

AN UPDATE ON CONSERVATION MANAGEMENT OF THE GREEN TURTLE (*CHELONIA MYDAS*) ON PANGUMBAHAN BEACH, SUKABUMI, INDONESIA

Adriani Sri Nastiti¹, Fayakun Satria¹, and Ngurah N Wiadnyana²

¹Research Institute for Fisheries Enhancement and Conservation (RIFEC)
Jalan Cilalawi No.1 Jatiluhur Purwakarta, Jawa Barat 41152 Indonesia.

²Research Centre for Fisheries Management and Conservation (RCFMC)
Jalan Pasir Putih No.1. Ancol Timur Jakarta Utara 14430 Indonesia.

ABSTRACT

Conservation of green turtles (*Chelonia mydas*) on coastal Pangumbahan (located at S 07° 19' 46.1" dan E 106° 23' 50.4") has been conducted since 1973. Efforts to improve knowledge and techniques, as well as enhanced management to increase the number green turtle eggs produced, hatched and successfully released as hatchlings are ongoing. Other improvements include: (i) hatching and letting the hatchlings live temporary in tub before immediately release into the sea; (ii) applying semi-natural outdoor systems for hatchery with *bronjong*; and (iii) improving skills of field workers to handle eggs and hatchlings, and involving local and Central Government in community base surveillance. The number of nesting turtles fluctuated and reached its peak in 2013, showing an increase of up to 3,245 individuals. The number of eggs since 2001 has also fluctuated, with the lowest number occurring in 2011 with 13,211 eggs, and the highest occurring in 2013 with 1,123,651 eggs. The number of eggs hatched reached 100 % in 2008, and has maintained 100 % hatching rate up to 2013. The number of newly hatched turtles successfully released into the sea also fluctuated, and reached its peak in 2013 with 633,272 hatchlings. The important and active roles of coastal Pangumbahan communities in green turtle conservation, as well as substantial support from the district, province and Central Government, are key factors in the success of green turtle conservation in this area.

Keyword: green turtle (*Chelonia mydas*) , conservation area management, Pangumbahan.

INTRODUCTION

Pangumbahan nesting area is located at S 07° 19' 46.1" dan E 106° 23' 50.4" in Ciracap District, Sukabumi Regency, West Java, Indonesia. The sea turtle conservation activities have been conducted on Pangumbahan beach since 1973. Thus, over more than 40 years this activity has been developing in terms of management arrangements (Wiadnyana and Nastiti, 2012). The last measure of conservation management of Pangumbahan beach was the declaration of this nesting area as a "Coastal Park and Turtle Center" in 2009. The management authority of Pangumbahan nesting beach was taken over by the Local Government (Marine and Fisheries Service of Sukabumi Regency) from a private company (C.V Daya Bakti). During the time when the private company managed Pangumbahan nesting area, access to the nesting site was limited and it was difficult to obtain data and information on the number of landed turtles and turtle eggs. Nowadays, data on nesting turtles and turtle release are managed much better than under the private company. In addition

to data and information on turtle conservation activity being accessible, the environmental conditions of the beach have been improved as well, compared to the situation before 2009. Currently, the Pangumbahan beach is clean with fine sand, and the presence of sea pandanus with a good indicator that the natural conditions of the beach are sufficient for preserving and supporting the presence of nesting green turtles.

The beauty of the Pangumbahan beach is very much enhanced by the presence of green turtles, and has attracted various visitors. Now, the beach is well known as a tourism area, an eco-education site, and area for researching and monitoring green turtles. The increase in visitor arrivals to this area, particularly for ecotourism, has had a positive impact on the socio economic conditions of the community. At the same time, there may be negative impacts, in that the beach has seen a decrease in the number of nesting turtles (Wiadnyana & Nastiti, 2015).

According to Dahuri (2003), the fundamental problems encountered in the

management of coastal and marine protected areas are: legal arrangements on conservation areas, habitat destruction and degradation, over-exploitation of bioresources, pollution and sedimentation, lack of facilities and infrastructure, weakness of participation and awareness of local communities, low capacity of human resources, and weak political commitment. To deal with problems in coastal and marine conservation areas, The Ministry of Marine Affairs and Fisheries of the Republic of Indonesia has pointed out the following six strategic programs that should be implemented: (1) active involvement of local communities in conservation areas; (2) regular monitoring and protection of the conservation core zone; (3) establishment of a single management authority; (4) increase of community awareness and knowledge of the importance of conservation area; (5) development of alternative livelihoods for local communities; and (6) development of monitoring programs including information system for conservation area management.

