Strategy Report Part II. National Conservation and Action for the Dugong in Indonesia.

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Part II

Strategy report

April 2009

Prepared by the Dugong Strategy Steering Committee

Edited by:

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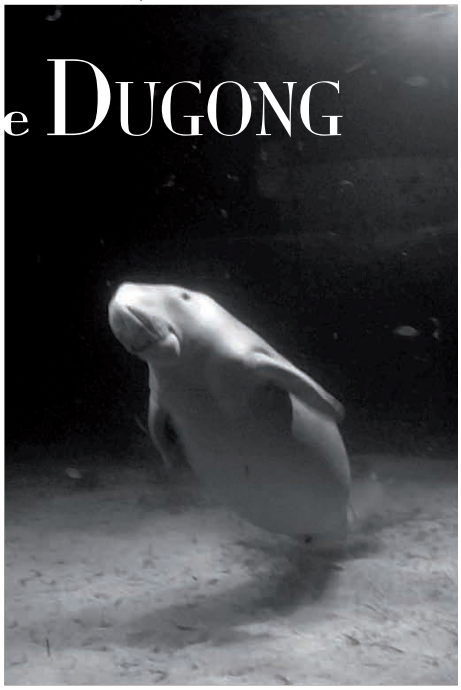
National Conservation Strategy and Action Plan for the Dugong in Indonesia



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Part II Strategy report April 2009

National Conservation Strategy and Action Plan for the Dugong in Indonesia

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Dr. Hans de Iongh - Dr. Malikusworo Hutomo
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Contents

Preface

It is a pleasure to present to you the publication of Part I (Scientific document) and Part II (Strategy document) of the National Conservation Strategy and Action Plan for the Dugong in Indonesia (NCSAPDI). This first publication is in English, a Bahasa Indonesia version is in preparation. The process which has resulted in the completion of these two publications has taken two full years. During those two years three meetings of the Steering Committee took place and two NGO consultations (in Bali and Manado). During the process a large number of stakeholders, including government staff, scientists and NGO staff have participated in the preparation of both documents.

The present document gives a follow up to the Global Status Report and Action Plans for Countries and Territories prepared by Marsh *et al.* (2002), which resulted from a resolution of the IUCN World Conservation Congress in Buenos Aires (1995). The present report also builds on the Policy, Strategy and Action Plan for Management of Seagrass Ecosystems in Indonesia (UNEP-GEF, 2003).

The completion of the National Conservation Strategy and Action Plan for the Dugong in Indonesia (NCSAPDI) would not have been possible without the active support of the main sponsors, the United Nations Environmental Programme (UNEP) and the Convention of Migratory Species (CMS) in Bonn, the Ecosystem Grant programme (EGP) of the Netherlands Committee for IUCN and the Hong Kong Ocean Park Conservation Fund.

The present publications include recommendations for dugong research, conservation and management, the selection of pilot projects, a communication and awareness programme and other actions. It is wished that these recommendations will result in improved management and conservation of the remaining dugong populations in Indonesia.

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Summary

This publication covers Part II (the Strategy Report) of the *National Conservation Strategy and Action Plan for the Dugong in Indonesia* (NCSAPDI): the actual conservation strategy and a list of actions. Part I covers the scientific background information regarding the ecology, population size and distribution of the dugong in Indonesia and recommendations for research and monitoring. This document is published separately. Part III is comprised of the National Dugong Database for Indonesia, which will become a web based database including information on dugong population numbers and distribution, regularly to be updated. The main goal of the NCSAPDI is to develop a conservation strategy and action plan which will be a viable basis for the long term conservation and management of dugong populations in Indonesia.

The present document gives a follow up to the Global Status Report and Action Plans for Countries and Territories prepared by Marsh *et al.* (2002), which resulted from a resolution of the IUCN World Conservation Congress in Buenos Aires (1995). The present report also builds on the Policy, Strategy and Action Plan for Management of Seagrass Ecosystems in Indonesia (ISC, 2003).

The preparation of this document was based on consultations with a joint Steering Committee (SC) and with a large number of NGOs during 2007 and 2008. The present report includes recommendations for dugong conservation and management, the selection of pilot projects, a communication and awareness programme and other actions.

I

Vision and Mission

As explained in this document, dugongs are considered a keystone species of the seagrass ecosystem. In the Policy, Strategy and Action Plan for the Management of Seagrass Ecosystems in Indonesia (ISC, 2003), it was stipulated that seagrass constitutes a renewable resource, and therefore it may be utilized at all time, provided that it is done in accordance to its carrying capacity. It was also emphasised that seagrass ecosystems have an important function for the human population and that declining dugong numbers may as well indicate deterioration of the seagrass ecosystem. For this reason it is necessary to manage both dugongs and their habitat (seagrass) in the most appropriate manner. The availability of a policy, strategy and action plan for the proper management and conservation of dugong populations in relation to seagrass ecosystems must be developed on the basis of a clear "mission and vision" of the program. This mission and vision will act as an overall guidance for any management and conservation action to be taken, which actions have been detailed in this policy, strategy and action plan. Similar to the document for seagrass ecosystems, in this document "vision" signifies perception, hope and idealistic wishes relating to dugong populations and their habitat for the benefit of nation and people, and perhaps even for humankind around the world. While the term "vision" essentially refers to a general situation, the term "mission" by contrast suggests some actions to attain intermediate targets in the effort to approach the idealistic goal as implied in the "vision". In line with the above mentioned, the "vision" for the management and conservation of dugong populations will guide the "policy, strategy and action plan" for dugongs in Indonesia, including those in trans-boundary areas. The "vision" has been defined as follows:

