamalera and that Indonesia, as a CBD member country, should manage the Lamalera whale hunting sustainably.

A survey conducted in the United States indicated that mammals (including marine mammals) are animals that trigger strong political will for their conservation and thus engender significant attentions from environmental NGOs (Czech et al. 1998). In Indonesia, several international environmental groups such as World Wide Fund for Nature (WWF), The Nature Conservancy (TNC) and Conservation International have or will include marine mammals (i.e., cetaceans) in their programs (Pet-Soede, 2002; Putra, 2005, *pers.comm*.). WWF is currently initiating a program to assist the establishment of the Solor-Alor MPA (see Chapter 7, Section 7.2). This program will address traditional whaling in the region.

The Cairns (Australia) based NGO, Apex Environment has also demonstrated enthusiasm for Indonesian marine mammals, suggesting that the Indonesian marine mammal management should preserve traditional whaling in Lamalera, on the proviso that the whale hunters only hunt sperm whales and no other cetacean species (Kahn 2003b). However, this proviso is unlikely to be feasible for two reasons: (1) the Lamalera villagers are now accustomed to hunt various small cetaceans and baleen whales in addition to sperm whales, and (2) the low food security in the region.

### 4.2. The Indonesian national government's position on traditional whale hunting

As of October 2005, the Indonesian government had not developed a formal definition of traditional whaling. Saptaputra (2004, *pers.comm*.) from the Ministry of Marine Affairs and Fisheries (MMAF) defined 'traditional whale fishers' as 'fishermen who have hunted whales of the same species since ancestral time'. Implicit in his explanation was that the traditional whale hunting ground should not have changed significantly over the time, and that the fishers do not use modern technology, i.e., motorised boats. Furthermore, Saptaputra (2004, *pers.comm*.) mentioned that if there are outboard motors in the boat, the engine is only

supporting the boat (i.e., *motor tempel*, or a boat with attached-machine), rather than an integral part of the boat. Thus, *jonsons* would be considered acceptable technology for whale hunting using this definition.

This opinion differs from the Australian definition of traditional hunting, as stated in the 1986 Australia Law Reform Commission, which considered that a practice can be defined as 'traditional' or not based on the purpose of the practice rather than the methods (Smith 1987). Thus in Australia, dugong hunting using motorboats and machine guns is legal as long as the hunting is for traditional purposes, i.e., meat is not sold. However, a survey in North Queensland, Australia, of 400 respondents revealed that 75% of the respondents approved of Indigenous hunting only when the hunters employed pre-European weapons (e.g., no firearms) (Ponte et al. 1994). Many respondents to Ponte's survey objected to special privileges being afforded to Indigenous Australians; some were also concerned about the sustainability of hunting using modern technology (Ponte et al. 1994). It has not yet been decided whether the Indonesian government will formally adopt Saptaputra's definition of traditional hunting or modify the definition to mirror the Australian definition. If the latter option is taken, Indonesia should be prepared to face debates between conservationists and pragmatists who support modern whale hunting practice (see Ponte et al. 1994).

Although the Indonesian government has no formal written position with respect to traditional whale hunting, the recently issued Fisheries Law No. 31/2004 mentioned the involvement of local communities in fisheries management. Article 6 Clause 2 states that 'Fisheries management for capture fisheries and aquaculture should consider customary laws and/or traditional knowledge with regards to community participation', and that 'customary laws and/or traditional knowledge to be considered in fisheries management should not contradict national laws'. This regulation and its relationship with traditional whale hunting will be analysed further in Chapter 8.

### 4.3. Local government's opinion on traditional whale hunting

The local government of Lembata Island values Lamalera whale hunting for the resultant tourism income, which positions the island as a national and international tourism destination. Laurent Wadu (2004, *pers.comm*.), the Head of the Tourism and Transportation Agency in Lembata, indicated that Lamalera whale hunting is one of the top tourism destinations in the Province of East Nusa Tenggara (i.e., resource provider, see Steinberg (2001)), and thus supports the preservation of the traditional whale hunting culture.

The Lembata government also understands the importance of whale conservation, as a means of sustaining the whaling culture. Therefore, the local government did not object to the idea of whale conservation, as long as the whale hunting tradition is not banned. However, Wadu (2004, *pers.comm*.) objected to the use of the term 'hunting', as it brings negative connotations to the traditional practice. Instead, Wadu (2004, *pers.comm*.) suggested that the term 'whale catching' should be used to replace 'whale hunting', a suggestion that invited unresolved debate among the local government officers during a meeting that I attended in Lembata in June 2004.

The whale hunting culture is apparently a shared resource between the Lamalera villagers and the local government. For instance, there was an interesting debate about whether or not the damaged road from Lewoleba to Lamalera should be upgraded. Wadu (2004, *pers.comm*.) objected to the planned road improvement because it might reduce 'the authenticity' of Lamalera as an olden day whaling village. However, better road conditions will benefit the villagers greatly, as it will shorten the amount of travelling time to the capital town of Lewoleba and make the journey more comfortable. When I left the village in December 2004, only three-quarters of the road from Lewoleba to Lamalera had been fixed, while the rest of road to Lamalera was still rocky.

In contrast to the situation in Lamalera, the local East Flores government who administer the village of Lamakera (Solor Island) do not consider Lamakera whale hunting as an issue. Sylvester Wungubelen (2004, *pers.comm*.), the Head of Fishing Division of the East Flores Marine and Fisheries Agency, admitted that there was no local regulation of traditional whale hunting. All regulations on biodiversity conservation refer directly to the Indonesian national regulations (Chapter 8 Section 8.4). In the light of the recently proposed Solor-Alor MPA (See Chapter 7 and 8), the local government of East Flores Regency should be more actively approached and engaged to gain additional support for marine mammal conservation in the Solor-Alor region.

### 4.4. Whale hunting from the perspective of the villagers of Lamalera and Lamakera

As illustrated in Chapter 3 Section 3.1, whale hunting is a very important tradition for Lamalera villagers. Although they do not perceive whales as sacred animals, they still appreciate whales as gifts from God to their fishing village. This position is consistent with traditional social construction of the ocean (and its contents) as a resource provider (in this case for food security) (Steinberg 2001). As whales are very precious natural resources for the villagers, currently the villagers are mostly not against whale conservation. The hunters understand that the whale populations needed to be conserved, and that the whales are protected globally. They also understand the objections of some tourists to seeing the whales being killed in Lamalera. Nevertheless, the hunters also stated that they hunt whales because they need food to survive, and they will suffer should the government ban traditional whaling (Chapter 3, Section 3.1.3.1).

In addition to the high spiritual and practical values, whale hunting also contributes to the identity of the Lamalera fishermen. The elders are proud to be traditional hunters. Being a *lama fa* (harpooner) is the highest status career for them. Generally speaking, although there is declining interest among the younger generation in conducting traditional (non-mechanised) hunting, the youngsters in Lamalera are still proud of their whaling tradition.

On the other hand, the villagers of Lamakera (Solor Island) do not adhere to traditional whaling practices any longer. In addition to not having any traditional *paledangs* left, the villagers no longer conduct rituals before and after the whale hunting. Whale hunting in Lamakera is now conducted with motorised boats and is not related to Lamakera's cultural identity. Nowadays, whale hunting in Lamakera is a matter of practicality; whales are natural resources available from the sea for local consumption, although not as important as manta rays and dolphins. As mentioned in Chapter 3, the differences between Lamalera and Lamakera might be the product of different belief systems embraced by each village. As Catholics, the people of Lamalera practice inculturation (see Paul II, 1985) that enables them to conduct ancient rituals in combination with Christian practices. On the other hand, the Lamakera villagers are Muslims. Paganism such as the whale hunting rituals is not encouraged as it is considered a sacrilege (Beatty, 2001; Kurnianingsih, 2004, *pers.comm.*; Hodijah, 2005, *pers.comm*.).

The villages of Lamalera and Lamakera do not appear to possess strong ancestral connections with the practice of small cetacean hunting. However, both villages depend on small cetaceans as an alternative source of food, from sperm whales (Lamalera) and manta rays (Lamakera). As the fishermen of Lamakera also catch fish regularly and are thus less reliant on marine mammals than their Lamalera counterparts, I anticipate that small cetacean hunting will be easier to curb in Lamakera (Solor Island) than Lamalera (Lembata Island), where consuming marine mammals is a higher priority. Borrowing Cronon's opinion (Proctor 1998), it would be harder to ask the Lamalera villagers to stop hunting cetaceans because they need the marine mammals as their daily food source.

As briefly mentioned in Chapter 3 Section 3.1, I also observed a declining interest among Lamalera's younger generations in conducting traditional whaling. Consequently, I expect the tradition to cease to exist within this century, or to be transformed into modernised whaling

(with motorised boats), despite the possibility that this change will decrease tourists' interest on the village (see Chapter 8 Section 8.2.1 for whale watching and whale-hunting tourism).

My observations suggest that the declining interest of the young men in conducting traditional whaling in Lamalera is based on different arguments from those that apply in Lamakera. In Lamakera, it is believed that ancient rituals were blasphemy, hence the discontinuity of hunting rituals (see also Chapter 3, Section 3.2.3.1). In Lamalera, the inefficiency of hunting whales with hand-held harpoons and traditional sailing and paddling boats is one of the main reasons for the hesitance of young men to become involved in whale hunting. Another deterrent is the increasing enthusiasm for working in Lewoleba (the capital town of Lembata) as daily workers, motorbike drivers and other 'modern' occupations. The tendency to discard old traditions in favour of new ones also happens in other places in Indonesia such as Bali. Modern Balinese women would like to escape from their traditional occupations as housewives to become career women (Suryani 2003). For example, Balinese women now chose to buy *canang* (offerings made of the arrangement of leaves and flowers) in the markets instead of making one themselves (Wijaya & Sarjana 2000).

**4.5. Personal social construction of traditional whale hunting**

As a researcher, despite my attempt to maintain the objectivity of this research, I understand that it was inevitable for me to insert my own opinions and social construction in the discussions of the traditional whale hunting. For instance, I began this research with a better ecological understanding of marine mammals compared with my understanding of the whale hunting culture in Lamalera and Lamakera. I came to the villages with an assumption that the whale hunting practice was a threat to marine mammals in the region, despite the lack of information on its sustainability.

In the course of spending two months in Lamalera and the surrounding regions, I began to understand not only the plight of the sperm whales and other cetaceans, but also the

predicament of being a traditional whale hunter. These hunters have to survive in a non-productive land and hunt whales for a living, while the 'outside' world criticises their constant hunt of a charismatic species such as the sperm whale. After going out to the sea on three occasions to see the fishers hunt the whales (without any whales being caught), I realised that the Lamalera villagers are very dependent on marine mammals. For instance, they would not throw fishing lines behind the boat to catch fish while waiting for the whales. The fishers argued that the fishing lines would only hinder their hunting process, not to mention the risk of entangling the whales. As later mentioned in Chapter 8, Section 8.2.2.1, there are few attempts to diversity fisheries products in Lamalera.

By the end of my fieldwork, I had formed my own social construction of whale hunting in the Savu Sea. Lupton (1999, p. 29) stated that 'scientific knowledge, or any other knowledge, is never value-free but rather is always the product of a way of seeing'. As the result of my fieldwork and despite my background as an ecologist, I found that my views have changed to an acceptance of traditional whale hunting, as long as the tradition is conducted in the traditional ways, i.e., with *paledangs* and hand-held harpoons. This construction is more or less consistent with Saptaputra's (2004, *pers.comm*.) suggestion as to how traditional whaling should be defined (Section 4.2). It would be interesting to explore various opinions of Indonesian stakeholders (including scientists and traditional communities) on 'traditional hunting/whaling', as it might shape a formal working definition of the term in question, that might differ from Australia's working definition on traditional hunting. I also increasingly comprehended that marine mammal conservation in the Savu Sea is a complex issue, which encompasses many issues, not only traditional whale hunting.

However, despite my understanding of the plight of the whale hunters, the absence of a scientific evaluation of the sustainability of the whale hunting practice (Chapter 3 Section 3.1.1.2) requires me to identify traditional whale hunting in Lamalera and Lamakera as a potential threat to marine mammals in the region. This position is further explained in the

threat analysis conducted in Chapter 5, notwithstanding the other anthropogenic threats to marine mammals that more in-depth research might identify as contributing more to the whale population decline than the current practice of traditional whaling.

In social constructionism, it is irrelevant to consider which social construction or perspective is the most 'accurate' (Lupton 1999). Instead, it is important to understand these differences and how these constructions are acted upon in addressing a complex issue such as marine mammal conservation. For instance, environmental NGOs and local governments might have differing opinions on the management of traditional whaling. The national government might adopt a specific working definition of 'traditional hunting/whaling' that might not fit into what the locals perceive regarding the term in question. The national government might also have an understanding that differs from that of the NGOs on conservation strategies such as the Solor-Alor MPA (Chapter 7, Section 7.2) or whale watching management (Chapter 8, Section 8.2.1). The managers who design a marine mammal action plan need to have a comprehension of the various issues from the perspectives of all relevant stakeholders.

### 4.6. Resource management as a social construction

Steinberg (2001), who takes a political economy perspective, sees resource management perspectives as a social construction as well. Steinberg's views about the social construction of oceans apply to marine and coastal resource management issues more generally:

'The perspective most often applied in academic studies of marine issues is that of the ocean as a space of resources. The ocean is perceived as akin to other resource-rich spaces, and its management is characterized by similar dilemmas: How can the maximum sustainable yield be calculated and how should portions of that yield be allocated to competing users? How can traditional tenure systems and production practices be integrated with emerging resource needs, political power differentials, and technological advances? How can one adjudicate between the needs of users of one ocean-space resource and those who wish to use the same area for a different, incompatible resource use? How can one implement comprehensive,

binding management of a space ...” (Steinberg, 2001, p. 11). My research clearly fits within this social construction of marine resource management (see also Constance and Bonanno, 2000).

### 4.7. Chapter summary

In this chapter, I discussed various social constructions of traditional whale hunting from several stakeholders, including myself. The understanding of various perspectives of the issue of traditional whaling is the basis of later discussions, especially the discussion of threat analysis (Chapter 5) and management options (Chapters 7 and 8). Similar principles are also applicable to my considerations of other potential anthropogenic threats to marine mammals in the region (Chapters 7 and 8).

# V. THE IDENTIFICATION OF ANTHROPOGENIC THREATS TO MARINE MAMMAL CONSERVATION

This chapter will discuss various threats to marine mammals and the traditional hunting of marine mammals in the Savu Sea. Better understanding of both facets will lead to more effective conservation measures. In this region, any threats to marine mammals (especially species that are targeted by hunters) have the potential to adversely affect whale hunting traditions as well.

## 5.1. Identifying the threats

Many human activities can have negative impacts on marine mammal populations, e.g., direct take (commercial or traditional), destructive fishing (long lines, trawling, blast fishing, cyanide fishing), marine debris, heavy marine traffic, contaminants, off-shore oil and gas industries, sonar experiments, and unsustainable tourism (Fair and Becker, 2000; Marsh et al., 2003). Prior knowledge of those threats guided my fieldwork; but I did not raise them as specific issues during the interviews. However, my informants also mentioned some of these threats in the interviews, despite their lack of understanding of the potential magnitude of the impact each activity on marine mammal populations, confirming the activities that occur in the region.

The transcripts of the interviews I conducted were reviewed to identify threats to marine mammals that occur in the Savu Sea. I used N-Vivo software to analyse the qualitative data and thematic analysis to identify threats from the transcripts (Bazeley and Richards, 2000; Ezzy, 2002) as discussed in Chapter 2. Eleven codes emerged from the transcripts of threats in the Savu Sea (see Appendix 4):

| | | |
|---|---|---|
| - commercial display | - ghost nets | - harbour and marine traffic |
| - artisanal fisheries | - modernised hunting | - dolphin hunting |
| - commercial hunting | - oil and gas | - traditional hunting |
| - destructive fishing | - pearl farming | |

The final results of my threat identification study are a combination of the results generated by: (1) questioning the informants, (2) my observations and findings during informal talks, and (3) cross checking by discussions during my fieldwork. The threats listed above were grouped into generic threats (those noticeable in more than one area in the Savu Sea) and specific threats (those that are restricted to certain places).

Because there are no quantitative data on the impact of these threats on marine mammal populations, in the discussion bellow I often resort to the 'Precautionary Principle'. The Precautionary Principle is 'a principle which states that in cases where there are threats to human health or the environment the fact that there is scientific uncertainty over those threats should not be used as the reason for not taking action to prevent harm' (Fisher 2001, p. 316). The Convention on Biological Diversity (CBD) also adopts the precautionary principle, stating that 'where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat' (CBD 2000, p. 8). In Indonesia, the human and financial resources required for a thorough analysis often might not be available, whereas the pressures towards the environment are ongoing. As Indonesia is a signatory to the CBD, the Precautionary Principle should also apply in Indonesia.

### 5.2. Generic threats

#### *5.2.1. IUU (Illegal, Unregulated and Unreported) Fishing*

The 5.8 million $km^2$ waters of Indonesia hold vast fisheries potential. In 2002, the economic value of marine fish to Indonesia was estimated at USD 15.1 billion (Bappenas 2003a),

including pelagic fishes, demersal fishes, coral fishes, shrimp, lobster and cuttlefishes (Bappenas 2003b), yielding 6.4 million tons of sustainable fisheries resources (MMAF 2005). To support national fishing industries, Indonesian waters are divided into nine Fisheries Management Areas (Figure 5.1). The Savu Sea is included in Zone IX, which encompasses the Indian Ocean adjacent to the Indonesian Archipelago.

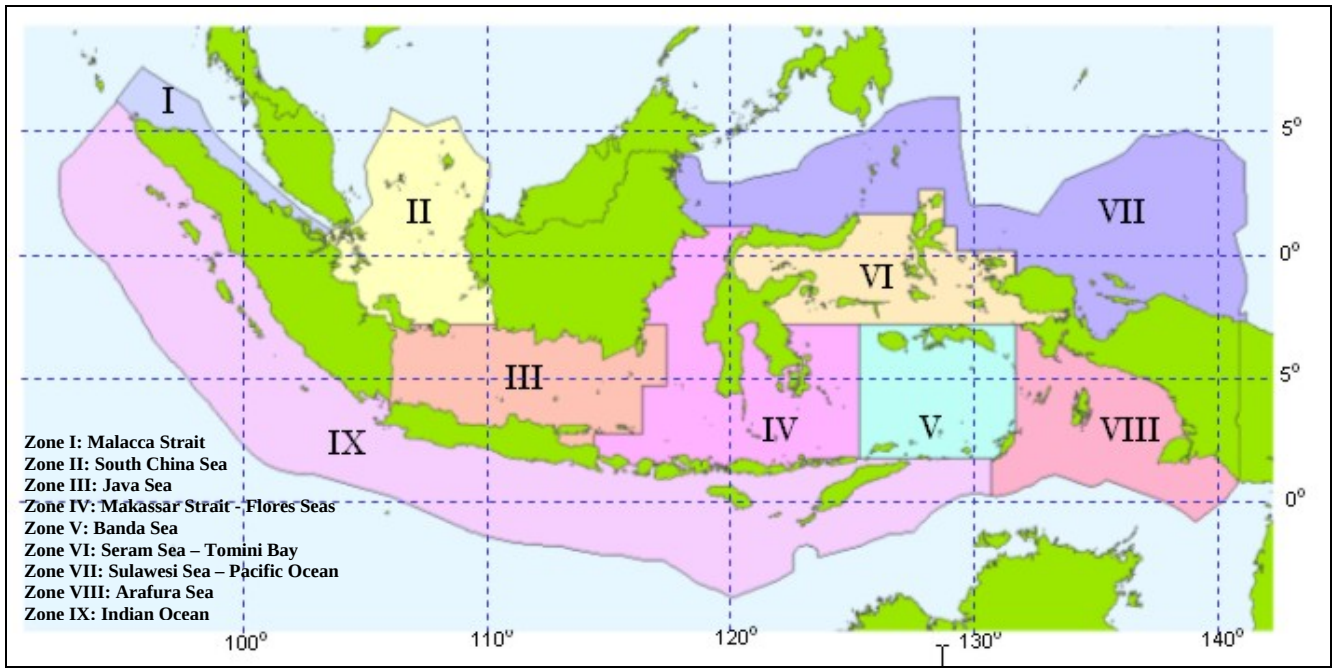


Figure 5.1. Indonesian Fisheries Management Areas (courtesy of www.dkp.or.id)

The vast territorial waters and EEZ (Economic Exclusive Zone) of Indonesia and the limited capacity of Indonesia to conduct appropriate surveillance over this huge area have made this country subject to IUU (Illegal, Unregulated and Unreported) fishing; an acronym used world wide to describe activities that are harmful to the future of sustainable fisheries (Bray 2000). Prior to 2005, Indonesia is estimated to have lost approximately USD 1.9 million from illegal fishing (MMAF 2005), mostly in the South China Sea (Zone 2) and the Arafura Sea (Zone 8). There is no information in this reference (MMAF, 2005b) as to the time period over which this estimate was calculated.

In addition, according to the Ministerial Decree released by the Ministry of Marine and Fisheries Affairs (MMAF) No. 10/2002, the Indonesian government divides fishing fleet operating zones into three (Tribawono 2002, Ginting 2006, *pers.comm.*):

| | |
|---|---|
| Zone 1: 0-6 nm | Artisanal vessels 1 – 10 GT (gross-ton), no permit required, starting from the lowest tide shore; district permit |
| Zone 2: 6-12 nm | Boats 10 – 30 GT including tuna long lines, provincial permit |
| Zone 3: 12-200 nm | Ships >30 GT, national permit, bordering Indonesia's Exclusive Economic Zone. |

This arrangement is different from the previous Indonesian Fisheries Management Area. The zoning of the Fisheries Management Area is based on geographic location, whilst the fishing fleet zones are based on boat capacity, measured in gross tonnes (GT).

*5.2.1.1. Lamalera*

In the Lamalera village, the IUU fishing activities include blast fishing (illegal), long lines (unregulated) and marine debris (unreported and unregulated). Hooker and Gerber (2004) categorised by-catch (including from long lines) as a direct threat to marine mammal populations because animals are caught and drowned. Marsh et al. (2003a, p. 11) defined marine debris as 'any manufactured item that may be lost or discarded in the marine environment'. Marine debris and physical habitat destruction from blast fishing are identified as indirect threats that 'may cause accumulating harm over longer time scales' (Hooker and Gerber 2004, p. 31). Entanglement from marine debris is likely to cause injuries or death from entanglement or ingestion (Marsh et al. 2003).

The villagers of Lamalera mentioned blast fishing many times during my interviews with them. They claimed that outsiders (mostly fishermen from the town of Ende, on the Flores Island, which is partly described in Figure 5.2) often visited southern Lembata and blew up

the reefs to collect fish. Whenever the Lamalera villagers attempted to get rid of the illegal fishers, the illegal fishermen literally threw bombs at the locals.

I found no evidence of illegal foreign long line fleets around Lembata. Possibly, the long lines described by the people in Lamalera were actually Indonesian long line vessels searching for blue-finned tuna in the Savu Sea (see www.dkp.go.id). Depending on tonnage (Gross-ton or GT), long line vessels can be categorised in Fishing Fleet Zone 2 or Zone 3 (Tribawono 2002) (see Section 5.2.1). It is hard to judge the zones of individual vessels on the basis of sightings from a distance, thus it is also hard to know whether or not these long line vessels have violated the fishing fleet zoning arrangements. Nevertheless, assuming that the long line vessels are classified in Zone 2, which means they can fish as close as 6 nm (nautical miles) from the shore; they would inevitably overlap with the Lamalera traditional hunting ground (Figure 5.2). Such overlap is supported by the reports of frequent incidents in which the Lamalera fishermen intentionally cut the long lines and brought the lines home. It is possible that this action is also a protest against long line ships which, according to the villagers, often discard the body of marine mammals entangled in their nets. Wasting is taboo for the Lamalera fishermen who believe it can bring misfortune upon them. The entanglement of marine mammals (i.e., dolphins) in long line ropes was also observed during a by-catch study conducted in several places in Indonesia in 2004, although there was no report of body-part discard (Zainudin 2005).

According to the Fisheries Law No. 31/2004, subsistence fishers are allowed to fish anywhere within the Indonesian fishing ground (Article 61, Clause 1). However, the Lamalera whalers do not go far from their village to search for the whales. They search only '*as long as the land is still visible'*. I assume 'the land' is the highest land features detectable from their boats such as a hill or a mountain. The highest hill in southern Lembata is 1,644 m, and it is very likely that this is the land feature the fishermen use to judge distance. The high elevation of southern Lembata (1,644 metres) would allow the island be seen up to the limit of atmospheric

visibility, expected to be about 10 nm on a clear day in tropical waters (Hazel 2005, *pers.comm.*). The 10 nm is also a reasonable limit for the *paledang*, which are propelled only by sails and oars.

As the traditional whaling ground of the hunters of Lamalera overlaps with the commercial fishing fleet zones, the hunters consider any commercial ships that use the area to be violating their traditional hunting ground. Yet, the fishermen also admitted that they do not know how far 6nm is from the shore to judge whether the ship is operating legally. Such spatial measurement is not in their traditional measuring system. The gap between modern and traditional distance measurement should be addressed in future management options in an attempt to reduce the conflicts between traditional hunters and modern fishers.

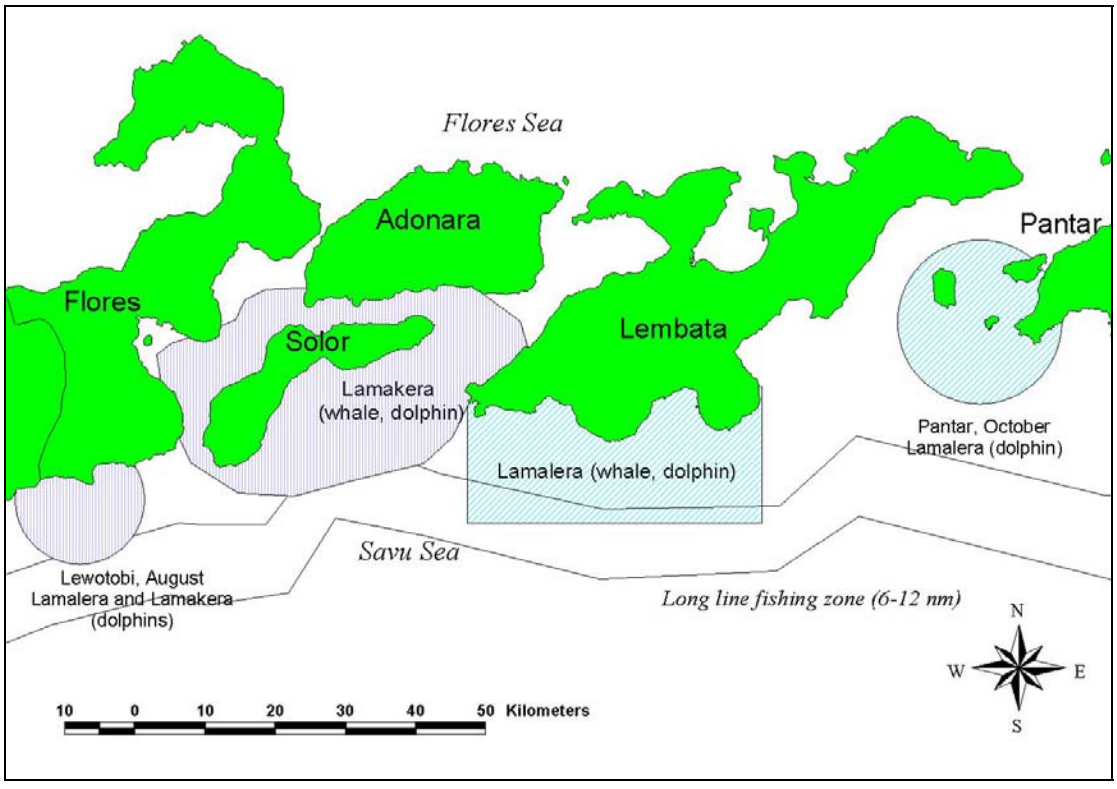


Figure 5.2. Traditional hunting grounds of the Lamalera
and Lamakera fishermen and the fishing zone of commercial long liners

The fishermen of Lamalera claimed that they occasionally find dead sperm whales entangled in long lines, reducing the population they harvested. Although marine debris was not frequently reported during interviews, these reports of whale entanglement suggested that marine debris might also be lethal in the longer term, not only to marine mammals but also to other migratory marine life as noticed by Hooker and Gerber (2004).

The local government provides a patrol boat called 'Torani 2' to guard the southern coasts of Lembata Island. Together with its sister ship, the 'Torani 1', this patrol boat was initially dedicated to the coastal patrol of Lembata ('Torani 1' was designated for northern Lembata), to guard the island from any IUU fishing. However, lack of financial support for patrolling led to the utilisation of both boats as regular shuttle transport for government officers between Larantuka (East Flores) and Lewoleba (Lembata).