Several efforts are being made to conserve green turtles on Pangumbahan beach. Demonstrated continuous efforts have shown improvements in strategies and techniques for conserving the green turtle. This paper describes the current conditions and various efforts conducted to conserve the green turtle on Pangumbahan beach.

MATERIALS AND METHODS

This study is based on monitoring data of green turtle landing and nesting on Pangumbahan beach. Data were collected by conservation officers from Regional Technical Implementation Unit (UPTD) Turtle Conservation of Pangumbahan during the period of 2008-2013. Specifically, data include number of landed turtles (2008-2013), number of green turtle eggs (2001-2013), number of hatched eggs (2001-2013), and number of hatchlings released to the sea (2008-2013). Ground checks were conducted in February 2014 in order to update the recent techniques for green turtle conservation on Pangumbahan beach. Other information collected in direct interviews with conservation officer and the technical aspects of management were collected during the ground check.

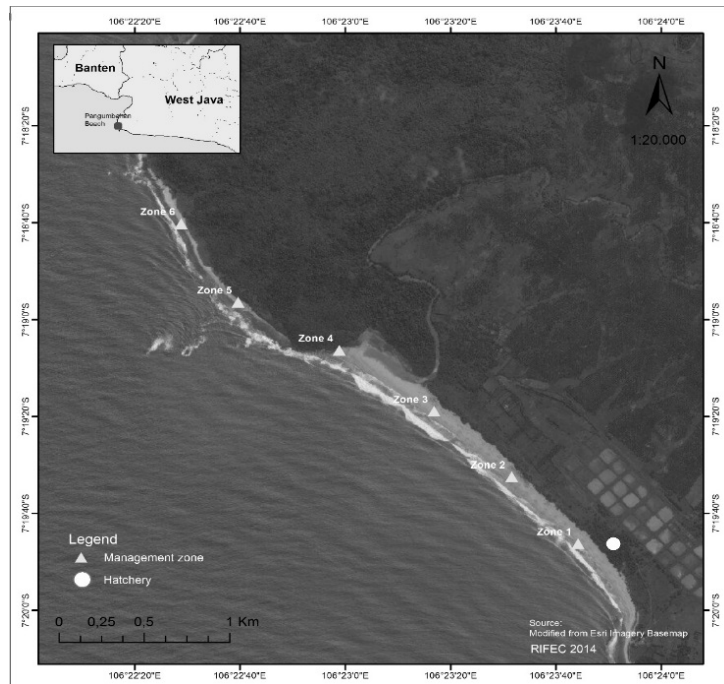


Fig. 1. Pangumbahan Beach, Ciracap District, Sukabumi Regency, West Java, Indonesia

RESULTS AND DISCUSSION

Area Management of Pangumbahan Beach

Considering generally the sensitivity of turtles to light and sound, in addition to their homing behavior, activities such as sand mining, shrimp farming and intensive tourism are the main factors contributing to the decrease in the number of green turtles present on the beach. Fortunately there is a local community that is aware of the importance of sustaining and conserving the green turtle. Within the management of Pangumbahan beach for the protection of green turtle nesting the approximately 2.8 km long beach has been divided into 6 zones (Fig. 1). Zones 1 and 2 are ecotourism zones and zones 3-6 are closed zone (core zone), designated as nesting area for the green turtles. This zone is guarded by officers who are trained to be on the lookout for any activities that might interfere with the turtles.

Management of Green Turtle Conservation

Green turtle conservation activities include a number of different stages, such as laying eggs, egg removal, hatching, hatchling removal, temporary storage and release of hatchlings into the sea.

Technical aspects of nesting green turtle rescue

From sunset the "Pangumbahan beach" green turtle conservation guards start securing the nesting beach.