> ***Establishment of an optimal and sustainable conservation management system of dugong populations in Indonesia, for the benefit of - and with the support of - local coastal communities.***

The perception as reflected in the vision described above is as a matter of fact representing a general target which can be characterized as "idealistic". Despite the fact that it will not be easy to reach this target, nonetheless the vision will function to provide the proper direction by which to approach this idealistic target. And this approach to the idealistic target is done through a chain of actions, which are defined as "the mission".
The mission of dugong conservation and management is to:

- Protect, manage and utilize dugong populations in a rational, sustained way through maintaining a balance between utilization and conservation;
- Develop management and conservation systems in a cooperative manner amongst relevant institutions and stakeholders which prioritise national economy, local community and sustainable development;
- Enhance awareness and cooperation amongst stakeholders in the management of dugong populations and seagrass ecosystems, and develop community based management plans;
- Develop mechanisms and principles of management and conservation, based on the "ecosystem approach", including both scientific data and local knowledge, which result in conservation and a sustained form of utilization within the carrying capacity of the seagrass ecosystem.

II

Introduction

II.1 Background

Indonesia is one of the largest and most varied archipelagic countries in the world. The country extends 5,120 kilometers from east to west and 1,760 kilometers from north to south. It encompasses 17,508 islands, of which only 6,000 are inhabited (CIA, 2007). There are five main islands (Sumatra, Java, Kalimantan, Sulawesi, and Papua), two major archipelagos (NusaTenggara and the Maluku Island), and sixty smaller archipelagos.

The first known written record of a dugong in Indonesia was made in 1712 by Samuel Falours, a Dutchman employed by the United East Indies Company (VOC), who described how a juvenile dugong was kept for four days in a bath tub in Ambon (Pietsch, 1991).

Scientific research on dugongs in Indonesia has been very limited (Allen *et al.*, 1976; Hendrokusumo *et al.*, 1976; Erftemeijer *et al.*, 1993; De Iongh *et al*, 2007). The main research effort on dugong seagrass interactions was done in the Moluccas province (Aru, Lease Islands) and in East Kalimantan (Balikpapan Bay), as summarised by De Iongh *et al*. (2007).

Evidence gathered through aerial surveys in the study area of the Moluccas province indicate a dispersed pattern of distribution of low numbers of dugongs in a small tropical island ecosystem with a narrow coastal shelf (De Iongh *et al.*, 1995a). The number of dugongs per survey hour in the study area was 5-11 dugongs/hour (De Iongh *et al.*, 1995a), which compares with the results of aerial surveys in other tropical island ecosystems: resp. 5.4 dugongs per hour in Palau (Brownell *et al.*, 1981), 9.2 dugongs/hour in the Torres Strait (Marsh *et al.*, 1984), and 1.9 dugongs/hour in the Philippines (Trono, 1995).

To date, the only observations on movements and home range of dugongs, using conventional and satellite telemetry, in a tropical small island ecosystem with a narrow coastal shelf, are reported in the Lease Islands (De Iongh *et al.*, 1998). Three adult females and one immature male were tracked for between 51 and 285 days. Similar to the findings of Preen (1995a), the animals showed an individualistic pattern of movement, moving over large areas. Dugongs move along restricted core areas where feeding takes place in smaller feeding assemblages. This confirms an observed pattern of grazing by small (facultative) herds of dugongs in restricted feeding swards.

Dugong grazing in an intertidal seagrass meadow dominated by *H. uninervis* showed a significant correlation with the carbo-hydrate content of the below-ground biomass and no significant relation with total N (De Iongh *et al.*, 1995b). It was concluded that the timing of dugong grazing in these intertidal meadows coincides with high below-ground biomass and high carbo-hydrate content in the rhizomes of *H. uninervis* in the upper 0-4 cm sediment layer.

In a recent review on dugong-seagrass interactions in Indonesia, mention was made of concentrated grazing swards inside coastal seagrass meadows, with a high density of dugong feeding tracks surrounded by relatively undisturbed meadows in an intertidal *Halodule* dominated meadow and in subtidal mono-specific *Halodule uninervis* and *Halophila ovalis* meadows in East Aru, Lease Islands and Balikpapan Bay (De Iongh *et al.*, 2007). Dugongs in this study do not show cultivation grazing similar as demonstrated by Preen (1995b), but they create grazing swards inside existing mono specific *Halodule* seagrass beds.

II.2 Distribution

Little data are available on dugong distribution and population numbers in Indonesia. Marsh *et al.* (2002) mentioned guestimates between 1000 and 10,000 dugongs in Indonesia. The Global Seagrass Atlas of Green and Short (2003) gives an insufficient insight in potential dugong habitats, since the shallow intertidal seagrass meadows on which dugongs in Indonesian waters depend, are not mapped in the atlas. A first distribution map of dugongs for Indonesia was prepared by Salm (1984). Nishiwaki and Marsh (1985) published a first overview of global dugong distribution, including Indonesia.