*5.2.1.2. Other places*

Illegal fishing also takes place in Lamakera and Alor, but there is currently no surveillance or enforcement. The Larantuka-based government of East Flores Regency used to have a patrol boat named *Hiu04* or Shark04 (Wungubelen, 2004, *pers.comm*.). This vessel operated as far as Flores Sea, Bali and the Banda Sea (see Chapter 7, Figure 7.3 for the location of Flores Sea and Banda Sea). In April 2004, the provincial government decided to use the patrol boat for provincial patrols and hence transferred the *Hiu04* to Kupang. Since then, the East Flores Regency has had no patrol boat, despite continuous complaints from local fishermen about the long line operations within their waters.

Despite frequent blast fishing occurring in Alor, the local government has insufficient infrastructure to control this impact. The local Marine and Fisheries Agency (DKP – Dinas Kelautan dan Perikanan) has no boat patrol (Boli, 2004, *pers.comm*.). The Agency has to ask the local Coastal Police to monitor blast fishing, yet the operational budget must come from

the DKP. With limited funding to conduct proper sea patrols, the Alor government is unable to handle IUU issues.

In addition, international illegal fishing incidents have escalated in the adjacent Timor and Arafura Seas. Illegal fishing boats from China, Thailand, Philippines and Taiwan operate in Indonesian waters (MMAF 2005), and some Indonesian fishermen also cause problems in Australia. On 21 September 2005, the Australian Broadcasting Corporation (2005) reported that twenty illegal fishing boats from Indonesia escaped the Australian authorities, while four other ice boats[1] were seized by the authorities off Arnhem Land. On 29 September 2005, an Australian patrol boat captured another ice boat loaded with more than 15 tonnes of fish (Murdoch 2005), possibly from Indonesia as well. In addition to endangering the diplomatic relationship between Indonesia and Australia, these illegal fishing cases also endanger marine mammals that migrate between the two countries, as it is doubtful that such illegal fishing boats would be careful with their fishing practices. Their nets might entangle marine mammals during illegal activities, and their crews might also cast away used or broken nets or ropes to the sea as marine debris, as observed during the WWF Indonesia by-catch survey in 2004 (Zainudin 2005).

In the light of illegal fishing issues between Australia and Indonesia, on December 19, 2005, the Minister for Fisheries, Forestry and Conservation of Australia signed an agreement with the Minister of Marine Affairs and Fisheries of Indonesia on 'new initiatives to end illegal fishing in Australia's northern waters' (Macdonald 2005). Both countries have agreed to regular coordinated patrols on the sea borders of both nations, aiming to dispel Indonesian fishermen before they reach Australian waters and conduct illegal fishing. In addition, Australia has expressed its commitment to support alternative livelihoods for Indonesian fishermen as an attempt to reduce the illegal fishing.

[1] Ice boats are fishing boats loaded with ice to store the harvest for a longer period of time

### *5.2.2. Marine traffic*

Like many other areas in eastern Indonesia, the Solor Strait used to be a quiet strait frequented only by sailing boats (Figure 5.3). In the 1980s, however, people started to equip their sailing boats with engines. Later, the sailing boats were replaced by motorised boats. Nowadays there are hardly any sailing boats in the Solor Strait.

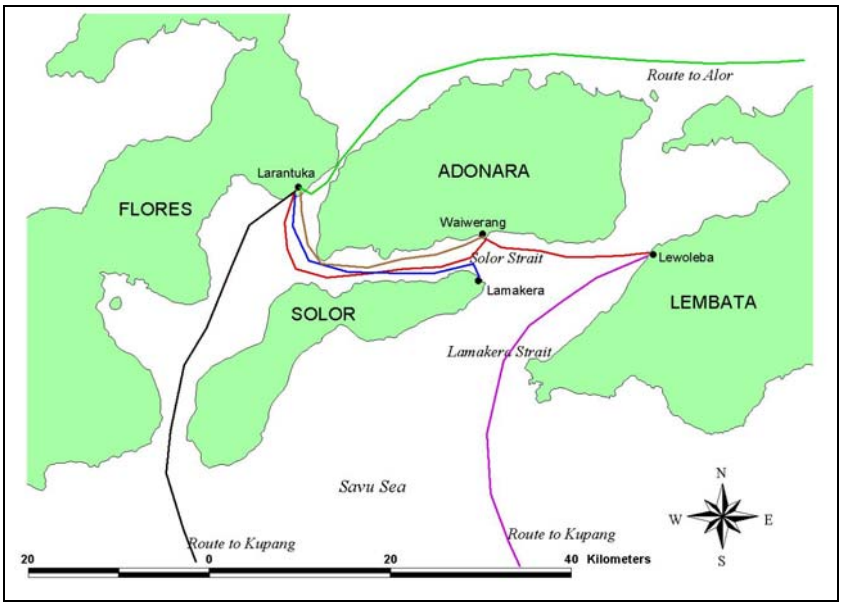


Figure 5.3. Main marine navigation routes around Solor Island (adapted from C.V. Kendali Handal (2003))

During my surveys in Solor and Lembata, I counted the number of vessels in each small harbour we visited from Larantuka to Lewoleba. On a busy day, up to 100 boats cruise around the straits, especially the Solor Strait, including small fishing boats and large inter-island ferries carrying passengers along the route Larantuka-Waiwerang (Adonara)-Lewoleba (Figure 5.3), as well as oil tanker ships from Kupang loaded with refined oil and petroleum for the daily needs of East Flores and Lembata.

Other parts of the Savu Sea also serve as marine transportation routes for passenger boats, cargo boats and oil tankers to many places in the area (Figure 5.4). Improvement in the

relationship between Indonesia and Timor Leste will likely boost traffic, especially around Ombai Strait, a suspected corridor for marine mammals.

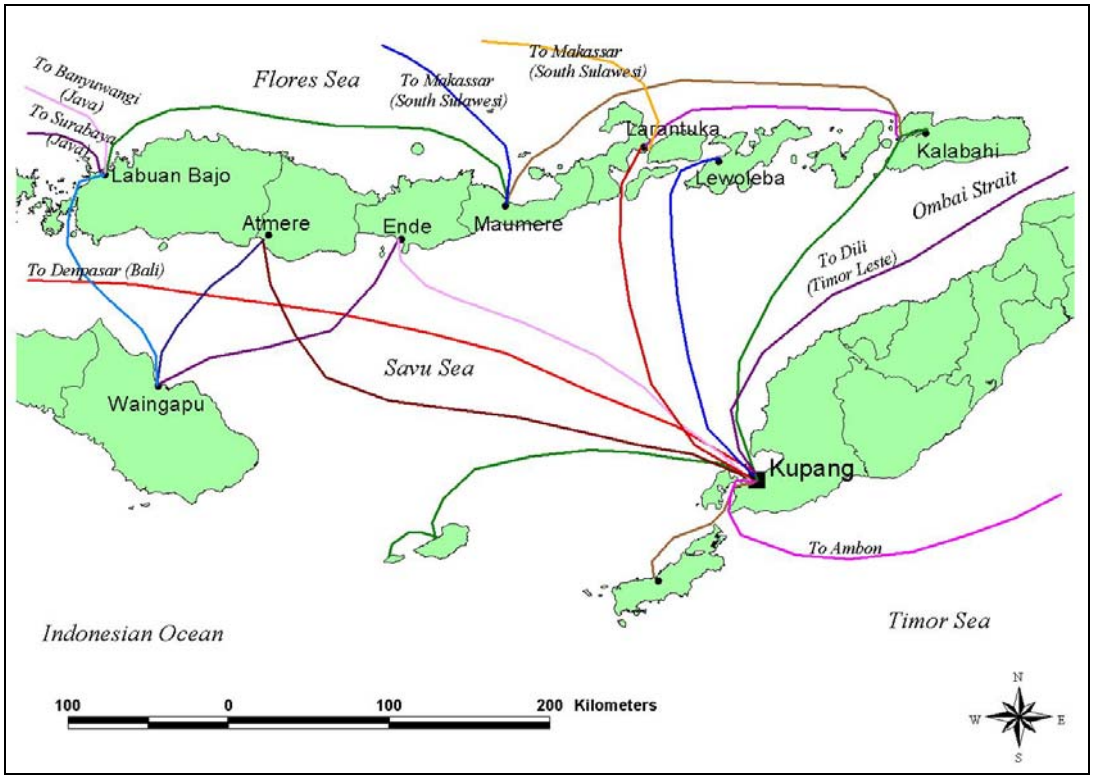


Figure 5.4. Marine traffic routes in the Savu Sea (adapted from C.V. Kendali Handal (2003))

Habitat alienation is believed to be one of several effects of heavy marine traffic on marine mammals in the Solor Strait. The local villagers of Lamakera have expressed their concerns about the decline of whales they sighted in the Solor Strait and adjacent areas. They concluded that it might be due to increased traffic in the strait beginning in the early 1980s. Although more research is needed to check the validity of this claim, heavy marine traffic is believed to have reduced the presence of marine mammals in many other areas (see Marsh et al., 2003; Pidcock et al., 2003). Despite the lack of scientific evidence, the Lamakera fishermen believed that the number of whales has decreased over the years. The fishers further attributed this decline to their use of motorised boats, claiming that the whales avoid the boats.

Collisions with ships can also be lethal to whales, especially those which tend to rest on the surface (Pidcock et al. 2003). Thus, boat strikes are also considered a direct threat to marine mammal populations (Hooker and Gerber 2004). Laist et al. (2001) reported several species of whales at high risk of boat collision, including fin whales (*Balaenoptera physalus*) and sperm whales (*Physeter macrocephalus*), both species that are found in Savu Sea. However, there are no reports of boat strikes on marine mammals in the straits. The fishermen argued that 'the dolphins are too smart to get struck' and that the whales have gone further out to avoid the noise from the boats.

### *5.2.3. Artisanal fisheries*

Artisanal or small scale fisheries are 'traditional fisheries involving fishing households (as opposed to commercial companies), using relatively small amounts of capital and energy, relatively small fishing vessels (if any), making short fishing trips, close to shore, mainly for local consumption' (FAO 2005). This type of fishing can be subsistence or market-oriented and designated for local consumption or export.

Hooker and Gerber (2004) categorised by-catch as a direct threat to marine mammals. There are few data on by-catch from artisanal fisheries compared with by-catch from commercial fisheries (Lewison et al. 2004). Occasionally some marine mammals are entangled in traditional fishers' nets. In Lamakera and Lamalera, dugongs are more likely to get entangled than whales or dolphins. Usually the fishermen then use the dugongs for local consumption instead of trying to release the animals back to the sea. In addition, whales are sometimes entangled in locally set nets (*bagan*) in Lamakera and thus destroy the nets in their attempts to escape.

I consider that whale by-catch from artisanal fisheries in Lamalera and Lamakera is not a serious threat compared with other threats. However, this conclusion is compromised by the lack of data on artisanal by-catch in both villages. For dugongs however, artisanal by-catch might be a more serious threat than direct hunting. Anecdotal information from Rote Island for instance, indicated that for unknown reasons, dugong populations were larger in the past than at present. Artisanal by-catch should be considered in designing research to uncover possible causes of dugong depletion in Rote and surrounding waters.

### *5.2.4. Oil and gas industries*

Currently there is no plan to explore and exploit oil and gas deposits in this area of the Savu Sea (Solor, Lembata, Alor and Rote). However at least two other parts of the Savu Sea have oil and gas deposits: off shore southern Flores and the north coast of West Timor as shown below (yellow circles in red boxes in Figures 5.5 and 5.6). Both are considered relatively low grade deposits.

The global oil price increased considerably in 2005, triggered by the Hurricane Katrina that hit New Orleans, Mississippi in the United States on August 29, 2005 (SBS 2005). The hurricane wiped out four major refineries in the U.S., contributing to the higher price of oil. OPEC (Organisation for Petroleum Exporting Countries) planned to increase the global crude oil supply to compensate for the increasing crude oil price that increased to USD $70.85 (AUD $92.65) per barrel (or A$ 0.56 per litre) on August 30, 2005 (SBS, 2005), compared with the recent crude oil price of around USD $ 64 per barrel (Forbes 2006). As an OPEC member, Indonesia is subject to this decision, which might lead to the exploration and exploitation of additional oil and gas deposits, including the ones in the Savu Sea.

Notwithstanding the current lack of plans to exploit the deposits of oil and gas in the Savu Sea, local and national governments need be made aware of the threats to marine mammals

and other marine life wrought by off-shore oil and gas industries, notably oil spills and noise pollution.

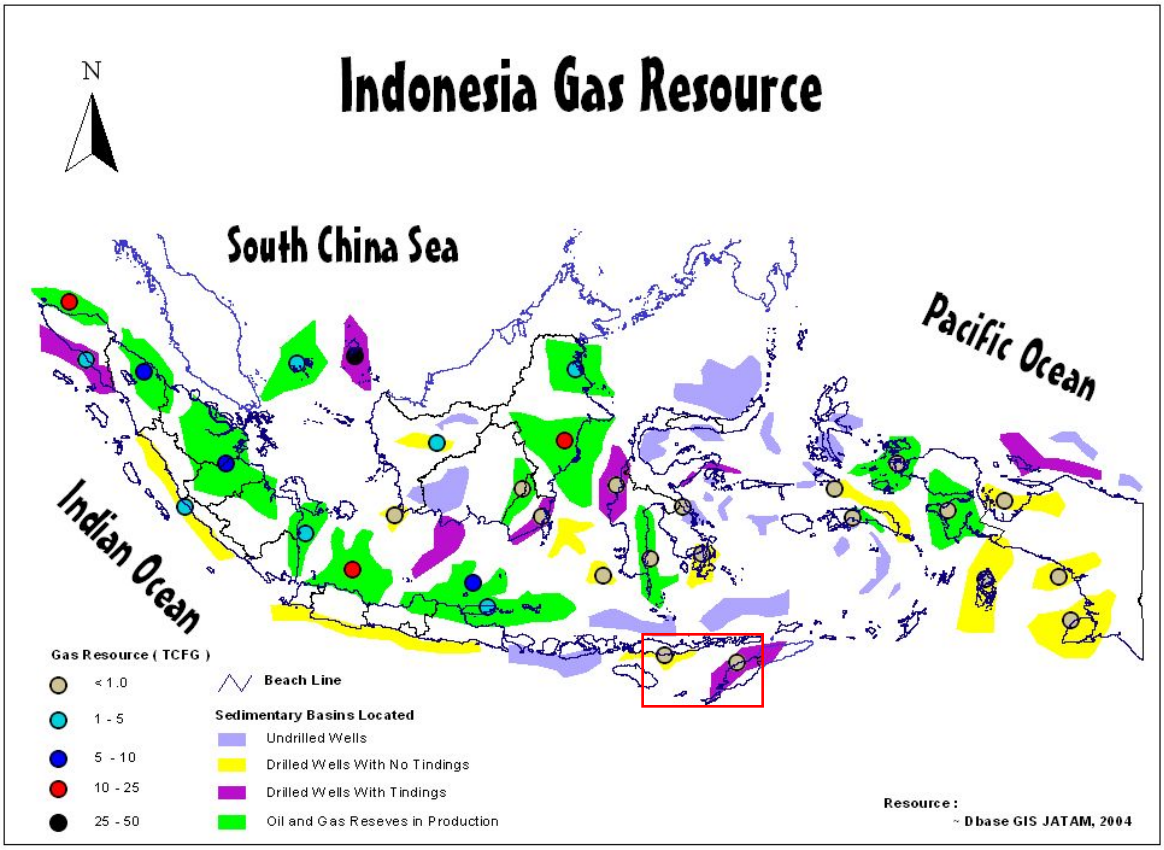


Figure 5.5. Gas deposits in Indonesia. The rectangle outlines my study area (courtesy of JATAM/Anti Mining Network Indonesia).

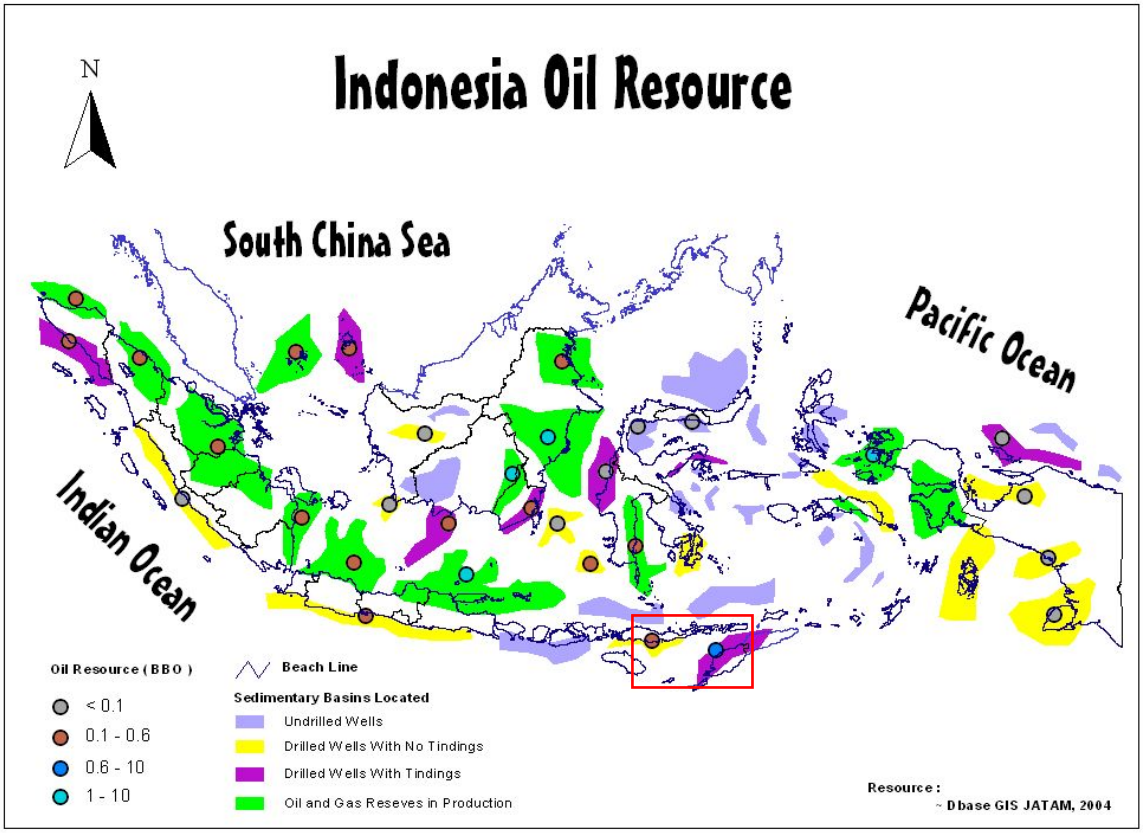


Figure 5.6. Oil deposits in Indonesia. The rectangle outlines my study area.
(courtesy of JATAM/Anti Mining Network Indonesia)

Oil spills have little impact on cetaceans (Pidcock et al. 2003), and thus are considered an indirect threat to marine mammals (Hooker and Gerber 2004). Nonetheless, a study conducted by Moore and Clarke (2002) showed that oil spills potentially affect the benthic prey of gray whales. This contamination is magnified through the food chain, and thus has an adverse impact on gray whales. In addition, oil contamination and bacterial infection might adversely impact on whales with rough or damaged skins (such as the barnacle-skinned whales). While there has not been an oil spill accident in the Savu Sea, the government and oil and gas companies have to be made aware of the potential for vast damage of oil spills and have risk management strategies in place.

During my several visits to the Pertamina (Indonesian National Oil and Gas Company) offices in Jakarta and Alor, it became apparent that Pertamina has adopted some mitigation measures

towards oil spills. The SHE (Safety, health and environment) divisions of every oil and gas regional station have established procedures for oil spill management, including slick bars and towing boats.

However, the oil and gas industries bring additional threats to marine mammals. Ocean noise produced by these industries potentially alters the behaviour of the animals. Pidcock et al. (2003) noted that whale breeding and resting areas are more affected by the negative effects of noise than feeding areas or migratory routes. This noise includes continuous noise from rig operations and seismic noise from air guns during exploration. Research has shown that whales avoid areas where air guns are in use (Pidcock et al. 2003). Human-made noise produced by the oil and gas industries might also limit the ability of marine mammals to detect natural sounds, and hence also alter their capacity to navigate, alienate them from key habitats or cause temporary or permanent declines in hearing ability.

Pertamina (Indonesian National Oil and Gas Company) is not yet aware of the level of the above risks. My discussions with Pertamina SHE (Safety, Health and Environment) Division as well as the Indonesia Oil and Gas Executing Agency (BP Migas) indicated that ocean noise from oil and gas companies is a new issue to them (Hamzah and Salim, 2004, *pers.comm*.).

On the other hand, several oil and gas industries worldwide have come to realise that mechanical noise in the ocean is detrimental to marine mammals (OGP 2005). Despite scepticism about the validity of the claim, some companies have started mitigation measures to prevent further damage to marine mammals, as explained during the session on 'Energy and biodiversity: Integrating biodiversity into oil and gas development' at the 3rd IUCN World Conservation Conference, 19 November 2004. British Petroleum, which has a natural gas project in Bintuni Bay, Papua Indonesia is an example of a company implementing mitigation measures. Lidia Ahmad of the BP (2004, *pers.comm*.) explained that they now

work only during daylight with passive acoustic devices instead of 24 hour transects with air guns.

## 5.3. Specific threats

### *5.3.1. Lamalera (Lembata Island)*

#### *5.3.1.1. Traditional Hunting*

Hooker and Gerber (2004) identified hunting as a direct threat to marine mammal populations. However, there has been no substantive research on the sustainable level of whaling in Lamalera (see Section 3.1.1.2 on Chapter 3) hence I cannot say whether the existing traditional whale hunting is threatening the sperm whale population in this area. Similarly, I cannot claim that traditional hunting is sustainable. There has been a steady decrease in the whale catching rate in Lamalera (see Figure 3.8 in Chapter 3). Thus, traditional whale hunting must be considered as one of many factors that contribute to the decline of the hunting rate, which suggests that the whale population is decreasing. Although I cannot determine whether traditional hunting is the major cause of the whale population decline, as a precaution I treat traditional hunting as a potential threat to marine mammals.

In addition, Figure 3.9 in Chapter 3 Section 3.1.5 showed the increasing catch of small cetaceans in Lamalera. Since 2001, the number of dolphins hunted has exceeded 100 individuals. As explained in Chapter 3 Section 3.1.5, the fishermen claimed that the increasing dolphin catch is a result of the declining whale catch. However, should the dolphin hunting continue at this rate, it is possible that the practice will not be categorised as ‘subsistence whaling’ by the IWC (Chapter 3 Section 3.1.6). Thus, dolphin hunting should also be considered as a threat.

*5.3.1.2. Commercial hunting*

There were two activities in Lamalera that might lead to commercial hunting and over harvesting of cetaceans. During my research in May and June 2004, it became clear that the villagers had started to increase their charges for TV crews. Originally, the rate for filming the hunting scenes (defined as 'any shoots taken starting from the moment the hunters chase the whale, stab and kill it, until it is dragged to the shore') was Rp 1,000,000 (around AUD $200). However, in April 2004 the villagers increased the price to Rp 5,000,000 (almost AUD $1,000). This price might encourage the hunters to hunt the whales for profit. The extreme increase shocked many TV crews who went to Lamalera to cover the 'Buka Lefa' ceremony on May 1st (see Section 3.1.2.3 on Chapter 3 for 'Buka Lefa'). This rate does not apply if the boat does not catch any whales, or if the shooting is done only from the beach.

Despite many protests from TV crews as well as some elders and villagers, the rate was kept high for several weeks. In mid June 2004 the villagers finally caught one sperm whale (the first whale of the season). By that time a decision had been made to lower the shooting rate to the original Rp 1,000,000.

Another commercial option for the villagers is the possibility of a whale export trade with Korea. In February 2004, a Korean visited Lamalera and offered to develop an export business with the villagers. The Korean reportedly took some meat samples to Jakarta, where he had lived for several years. However, he had not returned by the time I left the village in December 2004. By that time the villagers had already learned about Governmental Law No. 7/1999 (the Preservation of Flora and Fauna) stating that all marine mammals in Indonesia are protected from killing and trading. Thus they decided not to continue negotiations about the prospective trade with the Korean, should he return to Lamalera.

Although neither activity has reoccurred, I suggest that some precaution be taken to prevent this happening. There should be a permanent customary agreement on the filming rate that is

adjusted for inflation and an appropriate reflection on the importance of traditional whale-hunting practices in Lamalera. The filming rate should be low enough to pre-empt hunting commercialisation. In addition, governments at local and national levels should take mitigation measures to prevent commercial hunting by making sure that the Governmental Law No.7/1999 is well understood and enforced. Otherwise, there is significant risk that uncontrolled commercial hunting will become a direct threat to the marine mammal populations in the Savu Sea (see Marsh et al., 2003; Hooker and Gerber, 2004).

*5.3.1.3. Commercial display*

In the 1990s, several people from Jaya Ancol Oceanarium Jakarta (later referred as 'Ancol') went to Lamalera to catch killer whales (*Orcinus orca*) for display in Jakarta. The group hired several local fishermen to catch the orcas and made an offshore cage of 200 blue fibre cylinders to keep them temporarily. The plan was to relocate the orcas to Jakarta using helicopters. The oceanarium staff and the fishermen used sound to attract the killer whales and caught three whales using nets. Yet the whales managed to escape by biting the nets of their cage. After two months the Ancol people went back to Jakarta empty handed.

Figure 5.7. Fibre cylinders used to make floating cage for killer whales in Lamalera

Discussions with the national MMAF (Ministry of Marine and Fisheries Affairs), revealed that acquiring a permit for collecting living specimens (especially of protected species) for oceanarium display is not a simple process. The collectors have to show the local officials (e.g., Lembata officers) a recommendation letter from the *Lembaga Ilmu Pengetahuan Indonesia* (LIPI – the Indonesian Science Institute) and have a permit from the Ministry of Forestry prior to collecting the specimens. After collecting the animals, the collectors must provide health certificates to prove that the animals are in good condition. However, DiSciara (2004, *pers.comm*.) argued that it was impossible for LIPI to issue the collection permit unless the size of the population of the target species is clearly understood and the take sustainable. As the orca population in Savu Sea has not yet been studied, LIPI has no basis on which to issue permits, and hence, any proposals to remove orca from the wild to put in display tanks could not be valid.

Small and DeMaster (1995) established that the survival rate of killer whales in various oceanariums in the United States was slightly lower than in the wild. This finding suggests that holding tanks and expertise in marine mammal husbandries may both be inadequate. It is doubtful that the Ancol Oceanarium dolphin tank would be large enough to hold large cetaceans such as killer whales that can grow up to almost 10 m in the wild (see Jefferson et al., 1993 and Reeves et al., 2002). In addition, many NGOs consider that keeping killer whales in captivity is improper because of the animals' large size, high activity level and social structure (Lien 1999).

Ancol currently has only two quarantine tanks, each is 10m diameter and connected to the main display tank (Morante 2000). The display tank measures 26.15 m in its widest and 35.4m in its longest sides. Lien (1999) suggested that MHD (Minimum Horizontal Dimensions) for tanks to hold beluga whales, killer whales, bottlenose dolphins, harbour porpoise, narwhales and long-finned pilot whales should be 8.2 m or 3 times the AAL (Average Adult Length) of the species, whichever is the greater. Assuming that the AAL of

killer whales is 8 m (IWDG 2005), the MHD should be 24 m. Thus, the display tanks at Ancol are sufficiently large to accommodate orca, but not the quarantine tanks.

Beasley (2003, *pers.comm*.) reported that from 1974 until 1998, Ancol captured 84 small cetaceans. As of December 1st, 2002, nine small cetaceans were recorded as dying in captivity, none of the rest were present during Beasley's survey of Ancol (2003, *pers.comm*.). From 1975 until 2001, Ancol captured 18 dugongs, of which only two were present as of December 1st, 2002. Casualties also occurred during capture attempts by the Ancol staff, e.g., one *Tursiops aduncus* in September 1975 and one *Stenella longirostris* in 29 November 1976 died. These data show that the ability of the Jaya Ancol Oceanarium to handle small marine mammals, let alone killer whales, is questionable.

*5.3.1.4. Harbour plan in Wulandoni*

Responding to the increasing need for a direct link to Kupang, the Lembata government plans to establish a new harbour in Wulandoni District (Figure 5.8). The harbour will be designed to accommodate ferries that will bring passengers directly to Kupang. To date, Kupang can only be accessed by public transportation to Lewoleba, ferry from Lewoleba to Larantuka, and ferries or flight (every Thursday) from Larantuka to Kupang. Alternatively, a direct flight Kupang-Lewoleba return is available every Tuesday. The ticket for this flight is very cheap (Rp 160,000 or less than AUD 30), but there are only 14 seats available, thus this flight is always full. There is also another route to Kupang via Alor, but it takes two days in ferryboats that cost Rp 50,000 (less than AUD $8) per trip.

