Vol. 19, No. 2, Agustus 2008
Hal. 71-77

ISSN: 0853-1269

JURNAL
AKUNTANSI & MANAJEMEN

Tahun 1990

AN ECONOMIC VALUATION OF TURTLE CONSERVATION EFFORTS IN RIAU CASE ON TAMBELAN ISLAND AT 2006-2007

Pramono Hariadi
Fakultas Ekonomi Universitas Jenderal Soedirman
Jalan Prof. Bunyamin, Grendeng, Telepon +62 281 622035, 637970, 640268
E-mail: pramhariadi@hotmail.com

ABSTRACT

The purpose of this research is to give economic evaluation which is benefit aspect and collection fee of turtle's egg through two different management scenarios. For the first management strategic alternative, economic evaluation are concist of tree aspects, local goverment, license holder, and the citizen of Tambelan, Riau Province. For the second management strategic scenario, the valuation of total cost held for turtle's egg conservations which was response by license owner and local goverment by adding constraint from local and non-local factor which involved in the conservation effort. *Cost Benefit Analysis* (CBA) is used for analyzing tools. The study result shows that the economic benefit from the second scenario is around Rp8.302.184.400,-. Based on this research, the turtle's conservation effort in Tambelan, Riau Province is economically better than egg's collection conducted today.

Keywords: *Cost Benefit Analysis, economic evaluation, management strategic alternative.*

INTRODUCTION

As reported by Imran (1994) that turtle population to be environmentally concerns in Indonesia since 1970s, and in 1980, government of Indonesia through Ministry of agriculture with letter no.716/kpts/UM/10/1980 decided that turtle to be endangered species and protected animal from any exploitations. Following the decision to protect turtle as an endangered species, government of Indonesia then decided some locations through out Indonesia as natural park area, the protected locations could be found in the area such as in Bali province (Direktorat PPA, 1981), in Jakarta Seribu islands (Hermawan, 1992), and in West Java province.

The Riau province has an area around 339,996.6 km^2 with 70.6% as watery area, making the province to be well known for its aquatic resources production. Malacca strait and Tambelan islands (South-China sea area) are the two of very rich areas as fisheries resources in Riau province. From 4.7 million ton of Indonesia fisheries potency, 1.19 million ton (25.33%) lies in the Riau archipelagoes. Moreover, Erlambang (1998) wrote that in Riau province of Indonesia, turtle eggs have been one of free protein resources for fishermen families, and often the egg turtles to be the food serving for Tambelan islands people during traditional celebration days. Since 1908, the fishermen pay tax in return. Tax to be income source for local government by producing the license. However, the license fee tends to be increasing yearly, but the turtle egg production shown the contrary result. Higher of license fee is pure for local government revenue target, not for stimulate conservation efforts. To cover the costs (license fee, operational costs), the license holder compensates with "clear the beaches" to collect any single turtle eggs, and increasing the turtle egg price (since the demand

always higher than supply).

It is quite controversy, because catching turtles and collecting its eggs are illegal activities in several parts of Indonesia, but in Riau province to be commercial and source of income for local government until now. However, Ariff (1995 and 1996) said that to compensate with exploitation of turtles egg, ministry of agriculture have built hatchery in Senayang region, Riau Province. Moreover, local government suggested the license holder (egg collector) to breeding, growing and then free the suitable size of turtles to the ocean for conservation purpose. Unfortunately, the decreasing of turtle eggs for collection continues until recently. Instead of unsustainable exploitation of egg turtles, decreasing is believed to be caused by some other factors such as illegal using of dynamite and trawl to catch fish that directly and indirectly suppress turtle population from the area.

Unfortunately, to stop the eggs collection means to cut source of revenue for local government and to halt the business of license holder (turtle eggs collector). To stop using of dynamite/poison means to decrease income source of some fishermen. This idea (to stop eggs collection and un-proper use of equipment) could be rejected harshly by local government, license holder and fishermen.