Important dugong habitats are also believed to occur from Arakan Wawontulap to Lembeh Strait between Lembeh and the mainland (North Sulawesi); east coast of Biak Island and western Cendrawasih Bay Marine National Park (Papua Barat), the Lease and Aru Islands (Maluku), and Flores - Lembata Islands (East NTT) (De Iongh *et al.*, 1997; Marsh *et al.*, 2002). Marsh *et al.* (2002) moreover mentions dugong presence in Kotawaringin, Karimata Island Marine Reserve and Kumai Bay. From 2001 till 2007 students from Leiden University (The Netherlands) recorded a number of dugong sightings and a vast number of dugong grazing tracks in the Balikpapan Bay, East Kalimantan (De Iongh *et al.*, 2007). In 2007 during an aerial survey over Balikpapan Bay at least one dugong has been spotted. Kreb and Budiono (2005) reported the observations of dugongs in the Berau Archipelago around the Island of Derawan. The presence of dugongs around Derawan Island was confirmed during a survey in 2006 (De Iongh *et al.*, 2006b).

De Iongh *et al.* (1995a) identified a dugong population of between 22-37 individuals in the Lease Islands, based on areal surveys. This is the first known dugong population census, based on aerial counts, implemented in Indonesian waters.

The Jaya Ancol Oceanarium also mentions anecdotal evidence for dugong presence in East, West and South Kalimantan (Hendrokusumo *et al.*, 1976; Tas'an *et al.*, 1979). Seaworld Indonesia reported dugongs to occur in the following locations (Ibu Mega, personal communication):

- Bojonegara, Banten (West Java); 2000, 2002, 2003
- Yapen Island, Papua; 2003
- Lasalimu, Buton Island (South East Celebes); 2004, 2007
- Muntok (West Bangka); 2007
- Ujung Batee (Banda Aceh); 2006
- Cipanon, Labuhan (West Java); 2001, 2004, 2005
- Batam, Pekanbaru; 2006

Communities in East Aru are a target group of the dugong strategy

— Lubuk (Central Celebes); 2005

— Selayar Island (South Celebes); 2004.

It is clear that dugongs show a widespread and scattered distribution in Indonesian coastal waters, although accurate and present data is scarce.
Most sightings are from incidental records. Anecdotal evidence can give an indication on where dugongs might be present, but local areas will have to be checked before being able to draw conclusions on dugong distribution. Research activities on dugongs have been restricted mainly to the Moluccas, Sulawesi and East Kalimantan.

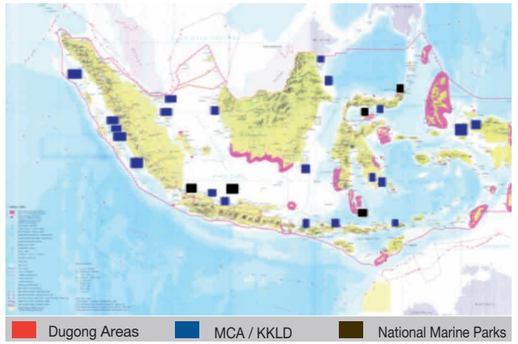
II.3 Cultural significance

In Indonesia there are almost no reports of dugongs being actively hunted, apart from the Aru Islands (De Iongh and Persoon, 1991). It has been suggested that in some areas local people consider the dugong a sacred animal and that this is the reason they do not hunt the animal (Marsh *et al.*, 2002; Hendrokusumo *et al.*, 1976).
Even though the dugong is not actively hunted, they often get caught in fisher nets and tidal traps by accident. The dugongs that get caught by accident will often be killed and eaten by the local community. The meat can be consumed dried or fresh and is said to be delicious (De Iongh and Persoon, 1991; Hendrokusumo *et al.*, 1976).
The tusks of the dugong are used by local people to make cigarette holders and the bones can be kept in the houses or elsewhere in the villages for protection or good luck (Persoon *et al.*, 1996).

Small statue of ancestor made of dugong tusk in Tanimbar

II.4 Legal status

The Conservation of Flora and Fauna Act No. 7, 1999 is the only legislation which protects Indonesian dugongs and seagrass directly. In appendix no. 20 of the Act, *Dugong dugon* is listed as protected fauna. In article 4, Verse 2 measures are dictated for protection: by a) management *in situ*, through identification and inventory of species and habitats, monitoring, management and research, and b) management *ex situ* through research, rehabilitation and protection of species and habitats.
However, a wide range of laws and regulations covering the coastal zone are relevant for the dugong and its principal habitat, seagrass ecosystems. Specific laws and regulations covering the coastal zone as an ecological entity are still non-existent in Indonesia. However several sectoral regulations are relevant. Among these regulations are the Act of the Republic of Indonesia No 5, 1990 concerning the conservation of living resources and their ecosystems; the Act of the Republic of Indonesia No. 24, 1992 on spatial planning; the Act of the Republic of Indonesia No. 5, 1994 concerning the ratification of the United Nations Convention on Biodiversity, and the Act of the Republic of Indonesia No. 23, 1997 on the management of the living environment. Other forms of regulations, apart from Acts or Statutes, include Decrees of the People Consultative Assembly, Government regulations, Presidential decrees and Ministerial decrees.
The Directorate of Marine Affairs and National Marine Parks of the Ministry of Marine Affairs and Fisheries has the mandate to protect and manage dugong populations in Indonesia. However the management of marine national parks is the mandate of the Ministry of Forestry and some of these marine national parks support dugongs and their habitat. The Directorate General for Marine, Coastal and Small Island Affairs of the Ministry of Marine Affairs and Fisheries has also received a mandate to manage marine protected areas and marine biota resource conservation. This Directorate General received its mandate based on 1) the Fisheries Act No. 31 of 2004; 2) the Management of Coastal Zone and Small Island Act No. 27 of 2007; 3) Government regulation No. 60 of 2007 regarding Fisheries Resource Conservation. Under the legislation mentioned above, the establishment of Regional Marine Protected areas (Kawasan Konservasi Laut Daerah – KKLD) has been made possible. There are now 24 KKLD's established by district heads (Bupati).
In terms of law enforcement, the legal protection of dugongs in Indonesian waters is not very effective. Enforcement is complicated by the nation's large area and numerous islands.