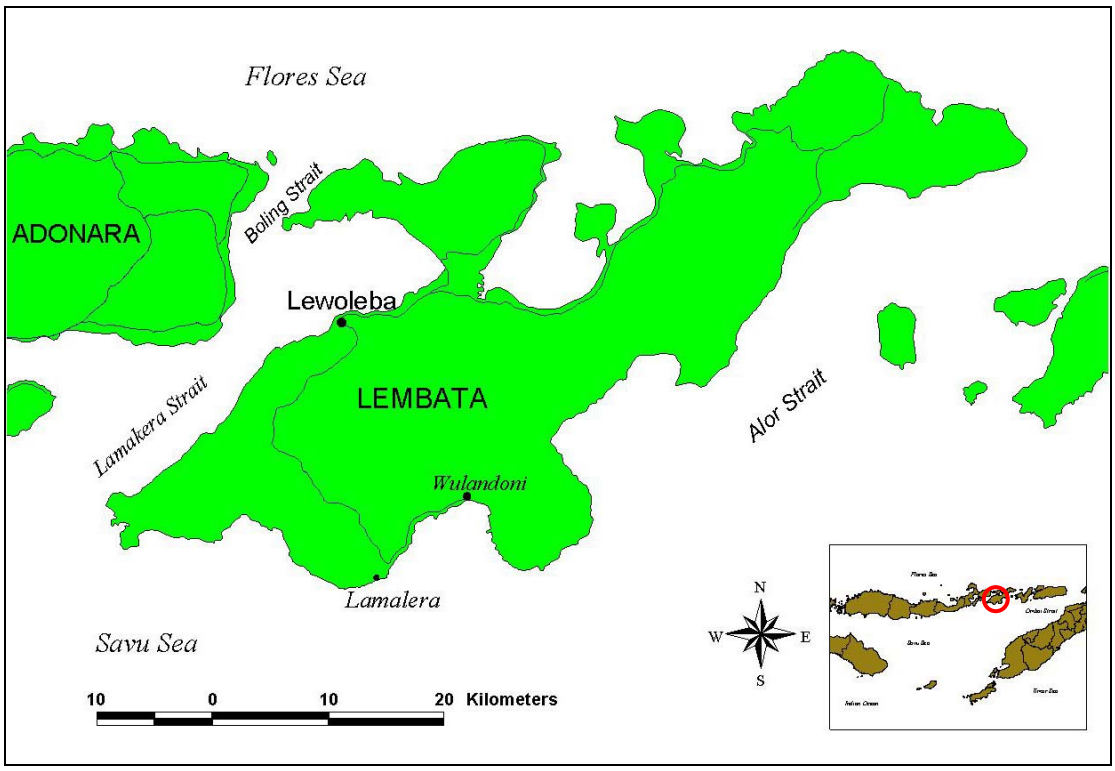


Figure 5.8. The site of the proposed harbour is Wulandoni village, Lembata Island

The Jakarta MMAF (Ministry of Marine and Fisheries Affairs) has raised concerns about the plan to develop the new harbour, because they understand that the area is a whale migratory route. The harbour noise may alienate marine mammals as well as increase the risk of boat strikes. The Ministry suggested that the Lembata government should develop a ship route plan to minimise the risk of vessels colliding with whales. The Lembata government acknowledged the importance of the whale migratory route, and promised to build the harbour in a way that would not disturb whales and other migratory marine animals. However, the strategies to achieve this objective are still uncertain. Data on the critical habitats of marine mammals in the Solor-Alor region can be derived from Kahn (2003a) and Kahn (2005), as well as several surveys conducted by the MMAF (Purnomo, 2005, *pers.comm.*).

Hooker and Gerber (2004) categorised acoustic pollution from boats as an indirect threat for marine mammals, whereas boat strike is a direct threat that risks killing the animals. Based on their research on whale collisions with fifteen trans-Atlantic ships, Laist et al. (2001) recommended that the length and speed of the vessels should be limited to a maximum of 80m and 14 knots respectively to avoid strikes with large cetaceans. Laist et al. (2001) also suggested encouraging the ship's crews to adopt the following practices to enhance the survival of cetaceans: (1) report collisions with whales to official institutions (either harbour management, environmental bodies or others); (2) advise the relevant officials of the anecdotal insights into cetacean biology and ecology (including distribution patterns); and (3) use sound to divert whales from the ships to enhance the cetaceans' survival rate. The last option, however, is unlikely to be adopted in Indonesia in the near future, so efforts to minimise boat collisions would be limited to the first and second options.

*5.3.1.5. Modernised hunting*

In 1974, the FAO (Food and Agriculture Organization) established a program to modernize the hunting gear used at Lamalera (Kedang, 2004, *pers.comm*). The villagers replaced traditional harpoons with mechanised harpoons and thus increased their catch rate significantly until 'there was no place anymore on our beach to put the whales' (Beding, 2004, *pers.comm*). However, there was no official record of the FAO catch to compare with the traditional catch (see Section 3.1.5 on Chapter 3 for Lamalera hunting record).

At first the villagers were pleased with the result. But as there were no refrigerators in the village due to the lack of electricity, the villagers could not store the over-harvested whale meat. Moreover, the over-supply led to difficulties in marketing, as there are not many communities in Lembata or other islands that prefer whale meat to other food sources. As a result, much of the meat deteriorated and was wasted.

The Head of the Wulandoni District, Mr. Agustinus Kedang, informed me that in 1978 the Ministry of Agriculture issued the Agriculture Ministerial Decree no 327 that listed some species of animals, including whales and dolphins, as protected species. In addition, the Indonesian army prohibited the ownership of any firearms by non-military citizens. Thus the use of mechanised harpoons was prohibited and the FAO project stopped.

### *5.3.2. Lamakera (Solor Island)*

#### *5.3.2.1. Traditional hunting*

Traditional whale hunting in Lamakera is not conducted as extensively as in Lamalera, thus most outsiders do not even consider this village when discussing traditional whale hunting in Indonesia; a fact that was admitted to me by the people of Lamakera themselves. Currently, there is no information on the catch or the whale population status available to ensure that the Lamakera whale hunting is sustainable. However, based on the precautionary principle I consider traditional hunting as a threat to marine mammals in waters adjacent to Solor Island, even though the harvest level appears less than the hunting in Lamalera.

In addition, the Lamakera villagers hunt small cetaceans (mostly various species of dolphins). There is no adequate information on small cetacean populations in Lamakera's adjacent waters either. Thus, I also classify small cetacean hunting in Lamakera as a potential threat to marine mammal populations in the region.

The villagers of Lamakera have been encouraged to continue recording their catches of whales, small cetaceans and dugongs. Hopefully in several years there will be enough data on the size of the marine mammal populations and the harvest level to estimate a sustainable level of traditional hunting in both Lamakera and Lamalera.

*5.3.2.2. Pearl farming*

Pearl farming industries started to develop around Solor Island in early the 1990s. The first pearl farm (Asa Mutiara Ltd) was established in Konga Island in 1996 (Figure 5.9).

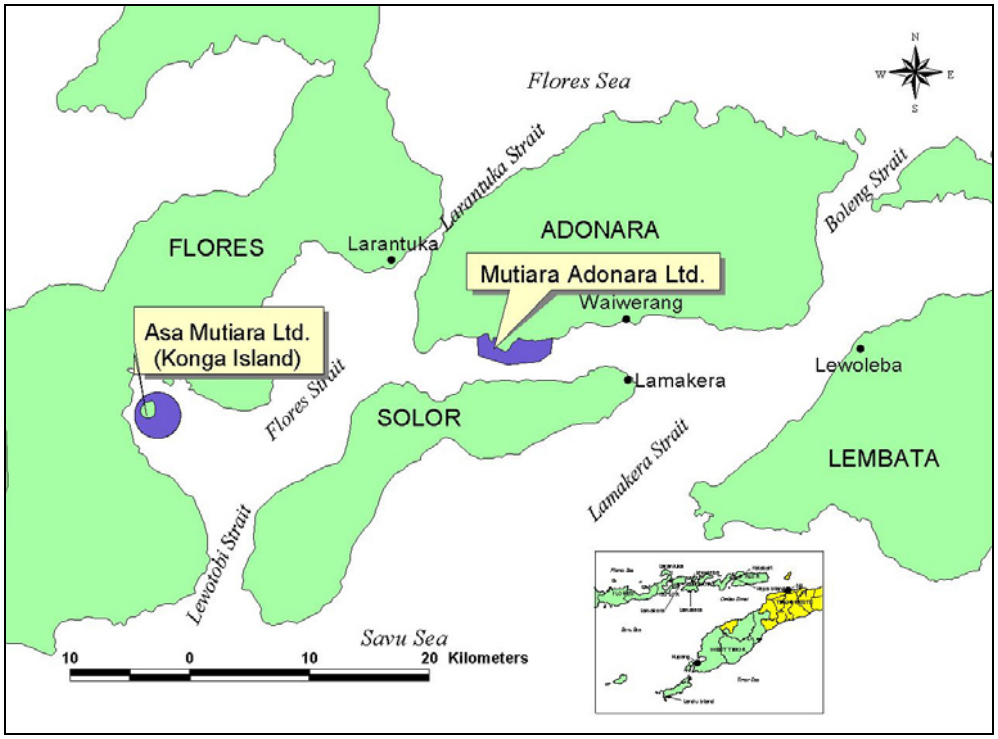


Figure 5.9. Pearl farm industries around Solor Islands based on my observations in 2004

Since the pearl farms were established, the fishermen have noticed that whales do not pass through the Konga Bay as often as before. They argue that the pearl nets 'scare the whales away' and reduce whale population within the area. Sanyakit (2004, *pers.comm*.), who had lived in the bay for five years, claimed that he has not seen whales entering the bay since he settled in the area. Sientific research conducted in Australia for bottlenose dolphins (*Tursiops sp.*) and in New Zealand for dusky dolphins (*Lagenorhynchus obscurus*) (see Markowitz et al. (2004) and Watson-Capps and Mann (2005)) suggest that these claims may be plausible. Both studies show a decline in dolphin numbers after pearl farm and oyster farms were established.

Hence, it is possible that marine mammals have been alienated from critical habitats in the Solor Strait as claimed by the local communities. It is also possible that numbers have been reduced by over harvesting.

Another pearl farm (Mutiara Adonara Ltd) was established in the southern waters of Adonara in 2004 (Figure 5.9). There is no report of any entangled marine mammals in the area, however, the pearl farming management have had negative comments from some of the villagers as well as the local Marine and Fisheries Agency because they wanted a fishing-free zone within a kilometre radius of their nets (Wungubelen, 2004, *pers.comm*.).

### 5.4. Chapter summary

In this chapter, I discussed all threats to the marine mammals of the Savu Sea identified during my fieldwork in Lamalera, Lamakera, Alor and Rote in Savu Sea. Those threats are summarised in Table 1 below.

**Table 1. Summary of threats to marine mammals in Savu Sea**

| No. | Threats | Actors | Conflict with other activity? | Government agencies involved for problem solving? |
|---|---|---|---|---|
| | *General threats* | | | |
| 1 | IUU fishing | Blast fishers, long liners, fishing industries in general | Traditional whale hunting, artisanal fisheries | Ministry of Marine Affairs and Fisheries (MMAF) |
| 2 | Marine traffic | Fishers, transport vessels, oil and gas tankers | Traditional whale hunting | MMAF and Dept of Transportation |
| 3 | Artisanal fisheries | Local fishers | Traditional whale hunting | MMAF |
| 4 | Oil and gas industries | Oil and gas companies | Marine traffic (possible) | Dept of Energy, Dept of Industry, MMAF, Pertamina (Indonesian National Oil and Gas Company) |
| | *Specific threats* | | | |
| | *Lamalera (Lembata Island)* | | | |
| 5 | Traditional hunting | Local fishers of Lamalera | Commercial fishing | MMAF, local tourism agency |
| 6 | Commercial hunting | Local fishers of Lamalera | Traditional whale hunting | MMAF, local tourism agency |
| 7 | Commercial display | Local fishers of Lamalera, Ancol Oceanarium (Jakarta) | Traditional whale hunting | MMAF |
| 8 | Harbour plan in Wulandoni | Local government of Lembata | Traditional whale hunting | MMAF and Dept of Transportation |

| | | | | |
|---|---|---|---|---|
| 9 | Modernised hunting | Local fishers of Lamalera | Traditional whale hunting | MMAF, local tourism agency |
| | *Lamakera (Solor Island)* | | | |
| 10 | Traditional hunting | Local fishers of Lamakera | Commercial fishing | MMAF, local tourism agency |
| 11 | Pearl farming | Pearl farm companies | Artisanal fisheries, traditional whale hunting | MMAF |

As the research is qualitative, I cannot rank the threats. However, the information derived from the threat analysis is important to build a better picture of problems that occur in Savu Sea with regards to marine mammal conservation.

In Chapters 7 and 8, I will discuss the way to prioritise the threats above as well as several management options to address the threats. I briefly discuss two existing management schemes in the Savu Sea in Chapter 6, lessons from which are applicable for marine mammal management in the Savu Sea.

## VI. EXISTING MANAGEMENT SCHEMES IN THE SAVU SEA

The threat analysis in Chapter 5 implies several requirements for a well-designed marine mammal management plan for the Savu Sea. In Chapters 7 and 8, I discuss several management options for marine mammal conservation in Indonesia, including Marine Protected Areas (MPAs). While marine mammals are migratory essential parts of the life cycles of some species are connected with coastal ecosystems that are conserved through MPAs (see Hoyt 2004). In the Solor-Alor Islands for instance, marine mammals are often sighted in coral reef and seagrass ecosystems. Hence, an MPA may be an appropriate conservation scheme for marine mammals in this region.

In Chapter 6, I discuss two existing management frameworks in the region: i.e., the Komodo National Park and the Pantar Strait Marine Park, in the context of a brief introduction to the concept of MPAs. Both parks are located in the Savu Sea (Komodo in the west and Pantar in the eastern part). Thus these initiatives could compliment with the proposed Solor-Alor MPA (Chapters 7 and 8) to form an informal network of parks in the region. Thus, the purpose of this discussion is to provide information on what has been done for marine mammal conservation in the region and the lessons learned.

### 6.1. A brief introduction to Marine Protected Areas

A Marine Protected Area (MPA) is ‘any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment’ (IUCN 1994). Although the concept of MPAs originated from terrestrial protected areas, the marine environment differs from the terrestrial environment in several important ways, which require different management approaches.

Kenchington (1990) identified several important characteristics of the marine environment that distinguish it from the terrestrial environment. The marine environment is three-dimensional (i.e., length, width and depth/water column) and the associated biota tend to have low site fidelity, whereas the terrestrial environment is largely two-dimensional (i.e., length and width) and most biota have high site fidelity. Each seascape (e.g., sea, strait, bay, etc) is usually larger than a landscape (e.g., forest, valley, riverbank, etc). Places within a marine environment are actively connected through the water column, and thus often lack permanent geographic boundaries, as opposed to the more definite and relatively permanent boundaries in the terrestrial environment.

Marine animals also have different life cycle strategies to terrestrial animals (Kenchington 1990). Many marine species (but not marine mammals) release large numbers of eggs and sperm to the water column and have a planktonic strategy and life history. In contrast, their more restrictive environment forces most terrestrial life forms to produce fewer and larger offspring. In addition, the larger geographical scale and lower numbers of boundaries to dispersal in marine environments means that marine species tend to have larger ranges than most terrestrial biota (Kenchington 1990). These differences require MPAs to be designed and managed differently from terrestrial protected areas.

In practice, two types of MPAs have evolved based on their geographic coverage and level of protection, i.e., large-scale multiple-use MPAs which tend to have core areas of high protection surrounded by zones with lower levels of protection and smaller MPAs with substantial portions of highly protected core areas (Hoyt 2004). Especially in areas with many human pressures, Kelleher (1999) suggested that larger MPAs that function as ‘sustainable multiple use managed areas’ are more appropriate than ‘isolated highly protected pockets’ as larger scale MPAs accommodate both anthropogenic activities in the region (e.g., with tourism or traditional fishing zones) while facilitating the conservation goals of the MPA, especially in the area of ‘no-take zones’.

According to the latest (April 2005) map of protected areas in Indonesia from the Ministry of Forestry, Indonesia has at least 60 MPAs or protected areas with marine components (Forestry 2005). The MPAs vary from multiple-use marine national parks to strict marine reserves with very limited access for research and tourism. Currently, Indonesia has seven marine national parks, i.e., Seribu Islands Marine National Park (107,489 ha – Jakarta Bay), Bunaken Marine National Park (89,000 ha – North Sulawesi), Komodo National Park (173,300 ha – Flores Island), Cendrawasih Bay Marine National Park (1,453,500 ha - Papua), Takabonerate Marine National Park (530,765 ha), Wakatobi Marine National Park (1,390,000 ha – Southeast Sulawesi) and Togean Islands Marine National Park (362,605 ha – Central Sulawesi). The remainder of the MPAs are strict marine reserves. In the province of East Nusa Tenggara alone, the reserves cover the Seventeen Islands Marine Nature Recreation Park (9,900 ha – District of Riung, Ngada Regency, northern coast of Flores Island), Lapang-Batang Islands Nature Recreation Park (1,000 ha – northeast of Lembata Island), Maumere Bay Marine Nature Recreation Park (59,450 ha – Maumere in Flores Island) and Kupang Bay Marine Nature Recreation Park (50,000 ha – Kupang in Timor Island).

The total coverage of MPAs in Indonesia is approximately 6,283,000 ha (Forestry 2005). Although none of the current Indonesian MPAs was specifically designed for marine mammals, the Bunaken, Wakatobi and Komodo National Parks are significant habitats for cetaceans (Hoyt 2004). In 1996, a scientific diving expedition from the Fisheries Diving Club of the Bogor Agriculture University witnessed a pair of whales in the Seventeen Islands Sanctuary (*pers.obs*), thus indicating that this marine reserve might contribute to the protection of critical habitats for cetaceans.

MPA planners are typically required to develop a zoning plan that will accommodate the needs of sustainable use and maintain biodiversity. A zoning plan is ‘the means by which the planners and managers define the purposes for which a protected area may be used’ (Kelleher

and Kenchington 1992, p. 32). In other words, zoning provides opportunities for various human activities in some zones; while at the same time conserving the nature of some areas, and minimising user conflicts.

There are several national and local matters to be considered in establishing an MPA (Kelleher 1999), including planning, zoning, community participation, and financial sustainability. Prior to planning, Kelleher (1999) suggested that the relevant management authority should develop clear objectives, which are simple enough for stakeholders to understand and break down into management plans. The authority should provide appropriate support to build management capacity of the protected area, particularly in the planning phase.

There are five main steps to create a zoning plan: (i) initial information gathering and preparation, (ii) public participation or consultation prior to the plan preparation, (iii) preparation of a draft plan, (iv) public participation or consultation about the draft plan, and (v) finalisation of the plan (Kelleher and Kenchington 1992). The draft zoning plan should be developed based on bio-physical and socio-economic research. Public consultation is very important in developing the draft plans to help the public understand the planning process and create a feeling of ownership towards the plan. The final zoning is a result of public input and tends to be based on knowledge and verifications of available bio-physical data and human activities.

During the planning processes, Kelleher and Kenchington (1992) advocate assembling teams of inter-disciplinary experts to work together to synthesise the knowledge of science, technologies and humanities to achieve comprehensive and feasible management solutions. Kelleher (1999) further suggests that to make sure that the balance between natural and social considerations is maintained, park planners and managers should collect data and document

the aspirations of local people to make sure that future conflicts among park users are minimised.

The importance of a MPA having access to sustainable funding is also crucial (Kelleher 1999). Without secure funding, the park authority will not be able to fulfil its duties to protect the park and its biodiversity. Ideally, governments should be responsible for the funding of a particular MPA. However, this situation rarely occurs in developing countries. Hence the national government has to find additional funding to ensure sustainable management of their MPAs, a process sometimes called '*privatisation*'. External funding or support can come from the private sector, NGOs, Indigenous peoples, local government or community-based partnerships. Kelleher (1999) suggested that MPA authorities should be able to generate funds from various types of activities as well, including park entrance fees (see also Walpole et al. 2001), alternative incomes, environmental trusts, etc. In turn, the authorities should consider reducing operational costs by conducting co-management with locals or the private sector, contracting out several services in the MPA to other stakeholders, leasing out the MPA to an NGO or tour operator or to a trust operated by local people (Kelleher 1999). These ideas should be explored in public consultations to avoid unnecessary friction between stakeholders (see Kelleher and Kenchington 1992).

The park managers also should be able to identify the economic benefits for local communities and provide compensation for local people displaced or impacted by the establishment of the MPA (Kelleher 1999). If the park eventually succeeds in providing sustainable income for locals (either via tourism, fisheries, etc) such compensation would only be a cost during the set-up periods.

Based on the concepts of MPA explained above, I now discuss the Komodo National Park and Pantar Strait Marine Park as two established protected areas in the Savu Sea. I also

compile the lessons learned from both parks for guidance to the establishment of other marine protected areas in the region, as later explained in Chapters 7 and 8.

## 6.2. Komodo National Park

### *6.2.1. Background information*

*6.2.1.1. The Park and Biodiversity*

The Komodo National Park is situated on the western tip of Flores Island. In contrast, the Solor-Alor Islands are located eastwards of Flores Island (Figure 6.1). The Park was established in 1980 by the Indonesian government with the initial goal of protecting the komodo dragon (*Varanus komodoensis*) (Pet and Yeager 2000). The United Nations Educational, Scientific and Cultural Organization (UNESCO) granted the Park the status of a Man and Biosphere Reserve in 1977 and a World Heritage Site in 1991 (UNESCO, 2005a; UNESCO, 2005b).

Komodo National Park covers 1,817 $km^2$ of protected area (Figure 6.1), including 1,214 $km^2$ of marine protected area and 603 $km^2$ of terrestrial protected area (Hoyt 2004). There was a proposal to enlarge the Park to a total of 2,321 $km^2$ by including uninhabited Banta Island (25 $km^2$) and the 479 $km^2$ of waters west of the present borders (Hoyt, 2004; Pet and Yeager, 2000). However, due to possible conflicts with the Province of West Nusa Tenggara (adjacent to Banta Island), this proposal has been cancelled (Welly, 2005, *pers.comm*.).

The biggest islands in the Park are Komodo and Rinca (Figure 6.1), both of which are inhabited. The largest town is Labuan Bajo, where a small airport services regular domestic airflights to Bali and other parts of Indonesia.

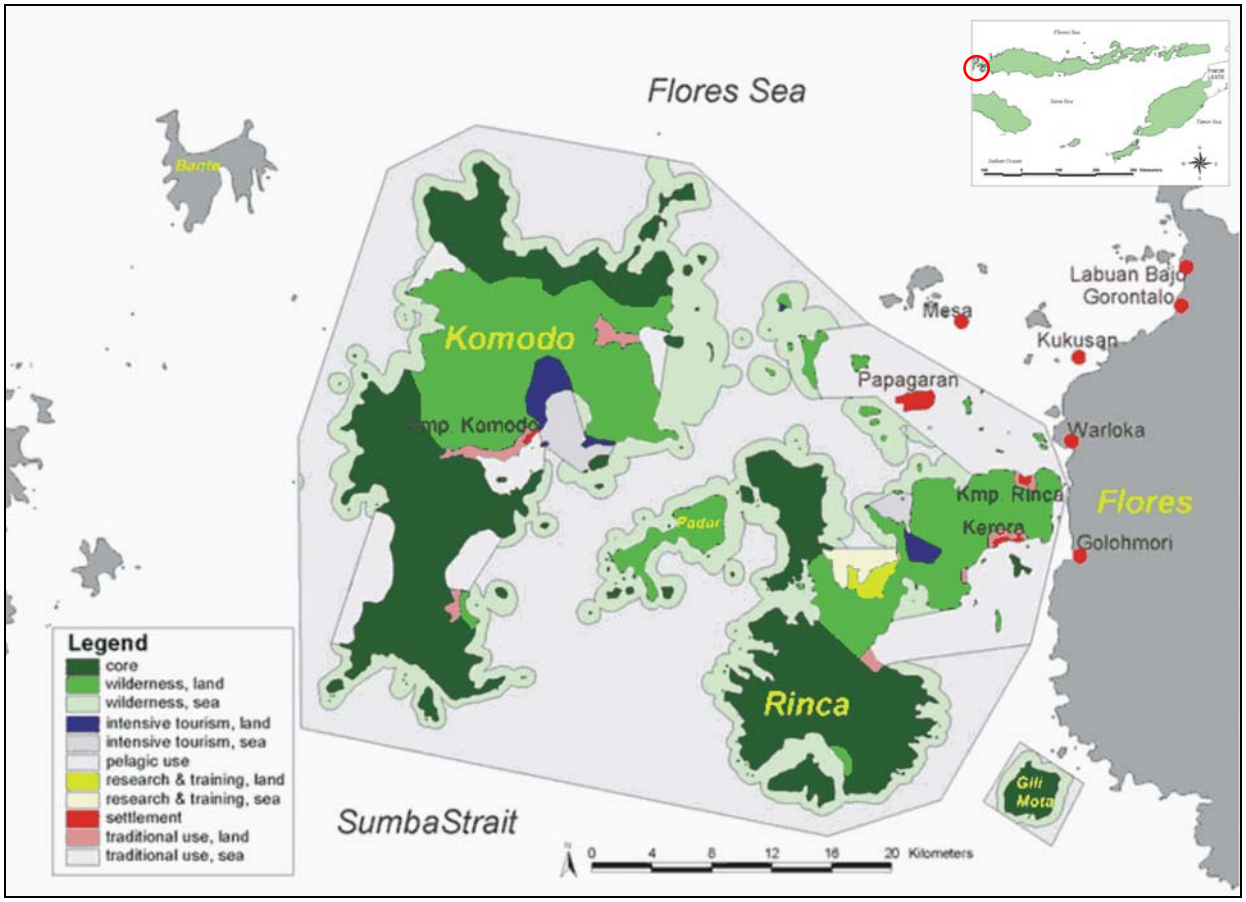


Figure 6.1. Komodo National Park (zoning courtesy of www.komodonationalpark.org)

Although initially famous only for the komodo dragon, the Komodo National Park is now also well-known for its marine environment, including coral reefs, mangroves and seagrass beds (Pet and Yeager 2000). The coral reef ecosystem of Komodo supports at least 260 species of corals, 70 species of sponges and 1,000 species of fish. In addition, the waters are inhabited by at least 18 species of cetaceans (Kahn and Pet 2003), dugongs, sea turtles and other marine life.

The Park Authority (under the Department of Forestry) has received support for the Park management from The Nature Conservancy (TNC) since 1995. In 2000, the Komodo National Park Authority, in cooperation with The Nature Conservancy and Gajah Mada University of Yogyakarta, developed a '25 Year Master Plan for Management of Komodo National Park' (Pet and Yeager 2000).

*6.2.1.2. The inhabitants*

According to the 1999 census, 3,267 people lived inside the Park (Pet and Yeager 2000). Another 16,816 people lived in villages adjacent to the Park. Although a portion of the human population in the islands came from the Bima Regency in West Nusa Tenggara, the majority of people living inside the Park are from the Bajau tribe, a sea gypsy tribe that originated in Sulawesi and migrated to Aceh (Sumatra Island) before going to the Komodo Islands (Welly, 2005, *pers.comm*). Most people living on the adjacent mainland are from the local Flores tribes. Pet and Yeager (2000) explained that around 97% of the people in the Park depend on pelagic lift net (local name: *bagan*) fisheries, which catch squids and small schooling pelagic fish.

There are four villages (*kampung*) within the Park: Kampung Komodo, Rinca, Kerora and Papagaran (Figure 6.1) (Pet and Yeager 2000). Kampung Komodo is the fastest growing village, mainly because of migration from other areas in the province of East Nusa Tenggara. According to the 1999 census, Kampung Komodo had 1,169 inhabitants, Papagaran 1,078, Rinca 835 and Kerora 185.

According to Pet and Yeager (2000), most of the villagers have only basic education. Fewer than 10% of the elementary school graduates continue to high school. Few pursue higher education because fishing, almost the only source of livelihood, is a largely manual occupation and rarely requires human resources with high school education. In addition, many islanders in the Park have incurred high individual debts in their dealings with middlemen traders (*tauke/toke*) and so cannot afford to send their children to high school.

Middlemen traders exist in many conservation areas in Indonesia, such as in Sumatra and Sulawesi (Sadovy, 2000; Welly, 2005, *pers.comm*.). Welly (2005, *pers.comm*.) explained that the middlemen usually offer a large amount of credit to villagers, who must return it at high

interest. The fishermen try to repay the debt by selling their fishes to the middlemen at such a low price that they remain indebted to the middlemen for long periods of time.