These are certainly key factors in Tambelan islands, since local people are intend to have cheap price of turtle eggs resource, but their fishing habit and license holder activities disturbed the turtle population direct and indirectly that contributed to scarcity of egg availability, and then stimulate higher price of eggs. Community-based management alternatives (voluntary) to current unsustainable, destructive, and in some cases inequitable practices are thus central to the success of any management strategy in Tambelan islands, Riau province. In certain circumstances, using the turtle resource for local government income may be justified, re-evaluated and even reauthorized. This research is concerned with the valuation of the economic benefits and cost of different management regimes (current and alternative management strategies) that could impact on turtle eggs collection and turtle conservation. The alternative managements were decided based on acceptable trade off assessment to local inhabitant, license holder and local government.

The specific objectives of the study are: to evaluate the potential management strategies for sea turtle resources in Tambelan islands, Riau province. Selection and specification of management options are economically, technically, politically and socially feasible; to provide information on economic benefits and operational practices of eggs turtles collection in Tambelan islands, Riau province; and to evaluate the social-economic factors that might be impact on decreasing of sea turtle egg collection.

MATERIALS AND METHODS

This research is conducted in Tambelan islands, Riau province. Tambelan area is the kecamatan level of adminitration, has the area with a hundred of islands. The people mainly live (500 households) in the Tambelan Besar, and only few families stay in Kepayang Island. Tambelan islands located in South-China sea, around 1,100 kilometers north of Jakarta, and 600 kilometer North-East Singapore.

There are around 20 islands that frequently visited by turtles, and 7 islands are the most commonly visited, namely 1.Pulau Menggirang, 2.Pulau Nangka, 3. Pulau Genting, 4. Pulau Mendara, 5.Pulau Wie, 6.Pulau Pejantan, and 7.Pulau Jengkolan. The 20 islands are in the range of one-day trip by a small boat from Tambelan besar (center of local administration). Some islands were fully circled by white sandy beaches; the other islands were surrounded by a half of coral stones. The size of the islands is between 0.5 km and 5 km in diameter. The beaches that frequently visited by turtle are non-human population islands, but to be coconut-farming area. Research was done for one-year duration, started on January 2006 and finished on January 2007. The main researchers came to the islands on the monthly base regularly, but two research assistants were stationed permanently to collect and monitor primary data.

Turtle eggs production is continuous in Tambelan islands, but has peak on several months in the year, namely was June to August for Green turtle. Whereas, April to June was peak breeding season for Hawksbill.The primary data on the variables of egg production and price will be collected detailly (two weekly data) during one-year research project.

CBA is quite straigth forward to be applied to assessed current management, since the current man-

agement is exist. Whereas, in the alternative management strategies, economic valuation was conducted after known the options of three parties: Local Government, License Holder and Tambelan inhabitants. In the second scenario of management strategies, total artificial conservation costs by local government and license holder that transformed to the turtle eggs to be constraints of inhabitant decision either to involve or not in the conservation efforts. Moreover, in the third scenario, local government, license holder and Tambelan inhabitants are freely to choose whatever degree of conservation efforts that they intend to involve.

Economic Variables

Since there are two turtles species in Tambelan islands, then we estimated the values of Hawksbill turtle eggs and Green turtle eggs. For determination of Hawksbill turtle eggs value, we u se the equation:

$$Vh_{it} = \sum_{J=1}^{i} Q_{ijt} * P_{ijt} \qquad (1)$$

From the equation (1), Vh is the value of Hawksbill turtle eggs at given time, Q is the quantity of hawksbill at given time, sign of * denotes for multiplication, and P is the price of hawksbill turtle at given time. For the value determination of Green turtle eggs, we use the following equation:

$$Vg_{it} = \sum_{J=1}^{i} Q_{ijt} * P_{ijt} \qquad (2)$$

In the equation (2), Vg is the value of Green turtle eggs at given time, Q is the quantity of hawksbill at given time, sign of * denotes for multiplication, and P is the price of hawksbill turtle at given time.

Cost Benefit Analysis on Current Management

Since turtle is endangered species (central government regulation No.716/kpts/UM/10/ 10/1980), local government compensates with building turtle hatchery in Senayang Island. And then, local government suggested the license holder to do the same efforts (hatching the eggs, rearing the young turtle until reach the proper size and released them back to the ocean).