Map of KKLD's and National Marine Parks in Indonesia in relation to dugong distribution

The coast of Siberut: mangrove forest, coral reefs and seagrass beds, important habitat for dugongs

III

Problems and Issues

III.1 Threats

Apart from the Aru Islands no data are available on a decrease of dugong populations in Indonesia. It is however safe to assume that such a decrease has taken place certainly in the Aru Islands. There is no clear indication on what is the cause of this decreasing population. Several factors can be of influence for the dugong's well being and thus can have a negative effect on the present dugong population (Marsh *et al.*, 2002; De Iongh, 1997):

— Habitat destruction and degradation of seagrass meadows caused by local industries, boat traffic, agricultural pollution;

— Destructive fishing; impact of destructive fishing methods such as sodium cyanide fishing and coral blasting;

— Accidental catches in shark nets, gillnets or tidal traps (*belat* or *sero*);

Dugong in the Sea World Oceanarium, Jakarta, 2008

— Indigenous hunting. The deliberate harpooning of dugongs is reported from the Aru Islands (De Iongh and Persoon, 1991);

— Boat related impacts. Mortality of dugongs by the impact of outboard engines has been reported both in Balikpapan Bay and in Ambon (De Iongh, 1996; De Iongh *et al.* 2007).

The shallow, near-shore habitat requirements of dugongs and the slow rate of reproduction make the dugong very vulnerable to extinction. Processes that threaten the dugong vary to some degree across its range. Direct threats and indirect threats may cause a serious risk to the remaining dugong populations.
Direct threats to the dugong populations are mainly formed by human activities such as unintentional and intentional catch of dugongs. But also oil spills or other forms of pollution can have a direct effect on the health and survival of the dugong.

III.2 Research needs

Marsh *et al.* (2002), defined the following research needs (see also Part I):

— The distribution and abundance of dugongs and their habitats need to be determined at an appropriate-sized but affordable spatial scale by interviews with local communities;
— The results of these interviews should then be used to plan aerial and/or vessel surveys.

Similar to Marsh *et al.* (2002), it is recommended to implement areal surveys nation wide in areas where dugongs are known to occur and later in areas where dugongs are suspected to occur.
It is recommended to study the impact of community based conservation of dugong core areas, during a mid term study of five years.
It is recommended to continue the research on the interactions between dugongs and seagrass meadows in Indonesian coastal waters, as initiated by De Iongh *et al.* (2007).
It is recommended to start a mid term study using satellite telemetry on dugongs in the following areas: a) Ujung Kulon and Miskam Bay; b) East Kalimantan; c) North Sulawesi; and d) Papua.
It is recommended to initiate a mid term study of five years to investigate the mechanism behind the creation of grazing swards by dugongs in Indonesian coastal waters.

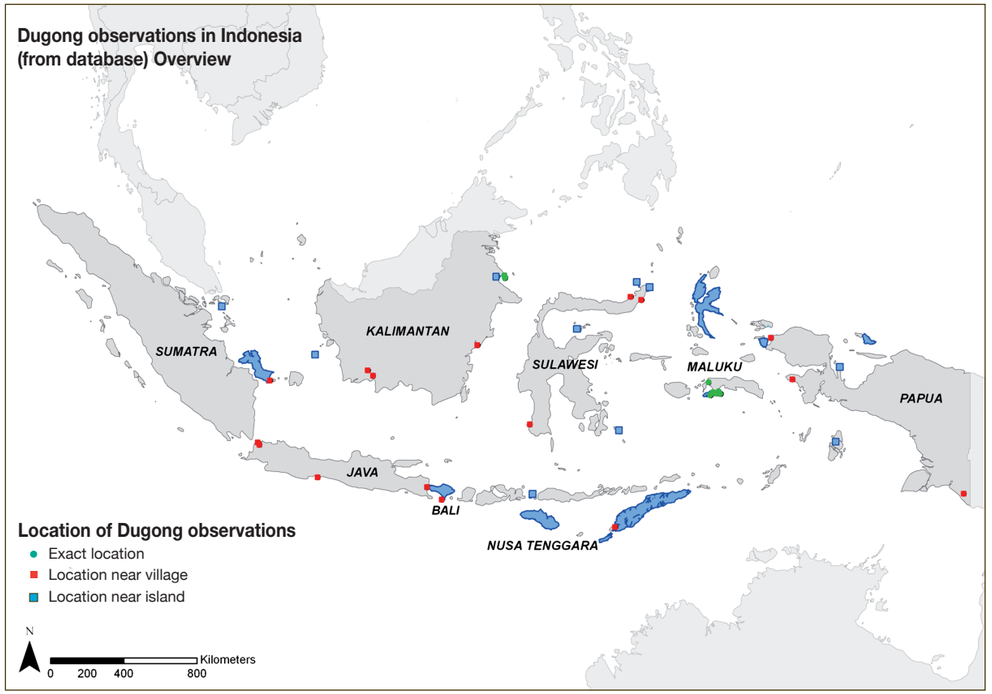
Fishermen report dugong declines during a survey