However, some fishermen still think that the middlemen are heroes who have provided much needed loans, because banks rarely grant loans to small fishing industries (Welly, 2005, *pers.comm*.). In addition, the middlemen provide the fishermen's daily needs such as fishing gear, fuel supplies, rice, sugar, coffee, salt, school fees, as well as the health service fee. Such a patron-client relationship makes it hard for fishermen to reduce their dependency on the middlemen.

During my research, I did not investigate the presence of middlemen in Solor, Lembata, Alor or Rote Islands. To my knowledge, there were no middlemen in Lamalera, while several middlemen operated in Lamakera. However, little is understood about the impact of these middlemen and their trade activities on the sustainability of local marine life. In the light of the proposed establishment of the Solor-Alor MPA (Chapter 7), the middlemen-fishermen relationship in other areas in the Savu Sea should be examined carefully to provide a better understanding of the socio-economic conditions of the villagers in the region. It is possible that middlemen also play important roles in the communities of Solor-Alor Islands. Their activities might adversely impact on conservation processes as they have done in the Komodo National Park.

*6.2.1.3. Threats to the Park*

There are various threats to the marine ecosystems of Komodo National Park. The biggest threat comes from destructive fishing practices, mainly blast fishing that is mostly conducted by communities who reside outside the Park areas (Pet and Yeager 2000). The majority of these fishermen come from Sape (West Nusa Tenggara), South Sulawesi and Palue Islands (east of Komodo Islands, north of the main Flores Island), although a small number of Park inhabitants also carry out illegal and destructive fishing within the areas (Welly, 2005,

*pers.comm*). The island inhabitants claim that such fishing is necessary because of the debt they owe the middlemen.

In addition to blast fishing, the local inhabitants who live inside the Park also have a habit of '*meting*' or reef gleaning. During *meting* (a Flores term for 'coral'), the locals search the lagoons for fishes and shells at low tide, and in the process destroy the corals as they walk on the reef (Pet and Yeager, 2000; Welly, 2004, *pers.comm*.). Often they also turn the corals upside down with iron canes to search for any fish or shells. Welly (2005, *pers.comm*.) also indicated that in addition to *meting*, the villagers use *bubu* (bamboo cages) to catch reef fish. This practice is destructive as the fishermen usually wreck corals to cover and stabilise the *bubu* underwater.

Other threats in Komodo National Park include pressure from the human population within the Park: over harvesting, uncontrolled tourism, plastic and chemical pollution, poaching of turtle eggs and mangrove woods, severe exploitation of limited resources, possible mining activities and oil explorations, as well as global warming (Pet and Yeager, 2000; Hoyt, 2004). However, Pet and Yeager (2000) indicate that the size of the human population living in the Park is the biggest factor affecting the environment, followed by destructive fishing activities.

### *6.2.2. Existing management regime*

As explained above, a 25 year management plan was developed in 2000, as a result of co-operation between the Komodo National Park's Authority, The Nature Conservancy, the Gadjah Mada University and the Manggarai District Authority (Pet and Yeager 2000). The Plan was developed in response to the Rapid Ecological Assessment undertaken by The Nature Conservancy in 1995. The 25 year plan comprises three parts: Part 1 (Management Plan), Part 2 (Data Analysis) and Part 3 (Site Planning).

Based on the current Management Plan, the Park's management goals are 'to protect its biodiversity (particularly the Komodo dragon) and the breeding stocks of commercial fishes for replenishment of surrounding fishing grounds' (Pet and Yeager, 2000). The Plan also recognises that the major challenge is 'to reduce both threats to the resources and conflicts between incompatible activities'.

*6.2.2.1. Zoning*

The Komodo National Park is a multiple use marine park with seven levels of zoning (Figure 6.1) as follows:

Zone 1: Core zone (IUCN 1994 category Ia)

Zone 2: Wilderness zone with limited tourism (IUCN 1994 category Ib)

Zone 3: Tourism use zone (IUCN 1994 category II and VI)

Zone 4: Traditional use zone (IUCN 1994 category II and VI)

Zone 5: Pelagic zone (IUCN 1994 category VI)

Zone 6: Special research and training zone (IUCN 1994 category II)

Zone 7: Traditional settlement zone (IUCN 1994 category II and VI)

Traditional fisheries are limited to Zones 4 and 5. Tourism is permitted in Zone 2 on a limited basis and in Zone 3. Commercial fishing with restricted gear types is permitted in Zone 5 only. Research (under permit), monitoring and environmental restoration are permitted in all zones. Welly (2005, *pers.comm*.) advised that the traditional use zone (Zone 4) was based on public consultation with the fishermen and villagers. Areas that were traditionally used by villagers to fish were designated as traditional fishing grounds, whereas areas without frequent fishing activities were zoned for other activities, such as marine tourism.

*6.2.2.2. Community participation and public consultation*

In order to meet its objectives, an effective MPA should provide sufficient resources for community consultation and education to enable park managers to understand community

aspirations (Kelleher and Kenchington 1992). Violent conflicts in Komodo National Park between park rangers and fishers indicate that the early Management Plan did not adequately reflect the needs of those communities dependent on park resources. For example, eight incidents of gun fire between blast fishers and park rangers occurred in and around the Park between 1980 until 1988, and resulted in the deaths of eleven fishermen (Daton and Nggarung 2003). Two more fishermen died in 2002, but the number of ranger casualties was not reported.

Daton and Nggarung (2003) recorded this violence from the perspective of two local human rights NGOs (PIAR and Kontras). Their article, however, does not explain the incidents in the context of marine park planning and management. It was not clear if the fishermen died because of brutal firing by park rangers, or as the consequence of the fishermen's attempts to fight the rangers. The article also failed to clarify whether the fishermen lived within the Park areas or came from other places.

Nonetheless, the high number of casualties suggests a lack of communication between the Park Authority and the local communities, especially before the establishment of the current Zoning Plan. It is possible that the fishers were so poor that they had few alternatives but to opt for destructive fishing, and their plight was not recognised by the authorities. The current Plan has not completely resolved stakeholder conflicts. The latest incident in 2002 triggered protests by some local and national NGOs, as well as the local government, against the Park Authority and The Nature Conservancy (Baran 2003).

The true cause of the violence is not easily ascertained, and I wish to emphasise here that I do not intend to denounce any stakeholders. I refer to the violence because it illustrates conflicts that often occur between park managers, fishermen (both those that operate inside or outside a Park), NGOs and governments. This conflict is an indication of inadequate public consultation prior to, and after, the establishment of the Park – an inadequacy that is common

in many other protected areas in Indonesia, as suggested by Alder et al. (1994) and Santiaji (2005, *pers.comm*.), an official who works for WWF Indonesia in the Wakatobi Marine National Park (Southeast Sulawesi). To pre-empt such friction, Kelleher and Kenchington (1992) suggested that any marine park management plan should document historical and possible conflicts of interest among users in the designated area. There is no guarantee that problems related to marine park establishment would not occur after a series of consultations, but at least the participation process should reduce conflicts in the designated areas.

These community dynamics suggest that the management plan of Komodo National Park was not based on comprehensive data about the socio-political and economic conditions. The 25 Year Management Plan recognised the importance of community participation and public consultation. However, this aspect of the Plan lacked detail and did not clearly explain the process by which the communities would be engaged or consulted. There was no status report within the Plan or accessible documents on levels of public awareness about the Park prior to the management plan. Therefore, the need for specific social management activities was unclear. The original socio-economic process involved in the establishment of the Park in 1980 was not analysed in the 25 Year Management Plan. However, drawing from the history of top-down management engaged in by the Indonesian government during those years, I suspect that the original Park design did not include in-depth socio-political and economic assessments.

Welly (2005, *pers.comm*.) suggested that more research on community perceptions of the park would be conducted in 2005. In addition, the Park Authority and The Nature Conservancy have been monitoring the pattern and level of natural resource use among the local Park inhabitants.

*6.2.2.3. Law enforcement*

As destructive fishing and other destructive activities often occur in the Komodo National Park, regular patrolling is one of the keys to maintaining this Park's biodiversity. Pet and Yeager (2000) and Welly (2005, *pers.comm.*) noted that blast fishermen usually do not live within the Park boundaries, and are therefore out of direct contact with park managers. In addition, many fishermen also own firearms, which elevate the conflicts with the park rangers to a dangerous level, hindering the law enforcement process.

In recent years, several NGOs have expressed their concerns about the methods of law enforcement in Komodo National Park (Baran, 2003; Daton and Nggarung, 2003). During my activities in conservation programs in Indonesia in 1997-2003, I perceived that some grass root Indonesian NGOs often misunderstood the concept and role of protected areas. They often see conservation as an attempt by foreign funding agencies to dominate countries, in contrast to the IUCN vision for protected area as areas that protect the local inhabitants and environment. 'Protection for whose benefit?' is a sensitive topic to discuss in relation to the establishment and management of any protected areas in Indonesia, including the Komodo National Park.

Based on the example above, law enforcement in any protected area should be modified or designed strategically to avoid conflicts between communities and other stakeholders, including the NGOs. Armed civilians (in this case the fishermen) are dangerous, and park rangers will understandably wish to defend themselves. It should be possible to pre-empt the attack and defence routines exemplified by the rangers of Komodo National Park in other places (such as the proposed Solor-Alor MPA) by meaningful dialogues between park users and inhabitants, and especially by involving local fishermen in routine patrols and paying them to do such work. Villagers, suitably trained and informed, have the potential role to become local park rangers, as has happened in Les and Pemuteran, Bali (Santiaji, 2005,

*pers.comm*.). Since 2000, both villages in Bali have established their own traditional patrol system to conserve the marine environment in their territories.

Welly (2005, pers.comm.) reported that there were plans to establish such a co-patrolling system involving local villagers in Komodo. So far, the patrolling in Komodo National Park has been conducted by park rangers with financial support from The Nature Conservancy. However, the Park Authority and the villagers have demanded to be paid for this work. The Nature Conservancy has rejected the request and the co-patrolling initiative is currently on hold.

*6.2.2.4. Alternative livelihoods*

To reduce the destructive activities and infringement incidents (Section 6.2.2.2 and 6.2.2.3) and to create sustainable incomes for those living inside the Park, The Nature Conservancy is currently involved with approximately 500 people in alternative livelihood projects (Welly, 2005, *pers.comm*.). These projects include grouper and seaweed mariculture and home industries (baking, carving, weaving). The 25 Year Management Plan also included low interest loans for the fishermen (Pet and Yeager 2000). So far, the Park Authority has been giving interest-free loans to the villagers to purchase fishing boats (in the hope that the fishers would use the boats for sustainable fishing instead of destructive ones), sewing machines and goats (for cattle) to support alternative livelihoods and improve the public consultation processes (Welly, 2005, *pers.comm*.).

*6.2.2.5. Tourism*

Tourism is the core activity that has the potential to create sustainable livelihoods and to provide future income for the Komodo National Park. In 1996, the total number of visitors reached almost 30,000, and most tourists were international travellers (Pet and Yeager 2000). Tourism growth reached 10-20% per annum in the early 1990s, but decreased during and after the Indonesian political and economic turmoil of 1997. However, several live-aboard vessels,

usually departing from Bali, still target Komodo as their tourism destination featuring the komodo dragon and the marine environment. Such activities will also benefit local people if managed properly, such as by involving local communities as tour guides and souvenirs sellers.

In 1995, a study which investigated the willingness of park visitors to pay the entrance fee to Komodo National Park (Walpole et al. 2001), concluded that the willingness to pay was six times higher than the entrance fee at the time of the research. The average visitor was willing to pay USD $11.70, yet the current entrance fee was around USD $2.00. Despite the potential that a gradually increased entrance fee has to benefit local communities, the entrance fee has not yet been increased. I discuss the tourism-related financing for the Park in the section below.

*6.2.2.6. Park financing*

As a result of the inadequacy of the national government funding, the Park has sought financial support from The Nature Conservancy, which has been the major provider for the Park to date. However, if appropriately developed, tourism could replace The Nature Conservancy as the source of funding to administer the Park, and eventually the Park could be self-financed. To attain that goal, tourism must be managed professionally to attract more tourists.

Accordingly, The Nature Conservancy has developed a joint venture with a national tourism agency (Jatasha Putrindo Utama, Ltd), named Putri Naga Komodo Ltd. (Welly, 2005, *pers.comm.*). This company will channel its entire profits to the Park by collecting entrance fees, and the income will be used to establish the Komodo Trust Fund for the Park.

The establishment of Putri Naga Komodo has helped the sustainability of the Komodo National Park. The Nature Conservancy resigned from the park from September 1, 2005, to

focus more on other sites such as Raja Ampat (West Papua), Derawan islands (East Kalimantan) dan Wakatobi National Park (Southeast Sulawesi). All programs in the 25 Year Plan will be continued and conducted by the Park Authority in cooperation with the Putri Naga Komodo.

### *6.2.3. Costs and benefits of the Park*

Komodo National Park was the first marine park in the Savu Sea. Indeed, it was the first marine park established in Indonesia (see Hoyt 2004). At the time of its establishment in 1980, the Indonesian government customarily employed a top-down management approach that rarely involved listening to the needs of local communities. The marginalisation of local communities often led to frustration and conflicts among stakeholders.

In my review of the 25 Year Management Plan of the Komodo National Park, I found that the socio-political and economic sections are not as detailed as the sections on the biophysical environment. The Plan briefly addresses the building of a local constituency within the Park, participatory planning, PRA (Participatory Rural Assessment), environmental education and awareness programs, and community development and alternative livelihoods. However, these references do not include specific details of the socio-political and economic parameters that should be included in the SIA (Social Impact Assessment) that will be important to reduce the social cost of the Komodo National Park.

However, the Komodo National Park has also brought numerous benefits. The Park has stimulated the most extensive research in Indonesia on marine mammals. Between 1999 and 2001, a series of surveys conducted in the Park identified at least 18 species of cetaceans (Kahn and Pet 2003). Eleven of those species were also spotted during the Solor-Alor survey in 2001 and 2002 (Kahn 2003c), including blue whales (*Balaenoptera musculus*) and sperm whales (*Physeter macrocephalus*). The reports on these studies call for more research on the population dynamics and migratory routes of whales occurring between Komodo Islands and

Solor-Alor Islands, as well as genetic analysis to assess the possible genetic links between whales using these areas.

In addition to the growing tourism industries in the Komodo National Park, the Park Authority and The Nature Conservancy have also established alternative incomes for villagers living inside the Park, so that the villagers do not have to rely on the unsustainable extractive use of natural resources (Pet and Yeager 2000). If sustainable livelihoods (including supporting tourism) are developed, the Komodo National Park will also increase the living standard of its human inhabitants, something that any inhabited protected areas should be able to achieve.

### 6.3. Pantar Strait Marine Park

#### *6.3.1. History of the Park*

Pantar Strait Marine Park was established in 2002 (Alor Decree no 5/2002: Establishment of Pantar Strait and Adjacent Waters as a Marine Park). This Park is located in the Alor Islands where I conducted my research (Chapter 3 Section 3.3). This Park includes the waters and coastal areas of Pura Island, Ternate Island, Buaya Island, Kepa Island, the beach of Alor Besar and the beach of Alor Kecil (see Figure 6.2). Izaac Pangwarmasse (2004, *pers.comm*.) from the Marine and Fisheries Agency of the East Nusa Tenggara Province reported that the national government declared Pantar and adjacent waters as a Local Marine Conservation Area (*Kawasan Konservasi Laut Daerah*) in 2004, under the authority of East Nusa Tenggara provincial government in Kupang. The government plans to establish a management body for the conservation area in 2005.

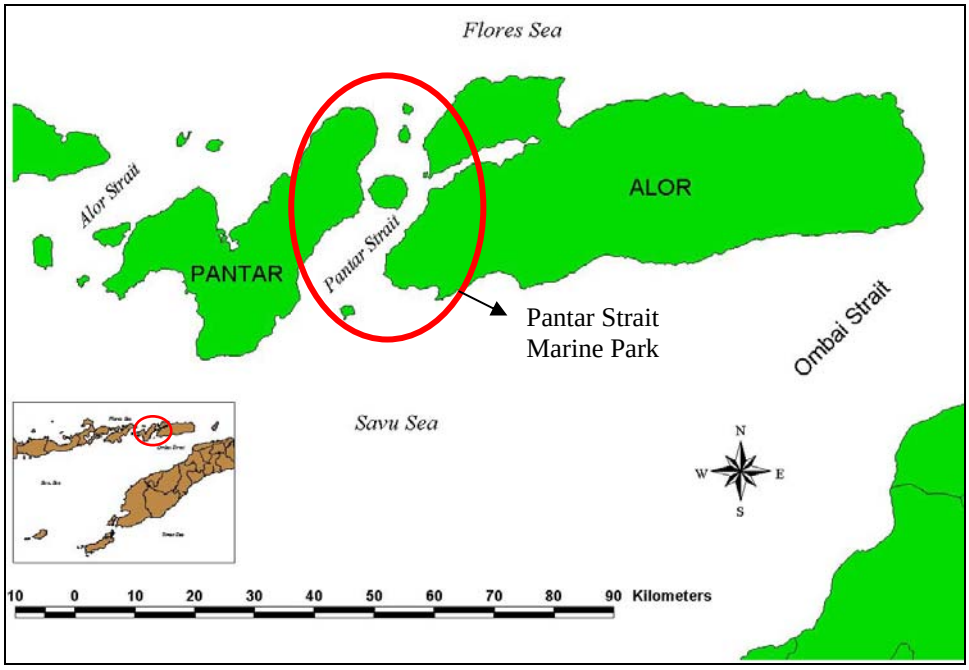


Figure 6.2. Map of Pantar Island and the Park areas

As a part of the waters of the Alor Islands, Pantar Strait supports significant populations of marine wildlife, including manta rays (*Manta birostris*), sea turtles (Order testudines, Families Cheloniidae and Dermochelyidae), tuna (Order Perciformes, Family Scombridae), sun fish (*Mola mola*), whale sharks (*Rhyncodon typus*) and cetaceans (blue whales, sperm whales, killer whales and other small cetaceans) (see Pet-Soede 2002; Kahn 2003c). There had been complaints from local communities about blast fishing and other destructive activities in Alor. A protected area such as the Pantar Strait Marine Park potentially benefits the biodiversity conservation of the region and provides solutions to the concerns from the local communities.

However, as happened with many other protected areas in Indonesia, Pantar Strait Marine Park was established under a top-down management system. During my visit to Alor Islands in July 2004, I heard nothing about this Park from people actively involved in conservation issues. Karsten van der Oord of the GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit or the German Technical Cooperation for Sustainable Development) Alor Office, whom I assumed would be abreast of most of governmental news given his position

and constant communication with officials of Kalabahi (Alor's capital town), had heard nothing of the plans for the Park. The villagers or tourist operators in Kepa Island were also unaware of the Pantar Strait Marine Park. I learned about the Park for the first time from the officials in the MMAF (Ministry of Marine and Fisheries Affairs) office in Jakarta. Apparently, in response to the increasing interest in marine conservation in Indonesia, the Alor government had decided to set up a marine park within their territory, without public consultation or devising conservation and management programs to maintain that park.

#### *6.3.2. Costs and benefits of the Park*

Despite the good intention to protect the marine environment of Alor, the first step of creating the Pantar Strait Marine Park was not conducted appropriately. There was insufficient public consultation. No conservation and management programs have been developed. Unless these issues are addressed as a matter of priority, the Pantar park rangers will have to face similar problems faced by the Komodo rangers (see Section 6.2.2.3.).

Nevertheless, the Pantar Strait Marine Park is an important component in the attempts to conserve biodiversity in the Savu Sea. The national MMAF is eager to create another marine protected area in the Savu Sea; the Solor-Alor MPA. With proper assessment and public consultation, the Pantar Strait Marine Park might evolve to become this much larger MPA, termed the Solor-Alor MPA, which would encompass more areas than the Pantar Strait, as well as serving as a part of the network of MPAs in Indonesia. Pantar may also be developed as the first transboundary marine park with neighbouring countries, in this case Timor Leste.

### 6.4. Lessons learned from Komodo and Pantar

Prior to the Indonesian reformation in 1997, Alder et al. (1994) compared three MPAs in Indonesia on the basis of their planning and management arrangements. These comparisons revealed that the problems occurring in Indonesia's protected areas usually derive from inadequate community participation from the planning stage, resulting in conflicts of interest

among users. As discussed in Section 6.2, these problems were evident in Komodo National Park. Similar conflict is also expected in the recently established Pantar Strait Marine Park should community consultation not take place immediately.

The success (or otherwise) of an MPA needs to be measured against clear objectives using both biological and social indicators. To redress the imbalance between the concerns for the physical and the human environment and to avoid further conflicts among stakeholders, park planners and managers should consider the existing socio-cultural ties and economic elements of the region and develop appropriate social, economic and cultural indicators for the success of the designated protected areas (see Fiske, 1992; Pomeroy et al., 2004). The socio-cultural elements include among others, behaviour, value and social structure with regard to marine resource use and the marine tenure system (Fiske 1992).

The need for sustainable funding is another lesson from Komodo National Park that is applicable in Pantar Strait Marine Park and the proposed Solor-Alor MPA (See Chapter 6 for further information for Solor-Alor MPA). Komodo is on the way to achieving sustainable funding through tourism. As marine tourism in Alor is steadily growing, this sector also has the potential to provide financial support for the Pantar Park and Solor-Alor MPA.

There is no point in establishing a marine reserve if compliance is not fulfilled. Compliance and law enforcement are major issues in the management of Komodo National Park. In addition, as shown in the case of Pantar Strait Marine Park, the locals were not even aware of the Park, let alone compliant with its regulations. Assuming that the locals would learn about the existence of the Park, it does not guarantee that they would agree with the delineated boundaries or even the establishment of the Park. Hence again, compliance would be very hard to achieve.

Law enforcement and compliance are also related to community consultation, as explained in Section 6.2.2.2. It is very important that local people understand the exact reason for a Park's establishment; that it was not only designed to protect natural resources, but also to increase the wealth of local communities. I also understand that the briefly mentioned Great Barrier Reef Marine Park (Section 6.1) would not thoroughly suit marine reserves in Indonesia because of the vast differences between Australia (a developed country) and Indonesia (a developing country). However, lessons learned from Komodo, Pantar or Great Barrier Reef would still benefit the plan to establish Solor-Alor MPA, as will be discussed in Chapters 7 and 8.

### 6.5. Chapter summary

I have discussed briefly the Komodo National Park and the Pantar Strait Marine Park as two existing protected areas in the Savu Sea region. Despite the biological and ecological research that has been conducted at both places (see Pet-Soede, 2002; Kahn and Pet, 2003; and www.komodonationalpark.org), there was a lack of appropriate socio-economic assessment prior to the establishment of both parks, something that should be avoided if another protected area is to be created in Savu Sea. More appropriate steps to create an MPA in Savu Sea (Solor-Alor MPA) will be discussed in Chapters 7 and 8, as well as other possible management frameworks for the Savu Sea based on lessons from Komodo and Pantar.

# VII. A MARINE PROTECTED AREA FOR THE SAVU SEA

Chapters 7 and 8 discuss several management options for the Savu Sea, based on the threats identified in Chapter 4. Some threats could be addressed by the establishment of a MPA, as discussed in this chapter. Management options other than MPA are discussed in Chapter 8, which outlines a way to progress the issues of marine mammal conservation in the region. As the conservation of marine mammals formed the original impetus for this study, I will first discuss the generic justification for marine mammal conservation with particular reference to Indonesia.

## 7.1. Why conserve marine mammals?

There are several answers to the question of why we should conserve marine mammals, both from biological and socio-economic perspectives. Biological justifications alone are not sufficient for marine mammal conservation in Indonesia. As a developing country with ongoing economic crises, Indonesians consider conservation as secondary to food security and monetary issues. Thus, it is crucial to explore the socio-economic as well as the biological justifications for conserving marine mammals in Indonesian waters to achieve an appropriate balance between conservation and sustainable resource use. It is also necessary to investigate the socio-economic needs of stakeholders who depend on a healthy marine ecosystem.

### *7.1.1. The biological rationale of marine mammal conservation*

Marine mammals have different trophic roles ranging from primary consumers to top predators. Sirenians (*Dugong dugon* and manatees / *Trichechus spp*.) are primary consumers of plants, especially seagrass (Reeves et al., 2002). Top predators such as dolphins and whales feed on fish, shrimp or squid (Carwardine, 2002). Some species of marine mammals such as killer whales (*Orcinus orca*) and false killer whales (*Pseudorca crassidens*) include other marine mammals in their prey. The wide variety of prey consumed by marine mammals' as

well as their large body size and abundance are believed to have contributed to changes in many aquatic ecosystems, especially as a result of marine mammals being removed from ecosystems (Bowen, 1997).

Dugongs play a crucial role in seagrass communities (Preen, 1995). In Moreton Bay Australia, several seagrass species (such as *Halophilia ovalis* and *Zostera capricorni*) are available for dugongs. These seagrass species have different nitrogen and fibre components, as well as different rates of recovery after grazing. Dugongs in Moreton Bay prefer *Halophilia ovalis* which has relatively higher nitrogen and low fibre. *Halophila* also recovers more quickly from grazing than species such as *Zostera capricorni*, which are not preferred by dugongs. Thus, repeated feeding activity by the dugongs tends to lead to conditions allowing their favoured forage species to become dominant, a phenomenon known as 'cultivation' grazing (Preen, 1995). This alteration in community structure is also likely to affect fish and shrimp communities supported by specific seagrass species. Hence, removal of dugongs from certain areas also is likely to result in consequential changes to some fisheries with resultant socio-economic effects.

Post mortem, all marine mammals continue to transfer nutrients to benthic communities via decomposition (see Katona and Whitehead, 1988). Remains of whales have been shown to support at least 407 metazoan species in some Californian basins (Smith and Baco, 2003). The situation is likely to be similar in the deep seabed of the Savu Sea. However, the relative importance of deep-sea falls of marine mammals in that sea cannot be assessed without more information, including data on other sources of nutrient input into this deep ocean system.

Historical research on the impact of overfishing for large marine species (including marine mammals) suggests that the populations of large consumers were much larger in the past compared with the present (Jackson et al., 2001). The decreasing number of krill-consuming large whales in the Southern Ocean is believed to have resulted in increases in the populations

of several species of seals, birds and penguins, which also feed on krill (Laws, 1985). On the other hand, the harvest of krill, anchovies, herrings and other pinnipeds (seals) is believed to have adversely impacted on the length of foraging trips and body size of pinnipeds such as elephant seals (Trites and Donnelly, 2003).

Increasing predation by killer whales is believed by some scientists to have caused the decline in sea otter populations in the Aleutian Islands, Alaska (Springer et al., 2003). During the period of industrial whaling in the North Pacific Ocean, great whales were hunted in large numbers. Great whales are important prey for killer whales and thus in their absence, killer whales are believed to have commenced hunting other marine mammals such as seals, sea lions and sea otters, greatly reducing their populations. Given the role of sea otters in maintaining local kelp forest communities by consuming kelp-eating sea urchins and hence nurturing fish populations (as identified by Estes et al., 1989), the decline in sea otter populations is considered by some scientists to have allowed the population of sea urchins to increase and adversely impacted on the fisheries populations in the region.

Recent scientific research suggests that marine mammals have important roles in maintaining the stability of marine ecosystems. The removal of top predators (cetaceans) and primary consumers (sirenians) may alter the food chain, and thus create effects that, although not predictable, might be severe, and ultimately may affect human socio-economic circumstances via their flow-on effects to fisheries. Thus, a precautionary approach should include maintaining populations of marine mammals at stable levels for their ecosystem service role. This justification should be relevant to institutions such as in Indonesia where the underlying philosophy is not conservation per se.

### *7.1.2. The socio-cultural and economic rationale for marine mammal conservation*

*7.1.2.1. Socio-cultural aspects*

Marine mammals play important roles in many coastal communities. The Aborigines and Torres Strait Islanders of Australia have been utilising dugongs for thousands of years (Chase, 1979; Rigsby and Chase, 1998; McNiven and Feldman, 2003). The Inuits living in the Arctic utilise various species of whales and seals for food and clothing, as well as a part of their cultural identity (Smith, 1984; Freeman et al., 1998). Sperm whales are very important in the life of the Lamalera villagers, providing them with food and cultural identity (Barnes, 1996) as discussed in Chapter 3 Section 3.1.

As marine mammals are important for the socio-cultural needs of local communities, their conservation will also help maintain cultural practices, including traditional hunting practices, providing that hunting is conducted sustainably. It is important to involve local hunters in marine mammal conservation. My observations in Lamalera, suggest that if locals are made aware of the declining trend in their hunting targets, they are more likely to cooperate in the conservation process, as long as they are not banned from future hunting, and especially if such a ban is not imposed by outsiders. This situation also occurs in other traditional communities such as in Hope Vale, Australia (Marsh, 2003). There, the local Aborigines were concerned about their overharvest of dugongs, and thus asked the GBRMPA (Great Barrier Reef Marine Park Authority) to help them manage their traditional hunting.