Sex ratio of turtle depends on incubation temperatures. Since there is no guarantee to maintain proper temperature due to "black out" problems in entire Indonesia electricity facility, local government efforts to hatch turtle egg in the artificial hatchery might be not to reach proper sex ratio as in natural sandy beach incubations. And license holder efforts, even worse with ex-situ hatchery. License holder efforts not only to result in un-proper sex ratio, but also low rate of egg hatching. Thus, both efforts seem impressive, but nonsense.

In the current policy, local inhabitants were excluded from any turtle eggs management activities. Unfortunately, the inhabitants behavior, especially fishermen activities cause to the environmental damages that affect directly or indirectly to the turtle conservation efforts. We will asses the economic values on the current policy. The economic gain of current policy by local government to let license holder to collect turtle eggs will be evaluated. The license holder will get the net revenue (benefit), after reducing their total revenue by components of operation and conservation costs. For simplify, we consider the following model.

$$BT = V \text{ (equation 1 and 2)} - T - OC - CC \qquad (3)$$

In the equation (3), BT is Benefit in term of net revenue for license holder. T is fee (tax) to be paid to local government. OC denotes for operation cost (employers salaries, boat maintenance and handling cost), and CC denotes for conservation costs for rearing and releasing turtles. The local government will get income from license that auctioned to license holder (egg collector) candidates. This income will be deduced for turtle hatchery operation and monitoring costs. Please see equation (4) for getting inspiration.

$$BG = T - HOP - MC \qquad (4)$$

From equation (4), BG denotes for benefit in term of net revenue for local government, T is fee (tax) that gained by local government, HOP denotes for Hatchery operation cost, and MC is monitoring cost to check either the license holder or hatchery officers done their job well or not. Moreover, combination of equation (3) and

(4), then deduced by forgone loss due to environmental damage, the result is called as Benefit for current policy (see equation 5).

Benefit of current management = (BT + BG) - Forgoneloss (5)

Second Scenario of Alternative Management

We'll try to assess an alternative management (second scenario) in which no loss on revenue for local government and no loss of rent for license holder. And, local inhabitants will gain free eggs (in some extend) to involve in the conservation. In this scenario, the total cost of artificial hatchery (by local government and license holder) that exchanged to the turtle eggs was given to the Tambelan inhabitants. Then, we let the Tambelan inhabitants to decided how many eggs to be consumed and how many to be hatched naturally.

Conservation efforts and stop using of dynamite/poison will have two benefits for conservation purposes: recruitment of the new turtle into the "club" and stop the mortality of adult turtles. Designing of the island for natural conservation purposes (managed by local people) could be rotated, lets say for 2-3 years was designing at Menggirang island, then another 2-3 years at Nangka island, and so forth until 20 islands that frequently visited by turtle have chance to be conserved.

To determine the benefit that Tambelan inhibitants could gain if they intend to involve in conservation activities, we will use the equation (6). And model (7) is the cost for natural conservation. Natural conservation means that the turtle eggs in the sandy holes is let to hatching naturally. The number of egg in the hole and the number of holes is determined by inhabitants. The inhabitants monitor the eggs during the incubation periods from any predators included the human, and inhabitants guarantee all hatching turtle is free to go to the ocean.

$$BI = (Qc*P) \quad (6)$$

$$Cn = (Qn*P) \quad (7)$$

Where BI is Benefit for Inhabitants, Qc is egg quantities for consumed, and P is yearly average price. Cn is the cost for natural conservation, and Qn is egg quantities for natural hatching. However, the numbers of eggs for consumed and natural hatching are exactly equivalent with the costs of conservation efforts by local administration and license holder.

The benefit of license holder in the alternative policy is equal to the benefit in the current policy (nothing to loose). The artificial conservation costs by license holder were transferred (in form of eggs) to local inhabitants for consumed and natural conservation purposes. The model is following:

$$BTa = BT = V \text{ (equation 1 and 2)} - T - OC - CC \quad (8)$$

From the equation (8), BTa is Benefit for license holder in the alternative policy, and BT is the benefit for license holder in the current policy. The meaning of T, OC and CC could be referred at equation (3).