Fig. 2. Traces of green turtles on Pangumbahan beach



Fig. 3. Green turtle nesting on Pangumbahan beach

Around 06:30 pm, when green turtles land on the beach (Fig. 2), green turtle conservation guards begin to eliminate disturbances (such as sound, light, ground vibration) to prepare the beach for nesting time. According to Nastiti and Wiadnyana (2012), the process of laying eggs, of green turtle takes about 2-3 hours (Fig. 3).

Nesting green turtles landing on Pangumbahan Beach

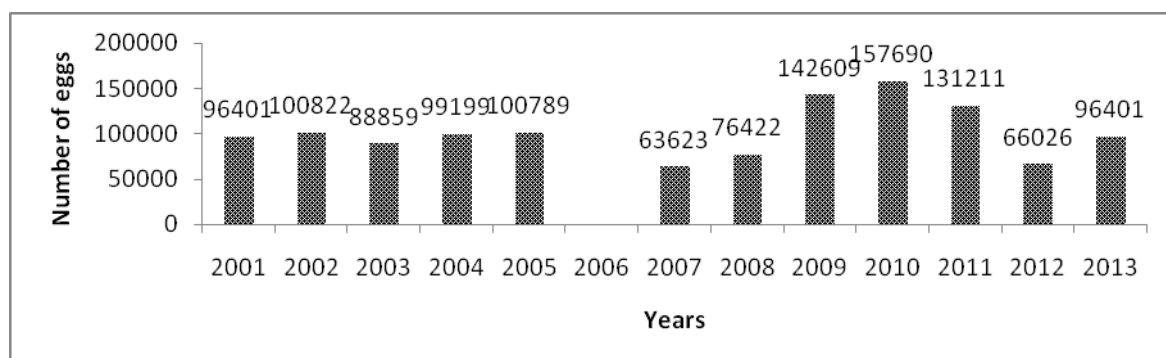
The number of green turtle nesting on Pangumbahan fluctuates, but has tended to show an overall decline, as shown by Wiadnyana and Nastiti (2015). Ecotourism activities on Pangumbahan beach started in 2009. Visitors activities often produce sound and light, from flashlights and camera flashes. Green turtles are known to be sensitive to these disturbances, and this is particularly so with turtles that are entering the beach to nest. It is speculated that the decrease in the number of green turtles nesting on the beach is due to the impact of tourism and visitor activities on Pangumbahan beach (Wiadnyana and Nastiti, 2015). However, in the last record from 2013, the number increased significantly, reaching about 3,245 individuals. It is hypothesized green turtle landings on Pangumbahan beach may experience

drastic fluctuations on a 5-year cycle, but more longterm monitoring is required in the following five to ten years.

Number of green turtle eggs on Pangumbahan beach (2001-2013)

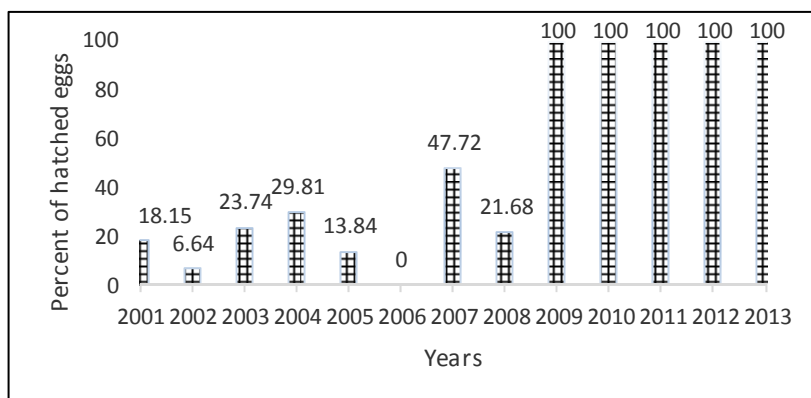
Data on the number of turtle eggs on the beach has been collected since 2001, until to 2013 (Fig. 4). The number of eggs was quite stable from 2001 to 2005, before dropping sharply to 63,623 eggs in 2007, which was the lowest number of eggs ever recorded on Pangumbahan beach. According to Anonymous (2011a, b), each green turtles can produce 80-200 eggs in one breeding. Turtles with a wider carapace width are likely to have a larger number of eggs.