However, there are further issues to be considered in the involvement of local hunters in the conservation of marine mammals. For instance, villagers are likely to be suspicious of outsiders who want to impose conservation initiatives, particularly if the villagers feel marginalised by government and/or the wider community. Thus the conservation agenda should be clearly explained to the villagers (including the status of traditional whale hunting and the expected benefit of sustainable hunting) to achieve mutual understanding. In order to have research and management schemes understood and accepted by the locals, it is also

important that the villagers are involved in monitoring and subsequent management efforts. Collaboration with local communities is further discussed in Section 7.2.2.2.

*7.1.2.2. Economic aspects*

In addition to this socio-cultural perspective, marine mammal conservation also has the potential to produce economic benefits from non-extractive activities. In recent years, whale and dolphin watching industries have grown rapidly worldwide, providing income for coastal communities (Hoyt, 2001). In 1998 alone, the global direct expenditures from whale watching reached USD$299.5 million, a 21.4% increase from 1991 (USD$77 million). Whale watching industries are direct benefactors of marine mammal conservation programs, as a stable (and preferably growing) whale population is essential to the success of whale watching activities. Section 7.3.1 explores further the option of whale watching as a sustainable alternative livelihood in the Savu Sea.

***7.1.3. Marine mammals as conservation tools***

Marine mammals can contribute to conservation management schemes as focal species, i.e., keystone species, composition indicator species, condition indicator species, umbrella species and flagship species (Hooker and Gerber, 2004). The first four of these categories are based on the ecological role of the relevant species; the last category is based on the species' influence on political will for conservation efforts (Zacharias and Roff, 2001) though a species may act simultaneously in more than one category.

Keystone species are species the removal of which leads to alteration of the composition of their ecosystem (Zacharias and Roff, 2001; Hooker and Gerber, 2004). Examples of keystone marine mammals include the sea otter (Estes et al., 1998), krill-feeding baleen whales (Zacharias and Roff, 2001) and dugongs (see Preen, 1995) as explained in Section 7.1.1.

Composition indicator species are ‘species whose presence or abundance is used to characterise a particular habitat or biological community’, such as the northern bottlenose whales in the Gully, Canada (Hooker and Gerber, 2004, p. 35). Hooker and Gerber (2004, p.35) also defined condition indicator species as ‘species that reflect ecosystem health or the levels of pollutants within the system’, such as Arctic cetaceans.

Umbrella species are ‘species with such demanding habitat requirements and large area requirements that saving them will automatically save many other species’ (Simberloff, 1998, p. 249). Hooker and Gerber (2004, p. 35) defined umbrella species as ‘wide-ranging species, the protection of whose habitat will encompass several other species within their ecosystem’. All migratory marine animals, including most marine mammals (whales, dolphins and dugongs) can be considered as umbrella species.

The flagship species concept is based on an animal’s ‘charismatic’ ability to trigger public support (Zacharias and Roff, 2001). As briefly mentioned in Chapter 4 Section 4.1, Czech et al. (1998) conducted a survey of over 600 respondents in the United States to understand the social construction of endangered species in that country. Respondents were asked to rank their preference for eight types of species (amphibians, birds, fish, invertebrates, mammals, micro-organisms, plants and reptiles). The survey revealed that most respondents valued birds, plants and mammals higher than other species groups. Consequentially, the political will to conserve mammals (including marine mammals) in the U.S. is substantial, although not as prominent as the political power for avian conservation (Czech et al., 1998).

The high public interest and affection for marine mammals has made these animals ideal flagship species (Reeves, 2000). International NGOs (Non Governmental Organisation) such as the WWF (World Wide Fund for Nature – www.panda.org) and WDCS (Whale and Dolphin Conservation Society – www.wdcs.org) use the charismatic appeal of marine mammals to attract public, financial and political support for species conservation. WWF’s

definition of a flagship species is ‘a species selected to act as an ambassador, icon or symbol for a defined habitat, issue, campaign or environmental cause’ (WWF, 2005b). Thus, ‘by focusing on, and achieving conservation of that species, the status of many other species which share its habitat – or are vulnerable to the same threats - may also be improved’. Cetaceans are included in the seven charismatic WWF species groups, along with elephants, tigers, pandas, rhinoceroses, great apes and marine turtles. WWF also designates ‘species of local concern’, a strategy that enables species groups other than the seven WWF flagship species groups to be addressed at country level. Dugong conservation is included in several WWF country programs such as in Mozambique (WWF, 2005a) and Tanzania (WWF, 2003).

Keystone, indicator, umbrella and flagship species are concepts that are used in species-based conservation schemes (Zacharias and Roff, 2001). However, as single-species management is likely to be inefficient, the use of ecosystem-based conservation or ecosystem management is becoming more popular (Simberloff, 1998). As defined by Grumbine (1994, p. 31), ‘Ecosystem management integrates scientific knowledge of ecological relationships within a complex sociopolitical and values framework toward the general goal of protecting native ecosystem integrity over the long term’. By maintaining ecosystem health, ecosystem-based conservation focuses more on ecological processes as opposed to the plight of single species in species-based conservation (Simberloff, 1998). The premise is that a healthy ecosystem will automatically support all component species, an approach which is actually similar to the concept of umbrella species.

The debate on the relative merits of species-based conservation versus ecosystem-based conservation continues (see Simberloff, 1998). Some claim that single species-based protected areas will cease to exist (Agardy, 1994). Nonetheless, species protection still serves as ‘a starting point for establishing a more comprehensive and ecologically realistic system of management’ (Agardy, 1994, p. 269). It does not matter what species is used as the starting point, as long as many other species and ecosystem processes within the protected region

benefit (Reeves, 2000). In addition, effective ecosystem conservation must also benefit those species that depend on the ecosystem. Cooperation between species conservation and ecosystem conservation is needed to ensure the sustainability of both the species and the niche/ecosystem where it lives. As an option for marine mammal conservation to be explored below, Marine Protected Areas should be able to accommodate both species-based and ecosystem-based conservation approaches.

### 7.2. Solor-Alor MPA

As discussed in Chapter 6 Section 6.1, Indonesia currently has seven marine national parks (Forestry, 2005). Several institutions have discussed the possibility of establishing a Solor-Alor Marine Protected Area (MPA), including the Indonesian MMAF (Ministry of Marine and Fisheries Affairs), TNC (The Nature Conservancy), WWF (World Wide Fund for Nature) Indonesia and APEX Environmental. The proposed Park would cover the whole of the Solor-Alor Islands region, at least 19,500 $km^2$ (1,950,000 ha) or 5,600 $nm^2$. During my discussions with Mr. Yaya Mulyana, the Director for Conservation and Marine National Parks of the MMAF in 2004, he expressed interest in expanding the conservation area to incorporate the whole Savu Sea (approximately 92,000 $km^2$ or 9,200,000 ha or 26,800 $nm^2$) (Figure 7.1.).

Acknowledging that a marine reserve is not only about marine mammal protection, I discuss the role of an MPA in conserving marine mammals in the section below. I also explore effective processes of establishing an MPA and some of the main biophysical and socio-economic issues to be addressed prior to the establishment of the Solor-Alor MPA.

#### *7.2.1. Are marine protected areas enough for marine mammals?*

Marine mammals have different characteristics from other marine biota that are traditionally targeted by marine reserves (e.g., coral reef and reef fishes). Many marine mammals undertake long distance migrations. For example, the sperm whale migration range varies from 1,600 km in more than a month to 7,400 km in 4.5 years (Whitehead, 2003), bottlenose

dolphins may cover 1076 km in 20 days (Wood, 1998), and dugongs have been observed to move over 600 km in five days (Marsh et al., 2002).

Similar to other large mammals, marine mammals usually only produce one offspring per calving interval, which they nurse for a protracted period (Reeves et al., 2002). Female marine mammals are inevitably more involved with parental care than the male parents (Reeves et al., 2002), in contrast to most other marine species that invest little in parental care (Kenchington, 1990). Thus, the mother-calf relationship needs to be included in the design of any protected area.

Marine mammals that use specific or predictable sites at various times throughout their lives, are easier to manage than the species with less predictable habitat choices. Some marine mammals use different sites during certain phases of their life cycle. For example, some baleen whales (*Balaenoptera spp*.) conduct long-distance migrations (up to 8000 km) from summer feeding areas in higher latitudes to winter breeding and calving grounds in tropical or subtropical waters (Reeves et al., 2002).

Because of their survival strategies and large migratory range, most marine mammals exhibit the Type B lifecycle of Kenchington (1990, p. 34). Thus, marine mammals and other migratory species need to be managed at scales of up to ten thousand km (Kenchington, 1990). Thus, although site-specific conservation (such as an MPA) can benefit marine mammals especially during critical life-cycle stages (such as whale calving areas), it may not be enough to protect the whole life cycle of marine mammals.

Marine protected areas are site-specific and important for conservation programs because they provide protection for critical areas (Allison et al., 1998). However, because of the migratory nature of most species of marine mammal, marine reserves cannot be the only management tool for these animals. Broader management measures must be instigated, such as protection

of migratory routes and habitats outside the MPA jurisdictions. As a consequence of the special mother-calf relationship, nursing grounds in particular should receive particular consideration when designing a protected area for marine mammals as explained above.

In order to be effective, a protected area should also be able to minimise threats within its designated area. Smaller scale threats are easier to manage in reserve areas compared with threats which operate over a larger scale (Allison et al., 1998). While the management of an MPA can be effective at controlling threats within the park area, other threats that occur outside the park's boundaries might not be addressed (see Kelleher and Kenchington, 1992).

In the Solor-Alor Islands for instance, the proposed MPA might be beneficial in addressing the threats of local blast fishing or uncontrolled hunting. However, larger-scale threats such as unregulated commercial long lines or oil and gas industries might not be addressed solely by the establishment of an MPA. Developing an MPA as the only management scheme for marine mammals is usually not sufficient.

Nonetheless, if the reserve is large enough and management is conducted appropriately, MPAs have the potential to offer important protection for some phases of the life cycles of marine mammals. The analysis by Grech and Marsh (in review) of dugong protection in the Great Barrier Reef Marine Park Australia has shown that MPAs that are specifically designed for marine mammals are not always required. A comprehensive and representative multiple-use MPA can potentially protect the core areas used by marine mammals such as the dugong, providing that the size of the reserve is large enough to be ecologically relevant to the focal species and all related agencies cooperate together to manage the relevant anthropogenic impacts, including land-based impacts (Marsh, 2000).

As a result of the importance of physical oceanographic processes to cetacean prey, the proposed Solor-Alor MPA in the Savu Sea also has the potential to: (1) protect prime fish-rearing habitat, productive upwellings and other important ecosystem processes in the ocean (Hoyt, 2004), (2) provide full protection for dugong calving, nursing and feeding habitats (see GBRMPA, 2005), and (3) minimise threats to all the population of marine mammals that use the region. Because areas of productive upwellings will support important fish stocks, conflicts with fishing industries will be inevitable, and thus in turn should be acknowledged in the design of the Solor-Alor MPA (see Section 7.2.2.1 and Chapter 8, Section 8.1).

### *7.2.2. Issues to be considered before establishing the Solor-Alor MPA*

As discussed in Chapter 5, there are various activities in Savu Sea potentially threatening marine mammal populations in the region, e.g., Illegal, unregulated and unreported (IUU) fishing, marine traffic, commercial display, oil and gas deposits, as well as artisanal fisheries. In addition, the Indigenous communities of Lamalera (Lembata Island) and Lamakera (Solor Island) hunt whales and small cetaceans in the Savu Sea. Based on the complexity of issues associated with marine mammals living in Savu Sea, the proposed Solor-Alor MPA needs to be co-designed and co-managed with all related stakeholders to minimize anthropogenic threats to the animals and to reduce conflicts with the local people, especially the traditional whale hunters.

I outline several biophysical and socio-economic parameters that should be investigated during the establishment of the Solor-Alor MPA below. However, the Park's establishment should not wait until all the information needed is gathered, because a protected area should be established on the basis of the precautionary principle, as explained in Chapter 5 Section 5.1 (see also Fisher, 2001).

*7.2.2.1. Biophysical parameters*

An appropriate MPA management plan should be based on robust scientific data, both on the biophysical and socio-economic aspects of the areas to be conserved. The discussion below is not only applicable for the proposed Solor-Alor MPA, but also to marine mammal research in Indonesia overall.

Pet-Soede (2002) discussed some of the main biophysical characteristics of the Solor-Alor Islands, including their coral reefs, reef fish, manta rays, cetaceans, sea turtles, whale sharks and sunfish. Pet-Soede (2002) also suggested that the rich biodiversity of the region might result from the geographic and bathymetric features of the region, including upwellings and currents. On the other hand the abundant biodiversity of Solor-Alor has made the area a target for exploitative activities such as blast fishing and modern, extensive fisheries. Therefore it is desirable to develop and fund robust conservation efforts that will protect the marine life and help to identify sustainable development choices.

As explained in Chapter 3 Section 3.3, recently several institutions have conducted cetacean research in the Solor-Alor area. In addition to regular surveys conducted by APEX Environmental, The Nature Conservancy (TNC) and the World Wide Fund for Nature (WWF), the Indonesian MMAF (Ministry of Marine Affairs and Fisheries) conducted a cetacean survey in Lamalera in August 2004. I participated in the research team. From December 2003 – January 2004 the INSTANT (International Nusantara Stratification and Transport program) survey team recorded several cetaceans in Ombai Strait, Sumba Strait and along the east coast of Sumba Island (Figure 7.1) (Sunuddin, 2004).

All the surveys indicate that the Solor-Alor Islands (as well as other parts of Savu Sea) are an important habitat for marine mammals. The marine mammals (especially cetaceans) are distributed from Komodo Islands on the west end of Savu Sea to the Alor Islands on the east end of the region, as well as in the south-western part of the sea near Sumba Island (Figure

7.1). These sites can serve as starting points from which to draw management boundaries, not only for the proposed Solor-Alor MPA, but also for integrated coastal and marine management in the broader sense.

Hoyt (2004) urged the identification of critical habitats, migratory routes and other movement patterns, species behaviour and food preference, and population monitoring as a basis for designing a proposed MPA to protect cetaceans. I suggest that further surveys be conducted to estimate the abundance of marine mammals in Savu Sea, particularly actual or potential hunting targets such as sperm whales (*Physeter macrocephalus*), killer whales (*Orcinus orca*), pilot whales (*Globicephala macrorhynchus*), bottlenose dolphins (*Tursiops truncatus* and *Tursiops aduncus*), Spinner dolphins (*Stenella longilostris*), and dugongs (*Dugong dugon*). Accurate estimates of the size of the whale populations are important to estimate sustainable harvesting levels for Lamalera hunters. The sperm whale and the killer whale are two species that possibly migrate through Ombai Strait (see Figure 7.1) to Timor Leste, and hence cooperation with the Timor Leste government for both research and management would be desirable.

In addition, it is imperative to know the population dynamics of the marine mammals in the Savu Sea region. Although research has been conducted (see Kahn, 2002; Kahn 2003; Sunuddin, 2004), the methods varied. Kahn (2002 and 2003a) used rapid ecological assessment, whilst Sunuddin (2004) used platforms of opportunity during an INSTANT oceanographic survey in Savu Sea. While all those surveys produced useful insights on the presence and distribution of cetaceans, there is no estimate on the absolute abundance of cetaceans in the region. More research is needed especially on abundance estimates (see Hiby and Hammond, 1989) and migratory routes.

It is important to confirm the anecdotal data provided by Seymour (2003, *pers.comm*.) about the distribution of dugongs along the northern coasts of Timor Leste and to explore the

possibility of dugongs moving between Alor and Timor Leste via Ombai Strait (Figure 7.1). There is evidence from Australia that individual dugongs are capable of travelling hundreds of kilometres in a few days and can cross the deep ocean trenches (Marsh et al., 2002). The 100km wide and 3,250m deep Ombai Strait (Figure 7.1) should be well within the dugong's migratory capacity. In addition, genetic analysis of dugong populations that includes a limited number of samples from Ashmore Reef shows that both Asian and Australian haplotypes are present at that site and that connectivity between dugongs occurring in neighbouring regions is hig (McDonald, 2005, *pers.comm.*). These results support the theory that at least some dugongs migrate from Savu Sea (either Solor-Alor Islands or Rote Island) to Ashmore Reef in Australian waters through channels in the Timor Sea.

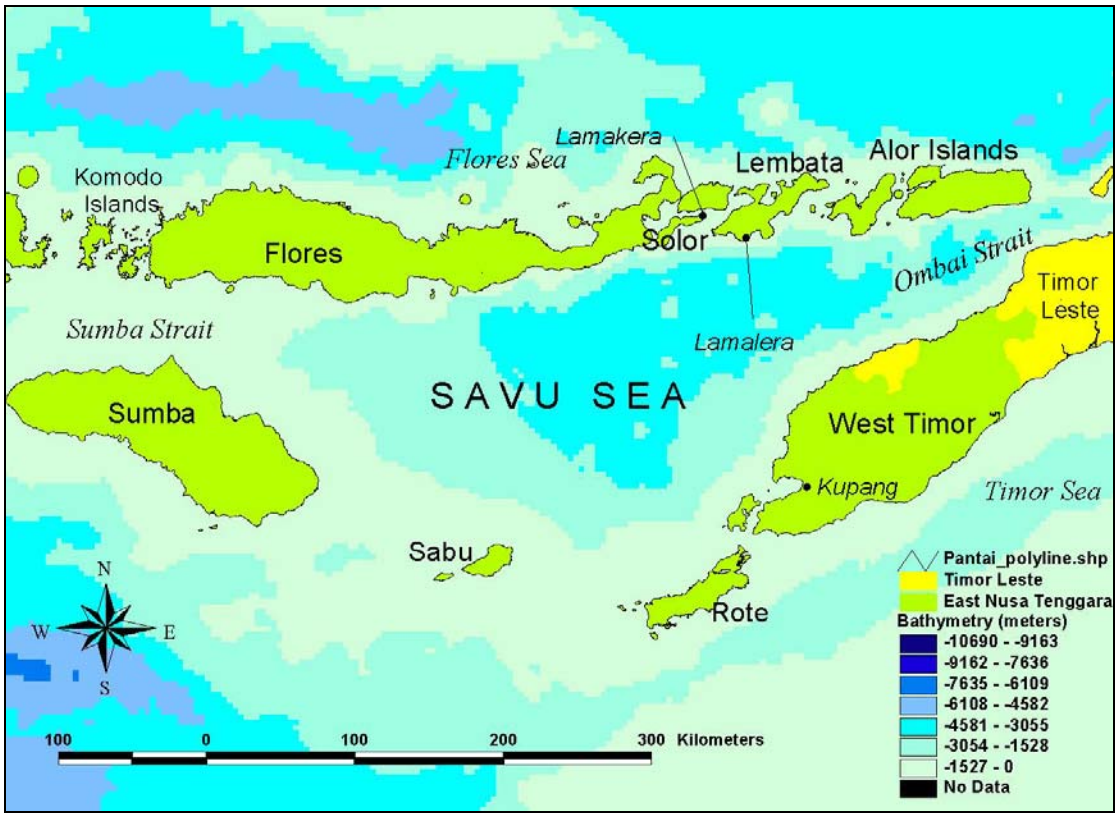


Figure 7.1. The Savu Sea and the surrounding islands

The relationship between cetacean abundance and physical oceanographic parameters obtained from INSTANT mooring buoys installed in several points in Savu Sea should also be investigated. Important parameters are likely to include bathymetry and topography, sea surface temperature (SST), salinity, velocity and direction of ocean current (in this case it is mainly the Indonesian Throughflow), as well as wind force and swell height (see Ferrero et al., 2002; Hanby, 2003). Analysis of the relationship between those parameters and cetacean sightings will inform our understanding of the habitat utilisation of various cetacean species. Further understanding the characteristics of cetacean habitats will lead to better planning of marine mammal conservation in Savu Sea, particularly in the designated Solor-Alor MPA.

Funding will be the major obstacle to on-board cetacean research in Indonesia. Thus, platforms of opportunity should be negotiated with diving and whale-watching cruises during the companies' regular boat trips in Savu Sea (see Chapter 8 Section 8.2.1) Although their routes will have to follow the diving/whale-watching schedules, the data produced will contribute to our understanding of cetacean distribution and relative abundance (see Leaper et al., 1997). The collaboration will save boat and petrol costs and increase the involvement of tourist operators in marine mammal conservation.

In the light of the potential for ocean noise to impact adversely on marine mammals (see Chapter 5 Section 5.2.4), I believe that the Indonesian government should oblige every oil and gas company operating in Indonesia (including the national oil company Pertamina) to address this issue and minimise their impacts, especially in the Savu Sea region. A low technology solution, which reduces exposures of the whales to noise, is: (1) reducing operational hours per day or (2) seasonally restricting oil and gas exploration to reduce disturbance to migrating whales.

Research on cetacean-fisheries interactions (especially marine debris) should also be conducted. Windia Adnyana of WWF Indonesia (2005, *pers.comm*.) informed me that

research on sea turtle by-catch has been conducted by the WWF in conjunction with several Indonesian longline and trawl industries. Although the companies were initially resistant, they have become partners with WWF after several meetings, demonstrating that it is possible to conduct collaborative research with the fishing industries on marine mammal and fisheries interactions. Furthermore, the boat captains and crews in Benoa Fishing Port (Bali) and Sorong Fishing Port (Papua) claimed that marine mammals (i.e., dolphins) were rarely entangled incidentally in their nets or fishing lines (Zainudin, 2005). However, the respondents admitted that they often cut their fishing gears in an attempt to release entangled sea turtles. The marine debris from these discarded fishing gears presumably threaten other marine lives (including marine mammals).

*7.2.2.2. Socio-cultural and economic parameters*

Because a Marine Protected Area is basically about managing people (see Kelleher and Kenchington, 1992) as well as a 'planned social change' (Fiske, 1992, p. 14), the design of Solor-Alor MPA should address the relevant socio-economic concerns of major stakeholders. A high level of constituent support is essential in managing a MPA, and it is best achieved through participatory processes which recognise and manage the different point of views (social construction) held by different constituents (see Christie et al., 2003). An imbalance between biophysical and socio economic parameters will lead to the MPA failing, as has happened in some countries in Southeast Asia, including Indonesia (Christie, 2004). In the case studies discussed in Chapter 6, conflicts between constituents have been largely overlooked to date.

As illustrated in Chapter 6 with reference to the Komodo National Park and Pantar Strait Marine Park, MPA planners need to understand both historical and potential conflicts to prevent tensions between constituents. It is inevitable that various constituents will not have the same perceptions/values with respect to conservation and other issues. My discussion of the social construction of traditional whale hunting (Chapter 4) is an example how one issue

(i.e., traditional whale hunting) is perceived differently by various stakeholders. Fiske (1992) suggested that park planners need to understand the perspective of various stakeholders (particularly Indigenous people) and value their concerns. Thus, the proposed Solor-Alor MPA should be designed with the understanding that various stakeholders in the Solor-Alor Islands will have different opinions on the establishment of a marine reserve in their area and on other issues related to the park establishment.

Research on the range and content of stakeholders' perceptions of the proposed Solor-Alor MPA is best done using qualitative social research methods, because this approach will identify potential areas of agreement and conflict (see Ezzy, 2002). Once the issues have been identified quantitative methods could be useful for determining the extent of views held and for obtaining demographic information and community profiling to allow for planning and management (see Neuman, 2003).

Participatory planning and public consultation can be used to achieve better understanding among stakeholders and avoid potential conflicts. As Fiske (1992, p. 40) stated, 'Participatory planning means more than asking people to provide input. It implies understanding people's perspectives and valuing their concerns'. In the participatory planning process, participants are able to learn about the perceptions and positions of other stakeholders, thus creating a better sense of ownership of the conservation plan. The time required for participatory planning (from original plan to implementation) is usually long. Thus, the Solor-Alor MPA planners will need to allow sufficient time and provide adequate funding to establish the Park. During the establishment phase, considerable efforts will be required in comprehensive planning and community participation. A series of PRAs and RRAs will need to be conducted, as well as local and national meetings to produce a park design that accommodates the aspirations of various stakeholders (see Chapter 8 section 8.1).

Participatory mapping is an important component in participatory planning, as it increases the sense of ownership over the map products (see Chambers, 1994a; Chambers, 1994b; Agdalipe and Boromthanarat, 2003). Although I discuss marine parks only from the perspective of marine mammal conservation, other resource mapping such as fishing grounds, land uses, etc should be conducted as well. During my fieldwork, I mapped the hunting grounds of the communities of Lamalera and Lamakera (Chapter 3 Figure 3.3) based on the villagers' descriptions of the hunting grounds and held several meetings to check the validity of the hunting ground maps. As part of the establishment of Solor-Alor MPA, a more comprehensive participatory mapping exercise should be conducted in Lamalera and Lamakera to verify these maps (Chapter 3 Figure 3.3) as well as other social and environmental characteristics. Western concepts of distance (i.e., km, miles, nautical miles, etc) are not readily relevant to local fishermen who will need to be trained how to judge distances in order to define their hunting ground boundaries. It would also be very useful to have the villagers map their land territories, including sacred places (*adat*-houses, cemeteries, etc) and the borders with adjacent villages. These maps are important for zoning input and to understand the potential conflict of interests that might occur in the proposed MPA. Some coastal villages in the Alor Islands (such as Alor Kecil, Kepa Island, Pantar Island, etc) should be involved in the participatory mapping, as their sea countries will be within the Solor-Alor MPA.

It would be beneficial to involve local communities in biophysical research as stressed by Kelleher and Kenchington (1992). Local community members need to develop the capacity to be involved in various stages of the research process, especially problem identification and data collection. Participation as field guides or data collectors will provide the opportunity for locals to better understand the scope and reasons for the research. This involvement will reduce scepticism that the results will marginalise or disempower them.

It is also important to design and fund effective law enforcement and compliance methods for the proposed MPA. While designing and implementing formal compliance methods (including appropriate patrol facilities and abilities) is crucial, community-based patrols in villages have proven cost effective, especially if they are designed together with the communities at the initial stages of the Park establishment. Some villages in Bali conduct community-based patrols to reduce IUU fishing and other destructive activities (Santiaji, 2005, *pers.comm*.). People in Alor Kecil (Alor Island) also often pursue blast fishermen (Van der Oord, 2004, *pers.comm*.). In accordance, the potential role of middlemen in the Solor-Alor Islands should be investigated. Middlemen have played an important role in the degradation of marine ecosystems of the Komodo National Park (Chapter 6 Section 6.2.1.2). Although middlemen do not yet occur in Lamalera, their role in other parts of the Savu Sea might be significant.

Indonesian government and related stakeholders (e.g., NGOs and tourism industries) will need to find an efficient way to fund the day-to-day management of the new MPA, e.g., through contributions from the tourism and fishing industries. In an attempt to pre-empt the resistance of these industries to making such contributions, a comprehensive explanation of the eventual benefit of an MPA to their industries (tourism and fishing will need to be developed. The ideal strategy would be to build alliances with tourism and fishing industries in the region.

In addition to the socio-cultural and economic parameters discussed above, park planners and managers should be aware of possible jurisdictional conflicts between central and local government agencies in relation to the establishment of the MPA. This is discussed in Chapter 8 Section 8.4.

*7.2.2.3. Biosphere Reserve as a model for Solor-Alor MPA*

Because ‘protection’ is the essence of a protected area, an MPA should have some parts of its coverage in strictly protected zones (i.e., core zone, IUCN category 1a and 1b) (Hoyt, 2004). However, as mentioned in the previous sections, marine reserves often need to accommodate human activities as well, thus core zones should be designed in conjunction with other zones that allow for sustainable human activity. One of the most effective approaches to accommodate sustainable use as well as conservation is the biosphere reserve concept (Figure 7.2) (Kelleher and Kenchington, 1992; Hoyt, 2004). This concept provides core areas for strict protection (IUCN category 1a and 1b), buffer zones (IUCN category II-V), and transition areas (IUCN category VI) (see IUCN, 1994 for the categories). Ideally, core areas are surrounded by buffer zones, which in turn are surrounded by transition zones.