In the alternative policy, the benefit of local government could gain is equal to current policy. The turtle hatchery operation (HOP) costs and monitoring costs (MC) were transferred (in form of eggs) to the Tambelan inhabitants for consuming and natural conservation purposes. The model at below:

$$BGa = BG = T - HOP - MC \quad (9)$$

In the equation (9), BGa denotes for benefit for local government in alternative policy, and BG is the benefit for local government in the current policy.

Total Economic Value on The Alternative Management

Benefit or could be said total economic value that could be gained in the alternative management is the combination of equation (6), (7), (8) and (9). The benefit shown at model 10.

Benefit or TEV on alternative management = (BI + Bta + BGa) + (Environmental Value) - (Cn) (10)

RESULT AND DISCUSSION

Although there is no break in breeding season in Indonesia, there is a pronounced cyclical variation in the intensity of breeding, with a marked maximum. The peak of the breeding season seems to have some cor-

relation with the monsoon period. The timing varies in different areas. In Tambelan islands, peak-breeding season for Sub-green turtle was June to August. Whereas, April to June was peak breeding season for Hawksbill. The average price of Sub-green turtle is Rp 800, and Hawksbill is Rp 400. The price slightly different follows the seasons. However, the price tends to higher since the demand always higher than supply.

As comparation, Wahjuhardini (1992) and Hermawan (1992) reported that Hawksbill laying eggs during January to March in Seribu Islands, Jakarta, with average number of eggs was 95-220 per-clutch (eggs/turtle/breeding). The mature hawksbill could come to the beaches 2-3 times during one breeding season. Nuitja (1975) and Nuitja (1983) observed that the breeding season for Green turtle in Sukamande (West Java) is around December to January, while in Ketapang (Nusa Tenggara province) is around April to July. One mature Green turtle could lay 80-120 eggs per-clutch. Either Hawksbil or Green turtle need 45-80 days for incubation period of eggs.

We could see economic analysis of current management (Scenario I) at Table 1 appendix. Based on economic analysis, total loss is Rp 9,230,000,000 (Nine billion two hundred Thirty million rupiah). In the second scenario, local government and egg collector (tax payer) will not loss their revenue, while local people also get benefit by free turtle eggs. Economic analysis of second analysis of second scenario could be seen at Table 2 appendix. Total economic value gained from second scenarios Rp 8,302,184,400 (eight billion Three hundred Two million One hundred Eighty four thousand Four hundred rupiah). The result showed loss (Rp 9.23 billion) significantly on the current policy (scenario I) suggest that combine factors such as turtle eggs harvesting, using of dynamite/fish poison, and destruction of natural habitat (coral reef) contributed to decreasing of turtle population.

In the second scenario, economic benefit gain is Rp 8.3 billion. These facts call for increased attention to integrated turtle population protection, sustainable turtle eggs collections, proper using of beach for any purposes and un-destructive fishing activities objectives in the Tambelan Islands area. Substantial areas of beach islands need to be allocated as landing eggs area, fisheries activities area, and conservation area. Local government as the islands manager must develop new beach management systems that which incorporates eggs production, turtle population protection, and local fishermen activities and other related objectives.

CONCLUSION

The results are thus of direct and immediate relevance not only to Tambelan islands, Riau province marine resources but also to the environment at large because as said by Erlinda and Erlambang (1998) that number of turtle eggs extremely decreasing year by year since 1991. In addition, the study has potential national (Indonesia) significance to the extend that it generates new and original results in a field characterized by an extreme dearth of rigorous applied research.

Female turtles return to the same beach (home instinct) regularly to lay their eggs, even they could swim as far as 2,000 km for searching of food (Carr, 1952). It is mean that collection of eggs in tremendous amount and killing of turtle due to using of dynamite/poison to catch fish in the coral reef area of Tambelan islands will contribute to the extinct of the turtle in that area. The impact of license holder, and fishermen livelihood activities on decreasing of turtle population and its egg collection is therefore a fundamental consideration in the design of management plans. The conservation is the long time process. The result of analysis show two scenarios on this case, the scenario I, the losses is Rp 9.23 billion; and Rp 8.3 billion of benefit gain on the scenario II.