Aerial photograph of Balikpapan Bay, showing a tidal fishing trap and oil pollution

IV

Conservation and Management Policy

It was stated previously that dugongs are considered keystone species of the seagrass ecosystem, which is no less important than the other components of the coastal zone. Nonetheless its existence and use in Indonesia are far less understood by science and by the coastal communities, resulting in neglect. There has been a tendency that people think they can freely do whatever they like in a seagrass ecosystem without having an adverse impact. Also dugongs have been deliberately caught for meat and tusks, and also accidentally in fishing nets. This has severely affected dugong populations throughout Indonesia and is probably one of the reasons of decline. This draft policy, strategy and action plan on the dugong population in Indonesia was prepared with the expectation to be used as a guideline for proper conservation and management. In line with the above, the general policy for the conservation and management of dugong populations in Indonesia has been defined as follows:



To conserve, manage and sustainably use dugong populations and their habitat; this conservation and management should be implemented in a synergic and integrated manner by local government, communities, private sector, universities and non-governmental organisations.

It is recognized that there is a need for both national long term strategic objectives and planning, and regional and local objectives and planning. Generally speaking the conservation and management of dugong populations in Indonesia aims ultimately at the protection of both dugongs and seagrass ecosystems as a life support system.
Specific objectives of the National Conservation Strategy and Action Plan for Dugongs in Indonesia have been defined as follows:

a) To establish a management framework for implementation of the Strategy, with a national NGO network, selection of pilot projects and establishment of regional task forces.

b) To make the National Dugong Database operational and establish a national research and monitoring programme of dugongs and seagrass.

c) To establish and implement pilot projects for community based conservation of dugongs and seagrass habitat.

d) To establish a national communication and awareness programme on dugongs and seagrass.


Dugong caught in East Aru

V

Strategy and Action Plan

This strategy and action plan for dugongs in Indonesia was inspired by several publications (De Iongh *et al.*, 2007; WWF, 2004; ISC, 2003 and Marsh *et al.*, 2002).
Local governments have neither the capacity nor the resources to control and monitor all activities in the marine and coastal zone in Indonesia. Prioritising actions for conservation is therefore essential if limited human and financial resources are to be effective. The conservation priorities listed below require commitment at all levels and some of them, such as aerial surveys, require considerable long-term financial input. The challenge for Indonesia as a whole lies in working together to find realistic community-based and sustainable mechanisms for achieving conservation goals and in ensuring the future survival of dugongs.
The available scientific information suggests that the protection of certain core areas as dugong sanctuaries is an important conservation measure. The declaration of dugong sanctuaries should coincide with the enforcement and enhancement of traditional community-based conservation systems, like the local '*Sasi laut*' with inshore-protected areas and restricted fishing practice. Marsh *et al.* (2002) and De Iongh *et al.* (2006a) have emphasised the importance of traditional management systems (called *Sasi* in Indonesia) for the conservation of dugongs in Indonesia, defined as the practice built around the principle of "prohibition" or of "abstaining from" catching specific resources for a certain period of time. Local elders or custom leaders may determine the timing of such temporal closures or they may be "spirited from heaven" through seasonal changes or dictated by calendar years. According to Novaczek *et al.* (2001) the institute of *Sasi* has survived over about 400 years in various parts of the Moluccas Province.
The following priority actions are recommended (WWF, 2004; Marsh *et al.*, 2002):

(a) Improve the level of protection for dugongs inside and outside marine protected areas.

— Throughout Indonesia, to improve the protection of dugongs in existing marine protected areas (National Parks and KKLDs) where dugongs occur, by promoting co-management and co-ownership of marine and coastal resources, including endangered species, among all stakeholders.

— Establish dugong sanctuaries or community-protected areas in sites currently unprotected and unmanaged. Proposed areas are listed in table 1.

— Gill and mesh nets are undeniably a major threat to this species, and trawling is probably also significant with regard to destruction of seagrass habitat. It is therefore essential that measures be strengthened or imposed to reduce the threat from these fishing gears both inside and outside marine protected areas in places where dugongs are known to exist. These could include: complete banning of gillnets and in-shore trawling activities; "open" and "closed" seasons for various fishing gears; or multi-user zoning.

— Success is likely to depend on providing incentives and alternatives to gillnet fishers as well as the capacity of government authorities to review existing policy and enforce regulations. Associated costs (incentives, alternative gears) should be included in national and site-specific management.

— It is suggested to start a number of pilots for community based dugong conservation. (See table 1.)

— For these pilots clear targets and indicators will be defined as outlined in table 2.

— Promote trans-boundary conservation collaboration and partnership initiatives (e.g. Philippines, Malaysia, Australia).