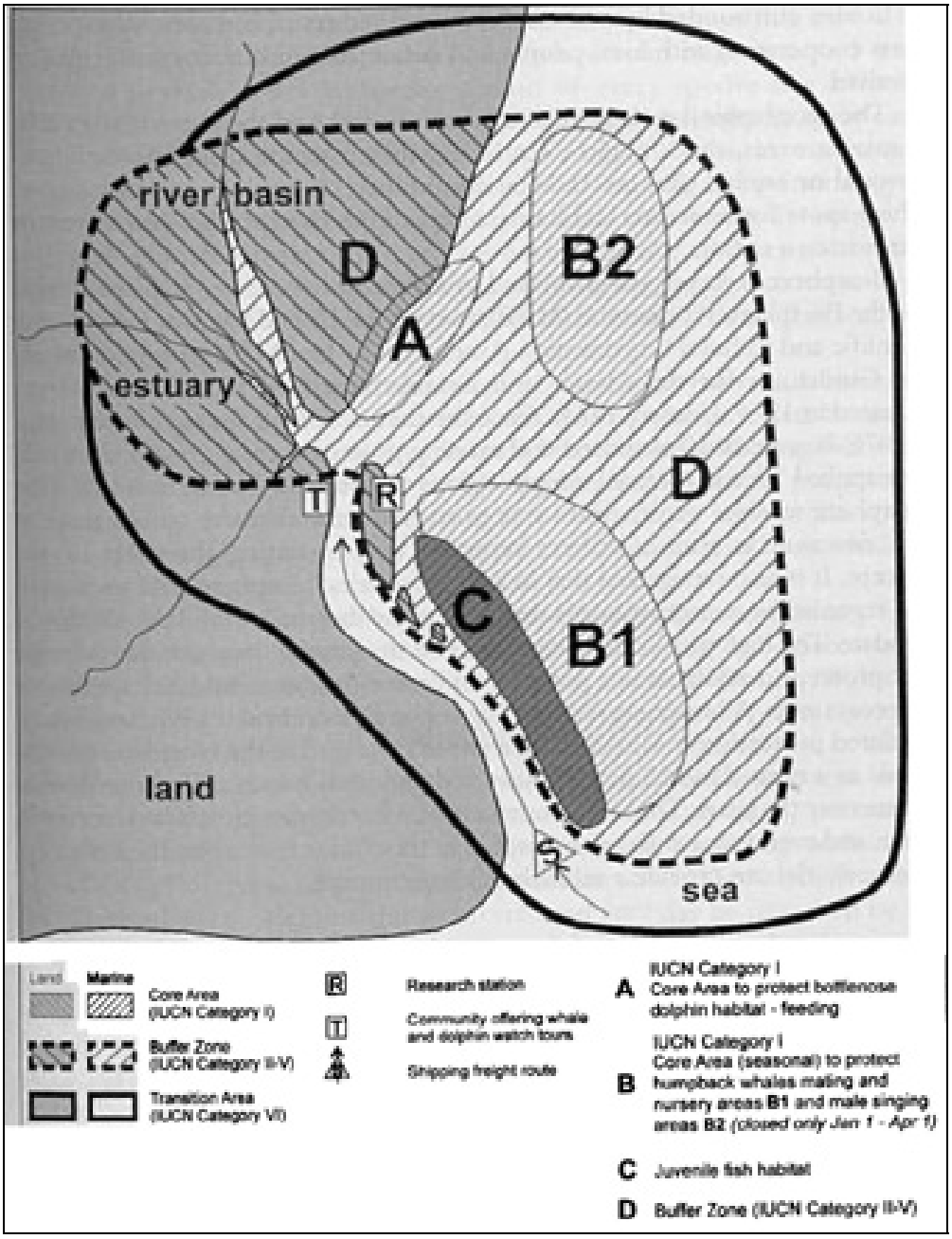


Figure 7.2. Hypothetical example of the biosphere concept (Hoyt, 2004, p. 27)

An ideal biosphere reserve design is sometimes hard to achieve, as there are often inevitable compromises between the biophysical considerations (on which the biosphere categorisation is based) and the socio-economic needs of the stakeholders, including the people who live within the boundaries of the proposed MPA. Accordingly, planning for the Solor-Alor MPA needs to include scientific data concerning the biophysical parameters as well as information about the socio-economic issues. In contrast to past practice, the planners of some national

parks in Indonesia (such as the Wakatobi Marine National Park in Southeast Sulawesi, Komodo National Park in Flores and Bunaken Marine National Park in North Sulawesi) have started to redesign the parks together with local communities and other stakeholders to comply with the biosphere concept without neglecting community needs (Welly, 2004, *pers.comm*.; Santiaji, 2005, *pers.comm*.). As of October 2005, the Wakatobi Marine National Park is still undergoing the redesign process started in 2002 (Santiaji, 2005, *pers.comm*.). Currently, the inhabited islands are administered under the local government, while the uninhabited islands are administered by the central Jakarta government; a very confusing arrangement.

### *7.2.3. Network of MPAs and Marine Mammal Sanctuary*

As explained in Section 7.2.1., marine mammals are migratory, thus a MPA is usually not sufficient to ensure their conservation, unless it has a very large coverage. A network of MPAs is required to support the needs of marine mammals. A reserve network generally provides better protection for a higher number of migratory species (such as marine mammals) compared with a single reserve (see Gaston and Rodrigues, 2003).

Although the idea of a network of MPAs for cetaceans has emerged only recently, the need for networks of MPAs has been promoted internationally by Kelleher and Kenchington (1992), the World Summit on Sustainable Development in Johannesburg (2002) and the World Parks Congress in Durban (2003). Several regions in the world have already developed networks of MPAs for cetaceans, such as the U.S. and Canada (for the Atlantic right whales) as well as the Mediterranean (high-seas network of MPAs) (Hoyt, 2004).

In the last decade, Indonesia has made advances in the establishment of networks of MPAs, although planning and management are still insufficient (Alder, 1997). Several MPAs such as the Wakatobi Marine National Park (Southeast Sulawesi), the Takabonerate Marine National Park (South Sulawesi) and the Komodo National Park (Flores) have the potential to be

included in a network of MPAs together with the proposed Solor-Alor MPA (Figure 7.3). The proposed Banda Naira Marine Protected Area in Maluku (see Hoyt, 2004) could also be included in the network, in addition to the proposed Jako Island Marine Park in Timor Leste (Teixeira, 2004, *pers.comm.*). By formally working together, the managers of those MPAs could anticipate and address related issues in the parks, for example, by developing a joint contingency plan for potential threats to marine species and ecosystems within the network.

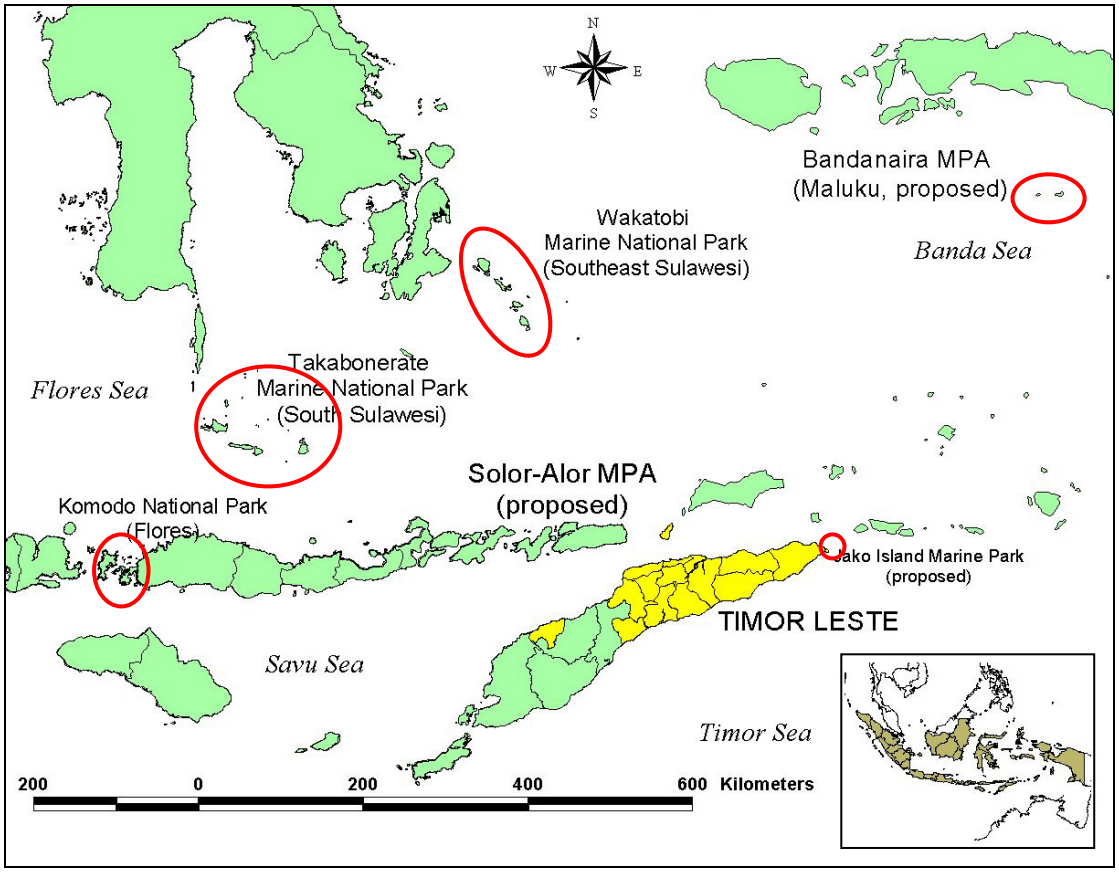


Figure 7.3. A network of MPA consisting of Komodo National Park in Flores, Wakatobi Marine National Park in Southeast Sulawesi, Solor-Alor MPA (proposed) and Banda Naira MPA (proposed)

My conversation with Yaya Mulyana (Director for the Conservation and Marine National Park of the MMAF/Ministry of Marine Affairs and Fisheries) (2004, *pers.comm.*) suggests that the Ministry is considering expanding the boundaries of the Solor-Alor MPA to cover the whole Savu Sea. However, I consider that a Savu Sea MPA might be too large to manage effectively with the funding likely to be available. As mentioned in Chapter 5 (Threat

Analysis), there are many anthropogenic activities in the Savu Sea that would need to be managed if a MPA is established over the whole sea. The establishment of a Savu Sea MPA would require managing the busy marine traffic routes, which are the regular means of transportation for many people in the municipal waters. The Indonesian government still faces problems in conserving Komodo National Park, which occupies an area less than 10% of the Savu Sea (Chapter 6). Alder et al. (1994) studied three MPAs in Indonesia (Seribu Islands, Bunaken and Takabonerate - none of them even half as large as the Savu Sea basin), and concluded that large marine reserves in Indonesia have historical management difficulties. Although a multiple-use marine park model (such as the Great Barrier Reef in Australia) might be applicable in the Savu Sea in the future, I believe such an approach is beyond the present capacity of the provincial and local governments. I therefore recommend a network of MPAs illustrated in Figure 7.3 as an initial step.

### 7.3. Chapter summary

In this chapter, I have discussed the underlying justifications for Marine Protected Areas (MPAs) as a management tool for marine mammals in the Savu Sea. I also have explored various biophysical and socio-economic information should be acquired prior to and during the establishment of the Solor-Alor MPA. Chapter 8 will discuss other types of management options that might be considered.

# VIII. A WAY FORWARD

This chapter discusses management options for the Savu Sea, in addition to the creation of an MPA as discussed in Chapter 7. Other threats to marine mammals in the region are rooted within the imbalance of the prevailing socio-economic conditions in Indonesia and thus need to be addressed by creating alternative livelihoods. Some other threats, such as IUU fishing, oil and gas industries and marine traffic, are too large in scale to be addressed at a local level and require a more generic approach. The management options I explore in this chapter are ideal options to conserve marine mammals in the Savu Sea region. However, effective methods should be considered to prioritise the options based on the likely available management resources.

## 8.1 Recommended processes

The Savu Sea is bordered by many islands, including Flores, Sumba, Sabu, Solor, Lembata, Pantar-Alor, Timor and Rote (Chapter 7, Figure 7.1). The western part of the Savu Sea is managed as part of the Komodo National Park. A part of the Alor Islands on the eastern tip of Savu Sea is currently managed under the Pantar Strait Marine Park. I did not include Sumba Island (see Figure 7.1) in this research. However, Sunuddin (2004) recorded bottlenose dolphins (*Tursiops truncatus*) and some unidentified small cetaceans off shore of the island, hence further surveys in Sumba would be required in the future for a more comprehensive knowledge of marine mammal distributions in the region.

Any management actions for the Savu Sea should be based on background study of the biophysical and socio-economic parameters, as well as a thorough threat analysis. As mentioned in Chapter 5, I identified and explored threats to marine mammals in the Savu Sea. However, as the data available are qualitative, those threats are not yet ranked. In order to decide which management action should be conducted, those threats need to be ranked and the countermeasures prioritised. The Delphi technique, i.e., a group facilitation technique

using questionnaires to achieve consensus among experts in a workshop, could be used to rank and weigh the threats in stakeholder workshops (see Duffield, 1993; Hasson et al., 2000; Keeney et al., 2001). Beebe (1988) considered group interviews in Rapid Rural Appraisal as an informal form of the Delphi technique (see also Dijk 1990). The information obtained from the Delphi technique could then be incorporated into a spatial risk assessment using GIS (Geographic Information System) along with relevant biophysical information (see Burgman et al. 1993; Kapustka et al. 2001; Grech and Marsh in review).

If the Indonesian government (or other interested party) is interested in the Savu Sea as an ecosystem-based area for marine mammal management, participatory stakeholder workshops would be the most effective way of ranking the threats and prioritising the management measures needed. A series of participatory stakeholder workshops would be required at different places in the region (Figure 8.1). With the representatives of government or NGOs as facilitators, workshops could be carried out at three levels; i.e., regencial level, provincial level and national level. However, I suggest that a series of Participatory Rural Appraisals (PRA – see Chapter 2 Section 2.2) be conducted in several villages prior to the regencial workshops. As traditional whale hunting has made Lamalera one of the main foci of the Solor-Alor MPA, using PRA in Lamalera would maximise the involvement of the whale hunting community. PRAs should also be conducted in Lamakera (Solor Island) and representative coastal villages in Alor Islands to document the local community's perceptions of and possible reactions to the establishment of the Solor-Alor MPA. Input from these PRA processes could then be tabled at the stakeholder workshops.

With the aim of exploring threats to marine mammals in the Savu Sea as well as formulating and prioritising various management frameworks for the region, the stakeholder workshops should be attended by as many representatives as possible, covering all identifiable stakeholder groups; i.e., the villagers, fishermen/hunters, government officers, etc. It would be beneficial to present a summary of the results of this thesis at the workshop along with

other research conducted in the Savu Sea (see Kahn, 2002; Kahn, 2003c; Sunuddin, 2004) to provide participants with a better understanding of the present status and threats to marine mammals in the Savu Sea.

I recommend that at least two series of workshops be conducted at the regencial level: one in Solor-Alor Island and the other one in Rote and/or Timor (Figure 8.1). The workshop in Solor-Alor would include representatives from Lamalera (Lembata Island), Lembata government, Lamakera (Solor Island), the East Flores' government and the Alor Islands' government. In my opinion, it would be more appropriate to invite the three regencialal governments and stakeholders of East Flores, Lembata and Alor to a workshop lasting several days than to conduct three separate workshops one in each regency. Arranging for all stakeholders in the three regencies to participate in the same event would stimulate a more comprehensive approach to a marine mammal management plan for the entire region and allow different stakeholders the opportunity to gain an understanding of each others' perspectives.

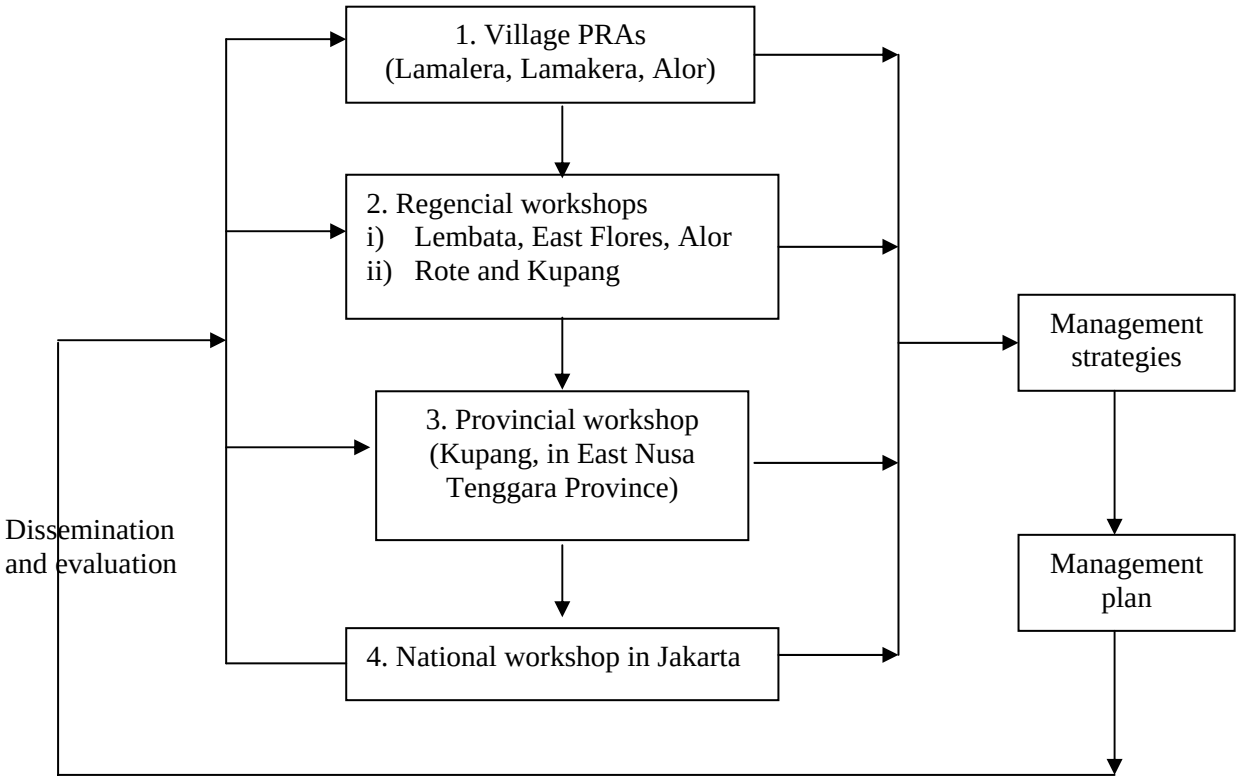


Figure 8.1. Flowchart for suggested participatory processes for the proposed Solor-Alor MPA

The second regencial workshop should include the Rote-Ndao regencial government and the Kupang regencial government (Figure 8.1). This workshop should be separated from the Solor-Alor workshop, as Rote is more culturally and historically connected to Kupang than Solor-Alor. This workshop might focus on IUU fishing and the possible migration of marine mammals between this region and the northern regions of Australia.

A provincial workshop could be conducted after the regencial workshops (Figure 8.1). It would be appropriate to invite senior representatives of the fishermen and whale hunters in addition to local government officers. Results from the two previous workshops should be combined in this workshop and aggregated to the provincial level.

The third workshop would be the national workshop to address the problem of conserving the marine mammals in Indonesia as a whole (Figure 8.1). This workshop should discuss the results of the regencial and provincial workshops in the Savu Sea, and adopt commitments for a national level program. The lessons learned from the Komodo National Park (Chapter 6 Section 6.2) could be discussed. I suggest that the national workshop also discuss the national management plan for marine mammals in Indonesia, including the research that needs to be undertaken, counter measures for threats to marine mammals, and the proposed national network of MPAs.

As this series of workshops would be a starting point to the establishment of the Solor-Alor MPA, all workshop decisions would need to be disseminated back to the villages, regencial governments, provincial government and other related national departments to gain feedback for further processes, such as the development of the Park zoning plan. After the draft zoning plan is completed, the whole cycle in Figure 8.1 should be conducted again to obtain additional feedback. This process will take a long time (I estimate more than two years), but it is crucial to ensure that the establishments of the Solor-Alor MPA as well as the network of MPAs are as participatory and thorough as possible.

Management evaluation should be integrated in every step of the planning. Hockings et al. (2000) outline a management cycle applicable to any protected area, starting from: (1) Context: status and threats ('Where are we now?'), (2) Planning ('Where do we want to be, and how will we get there?'), (3) Inputs ('What do we need?'), (4) Management process ('How do we go about it?'), (5) Output ('What did we do, and what products or services were produced?'), (6) Outcome ('What did we achieve?'). The flowchart in Figure 8.1 above is an attempt to portray a management cycle (Step 1 to 4), each component of which is subjected to constant evaluation.

In addition, the recently established Jakarta-based *Komnaskolaut* (Komite Nasional Konservasi Laut – National Committee of Marine Conservation) might serve as the facilitator to the network of MPAs proposed in Chapter 7 Section 7.2.3. This committee is a joint-committee of several government agencies (Ministry of Marine Affairs and Fisheries, Ministry of Environment, and Ministry of Forestry), NGOs (World Wide Fund for Nature, The Nature Conservancy, Conservation International, Telapak Indonesia, Kehati, Destructive Fishing Watch and Jaringpela), university lecturers and experts to provide recommendations regarding various coastal and marine conservation policies in Indonesia (Lakaseru, 2006, *pers.comm.*). As the committee has three responsibilities, i.e., MPA networks, sustainable fisheries, and the conservation of species and genetic stocks, the *Komnaskolaut* would be a good start to promote a network of MPA in Savu Sea and surrounding waters.

**8.2. Alternative livelihoods**

Some threats to marine mammals in the Savu Sea originate from the unfavourable socio-economic conditions of the local communities. In order to ensure that a MPA is effectively meeting its conservation goals, threatening activities outside the park boundaries need to be controlled (Kelleher and Kenchington 1992). As explained in Chapter 5 Section 5.2.1, IUU fishing is one of the most frequently cited destructive activities in the Savu Sea. In this region,

fishermen without alternative fishing methods usually conduct blast fishing. Thus, alternative livelihoods (or at least alternative fishing methods) need to be developed to encourage these fishermen to stop the destructive fishing, as in the Komodo National Park (Chapter 6 Section 6.2.2.4). In this section, I only discuss alternative livelihood for Lamalera villagers. I purposely left out Lamakera (Solor Island) in the discussion, as whale hunting is not a major activity for Lamakera fishers, and the fishers are unlikely to be affected by any whale-catch restriction as opposed to the people of Lamalera.

As explained in Chapter 5 Section 5.3.1.2, the plan to commercialise whale hunting derives from the need of the villagers of Lamalera to ensure their food supplies. The determination to continue hunting whales in Lamalera is also triggered by the need to increase general wealth, notwithstanding the desire to preserve traditional culture. Establishing an MPA will not guarantee that those problems will be addressed. With or without a marine park, the socio-economic needs of the fishermen (specifically the Lamalera whale hunters) need to be addressed by creating sustainable alternative livelihoods or establishing a sustainable harvest quota.

### *8.2.1. Sustainable cetacean watching*

#### *8.2.1.1. Potential of cetacean watching*

As briefly mentioned in Chapter 7 Section 7.1.2.2, whale watching (including dolphin watching) industries have grown rapidly in the last decade (Hoyt 2001). The industry generated a minimum of $ 1 billion USD in 1998, attracting more than 9 million whale watchers in 87 countries around the world. The average annual increase for worldwide whale watching industries from 1991-1998 is 12.1%. The numbers of communities involved in whale watching increased from 295 in 1994 to 492 in 1998. Most whale watching activities are boat-based (72% of all whale watching), while the rest are land-based operations (28%) and less than 0.1% of all whale-watching operations involve aeroplanes or helicopters (Hoyt, 2001).

Benefits from whale watching include direct and indirect benefits from tourism expenditure plus an investment return ranging from 10% p.a. (commercial whale watching) to 25% p.a. (community-owned operations) (Hoyt 2001). Whale watching also helps promote marine conservation awareness among the participating communities, through activities such as the whale festivals that are conducted in the United States, South Africa and Ireland. In addition, scientists are able to obtain data through records obtained by whale watching companies or by joining the whale-watching cruise as tour guides and data collectors (Leaper et al., 1997; Childerhouse, 2001; Evans and Hammond, 2004).

Cetacean watching in Indonesia began in 1991 in north and south Bali, as low budget operations with very low numbers of visitors (Hoyt 2001). Targeting bottlenose dolphins (*Tursiops sp*.) and spinner dolphins (*Stenella longirostris*), the companies usually conduct dolphin watching with day-boats, leaving for the sea early in the morning and returning at around noon. Cetacean watching in Indonesia grew to 12,000 whale watchers in 1994, with direct expenditure of USD 100,000 (Hoyt 2001). By 1998, the participants had reached 41,000 people with USD 1,281,000 direct expenditure. I found no available data on whale watching revenue in Indonesia after 1998.

Cruises with whale watching programs also operate in Bunaken Marine National Park (North Sulawesi), Lombok (West Nusa Tenggara), Komodo (East Nusa Tenggara) and Papua. There are live-aboard vessels that carry tourists to remote places in Indonesia (including the Savu Sea), and these operators often include whale watching in their agenda. The SongLine Cruises have a whale watching route from Kupang-Alor-Kupang that includes Lembata and Rusa Island (Pantar), with seven trips in 2004-2005 (see www.songlinecruises.com). The Pindito Dive Cruises offers a 'Biodiversity Cruise' travelling from Maumere (East Nusa Tenggara) to Sorong (Papua), passing by Pantar and Alor (East Nusa Tenggara), Wetar and Seram (Maluku) and Misool and Sorong (Papua) (see www.pindito.com). The Komodo Islands-

based Dive Komodo has also expanded their cruise coverage to the Alor Islands (www.divekomodo.com).

As the Solor-Alor Islands in the Savu Sea are critical habitats for cetaceans (see Pet-Soede, 2002; Kahn, 2003c), whale watching is a potential alternative livelihood for the coastal communities in those areas (who can provide tour guides), as well as a potential source for sustainable park financing (through entrance fees and other services). Although the Alor government has not considered whale watching as a potential tourism activity, whale watching in Alor has the potential to be promoted and conducted in sustainable ways.

Cetacean watching industries also provide 'platforms of opportunity' for cetacean researchers (Childerhouse, 2001; Evans and Hammond, 2004). Several cetacean surveys have been conducted in whale-watching boats or dolphin tour boats, among others in New Zealand (Childerhouse 2001) and Europe (Leaper et al., 1997; Evans and Hammond, 2004). These opportunistic surveys have provided important insights on the status and distribution of cetaceans in waters where the cetacean-watching companies operate. Live-aboard vessels often visit Alor and surrounding waters. Cooperation between these companies and scientists could result in more robust research. In turn, the tourist operators will benefit from the practical data obtained from the research, an added bonus for the leisure activities they offer to the tourists.

*8.2.1.2. Possible obstacles for cetacean watching in Lamalera*

Despite the benefits of cetacean watching as explained above, this activity is likely to face challenges if conducted in Lamalera due to the tradition of hunting whales. In addition, whale hunting in Lamalera is a tourist attraction, with the potential to conflict with the plan to establish whale-watching tourism.

8.2.1.2.1. Lamalera's identity as a whale hunting community

In Lamalera, whale watching might be hard to establish despite its promising future as an alternative livelihood to whale hunting. Lamalera fishermen have been hunting whales for at least five centuries (Chapter 3 Section 3.1.2.1); altering their mindset will be difficult. Pride is one of the key issues driving whale hunting in Lamalera. Although shifting from the identity of 'whale hunters' to 'whale lovers' might seem appealing for outsiders, the Lamalera hunters might not agree. The notion of whale watching was rejected by a community of traditional whale hunters in Taiji, Japan (Segi 2003). The community considered that whale watching conflicts with their cultural identity. The people of Taiji also saw whale watching proposals as outsiders imposing ideas on them, thus suppressing their identity as whalers. If not addressed carefully, the Taiji situation might also apply to Lamalera.

On the other hand, tourists that regularly come to Lamalera to see the whale hunting might be interested to have the Lamalera villagers switch to sustainable whale watching. However, there is a possibility that the whale hunters would refuse to stop whale hunting; they might still conduct whale hunting, while also doing whale watching at certain times. This anomalous situation has the potential to alienate potential whale watchers, who are unlikely to be comfortable with whale hunting. Therefore, if a whale watching industry is proposed for Lamalera, research should be conducted to investigate the responses of potential tourists to the two potentially conflicting activities. Possible conflicts between whale-watching tourism versus whale-hunting tourism are discussed in the next section.

8.2.1.2.2. A whale-watching industry versus whale-hunting tourism

Based on a series of surveys of whale watchers' attitudes towards whale hunting practices, Hoyt and Hvenegaard (2002, p. 386) showed that 75% of whale watchers in California considered that it was 'morally wrong to kill whales' and 83% of whale watchers in New England thought that it was 'morally wrong to kill whales regardless of the reason'. However,

there are tendencies for the wider community to accept ‘genuine subsistence whaling’ for the purpose of ‘personal food consumption’ (Hoyt and Hvenegaard, 2002, p. 387).

Because tourists (mostly from the international market) come to Lamalera to witness the practice of traditional hunting, whale-hunting tourism in Lamalera needs to be considered in the management framework for the proposed Solor-Alor MPA. The opinion of the tourists visiting Lamalera (by boat or travelling from the capital Lewoleba) about the whale hunting tradition has not been investigated formally, although the villagers informed me that some tourists have expressed concerns. Nonetheless, some tourists that I interviewed did not object to the traditional whale hunting in Lamalera. The Lamalera tourists presumably accept traditional whale hunting because it is conducted: 1) for daily food consumption (a result consistent with the surveys in California and New England (see Hoyt and Hvenegaard 2002), and 2) the practice is conducted in unique ceremonial ways without the aid of modern technology. In addition, tourists who strictly oppose traditional whaling are unlikely to travel to a remote place like Lamalera to observe a tradition to which they object.