Before 2009, the utilization of 50-70 % of green turtle eggs was allowed for the purposes of area management by the CV Daya Bakti limited company. The increase in number of eggs since 2009 is due to the prohibition of green turtle egg harvesting initiated by the authorities. This resulted in keeping 100 % of the eggs within the Pangumbahan beach area. The decrease in number of eggs seen in 2012 and 2013 is due to the increase of disturbance from visitors to Pangumbahan beach.



Remarks: 2006: no data

Fig. 4. Number of green green turtle eggs on Pangumbahan, 2001-2013



Remarks: 2006: no data

Fig. 5. Percentage of turtle eggs successfully hatched in Pangumbahan from 2001 to 2013.

From 2001 to 2008 the percentages of hatched eggs are low, but since 2009 almost all turtle eggs were successfully hatched on Pangumbahan (Fig. 5). In addition to the policy change, green turtle egg hatching success after 2008 further increased probably because of entirely outdoor hatching. The system of outside hatching is more efficient, natural and can be done at stable sand temperatures, when compared with indoor hatching (Hutabarat et al., 2009). With the outdoor hatching system, the hatchling production rate is nearly 100%, while the indoor hatching system achieved only about 6.64 to 47.72% hatchlings.

Technical aspects of relocating green turtle eggs from nests to incubation site

Green turtle eggs are transferred from natural nests to outdoor semi-natural nests. The outdoor semi-natural nests are located about 150-200 m from the beach. It is a specific site, enclosed with fences and sheltered by trees, making the site suitable for the incubation process. Trained conservation officers take green turtle eggs carefully, without altering the position of the eggs, to the incubation nests.

The incubation nests are well labeled, indicating starting date, number of eggs, name of institution or person adopting. The incubation process takes 45 to 90 days (Anonymous 2011a) (Fig. 6).

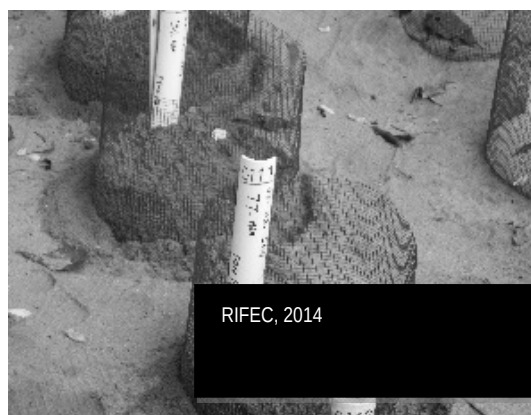


Fig. 6. Turtle egg hatching techniques in the outdoor hatching system on Pangumbahan beach.

Bronjong Technique: Protecting natural nests

Recent techniques to secure the green turtle eggs use bamboo fences, called *bronjong* to cover the natural nest (Fig. 7a, b). This new technique minimizes the risks associated with relocating and transporting the green turtles eggs to a different place. Trials have been successful, with almost 100% of the turtle eggs successfully hatched. However, this technique requires careful preparations to secure the nests from potential external disturbances, such as poachers, wild boars, snakes, monitor lizard and ants, which are attracted by garbage. It also requires a high level of commitment from the officers to constantly monitor the bronjongs at each site.

The *bronjong* is mainly made from bamboo. The bamboo is cut into pieces of 120 cm length. The pieces of bamboo are arranged and shaped like a basket, with a diameter of 50 cm and a length of 120 cm. Each piece is tightly bound and fastened with bamboo in 4 cm incisions in the four points, as shown in Figure 7b. Before covering the nests with *bronjong*, the number of turtle eggs is counted in each nesting site. The advantages of using *bronjong* include cost effectiveness (cheap bamboo materials), ease in finding places for natural nests, environmental friendliness, efficient



Fig. 7a. *Bronjong*, protecting turtle eggs during hatching, on Pangumbahan beach

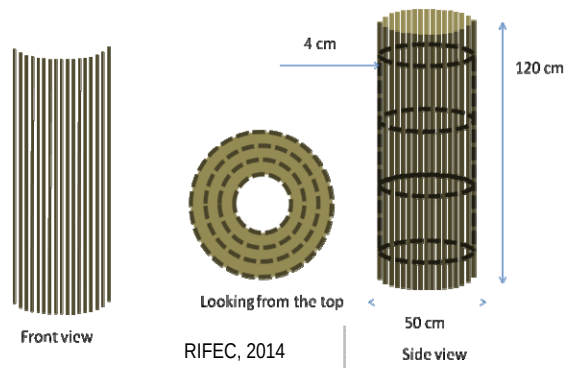


Fig. 7b. *Bronjong* scheme

officers work, natural condition of eggs, stable sand temperature, and higher hatching rates.