— Where opportunities exist, integrate dugong conservation activities and actions with existing or proposed coastal management and development initiatives and the tourism sector. For example, there is scope for dugong conservation actions to be incorporated into national Integrated Coastal Environment Management Strategies launched in several Provinces, like East Kalimantan (Projet Pesisir). Conservation actions can

Table 1. Proposed pilot areas for dugong protection

Province	Dugong pilot sanctuary /Community protected area
Banten	Ujung Kulon
East Kalimantan	Balikpapan Bay
Moluccas	Lease Islands / Aru
Central / North Sulawesi	Bunaken
Papua	Cendrawasih Bay / Misool / Raja Ampat
Riau	Bintan / Batam
West Sumatra	Siberut

Table 2. Targets and indicators for pilot projects for dugong protection

Objectives	Targets	Indicators
Management	task force established at district level	- task forces at pilot sites established and operational - management plans for pilot sites prepared and implemented
Ecology	dugong population stable or increased	- dugong and seagrass monitoring system established and operational - dugong and seagrass research plan prepared and implemented
Socio-economy	decrease in accidental catches increase village income	- accidental dugong catches show decrease - local village income stable or increase
Awareness	increase in community awareness re. dugong conservation	- communication plan prepared and implemented - more than 50% of villagers are aware of dugong as flagship species

also be implemented in partnership between national and international NGOs working in coastal areas, national and regional governments and local communities. There are further opportunities to promote conservation and monitoring activities over a wider area through collaboration with the tourism sector, e.g. in Bali, Lombok, North Sulawesi (Bunaken), Maluku (Banda) and Papua (Cendrawasih Bay).

(b) **Adopt the dugong as a flagship species and initiate a public awareness campaign in the pilot areas.**

— Due to their highly endangered status and rarity in Indonesia, the provinces and districts with community based pilots should be encouraged to adopt the dugong as their marine "flagship" species. Elevating their public status can be used to raise awareness and obtain essential funds for conservation actions.

— There is a need to initiate local education and awareness campaigns targeting all stakeholders within the region. Information can be disseminated through national and local media and through promotion of culturally sensitive educational activities: shadow puppets (Wayang Kulit), posters, videos, competitions. Information should be disseminated through relevant government authorities and the existing network of marine protected areas and conservation initiatives. The impact of a marine / dugong education campaign on local perceptions and behavior should be monitored and evaluated. Sharing of educational materials across the nation is also recommended.

(c) **Strengthen capacity of relevant (provincial) authorities to enforce legislation.**

— Provide technical training and resources (boats / engines, vehicles, radios, fuel, maintenance) necessary for relevant government authorities to enforce the law, monitor illegal activities and raise awareness at key sites in the provinces.

— To maximize effectiveness along the coast, surveillance and monitoring of illegal activities by tourist operators, commercial and private air passenger services, NGOs and local communities should be promoted and developed.

(d) **Determine and monitor dugong population characteristics (status, distribution, movements) and the level of threats in Indonesia (see also Part I).**

— Conduct local quantitative aerial surveys in the region, using methods developed for remote areas in Australia.

— Carry out annual site-based aerial surveys in priority dugong areas to determine abundance and establish population trends. These surveys could be combined with surveys of other marine species (e.g. turtles, cetaceans) to maximize efficiency and share resources and costs.

— Initiate catch-monitoring programmes, focusing on gillnets, trawlers and fence traps, in collaboration with government institutions, academic and research institutes and local communities. Promote participation of local fishers to become "community monitors".

— Initiate dugong satellite-tagging programmes to track fine scale and long distance movements. Liaise with experts in Australia on methods of capture and re-capture and the most appropriate tagging equipment. This should be coordinated on a national scale.

— Map seagrass habitats and monitor health and carrying capacity in key dugong areas.

(e) **Establish a national network for NGO's and general conservation practitioners and researchers.**

— Encourage the establishment of a national NGO network and of regional dugong conservation task forces in each pilot province to facilitate the development and implementation of dugong conservation pilots.

— The existing international Sirenian list server sirenian@listserv.tamu.edu could provide a useful forum for regional scientists and conservation practitioners and other interested parties to exchange ideas and experiences and disseminate information on dugongs.

— Twinning arrangements between Indonesia and Australia to control discarded nets.

(f) **Organisations involved in implementation**

— A large range of government organizations and NGO's can get involved in the implementation of the strategy and the pilot projects. Examples are local governments, international NGO's (WWF, CI, WCS, IUCN), local NGO's (Yayasan Terangi, Yayasan Nazareth) and Community Based Organisations (CBO's).

(g) **Start a monitoring system of dugong abundancy in the pilot areas.**

— Monitoring data can be used in the future for red list assessments.

(h) **Project proposals**

— As a follow up to this strategy one page pre-proposals of pilot projects will be prepared to be submitted to sponsors.

List of pilot projects proposed under the National Conservation Strategy and Action Plan for Dugongs in Indonesia.

Project 1.
Establishment and implementation of the National Dugong Database.

Project 2.
Establishment of a national NGO network for dugong and seagrass conservation.

Project 3.
Community based conservation and management of dugongs in Ujung Kulon and Banten Bay, Banten province.

Project 4.
Community based conservation and management of dugongs in Batam / Bintan Island, Riau province.

Project 5.
Community based conservation and management of dugongs in Balikpapan Bay and Derawan Island, East Kalimantan.

Project 6.
Community based conservation and management of dugongs in Siberut, West Sumatra.

Project 7.
Community based conservation and management of dugongs in Lease Islands and Seram, Moluccas province.

Project 8.
Community based conservation and management of dugongs in Bunaken Island, North Sulawesi.