Vava’u village (Tonga) and Taiji village (Wakayama Prefecture, Japan) are examples of places where whale hunting practices and whale watching industries operate in neighbouring areas, despite its difficulties (Orams, 2001; Segi, 2003). A study of the potential for a whale watching industry in Vava’u argued that the co-existence of whale watching tourism and whale hunting tradition might be hard to achieve (Orams 2001). In Japan, five companies have been conducting cetacean watching in the southern region of the Wakayama Prefecture, adjacent to the Taiji village (Segi, 2003). Although whale watchers tolerated whale and dolphin hunting practices, the Taiji whale hunters rejected the existence of whale watching industries in their town. As briefly explained in Section 8.2.1.2.1, the main reason for this resistance is the perception that whale watching, which is supported by ‘excessive and aggressive environmentalists’, has a hidden agenda to suppress the identity of Taiji traditional whale hunters (Segi, 2003).

Should whale watching be established in Lamalera, it would be possible to market the industry as 'sustainable whale watching that involves former traditional whale hunters' or 'sustainable whale watching that goes hand in hand with traditional whale hunting'. The goal would be to attract more tourists and differentiate the Lamalera whale watching from whale watching industries in other places.

8.2.1.2.3. The behaviour of the target species

Another impediment to effective whale (and dolphin) watching in Lamalera is the behaviour of the target species. As explained in Chapter 2 Section 2.3.1, I joined the whale hunters three times during my visits in Lamalera. None of the trips resulted in any whales being caught. In addition, there was no close encounter with dolphins which swam away every time a boat was approaching, apparently alerted by the sound of the *jonson* boats. A similar 'learned avoidance response' was observed in Greenland, where the fin whales in recently hunted areas were hard to approach (Hoyt and Hvenegaard 2002).

Thus, whale watching may need to be established in other parts of the Savu Sea (such as the Alor Islands, rather than at Lamalera). The boat crew, especially the captains would need to be trained to understand the importance of minimal disturbance to whale populations (see Hoyt, 2002; Marsh et al., 2003). Educational values would need to be included in the programs. Trained villagers should be recruited for either boat operators or as tour guides. Local schools should be involved in the whale watching programs, and if possible, given a chance to join the whale watching boats free of charge. If conservationists would like the Lamalera villagers to also join whale-watching program, a cost-benefit analysis of whale watching versus whale hunting should be conducted and communicated to the hunters and conservationists.

### *8.2.2. Sustainable fisheries*

#### *8.2.2.1. Sustainable small-scale fisheries*

Currently, there are no data on the population dynamics of the whales using the Savu Sea. However, based on the precautionary principle (Chapter 5 Section 5.1), it is possible that in future the whale populations will not support the existing whale hunting practice. Consequently, a contingency plan to reduce the hunters' dependency on marine mammals is needed. In addition to the whale watching option mentioned above, alternative fisheries might be used to shift the pressure from the local whale populations, as well as creating alternative income for the villagers.

Food security is an issue in Lamalera (see Chapter 3 Section 3.1.6). The Lamalera fishermen admitted to me that whale hunting has not been very successful in recent years, yet they still do not catch fish to meet their food needs. The only fish species caught is the flying fish (*Cypselurus heterurus*), which is caught by a small number of fishermen. The Lamalera villagers bought other fish species (snapper, jack, grouper, etc) from the Wulandoni market or from Wulandoni fishermen that often visited Lamalera. I observed no effort to expand their fishing methods, an observation confirmed by Mr. Hendrik Keraf and Mrs. Udis Keraf of Lamalera village.

To reduce the villagers' dependency over whale products and introduce them to other livelihoods, the Global Environment Facility – Small Grant Program (GEF-SGP) Indonesia visited Lamalera in August 2004. The GEF team identified several opportunities for alternative livelihoods, including alternative fishing methods, so that Lamalera could catch their own fish instead of having to buy the fish from Wulandoni fishermen. Mahaningtyas (2004, *pers.comm*.) admitted that the process of establishing such alternative fisheries would be 'a bit slow' (due to low level of self-organization among the villagers). Nonetheless, there is still a chance for the GEF to help the villagers, by cooperating with local government, NGOs and other stakeholders.

As mentioned in Chapter 3 Section 3.1.1 and 3.1.6, the Wulandoni fishermen catch fish in the same areas as the fishermen of Lamalera hunt whales. Therefore, the sea can potentially be utilised by both fishermen from Lamalera and Wulandoni. Situated approximately 10 km northeast of Lamalera, Wulandoni is a small farming village of 506 people in 2004 (see Figure 7.1 for the location of Lamalera). The members of only three households are permanent fishermen, ten households are seasonal fishermen, and the rest are farmers. According to the Lembata record, there were only 19 *jukung* (traditional boats) and two *sampan* (small wooden raft) for fishermen to use. When I asked the Wulandoni villagers about their reaction to the prospect of the Lamalera villagers catching reef fishes instead of whales, the villagers did not seem to object. I found no record or any oral history of traditional agreements between Wulandoni and Lamalera for either fishing or whaling rights.

It is important to make the Lamalera villagers self-sufficient, instead of relying on the uncertain whale populations or on the Wulandoni for fish. There are 18 *jonsons* (motorised boats) in Lamalera, and all of them are potential platforms for catching fish. Wiadnyana (2004, *pers.comm*.) from the MMAF (Ministry of Marine Affairs and Fisheries) suggested a simple spool and line method; attaching several hooks and lines on the stern part of each *jonson*. Each time the fishermen go hunting dolphins or manta rays (they are allowed to hunt non-whale targets with *jonson*), the fishermen could also drag the hooks and lines, to catch pelagic fishes. In addition to providing food and cash, the local bartering tradition encourages social interaction and relationship through co-operation. Nonetheless, there is a risk that the diminishing whale catch and the introduction of new fishing methods will influence this bartering tradition, and thus alter the long-established social relationship between the villagers of Lamalera and Wulandoni.

To aid the Lamalera fishing industry, the Lembata Fisheries Agency donated two fishing boats (about 10 m in length, made of wood and fibre) to this village in December 2004.

Although these boats would potentially be useful for alternative fisheries, they are too heavy to tow back to the beach, and had to be left anchored offshore. Thus, as feared by Hendrik Keraf (2004, *pers.comm*.), the boats were susceptible to drift in strong currents, and proved to not be useful for local fishermen. This is not the first time that the local government has provided infrastructure that was not entirely useful for the villagers due to lack of proper assessment of their needs. The Wulandoni villagers also received two set-nets (*bagan*), which soon drifted away on the strong currents of the Savu Sea.

For alternative fisheries to be effective, the Lamalera villagers need training in hook and line fisheries (or other alternative fishing techniques) and post-processing methods. The fishers might also need to establish their own marketing network in Lembata. Mahaningtyas (2004, *pers.comm*.) noticed that mountain villagers have to take a 2-3 hours' journey to the market in Lewoleba (the capital town of Lembata) to buy fish, or wait for Lewoleba sellers to come to the mountain to sell the fisheries products. This market niche has potential for the Lamalera villagers, as Lamalera's location is closer to the inland villages (only 1 hour drive) than Lewoleba. Thus, the harvested fishes could be consumed in Lamalera, or processed (smoked, boiled or other simple methods) and sold to markets in Lembata Island, including the upper market. However, none of the post-harvest techniques have been used in Lamalera before. These small-scale alternative fisheries are also applicable for blast fishers who live in other regions, as those fishermen are usually poor fishermen without proper alternative livelihoods.

Government agencies can also provide loan funds for small-scale fishers to promote alternative fisheries in Lamalera. However, to participate in sustainable fisheries, the Lamalera villagers would have to be convinced that the returns were worth the effort, instead of their being reliant on incentives given by the government and aid agencies. There are four conditions that Lamalera villagers must have to establish sustainable fisheries (see Singleton 2005), i.e., the villagers need: (1) a preference for sustainable fisheries to reduce their dependency on whale hunting, (2) the capacity to solve the problems associated with the

alternative fishing, (3) the belief that their alternative livelihood will not only benefit their daily consumption needs and immediate income, but also the marine environment, and (4) the capacity to create effective management of the new fisheries system. These preconditions should be explored and fulfilled prior to the establishment of a sustainable fisheries program in Lamalera.

*8.2.2.2. Sustainable commercial fisheries*

As discussed in Chapter 5 Section 5.2.1, Illegal, Unregulated and Unreported (IUU) fishing is one of the most frequently cited threats in the Savu Sea. Therefore, research on IUU fishing is a priority to reduce the pressure of this threat of marine mammals. Illegal fishing should be addressed seriously, as this activity does not only affect local livelihoods, but also national and international fisheries (see Chapter 5 Section 5.2.1.2.). Focus should also be given on investigating the current status of by-catch and ghost nets/marine debris as the result of unregulated long line and other fishing operations in the Savu Sea (see Zainudin 2005).

The issue of 'whales competing with fishermen' might be raised among the Indonesian fishery industries. This issue has been discussed internationally, as some cetacean species consume fish species used for human consumption (IFAW 2001). Some whaling countries (such as Japan) have used this concern to justify whale culling (see Yodzis, 2001; Hirata, 2005). This cetacean-fisheries interaction should be addressed in public education and awareness, especially in programs targeting Indonesian fishing communities (see Section 8.6).

Kahn (2003c) has raised these issues in the context of the proposed Indonesia Protected Marine Mammal Fisheries Area or PMMFA. The PMMFA has been proposed to improve the conservation of marine mammals in Indonesia by creating a no-take zone for all marine mammals with the exception of traditional whaling in the Solor-Alor Islands. Compliant Indonesian fishing industries will benefit by their more environmentally friendly image that

will not conflict with the international marine mammal by-catch regulations and international fisheries certification.

### 8.3. Management of traditional whale hunting

#### *8.3.1. Traditional whale hunting*

As discussed in Chapter 3 Section 3.1.5, desirable management measures for traditional whale hunting include catch recording, as this is one of the main data sets needed to estimate a sustainable level of harvesting (using the PBR technique, see Wade, 1998). As discussed in Chapter 3 Section 3.1.1.2, many Lamalera fishermen are not aware that sperm whales and other marine mammals do not have the same life cycles as fish. The fishers need to be educated on the biology and importance of marine mammals (especially the sperm whale).

#### *8.3.2. Small cetacean hunting*

As discussed in Chapters 3, 4 and 5, dolphin hunting may be a recent activity in Lamalera (Lembata Island) and Lamakera (Solor Island). Although Barnes (1996) mentioned that small cetaceans such as dolphins, killer whales and pilot whales have been hunted in Lamalera, it is not clear when the practice originated. If the exploitation of small cetaceans is subject to the same regulations as whaling, dolphin hunting in Lamalera (and Lamakera as well) might not be legitimate under the IWC definition of subsistence whaling (Chapter 3 Section 3.1.6). The IWC has no capacity to regulate cetacean hunting. Rather, the IWC has 'suggested' that member countries 'submit full and complete information on direct and incidental takes' on small cetaceans (IWC, 2001, p. 35). As Indonesia is not a member of the IWC, this suggestion is irrelevant to the situation in the Savu Sea.

Continuous monitoring of small cetacean hunting and research to estimate the size of small cetacean populations in the Savu Sea are both required to calculate the sustainable harvest level or PBR (Potential Biological Removal) (see Wade and Angliss, 1997; Marsh et al.,

2004). Eventually, the estimated PBR will help guide decision makers and managers to avoid over-harvesting and international critiques of small cetacean hunting in the Savu Sea.

### 8.4. The legal basis of a marine mammal action plan

Indonesia has several laws relating to marine mammals although such laws might not specifically address the conservation needs of those species. The list below is taken from Hoyt (2004), Indoregulation (2005), The Indonesian Ministry of Environment (MENLH 2005) and The Indonesian Ministry of Marine Affairs and Fisheries (MMAF 2005a), and does not include decrees about marine reserves. Some of these regulations have also been mentioned in previous chapters of this thesis.

1. Government Regulation No. 35/1975 (Protection of wild animals) – including dolphins
2. Presidential Decree No. 43/1978 (Ratification of Convention on International Trade in Endangered Species of Wild Flora and Fauna - CITES)
3. Government Regulation No. 327/1978 (Protection of wild animals – addendum for whales and dolphins)
4. Government Regulation No. 716/1978 (Protection of wild animals – addendum for whales)
5. Law No. 17/1985 (Ratification of 'Principles of the Archipelagic Concept' and the United Nations Convention on the Law of the Sea – UNCLOS) – see Chapter 1 Section 1.1
6. Law No. 5/1990 (Conservation of living natural resources and their ecosystems)
7. Presidential Decree No. 32/1990 (Management of protected areas)
8. Law No. 5/1994 (Ratification on the United Nations Convention on Biological Diversity - CBD) – see Chapter 4
9. Law No. 23/1997 (Environmental Management)
10. Government Regulation No. 68/1998 (Nature Reserves and Protected Areas)

11. Government Regulation No. 7/1999 (Preservation of Flora and Fauna) – see Chapter 5 Section 5.3.1.2
12. Government Regulation No. 8/1999 (Exploitation of Wild Flora and Fauna)
13. Government Regulation No. 19/1999 (Pollution or Marine Contamination Control)
14. Government Regulation No. 27/1999 (Environmental Impact Assessment)

In addition, the Indonesian government also issued Local Autonomy Law No. 22/1999, triggered by grass root movements in Indonesia that demanded more decentralised governance. This law was welcomed by regencial governments in Indonesia, as the increased freedom from the central Jakarta government has enabled regencial governments to increase their domestic income, without interference from provincial governments. Article 10, clause 1 stated that 'Regencial governments are entitled to manage national resources within their territories and are responsible to conserve the environment in accordance with the existing laws'. The law also decreed that regencial governments are entitled to: (1) marine resources as far as 4 nautical miles offshore (article 10, clause 3) and (2) exploration, exploitation and conservation of marine resources within their territories (article 10, clause 2). However, there are indications that regencial governments in Indonesia have increased the exploitation of their natural resources, including marine resources, without a concomitant increase in conservation initiatives. Hence, Law No. 22/1999 affects the status of marine mammals as there are many threats to marine mammals occurring in coastal zones (such as fisheries, land-based pollutants, etc).

In 2004, the Indonesian government issued Law No. 32/2004 (Local Governance) to clarify Law No. 22/1999. The latter law stated that 'The State acknowledges and respects traditional communities and their rights as long as they exist in accordance with the people and principles of the Republic of Indonesia' (article 2, clause 9). The new law also decrees that both provincial and regencial governments should be responsible for environmental conservation in their territories (article 13, clause 1 and article 22).

The latest Indonesian regulation relevant to marine mammals is the Fisheries Law No. 31/2004. According to this law, 'fish are all living organisms of which all or parts of their life cycles are in the aquatic ecosystem' (Article 1, clause 4). Thus, marine mammals are considered 'fish' under Indonesian law. The law also addresses fisheries conservation, including marine mammals, i.e., 'protecting, conserving and utilisation of fisheries resources, including ecosystems, species and genetics to ensure the presence, supply and sustainability by maintaining and increasing the value and biodiversity of the fisheries resources' (Article 1, clause 8). In addition, article 7 clause 5 stated that 'The Minister declares protected fish species and aquatic ecosystems, including national parks, for the sake of science, culture, tourism and/or the conservation of fisheries resources and their ecosystems'. Marine mammals ('whales, dolphins, fresh water dolphins, dugongs, etc') were grouped as 'fish' as described in the Explanation Section (article 7, clause 5).

However, labelling marine mammals as 'fish' has the potential to lead to a misconception that those species are available for harvesting. However Government Regulation No. 7/1999 clearly states in its appendix that all cetacean species and the dugong are protected under Indonesia law, and thus should not be caught, killed or traded. Marine mammals in captivity or display were not elaborated upon in either Government Regulation No. 7/1999 or the following Government Regulation No. 8/1999 (Exploitation of Wild Flora and Fauna).

Law No. 31/2004 also mentions the involvement of local communities in fisheries management. Article 6 clause 2 stated that 'Fisheries management for capture fisheries and aquaculture should consider customary laws and/or traditional knowledge with regards to community participation'. It is further explained that 'customary laws and/or traditional knowledge to be considered in fisheries management should not contradict national laws'.

As such, Law No. 31 and Law No. 32/2004 have implications for the Savu Sea, especially for whale hunting in Lamalera. Under both laws, traditional hunting is allowed as long as it does not disturb whale conservation; i.e., the hunting must be conducted sustainably. Consequently, research is needed to assess the sustainability of whale hunting in Lamalera, as well as to identify protective measures if the practice is proven to be unsustainable.

These laws have provided protection for marine mammals in Indonesia. However, I suggest that Indonesia also requires a specific national action plan for marine mammal conservation. This document should address the importance of marine mammal protection in Indonesia in the context of scientific advice. The document should clarify the national government's position on traditional whale and small cetacean hunting and other similar activities, and (if the government supports the practice), outline basic measures that should be conducted to ensure that hunting is sustainable. The action plan should also acknowledge other threats to marine mammals, including IUU fishing, commercial hunting, as well as by catch in artisanal and commercial fisheries. The plan should also discuss threats from ocean noise, including oil and gas industries, ships and sonar activities. Marine traffic, sustainable whale watching and the response to stranding events should also be elaborated. In addition, the emerging trend of capturing marine mammals for display should be regulated, including the required infrastructure and animal welfare issues.

Currently there are overlaps among the responsibilities of the Ministry of Marine Affairs and Fisheries (MMAF), the Department of Forestry and the Ministry of Environment with respect to marine conservation issues. The Ministry of Environment has considerable interest in the preservation of the marine environment, including issues of pollution and contamination. The Department of Forestry, the original authority to manage marine ecosystems (including mangroves) under MPA frameworks, is also the authority responsible for issuing permits for collecting wildlife species (including marine species) for display purposes. These overlaps

ought to be rationalised to improve the efficiency of marine mammal management in Indonesia.

However, despite these overlaps and inter-departmental coordination issues, I argue that the MMAF would be the best department to regulate marine mammal conservation. Although the Department of Forestry was traditionally in charge of the management of Marine Protected Areas, it does not have the expertise to manage marine ecosystems. It is appropriate for the Department of Forestry and the MMAF to collaborate on mangrove ecosystem management. However, other marine ecosystems (i.e., coral reefs, seagrass beds, deep seas and high seas) should be under the MMAF, which currently assigns a specific Directorate General of Coastal and Small Islands to manage seascapes, MPAs, small islands and coastal communities. Collaboration between the MMAF and the Ministry of Environment is also necessary, as the latter ministry focuses on pollution (including hazardous materials), environmental impact assessments, public awareness and community empowerment.

In addition jurisdictional conflict over MPA management is likely between the central and local government agencies. If the Ministry of Forestry in the central government declares the Solor-Alor MPA, the government of Lembata Regency would lose its jurisdictional authority of the region. The MPA could be modified as a marine mammal sanctuary or local marine conservation area (KKLD – *Kawasan Konservasi Laut Daerah*), which would fit with the authority of the decentralised government of Lembata Regency, and could be co-managed with the central MMAF in Jakarta. However, the capacity of local Lembata human resources might be insufficient for such an arrangement, resulting in a 'paper park'.

### 8.5. Law enforcement

As mentioned in Chapter 5, the Savu Sea is the site of IUU fishing. Management measures to address IUU fishing include: (1) restrictions on long line operation areas, (2) coastal patrols to

prevent blast fishing, and (3) regulations, law enforcement and incentives to limit the discard of marine debris targeting commercial fishing vessels in the Savu Sea.

Although restricted areas for long line fisheries have been declared under Indonesian law, compliance needs to be monitored to reduce the conflict between long liners and local fishermen. Long line operators should be required to report any marine life entangled in their nets, even though compliance might be impossible to enforce. The local governments in Savu Sea should advocate for more funding as well as more effectively using the existing boat patrols for patrols and monitoring. Breaching of sea regulations should be addressed, as well as educating fishermen (small scale or commercial) about the conservation laws. The problem of marine debris is difficult to address, because this issue is not widely recognised even among Indonesian officers. However, harbour management authorities might make regulations prohibiting disposal of unused fishing gears into the sea. The harbour managers could charge lower user fees (or other incentives) to those complying, in addition to fining those who violate the rules.

In response to the problem of illegal fishing in the Indonesian waters, the MMAF plans to install between 900 to 1,500 units of VMS (Vessel Monitoring System) in registered Indonesian fishing boats (Lubis et al., 2005; MMAF, 2005b). The idea is to track the movement of each boat, and with the help of GPS and Argos satellites and GIS, enabling the Jakarta processing centre to produce up-to-date maps of fishing boat distribution in Indonesian waters. Because the satellite images will not only contain features representing VMS-installed vessels, but also non-VMS ones, the authority theoretically is able to assess the frequency of illegal fishing conducted in the waters documented in satellite images. The VMS will contribute to the joint border patrols between Australia and Indonesia (Macdonald 2005). Figure 8.2 below is an example of how illegal fishing boats in Arafura Sea (next to Papua) were detected using VMS. The dots represent all boats (legal & illegal) captured by Radarsat, while the symbol of fishing boat represents boats fitted with VMS.

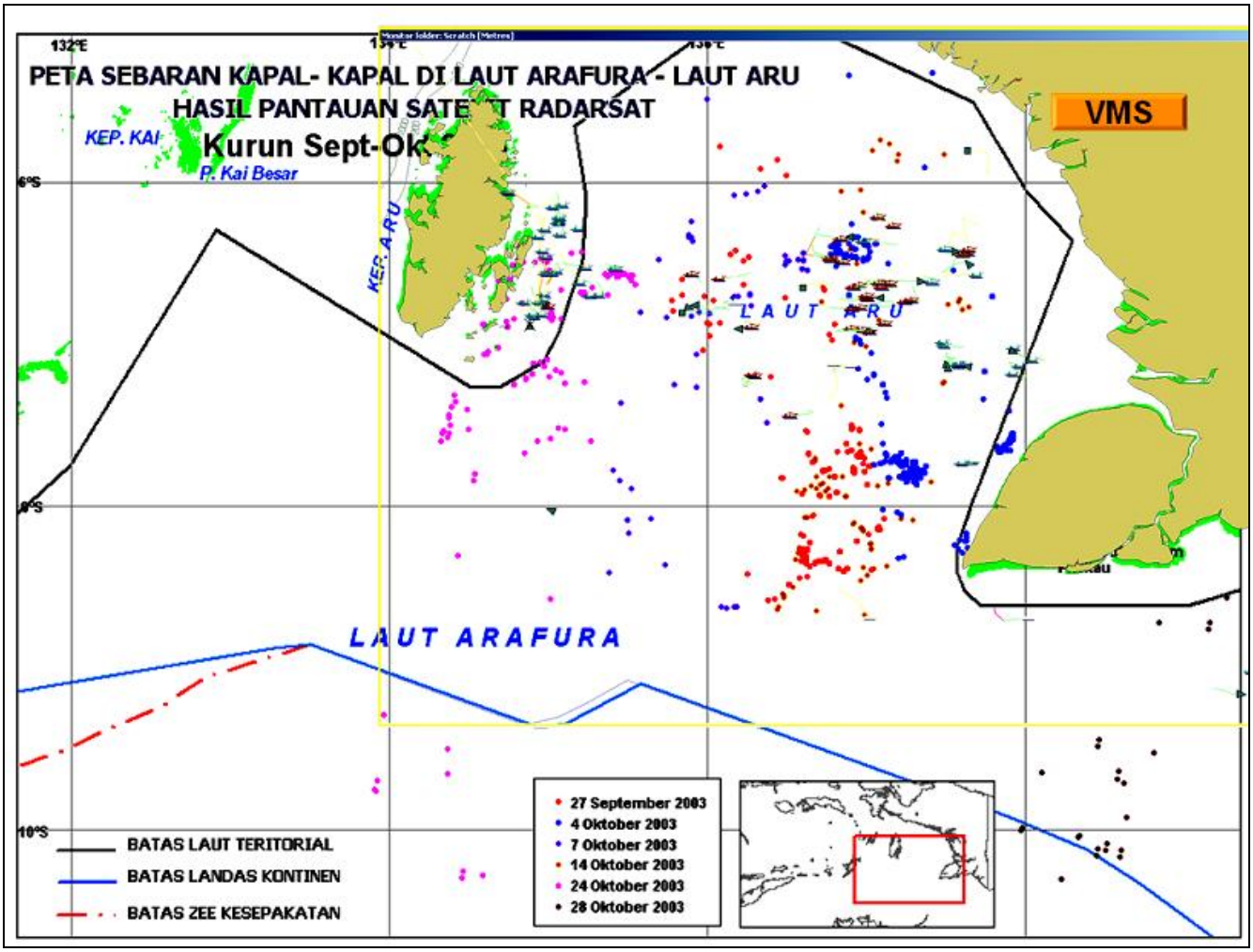


Figure 8.2. Map of fishing boats in Arafura Sea from September to October 2003. Compilation of VMS and Radarsat, courtesy of Marine and Fisheries Research Agency – Ministry of Marine Affairs and Fisheries.

In addition to inter departmental cooperation between the MMAF and the national navy, international cooperation in combating IUU fishing should be encouraged. So far, Indonesia has signed agreements with China, Thailand, Vietnam and the Philippines (MMAF 2005b) as well as Australia (Macdonald 2005) to combat illegal fishing It is imperative that similar agreements also be made with Timor Leste and Papua New Guinea.

Apart from IUU fishing, the possibility of breaching the regulations by trading whale meat commercially is low. However, oil spill incidents and other pollution, unregulated/illegal

display of marine mammals for public entertainment, etc might still occur, and need to be addressed in regulations.

### 8.6. Community awareness

Marine mammal science is a relatively new subject for Indonesian scholars and governments, and public awareness of marine mammal conservation is low. Marine mammals are susceptible to the effects of human noise and other anthropogenic threats. The public needs to understand that the conservation of marine mammals would benefit ecosystem conservation and eventually benefit humankind as well. In addition, a public campaign is needed to inform the communities about how to deal with stranded animals. The WWF, APEX Environment and The Nature Conservancy have conducted training to handle marine mammal strandings, but the knowledge should be disseminated to remote areas. Collaboration with the MMAF (Ministry of Marine Affairs and Fisheries) as well as the Ministry of Environment should be made to ensure that public education on marine mammal conservation is conducted at a national level to various stakeholders, including the fishing industries.

### 8.7. Indonesia and the CMS (Convention on Migratory Species)

The Convention on Migratory Species (CMS), also known as The Convention on the Conservation of Migratory Species of Wild Animals or the Bonn Convention, was developed in Bonn, Germany in 1979 and aims to conserve terrestrial, marine and avian migratory species throughout their range (CMS 2005a). By 1 August 2005, 92 countries have joined CMS, including parties from Africa, Central and South America, Asia, Europe and Oceania.

CMS has an appendix system to describe the level of urgency of specific migratory animals (CMS 2005a). Appendix I lists migratory species that are in danger of extinction throughout all or a significant portion of their range. CMS parties are required to expend serious efforts in the conservation of species in Appendix I, including habitat restoration, clearing the migratory corridors of obstacles, etc. Appendix II lists migratory species that have

unfavourable conservation status or would benefit significantly from international agreements. Sperm whales (*Physeter macrocephalus*) and all baleen whales are included in Appendix I, while the remaining cetaceans and the dugong are listed in Appendix II.

Indonesia is not yet a full party to the CMS. However, recently the Indonesian government has become an MOU signatory to this convention (CMS, 2005b). At the 3rd IUCN World Conservation Conference in Bangkok, in November 2004, I talked with several MMAF (Ministry of Marine Affairs and Fisheries) government officers about the possibilities of Indonesia fully joining the CMS. Marsh (2005, *pers.comm*.) confirmed that the Indonesian government attended a CMS meeting for dugongs in Bangkok in September 2005.

Indonesia has already joined the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) and the Convention on Biological Diversity (CBD). CITES is focused on regulating the trade of endangered species, while the CBD is an umbrella convention for the conservation of biodiversity. By fully joining the CMS, Indonesia will likely gain more support to conduct collaborative research on migratory marine mammals, particularly with Australia, which is a member of CMS. In addition, Indonesia will also receive assistance and guidance from CMS in conserving all migratory species occurring in Indonesian land and sea territory.

In contrast, I suggest that it would be inadvisable for Indonesia to join the International Whaling Commission (IWC) in the near future. There are two polarised groups in the IWC that argue about the validity of traditional whaling (see Donovan (1982) and Hirata (2005). There is insufficient information of the sustainability of traditional whaling in Lamalera and adjacent waters, thus I think it would be more strategic for Indonesia to conduct a comprehensive study of the cetacean populations in Savu Sea and build up mutual understanding with traditional whale hunters of the region, rather than join the IWC and invite

unnecessary international comments that might cause friction with traditional hunters in Lamalera who are dependant on marine mammal resources.