Technical Handling of Hatchlings

After the nesting hole is covered with sand, it is then encircled with a *bronjong*, which lets the turtle eggs hatch naturally. Each *bronjong* is labeled with date, day, hour at early eggs incubated and number of eggs. After hatching, hatchlings are transferred by skilled officers to a temporary room for 9-10 hours, before being released to the sea. However, it has been suggested that this method of hatchling release

might be not appropriate (Okuyama et al., 2009), because turtles reared for some period of time have a decreased probability of experiencing the same migration routes as wild hatchlings. The best practice is to release the hatchlings into the sea soon after they have emerged (Okuyama et al., 2009). In Pangumbahan beach the workers make the best effort to handle hatchlings before releasing into the sea, but releasing methodology needs improvement (Wyneken, 2000; Okuyama et al., 2009).

Hatchlings are taken from the nest by skilled officers and placed in a rubber container (Fig. 8). Hatchlings are released into the tub sea sand at room temperature, or approximately 27-29 °C (Fig. 9). Hatchlings are kept for 9-10 hours without feeding before release into the sea.



Fig. 8. Hatchlings from hatching process on Pangumbahan beach



Fig. 9. Hatchlings at rest in tub at room temperature on Pangumbahan

Technical issues regarding release of hatchlings into the sea

After 9-10 hours the hatchlings are transported manually in rubber buckets (Fig. 10). The preferred release time is in the afternoon, at around 05:00 to 05:30 pm. This minimizes the hatchlings risk of predation. The number of hatchlings released back into the sea (at one place on Pangumbahan beach) on February 5, 2014 was 435 individuals (Fig. 11).

The number of hatchlings released on Pangumbahan beach since 2008 fluctuated yearly, with the highest number of 190,533 in 2013 (Fig. 12). The number of turtle eggs is not necessarily correlated with the number of hatchlings released into the sea (Fig. 4 and Fig. 12). In some cases the number of hatchlings released into the sea was higher than the number of green turtle eggs hatched. This is likely due to the participation of local communities, who release hatchlings originating from adjacent districts of Pangumbahan beach.



Fig. 10. Hatchlings prepared for release into the sea on Pangumbahan

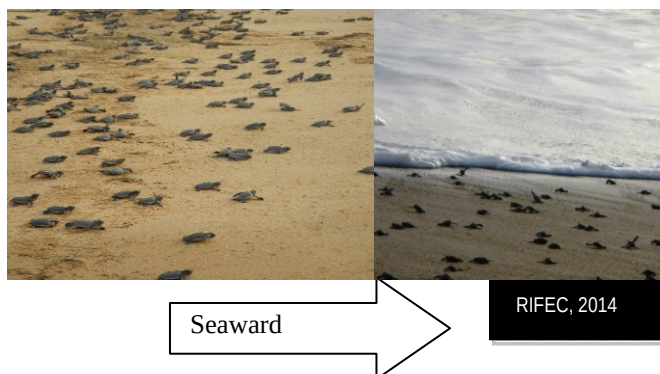


Fig. 11. Hatchlings just off into the sea on Pangumbahan

Community participation in supporting green turtle conservation on Pangumbahan

Community awareness of green turtle conservation is rising continuously. Independently, community members have established a conservation group called “Sukabumi Turtle Conservation Group”, which cares for green turtles on Pangumbahan beach. Members of the private sector, individuals and companies are also involved in caring for green turtles, particularly through hatchling release programs, and activities to promote understanding and dedication to loving and caring for sea green turtles as protected animals. In addition, some people are involved in releasing adopted hatchlings as adoptive parents of the hatchlings, and setting up of bamboo *bronjong* to secure the eggs from external disturbances.