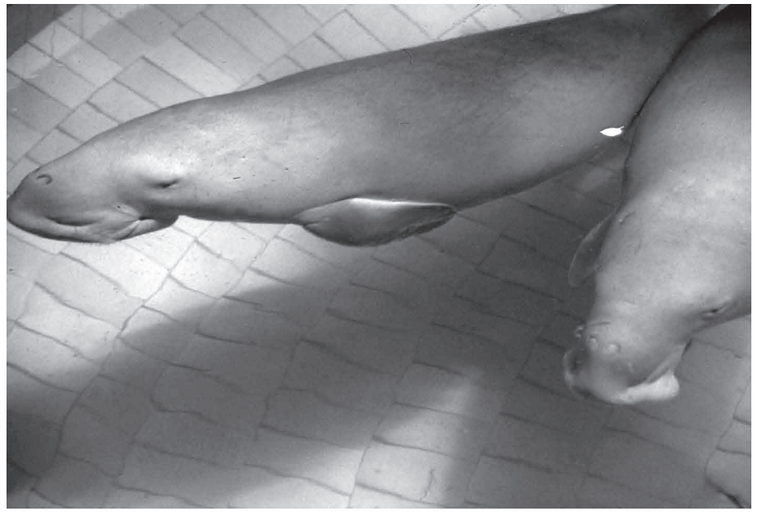
Project 9.
Community based conservation and management of dugongs in Cendrawasih Bay, Papua.

Project 10.
Community based conservation and management of dugongs in Raja Ampat Islands, Papua.

VI
Concluding Remarks

Marine and coastal conservation and sustainable resource use in Indonesia are among today's most important global environmental issues. Pressures on the marine environment are particularly acute in Indonesia, which is characterized by a large and expanding human population and rich biodiversity. In response to the growing pressures and threats, initiatives to mitigate damage and ensure sustainability are escalating worldwide, through establishment of marine protected area networks, initiation of an eco-region approach to biodiversity management, and the development and implementation of integrated marine and coastal management strategies. Within this context, through the network of existing and planned government and non-government coastal and marine initiatives in Indonesia, reduction or elimination of the main threats to dugongs should be possible and the survival of the endangered dugong assured.

While much more is still to be learned and discovered, this preliminary overview serves as an important first step in assessing the known conservation status and distribution of dugongs in Indonesia. It calls for urgent action and long term commitment in the protection of this species and sets the scene for greater future collaboration in the region.



Two dugongs from Banten Bay in the Jaya Ancol Oceanarium, Jakarta, in 1995

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Coastal village in Indonesia 2007

Annex II

National Dugong Database and Questionnaire

Introduction
During 2007 and 2008 a draft National Dugong Database was developed within the framework of the NCSAPDI. The aim was to create an adaptable and accessible National Database of dugong sightings. This Database would give more insight into the status, distribution and trends of dugong populations in Indonesia. Based on this, the main gaps in the present information can be identified.

Sub-objectives of the database are:

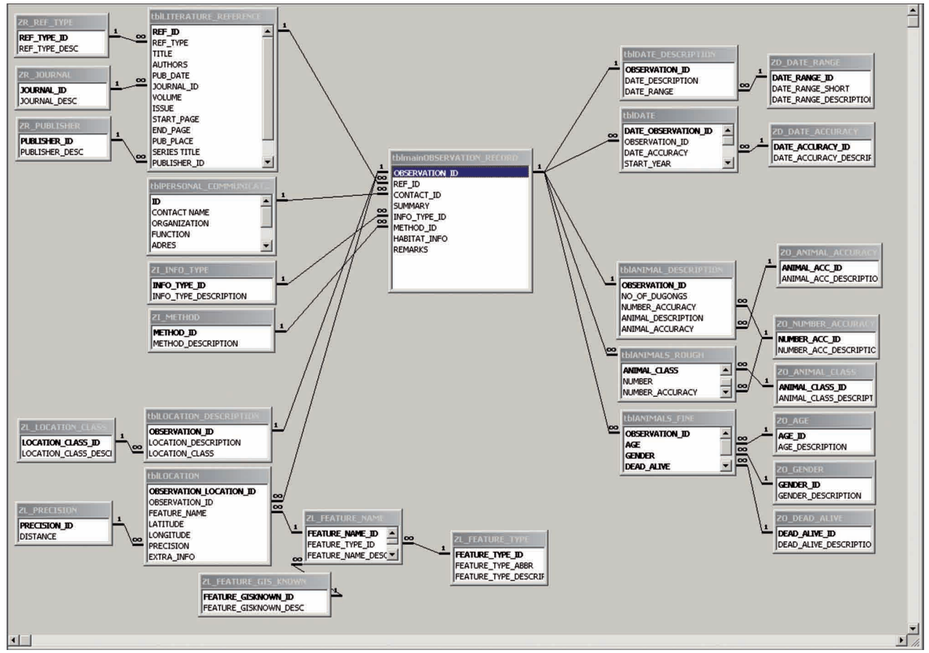
1) To provide a tool in which information on dugong sightings in Indonesia can be stored and actively used by stakeholders as an information source on dugong status and distribution.

2) To provide a tool which can serve as input for graphic representation of dugong distribution and trends in Indonesia.

User profile
The information, which can be gathered from the database, will be useful for many people and organizations. The user profile of the National Dugong
Database is defined as:

1) National and international NGO's involved in coastal conservation in Indonesia.