### 8.8. Chapter summary

In this chapter, I have described several management options for marine mammals in the Savu Sea. The management of traditional hunting is the only management measure that is specific to Lamalera and Lamakera in the Savu Sea. Other recommendations such as the management of IUU fishing, MPA, continuous research, alternative livelihood, law empowerment and possible membership in CMS are applicable to Indonesia in general. Nonetheless, I suspect that IUU fishing, not traditional hunting, is the biggest threat to marine mammals in the Savu Sea. A formal threat prioritisation is required informed by studies to examine the magnitude and consequences of threats and the options I have proposed. I summarise all issues discussed in this thesis in the final Chapter 9.

# IX. CONCLUSIONS AND RECOMMENDATIONS

## 9.1. Summary of the research

The overall aim of this study was to provide options for a marine mammal management plan in Indonesia, particularly in Savu Sea, that facilitates the inclusion of the existing traditional whale hunting in the plan. This aim was achieved by:

1. Documenting the cultural importance and perceptions of whale hunting cultures in Lamalera and Lamakera (Chapters 3 and 4).
2. Analysing the potential threats to marine mammal populations in Savu Sea, as perceived by the locals and based on observations (Chapter 5).
3. Identifying potential conflicts among stakeholders of the Savu Sea (including the whale hunters and other Indigenous groups) in relation to the establishment of a marine mammal management area in Indonesia (Chapters 3, 4 and 5).

In doing so I have been able to address the research questions identified in Chapter 1, which related to identifying:

1. The status of the whale hunting traditions in Lamalera (Lembata Island) and Lamakera (Solor Island) and their possible threats to marine mammals
2. Other anthropogenic threats to marine mammal populations
3. Possible ways of integrating whale hunting traditions and other potential anthropogenic threats into the marine mammal conservation plan

I also outline a set of management options and recommendations that would balance the conservation at both marine mammals and the whale hunting culture as well as address the threats identified in Chapter 5.

By taking a social constructionist approach I explicitly presented and considered the different perspectives of the various stakeholders. The core of social constructionism is the

acknowledgement of the different perceptions and positions of different stakeholders, to achieve a balance. I used social construction theory to understand the perceptions of several stakeholders concerning traditional whale hunting in Lamalera and other anthropogenic activities that potentially threaten marine mammal populations in the region. This approach clearly assisted me to understand the complex issue of the conservation and management of marine mammals in the Savu Sea. For instance, my personal social construction has developed from that of an environmentalist with the goal to conserve marine mammals in the region to a more balanced researcher who understands the predicaments of traditional whale hunting and other anthropogenic threats to marine mammals, without abandoning my original intention of conserving the animals.

The Rapid Rural Appraisal (RRA) I used resulted in an effective and efficient research process to answer the research questions. Participatory approaches such as the ones I used cannot guarantee the success of the management options I elaborated in Chapters 7 and 8. However, taking a non-participatory approach will almost guarantee the failure of the designated management schemes, i.e., the Solor-Alor MPA.

The results of this research make an original contribution to the broader literature on the design of MPAs in the Indonesian context. In particular, the inclusion of participatory approaches from the inception of the development of an MPA would be a significant innovation for the Indonesian government. As well, this research contributes a greater understanding of the issues to be faced when attempting strategies for marine mammal conservation in Savu Sea and Indonesia more broadly.

### 9.2. Major results

I have concluded that the whale hunting practised in both Lamalera (Lembata Island) and Lamakera (Solor Island) is subsistence whaling according to the IWC (International Whaling Commission) definition. While this tradition appears no longer to be important for the

villagers of Lamakera, it is still a very important part of the cultural and spiritual identity of the Lamalera villagers.

Although the whale catch has been relatively low in recent years (5 to 23 whales per year since 1996), the Lamalera fishermen have compensated by increasing their catch of small cetaceans and other marine megafauna, thus confirming their dependency on marine megafauna, including whale sharks, sunfish, manta rays, etc. The recently escalating hunting of small cetaceans needs to be carefully managed to ensure it is sustainable. It is possible that this practice does not fall into the IWC category of subsistence hunting because of its apparently recent origin.

The sustainable harvest levels or PBR (Potential Biological Removal) for whale hunting in Lamalera are still unknown. Using a precautionary approach (as advocated by the Convention on Biological Diversity to which Indonesia is a signatory), this practice must be considered a potential threat to the local whale population. Research should be conducted to understand the level of threat that this tradition imposes on the population of sperm whales and other major hunting targets. Research on the stock identity and population sizes of the main target species is imperative to determine the sustainable harvest level of each species, especially in relation to the recently escalating trend of small cetacean hunting in Lamalera.

I have identified several other anthropogenic threats to marine mammals in the Savu Sea. These threats need to be prioritised via stakeholder meetings for further management actions. IUU fishing was the threat most frequently mentioned in my interviews with the local people. Inter-governmental agencies should work together to reduce IUU fishing activities. The Indonesian government should also continue to coordinate with neighbouring countries such as Australia and Timor Leste to combat illegal fishing in the region. Threats such as marine traffic and the harbour plan in Wulandoni, oil and gas exploration and exploitation, as well as

commercial displays also threaten the marine mammal populations in Savu Sea and need to be assessed, and if possible, addressed.

During my fieldwork, I identified several potential conflicts. In informal discussions, I found that the whale hunters of Lamalera are resistant to any attempts to prohibit their hunting. There is also a risk that the hunters may shift to commercial and modernised practice to increase short-term profits by installing outboard machines to *paledangs* and selling whale meat in non-traditional markets (such as Kupang in Timor Island or other places). There is significant risk that the hunting of small cetaceans by the villagers of Lamalera and Lamakera may be subjected to international scrutiny, hence creating conflict with the hunters. In addition to the ongoing conflict between local whale hunters and commercial long liners, there are potential conflicts between whale hunting tourism and proposed whale watching tourism. An important outcome of this is the recognition that even though conservation agencies might focus on iconic species (such as marine mammals), it is essential that they do not lose sight of the broader issues such as fisheries, food security and cultural issues with regard to marine mammal conservation in Indonesia.

### 9.3. Recommendations

On the basis of these conclusions, I make several recommendations for the improvement of marine mammal management in Indonesia. Some of my recommendations are applicable at local level, while others are applicable at national and international levels. It is important to inform relevant stakeholders that the recommendations will not only conserve the marine mammals and traditional hunting, but also improve their socio-economic conditions. For instance, as mentioned in Chapter 5 Section 5.2.1, Indonesia has lost USD 1.9 million due to illegal fishing (MMAF, 2005b). Mitigation measures such as controlling IUU fishing will not only benefit marine mammal populations, but also encourage sustainable fisheries that will eventually increase the socio-economic benefits to local peoples.

### *9.3.1. Management implications*

Although the threat level of traditional whale hunting has not yet been assessed, the traditional hunting of cetaceans cannot be managed separately from other issues in Savu Sea. Most of the other threats to marine mammals have the potential to alter traditional whale hunting cultures. Provided that traditional whaling in Lamalera is conducted sustainably, the Convention on Biological Diversity stipulates that this practice should be preserved by the Indonesian government. Thus, based on the spirit of cooperative management, it is important to involve the local hunters and villagers in the mitigation of these identified threats. Western scientific research should be conducted to ensure that the current whale and small cetacean hunting practices in Lamalera are sustainable. The villagers need to be involved in all phases of the research, so that they can understand the basis of any resultant management intervention.

The Indonesian government has recently announced plans to establish the Solor-Alor Marine Protected Area as a management option in the Savu Sea region. I suggest that the Pantar Strait Marine Park should be merged into the Solor-Alor MPA. The new MPA proposal should be supported by comprehensive studies on the biophysical parameters of marine biodiversity and ecosystems in Solor-Alor Islands, as well as research to document community aspirations and public opinion about the notion of establishing the MPA. The latter study can be achieved by conducting Participatory Rural Appraisal (PRA) among various stakeholders in the Solor-Alor Islands. These stakeholders include the traditional hunters, tourism industries, fishing industries, government agencies etc. The PRA process will also help with ranking the various threats to marine mammals in Savu Sea identified by this research.

To ensure the effectiveness of the proposed Solor-Alor MPA, a network of MPAs in the region should be considered as a first step. Facilitated by the National Committee for Marine Conservation, this network could include the existing Komodo National Park (Flores), the Wakatobi Marine National Park (Southeast Sulawesi), the proposed Solor-Alor MPA and the

proposed Bandanaira MPA (Maluku), and Timor Leste. In the southern waters of Savu Sea, opportunities to conduct collaborative research with Australia should be explored.

Alternative livelihoods for whale hunters and destructive fishers must be developed with their full co-operation. Whale watching is a potential option to be conducted in the Savu Sea, although converting the traditional whale hunters to be whale watch operators maybe a challenging task. Options for both whale-hunting and whale-watching tourism should be investigated to understand the perspectives and expectation of tourism operators and tourists, the economic viability and possible conflicts between them. Alternative fisheries to reduce the dependency of Lamalera villagers on marine megafauna products are also feasible options. The villagers of Lamalera need to be taught alternative fishing methods, post-harvesting techniques, and local marketing strategies.

At the national level, it is crucial to remedy the problems associated with the overlap between Indonesian regulations and government agencies with respect to the management of marine mammals as well as encouraging law enforcement to prevent the escalation of the threats identified above. The formal definition of 'traditional whaling/hunting' should also be defined, as at the moment there are no regulations specifically explaining this term.

In the international context, I suggest that Indonesia join the Convention on Migratory Species (CMS), because the Convention can assist Indonesia in the management of and research on marine mammals, especially species targeted by whale hunting. Joining the CMS should facilitate regional collaboration with Australia and other countries that have been conducting extensive studies on marine mammals. In contrast, considering the lack of information on the sustainable level of whale hunting in Savu Sea, the importance of whale hunting to the people of Lamalera and the complexity of International Whaling Commission (IWC), I suggest that Indonesia not join the IWC, and instead focus on the science required to establish whether the traditional whale hunting is sustainable.

### *9.3.2. Research implications*

I suggest that the Indonesian government actively encourage research on marine mammals, and promote public awareness of marine mammal conservation. The Lamakera whale hunting tradition has not been researched as extensively as the Lamalera tradition. Further research is needed to examine past and present whale utilisation in the village. There are indications that Alor and Rote serve as important migratory passages for marine mammals in the Savu Sea. Collaboration between Indonesia, Timor Leste and Australia with coordinated marine mammal research and management has the potential to provide results useful to all these countries.

To understand public opinion regarding the establishment of the Solor-Alor MPA, it is imperative that a series of PRA (Participatory Rural Appraisal) exercises be conducted in the region. Because the Solor-Alor Islands are a heavily utilised archipelago, any parks should accommodate human activities in a multiple-use zone design. The fact that the Solor-Alor Islands is a populated region with busy marine traffic should be integral to the design of any MPA.

Research on the population status, migratory routes and sustainable harvest levels of the marine mammals in the Savu Sea, particularly the species targeted by hunters, should be conducted with high priority, perhaps with international assistance. The increasing trend of small cetacean hunting in Lamalera and Lamakera should be investigated. Although I understand that obtaining the funding for cetacean vessel-based surveys will be challenging in Indonesia, the Ministry of Marine Affairs and Fisheries (MMAF) have three times conducted specific cetacean surveys and twice oceanographic surveys with cetacean components in the Savu Sea, from 2003 to 2005, suggesting an increasing focus on marine mammal surveys in Indonesia.

Research on fisheries by-catch and marine debris should also be conducted in the Savu Sea. Although traditional hunting is the most prominent activity with impact on marine mammals in the region, it is vital to understand and address the level of threats that other anthropogenic activities pose to the animals, particularly the IUU fishing.

Last but not least, research for sustainable alternative livelihoods (e.g., whale watching and sustainable fisheries) with adequate socio-economic analysis should be encouraged with a view to enabling the whale hunters and local villagers of Lamalera and Lamakera to be less dependent on cetaceans and other megafauna. To be effective, all decisions must reflect mutual understanding between traditional hunters and conservationists, a major ingredient for comprehensive and effective marine mammal management in Indonesia.

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**Appendix 1. List of marine mammals in Indonesia**
(Adapted from Barnes (1996), Rudolph et al. (1997), IUCN (2003), Kahn (2003b), and Reeves et al. (2003))

| No | Species | English name | Indonesian name | Local name* | IUCN status |
|---|---|---|---|---|---|
| | **CETACEAN** | | | | |
| 1 | *Balaenoptera acutorostrata* | Minke whale | Paus minke | Kelaru | LR (nt) |
| 2 | *Balaenoptera brydei* | Bryde's whale | Paus Bryde | Kelaru | DD |
| 3 | *Balaenoptera edeni* | Pygmy Bryde's whale | Paus Bryde kerdil | Kelaru | DD |
| 4 | *Balaenoptera borealis* | Sei whale | Paus sei | Kelaru | EN |
| 5 | *Balaenoptera physalus* | Fin whale | Paus sirip | Kelaru | EN |
| 6 | *Balaenoptera musculus* | Blue whale | Paus biru | Lelangaji | EN |
| 7 | *Megaptera novangliae* | Humpback whale | Paus bongkok | N/a | VU |
| 8 | *Physeter macrocephalus* | Sperm whale | Paus sperma | Kotekelema | VU |
| 9 | *Kogia simus* | Dwarf sperm whale | Paus sperma cebol | Fefa kumu | DD |
| 10 | *Kogia breviceps* | Pygmy sperm whale | Paus sperma Kerdil | N/a | DD |
| 11 | *Globicephala macrorhynchus* | Short-finned pilot whale | Paus pemandu sirip pendek | Temu bela | LR (cd) |
| 12 | *Orcinus orca* | Killer whale | Paus pembunuh | Seguni | LR (cd) |
| 13 | *Pseudorca crassidens* | False killer whale | Paus pembunuh palsu | Temu bela | DD |
| 14 | *Feresa attenuata* | Pygmy killer whale | Paus pembunuh kerdil | Temu kebung | DD |
| 15 | *Peponocephala electra* | Melon-headed whale | Paus kepala semangka | Temu kebong | DD |
| 16 | *Stenella longilostris* | Spinner dolphin | Lumba-lumba paruh panjang | Temu kira | LR (cd) |
| 17 | *Stenella attenuata* | Pantropical spotted dolphin | Lumba-lumba totol | Temu kira | LR (cd) |
| 18 | *Stenella coeruleoalba* | Striped dolphin | Lumba-lumba bergaris | N/a | LR (cd) |
| 19 | *Steno bredanensis* | Rough toothed dolphin | Lumba-lumba gigi kasar | N/a | DD |
| 20 | *Grampus griseus* | Risso's dolphin | Lumba-lumba abu- | Temu bura | DD |

| | | | | | |
|---|---|---|---|---|---|
| | | | abu | | |
| 21 | *Tursiops truncatus* | Bottlenose dolphin | Lumba-lumba hidung botol | N/a | DD |
| 22 | *Delphinus delphis* | Short-beaked common dolphin | Lumba-lumba paruh pendek | N/a | DD |
| 23 | *Delphinus capenis* | Long-beaked common dolphin | Lumba-lumba paruh panjang | N/a | DD |
| 24 | *Lagenodelphis hosei* | Fraser's dolphin | Lumba-lumba Fraser | Temu notong | DD |
| 25 | *Sousa chinensis* | Indo Pacific humpback dolphin | Lumba-lumba putih Cina | N/a | DD |
| 26 | *Orcaella brevirostris* | Irrawaddy dolphin | Pesut Mahakam | N/a | DD |
| 27 | *Neophocaena phocaenoides* | Finless porpoise | Lumba-lumba tak bersirip | N/a | DD |
| 28 | *Mesoplodon sp.* | Beaked whale | Paus paruh | Ika mea | DD |
| 29 | *Ziphius cavirostris* | Cuvier's beaked whale | Paus paruh Cuvier | Ika mea | DD |
| 30 | *Hyperoodon sp.* | Bottlenose whales | Paus hidung botol | N/a | LR (cd) |
| | | | | | |
| | SIRENIAN | | | | |
| 31 | *Dugong dugon* | Dugong | Duyung | Juru | VU |
| | | | | | |

Note for IUCN status**:
EN = endangered
VU = vulnerable
LR = lower risk
DD = data deficient

*Local names are in Lamaholot language used in Solor and Lembata Islands
** See Appendix 2 for explanation of IUCN status and criteria

**Appendix 2. IUCN Categories and Criteria**

(after Reeves et al. (2003), except for the LR criteria after IUCN (1994))

**ENDANGERED (EN)**

A taxon is Endangered when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a very high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of 70% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:

    (a) direct observation

    (b) an index of abundance appropriate to the taxon

    (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat

    (d) actual or potential levels of exploitation

    (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

2. An observed, estimated, inferred or suspected population size reduction of 50% over the last 10 years or three generations, whichever is the longer**,** where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1
3. A population size reduction of ≥50%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.
4. An observed, estimated, inferred, projected or suspected population size reduction of 50% over any 10 year or three generation period, whichever is longer (up to a

maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 5000 $km^2$, and estimates indicating at least two of a–c:

   a. Severely fragmented or known to exist at no more than five locations.

   b. Continuing decline, observed, inferred or projected, in any of the following:

      (i) extent of occurrence

      (ii) area of occupancy

      (iii) area, extent and/or quality of habitat

      (iv) number of locations or subpopulations

      (v) number of mature individuals.

   c. Extreme fluctuations in any of the following:

      (i) extent of occurrence

      (ii) area of occupancy

      (iii) number of locations or subpopulations

      (iv) number of mature individuals.

2. Area of occupancy estimated to be less than 500 $km^2$, and estimates indicating at least two of a–c:

   a. Severely fragmented or known to exist at no more than five locations.

   b. Continuing decline, observed, inferred or projected, in any of the following:

      (i) extent of occurrence

      (ii) area of occupancy

      (iii) area, extent and/or quality of habitat

(iv) number of locations or subpopulations

(v) number of mature individuals.

c. Extreme fluctuations in any of the following:

(i) extent of occurrence

(ii) area of occupancy

(iii) number of locations or subpopulations

(iv) number of mature individuals.

C. Population size estimated to number fewer than 2500 mature individuals and either:

1. An estimated continuing decline of at least 20% within five years or two generations, whichever is longer, (up to a maximum of 100 years in the future) OR
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a–b):

a. Population structure in the form of one of the following:

(i) no subpopulation estimated to contain more than 250 mature individuals, OR

(ii) at least 95% of mature individuals in one subpopulation.

b. Extreme fluctuations in number of mature individuals.

D. Population size estimated to number fewer than 250 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer (up to a maximum of 100 years).

**VULNERABLE (VU)**

A taxon is Vulnerable when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of ≥ 50% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are: clearly reversible AND understood AND ceased, based on (and specifying) any of the following:

   (a) direct observation

   (b) an index of abundance appropriate to the taxon

   (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat

   (d) actual or potential levels of exploitation

   (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

2. An observed, estimated, inferred or suspected population size reduction of ≥30% over the last 10 years or three generations, whichever is the longer**,** where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible**,** based on (and specifying) any of (a) to (e) under A1.
3. A population size reduction of ≥30%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.
4. An observed, estimated, inferred, projected or suspected population size reduction of ≥0% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR

may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 20,000 $km^2$, and estimates indicating at least two of a–c:

   a. Severely fragmented or known to exist at no more than 10 locations.

   b. Continuing decline, observed, inferred or projected, in any of the following:

      (i) extent of occurrence

      (ii) area of occupancy

      (iii) area, extent and/or quality of habitat

      (iv) number of locations or subpopulations

      (v) number of mature individuals.

   c. Extreme fluctuations in any of the following:

      (i) extent of occurrence

      (ii) area of occupancy

      (iii) number of locations or subpopulations

      (iv) number of mature individuals.

2. Area of occupancy estimated to be less than 2000 $km^2$, and estimates indicating at least two of a–c:

   a. Severely fragmented or known to exist at no more than 10 locations.

   b. Continuing decline, observed, inferred or projected, in any of the following:

      (i) extent of occurrence

      (ii) area of occupancy

      (iii) area, extent and/or quality of habitat

      (iv) number of locations or subpopulations

      (v) number of mature individuals.

c. Extreme fluctuations in any of the following:

(i) extent of occurrence

(ii) area of occupancy

(iii) number of locations or subpopulations

(iv) number of mature individuals.

C. Population size estimated to number fewer than 10,000 mature individuals and either:

1. An estimated continuing decline of at least 10% within 10 years or three generations, whichever is longer, (up to a maximum of 100 years in the future) OR
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a–b):

   a. Population structure in the form of one of the following:

      (i) no subpopulation estimated to contain more than 1000 mature individuals, OR

      (ii) all mature individuals are in one subpopulation.

   b. Extreme fluctuations in number of mature individuals.

D. Population very small or restricted in the form of either of the following:

1. Population size estimated to number fewer than 1000 mature individuals.
2. Population with a very restricted area of occupancy (typically less than 20 $km^2$) or number of locations (typically five or fewer) such that it is prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and is thus capable of becoming Critically Endangered or even Extinct in a very short time period.

E. Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.

**LOWER RISK (LR)**

A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the category Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories:

1. **Conservation Dependent (cd).** Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for enlisted on the threatened categories above within a period of five years.
2. **Near Threatened (nt).** Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.
3. **Least Concern (lc).** Taxa which do not qualify for Conservation Dependent or Near Threatened.

**DATA DEFICIENT (DD)**

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified**.**

**Appendix 3. Questions asked during the interviews in Lamalera, Lamakera and other places in Savu Sea**

Note: As the result of the qualitative nature, these questions usually triggered other follow up questions that I do not elaborate here because they were very variable and situation dependent.

1. **Distribution and migration of marine mammals**
    a. Have you seen any marine mammals (whales/dolphins/dugongs) in your areas?
    b. What species/group do you often see? How do you differentiate males and females?
    c. When do you usually spot the animals? After the sighting seasons, do you know where they go?

2. **Social construction on marine mammals and their role in indigenous cultures**
    a. Do you have any folklore on marine mammals in your region? Can you elaborate the story?
    b. Why and how did these animals become important in your traditions?

3. **Traditional hunting ground/sacred places**
    a. Who owns the right to hunt whales? All the villagers or only specific members?
    b. Who goes on the hunt? What hunting tools and type of boats do you use?
    c. When and where do you hunt?
    d. What is the whale hunting procedure/sequence?
    e. Do you have any taboo related to the whale hunting in this region?

4. **Marine mammal utilisation**
    a. Do you use the animals for daily needs?
    b. What do you use them for usually?
    c. Which body parts do you utilise?

d. How much does the body part(s) cost?

e. Who handles the post-harvesting?

f. How do you preserve the whales? What are the post-harvesting methods?

g. Who are the consumers?

h. Could you tell me the chain of custody? Local, regional, export?

**5. Potential threats to marine mammals**

a. Do you think that marine mammals need to be protected?

b. Can you identify any activities that disturb/alter the presence of whales/dolphins/dugongs in your areas?

c. When and where do you usually spot the threatening activities?

**6. Potential threats to traditional whale hunting**

a. Are there any activities in the region that compete with your traditional whale hunting activities? Could you explain?

**7. Official catch record**

a. Have you ever routinely reported your catch record to village leaders, government officers or other parties?

b. Are there any quotas or whale catch restrictions in this region? In what sense?

c. If the recording of catch is not yet working, what do you suggest to do about this? Is catch recording important for you? Do you have any specific people organised to do the recording?

**Appendix 4. Codes emerged from thematic analysis of the transcripts**

Below are the codes resulted from the transcript analysis and produced using N-Vivo software. The codes are not necessarily meaningful to most readers; I made the codes as easy as possible for me to analyse. The 'threat' codes were mainly used in Chapter 5 (Threat Analysis). The 'management option' codes were mainly used to guide the discussions in Chapters 5, 6 and 7. The remaining codes were used in Chapter 3 and 4.

| No | Open coding | Axial coding | Selective coding |
|---|---|---|---|
| 1 | Tourism in Lamalera | 1. Lamalera and Lembata | 1. Marine mammals and people in Savu Sea |
| 2 | Economy in Lamalera | | |
| 3 | Lembata fisheries | | |
| 4 | Lembata tourism | | |
| 5 | Lamalera youth | | |
| 6 | Wulandoni clans | | |
| 7 | Wulandoni livelihood | | |
| 8 | Women's role | | |
| 9 | Bad road | | |
| 10 | Barter tradition | | |
| 11 | Baulolon ceremony | | |
| 12 | Boats in Lamalera | | |
| 13 | Electricity, water, road, phone | | |
| 14 | Emancipation | | |
| 15 | History of Lamalera | | |
| 16 | Local curricula | | |
| 17 | Natural disaster | | |
| 18 | Schools | | |
| 19 | Village statistics | | |
| 20 | Whale hunting and tourism | | |
| 21 | Subsistence whaling | 2. Traditional hunting | 1. Marine mammals and people in Savu Sea |
| 22 | Traditional whaling | | |
| 23 | Traditional community | | |
| 24 | Whale museum | | |
| 25 | Whale scarcity | | |
| 26 | Appreciating whale hunting in arts | | |
| 27 | Catholic influence | | |
| 28 | Customary rights | | |
| 29 | Danger of hunting whales | | |
| 30 | Endangered whale hunters | | |
| 31 | Hunting agreement with other villages | | |
| 32 | Hunting gear | | |
| 33 | Hunting ground | | |
| 34 | Hunting records | | |
| 35 | Hunting seasons | | |
| 36 | Hunting tradition | | |

| | | | |
|---|---|---|---|
| 37<br>38<br>39<br><br>40<br>41<br>42<br>43<br>44<br>45<br>46 | Hunting whales in Lamakera<br>Increased filming rate<br>Lamalera villagers are not whale killers<br>Pride<br>Share of meat<br>Story of *kelaru*<br>Story of the hunters<br>Superstitious<br>Taboo<br>TEK/ Traditional Ecological Knowledge | | |
| 47<br>48<br>49<br>50<br>51 | Agriculture and farming<br>Famine<br>Food in Lamalera<br>Hard season<br>Life is hard in Lamalera | 3. Food security | 1. Marine mammals and people in Savu Sea |
| 52<br>53<br>54<br>55<br>56<br>57<br>58<br>59<br><br>60 | About Lamakera<br>Big catch<br>Boats in Lamakera<br>Dugong in Lamakera<br>Dugong tale<br>Marine tourism East Flores<br>No more paledang in Lamakera<br>No spirituality in hunting whales in Lamakera<br>Pre-motorised boats | 4. Lamakera and Larantuka | 1. Marine mammals and people in Savu Sea |
| 61<br>62<br>63<br>64<br>65<br>66 | About Rote<br>Border trespassing<br>Dugong consumption<br>No dugong ceremony<br>Rare dugongs<br>Whale Indo-Oz | 5. Rote | 1. Marine mammals and people in Savu Sea |
| 67<br>68<br>69<br>70<br>71 | Air transportation<br>Cold current in Alor<br>Marine tourism Alor<br>Other environment issues<br>Whales for Alor people | 6. Alor | 1. Marine mammals and people in Savu Sea |
| 72<br>73<br>74<br>75 | Aphrodisiac<br>Pricing of whale product<br>Selling whale meat<br>Whale products | 7. Marine mammals products | 1. Marine mammals and people in Savu Sea |
| 76<br>77<br>78<br>79<br>80<br>81 | Sperm whale<br>Baleen whales<br>Dugongs<br>Killer whales<br>Mating ground<br>Sighting areas | 8. Marine mammals | 1. Marine mammals and people in Savu Sea |

| | | | |
|---|---|---|---|
| 82<br>83<br>84<br>85<br>86 | Sighting season<br>Stranded dugong<br>Stranded whale<br>Target species Lamalera<br>Target species Lamakera | | |
| 87<br><br>88 | Changing water current (*lefa-baleo*)<br>Declining catch | 9. Whale population | 1. Marine mammals and people in Savu Sea |
| 89<br>90<br>91<br>92 | Common fishing gear<br>Fishing zones<br>License of fishing fleet<br>Modern fishing | 10. Common type of fisheries | 1. Marine mammals and people in Savu Sea |
| 93<br>94<br>95<br>96<br>97<br>98<br>99<br>100<br>101<br>102<br>103 | Commercial display<br>Artisanal fisheries<br>Commercial hunting<br>Destructive fishing<br>Dolphin hunting<br>Harbour and marine traffic<br>Ghost net<br>Modernised hunting<br>Oil and gas<br>Pearl farming<br>Traditional hunting | 11. Threats | 2. Threats |
| 104<br><br>105<br>106<br><br>107<br>108<br>109<br>110<br>111<br>112<br><br>113<br>114 | MPA (Management of Protected Areas)<br>Managing destructive fishing<br>Legal instrument for whale conservation<br>Quota<br>Alternative livelihood<br>Whale migratory route<br>Trade chain<br>Environmental awareness<br>EIA/ Environmental Impact Assessment<br>Government doesn't care<br>Action, not just words/research, please | 12. Management options | 3. Management options |