Programs in cooperation with local governments and communities

The province and district governments play an important role in assuring the success of green turtle conservation management on Pangumbahan. Efforts that have direct impact on the improvement

of conservation management on Pangumbahan are:

- Issuing district decision No:23/Kep.639-Dislutkan/2008, conferring the area with the status of Coastal Park of Pangumbahan;
- Launching and implementing the program for adoptive parents of hatchlings. Hatchlings from one nest are adopted until the time that they are to be released into sea and given name tags by the adoptive parents;
- Strengthening law enforcement vis a vis egg poachers, egg sellers and breeders, and the sellers and buyers of green turtle;
- Financial support from private companies to complete infrastructure for green turtle nesting and hatching;
- Conducting specific training on turtle conservation management for officers in the field and workers in transporting eggs to the hatchery, implementing the semi-natural outdoor hatching system and *bronjong* techniques;
- Conducting necessary research focusing the impact of visitor disturbances on the rate of green green turtles nesting and hatching.

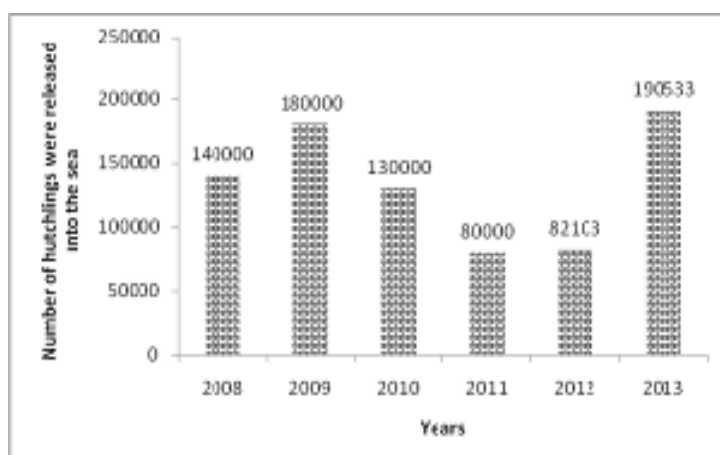


Fig. 12. Fluctuation in the number of hatchlings released on Pangumbahan

Central Government support

The Government of Indonesia has consistently provided support for efforts to conserve natural resources, as a prerequisite for sustaining resources for long term use. The government has ratified various regulations related to the conservation of green turtles. As a member of three Regional Fisheries Management Organisations (RFMOs), such as IOTC, CCSBT and WCPFC, Indonesia also complies with management measures for conserving marine turtles from fishing activities. An important effort of the Central Government, directly related to successful conservation

management of green turtles on Pangumbahan, is the establishment of the Directorate of Area and Species Conservation, under The Ministry of Marine Affairs and Fisheries, as the national management authority mandated to manage the conservation of fish resources, including marine turtles.

The establishment of Regional Technical Implementation Unit (UPTD) that occupies the Pangumbahan Turtle Conservation, Sukabumi, coordinated by Directorate of Area and Species Conservation, with duty to regularly monitor the conservation of turtle in Pangumbahan. The establishment of the Research Institute for Fisheries Enhancement and Conservation which has the task to conduct research on the habitat, species and genetic conservation under coordination by Research Center for Fisheries Management and Conservation, Ministry of Marine Affairs and Fisheries.

CONCLUSION

Pangumbahan beach is one suitable beach for green turtle nesting, and has been established as a turtle conservation area in West Java Island. A continuous effort to enhance the success of green turtle conservation has been made, bringing together community, local government and Central Government. The adoption of new techniques using *bronjong* has enjoyed success in improving green turtle egg hatching. In Pangumbahan beach the workers make the best effort to handle hatchlings before releasing into the sea, but releasing methodology needs improvement.. Continuing the adoptive nesting program for green turtle hatchlings will encourage people to follow and support conservation management into the future.