2) Other relevant stakeholders who contribute to management and conservation of dugong population.



Overview of the database structure, with tables and relations

Design of the database
The database stores information on dugong observations in Indonesia.
A dugong observation is defined as: an observation in a specific location in a certain period of time, during at most one month. For instance: 3 dugongs observed in a certain area during one month can be recorded as one observation.
The literature research carried out for the NCSAPDI was used as a basis for the available information on dugong distribution.

Four main types of information are distinguished for each dugong observation:

1) The origin of the information (literature, personal communication).
2) The location of the observation.
3) The date of the observation.
4) Characteristics of the observed dugongs (number of dugongs, age, gender, dead / alive).

Since so little information is available on dugong distribution in Indonesia, the goal is to store as much information as possible in the database. This implies that also ill described dugong characteristics and ill described date and location specifications should be taken into consideration. To keep the data 'clean' (don't leave out valuable information or make information more detailed than it actually is), different data quality classes were created to distinguish between detailed and 'rough' information.

TblmainOBSERVATION_RECORD is the main table to which all the other tables are linked. There are four main groups linked to the main table.

1) **References**
This is where the origin of the data is stored.

Data can originate from literature reference (tblLITERATURE_REFERENCE) or from personal communication (tblPERSONAL_COMMUNICATION)

2) **Location**
This is where all the information involving the location of the observation is stored. Rough location description (tblLOCATION_DESCRIPTION) and detailed location description with coordinates (tblLOCATION) and information about the presence in ArcGIS (ZL_FEATURE_GIS_KNOWN) are represented in this area.

3) **Date**
This is where all the information involving the date of the observation is stored. A rough date description (tblDATE_DESCRIPTION) and the detailed date (tblDATE) can be stored here.


Dugong in the Sea World Oceanarium, Jakarta in 2008

4) **Animal description**
This is where all the information on the characteristics of the observed dugongs can be stored. A rough description of the information (tblANIMALS_ROUGH) and a detailed description of the characteristics of the dugongs (tblANIMALS_FINE) can be stored here.

Questionnaire

A questionnaire was developed with the objective to feed the database with additional information on dugong sightings in Indonesia. The questionnaire below presents questions that correspond to the different fields in the database (location, date, dugong description, etc.). The results can therefore be easily transported to the database.
Also other questionnaires, similar to this one but with different objectives (e.g. monitoring dugongs at local level for research purposes) can be developed. However caution is needed when using questions similar to the ones presented in the questionnaire below. These questions may be too difficult to use in the field or could be misinterpreted easily.

Dugong questionnaire

This dugong questionnaire is meant for individuals who have sighted dugong(s) in Indonesia or have other information involving dugong presence in Indonesia. Per questionnaire one dugong observation can be filled in. It is requested to try to fill in the answers as detailed as possible.

Contact Information

Name:
Nationality:
Occupation:
Organization:
Address:
Phone:
Email:

1. General Information

1a. How often have you seen a dugong/dugongs? (Choose from the list below)

- o Regularly, every: o year, o month, o week, o day
- o Several times: fill out a questionnaire for each dugong observation*
- o Only one time
- o Never: go to 4c
- o Other

1b. What were the circumstances during which the dugong(s) were observed (e.g. in the framework of research, vacation, during fishing activities, on the market, etc.)

1c. Which method was used for the observation? (Chose from the list below)

- o Accidental catch
- o Deliberate catch
- o Aerial survey
- o Field survey
- o Satellite tracking
- o Incidental sighting
- o Unknown
- o Other

1d. In what sort of habitat were the dugong(s) seen? (Choose from the list below)

- o Seagrass
- o Coral reef
- o Open water
- o Unknown
- o Other

2. Location

2a. Where were the dugong(s) sighted (Give a detailed location description, exact coordinates or close to a village, bay, island, etc.)

2b. If the dugong(s) were seen in the vicinity of a village, bay or island, etc., what was the estimated distance of the observation in relation to the described location? (Chose from the list below)

- o <1km
- o 1-5km
- o 5-10km
- o 10-15km
- o 15-20km
- o >20km
- o Unknown

2c. Do you have any extra information about the location?

3. Date

3a. When were the dugong(s) sighted (give exact date or period)?

4. Dugong characteristics

4a. How many dugongs were sighted?

4b. Please fill in the table below as detailed as possible for each dugong that was observed.

No.	Age (juvenile / adult / unknown)	Gender (male /female / unknown)	Dead / alive
1			
2			
3			
4			
5			
6			
7			
8			

4c. Do you have any other relevant information?

Thank you for your cooperation
Date: ----------
Place: ----------

***What is one dugong observation?**
One dugong observation is an observation in a specific location in a certain period of time (no longer than one month). For instance if you have seen a group of dugongs in a certain area during one month, this can be filled in as one observation. But, if you have seen dugongs in a certain area during two months, this are two separate observations. Please fill in the questionnaire again for the second observation.
When a lot of dugongs are observed in a certain area over a long period of time (for instance, 3 observations per day or data from tracking research), then the observations from one month can be regarded as one observation. This in order to prevent every dugong sighting from becoming a separate dugong observation which will give an inaccurate picture of the whole dugong population.

Harpoon used in East Aru for dugong hunting

Poster used for awareness campaign in Ambon

Part II Strategy report

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