ACKNOWLEDGEMENT

Thanks to the head of the Regional Technical Implementation Unit (UPTD), Pangumbahan Turtle Conservation, Mr Ahman Kurniawan, who made dedicated efforts to collect data and allowed us to analyse and present them in this paper. Special thanks are delivered as well to the Head of the Research Institute of Fisheries Enhancement and Conservation (RIFEC), which supported the ground check to update green turtle status on Pangumbahan beach and facilitated our attendance at the SEASTAR Conference in 2014 in Kyoto, Japan (Budget of RIFEC FY 2014). Many thanks are also expressed to the reviewers of this manuscript for their valuable comments and corrections.

REFERENCES

Act 17 of 1985. Ratification of UNCLOS.

Act No. 5 of 1990 on Conservation of Natural Resources and the Ecosystem.

Anonymous. 2011a. Progress Report on Green turtle Conservation Area Management Coastal.

Park Turtle Pangumbahan Sukabumi (until 2010) Local Government Sukabumi. Department of Marine and Fisheries. 118 pages (not published).

Anonymous. 2011b. Progress Report on Green turtle Conservation Area Management Coastal Park Turtle Pangumbahan Sukabumi (up to June 2011). Local Government Sukabumi. Department of Marine and Fisheries. 26 pages (not published).

Bengen, D. G. 2002. Synopsis Ecosystem and Natural Resources Coastal and Marine Principles and their Management. Bogor Agricultural University (IPB). Bogor.

Dahuri, R. 2003. Marine biodiversity, sustainable development Indonesian assets. Publisher PT. Gramedia Pustaka Utama. Jakarta.

Government Regulation (PP) No. 7 of 1999 on the Preservation of Fauna and Flora. "That the following turtle parts including an animal egg protected by the state.

Government Regulation (PP) No. 8 of 1999 on the Use of Wild Fauna and Flora. Exploiting opportunities through breeding.

Hutabarat, A. A., Yuliandi F., Fahrudin A.S. and K. Hartati. 2009. Management of Integrated Coastal and Marine. Centre for Education and Training-Forestry Forestry SECEM RI-Korea International Cooperation Agency. Bogor.

Indonesian Government Regulation No.60 Year 2007 on the conservation of fish resources.

Local government decision No: 523/Kep.639-Dislutkan/2008. Determine the status of the beach Pangumbahan as Coastal Park.

Nastiti, A.S and N. N. Wiadnyana. 2012. Management of Green Turtle Eggs (*Chelonia mydas*) as one of the Supporting Aspects for its Sustainability in Pangumbahan Beach, Sukabumi Regency, West Java Province, Indonesia. Proceedings. The Design Symposium on Conservation of Ecosystem (SEASTAR 2000): 21-29.

Okuyama, J., O. Abe, H. Nishizawa, M. Kobayashi, K. Yoseda and N. Arai. 2009. Ontogeny of the dispersal migration of green turtle (*Chelonia mydas*) hatchlings. Journal of Experimental Marine Biology and Ecology, Vol. 379: 43-50.

Regulation of the Minister of Marine and Fisheries of the Republic of Indonesia No. 36/MEN/2011 Organization and Work Research Institute for Fisheries Enhancement and Conservation which has the task of research and conservation of freshwater fish resources and marine/

Tuheteru, F. D. and Mahfouz. 2012. Ecology, Coast Benefits & Rehabilitation of Beach Forest Indonesia. Research Institute Forest Manado.Indonesia.178.

Wiadnyana, N.N. and A.S. Nastiti 2012. Green turtleManagement Progress of Pangumbahan Beach, Sukabumi District, West Java. Indonesia. Proceedings.The Design Symposium on Conservation of Ecosystem (SEASTAR 2000): 29-35.

Wiadnyana, N.N and A. S. Nastiti. 2015. Impact of turtle conservation development on the socio-economy of coastal communities and the number of nesting turtles: a case study of Pangumbahan Beach, Sukabumi Regency, West Java, Indonesia. Proceedings of the Design Symposium on Conservation of Ecosystem (SEASTAR 2000) , Vol. 3: 6-10.

Wyneken, J., 2000. The Migratory Behavior of Hatchling Sea Turtles Beyond the Beach. In: Pilcher, N., Ismail, G. (Eds.), Sea Turtles of the Indo-Pacific. ASEAN Academic press, London, pp. 121–129.