From the case we recommend that the important issue is the awareness of everybody, government and people. We believe that local government; license holder and Tambelan inhabitants will reach the understanding of how important to conserve endangered species in the next coming years (could be 5 years to 20 years). To reach that awareness, efforts must be done. This research only initial idea is to start awareness of how important to preserve our natural resource for our future generations.

REFERENCES

Arif, D. 1995. *Budidaya penyu Sisik (Eretmochelys imbricata) di Kecamatan Senayang, Kabupaten Kepulauan Riau.* Laporan praktik

lapangan. Fakultas Perikanan, Universitas Riau. Pekanbaru.

Arif, D. 1996. *Pengaruh pemanasan yang berbeda terhadap daya tetas telur penyu Sisik (Eretmochelys imbricata). Skrips*i. Fakultas Perikanan, Universitas Riau, Pekanbaru.

Anonimous. 1981. *Pola pemanfaatan fauna yang selaras dengan azas kelestarian alam di Propinsi Bali dan sekitarnya.* Laporan diskusi penyu, Denpasar-Bali. Direktorat P.P.A, Bogor.

Carr, A. 1952. *Handbook of Turtles. The Turtles of the United States, Canada and Baja California*. Comstock Publishing Associates. Ithaca, New York.

Erlambang, T. 1998. *Malay of Riau archipelagoes: Socio-Economic perspective.* Majukan Melayu Foundation, Tanjung Pinang.

Erlinda, E and T. Erlambang. 1998. *Marketing of sea turtle eggs: preliminary observation in Tambelan islands, Riau Province,* Indonesia.

Hermawan, D. 1992. *Studi habitat peneluran penyu sisik (Eretmochelys Imbricata L) di pulau Peteloran timur dan barat, Taman Nasional Alas Kepulauan Seribu*. Jakarta. Fakultas Perikanan, IPB. Bogor.

Imran, Z. 1994. *Studi habitat peneluran dan populasi Penyu Lengkang (Lepidochelys olivacea) di pantai Marengan, Taman nasional Alas Purwo, Bayuwangi, Jawa Timur.* Fakultas Perikanan, Institut Pertanian Bogor.

Nuitja, I.N.S. 1983. *Penyu laut di Indonesia (Bahan bacaan herpetologi, vol. I).* Penelitian Fakultas Perikanan, IPB. Bogor.

Nuitja, I.N.S. 1975. *Beberapa aspek biologi penyu Sala (Chelonia mydas) dan kemungkinan cara pengelolaannya di perairan Ketapang, Kabupaten Sumbawa.* Fakultas Perikanan, IPB. Bogor.

Wahjuhardini, P.L. 1992. *Studi beberapa aspek biologi penyu sisik (Eretmochelys imbricata) di Kepulauan Seribu.*Fakultas Perikanan, IPB. Bogor.

Table 1
Economic Analysis

ECONOMIC ANALYSIS			
1.Benefit			
a.Egg collector (Tax payer)			
*Sub-green turtle (*Chelonia sp*)	: 800,000 eggs x Rp 800	= Rp	640,000,000
*Hawksbill (Eretmochelys sp)	: 600,000 eggs x Rp 400	= Rp	240,000,000
b.Revenue for local government		= Rp	160,000,000
Sub-total benefit		= Rp	1,040,000,000
2.Costs			
a.Egg collector (tax payer)			
*5 employers x Rp 300,000 x 12 months		= Rp	18,000,000
*3 boats x Rp 400,000 x 12 months		= Rp	14,000,000
*Conservation costs :			
-10,000 sub-green turtle eggs x Rp 800		= Rp	8,000,000
-10,000 hawksbill turtle eggs x Rp 400		= Rp	4,000,000
-2 floating cages x Rp 2,500,000		= Rp	5,000,000
-Turtle food Rp 10,000 x 12 months		= Rp	1,200,000
b.Monitoring cost (local government)		= Rp	20,000,000
Sub-total costs		= Rp	59,800,000
3.Forgone Loss			
a.Coral reef destruction due to using of dynamite and fish poison			
*Replacement cost : 200 ha (2,000,000 m^2) x Rp 5,000 = Rp 10,000,000,000			
b.Loss of non-economic fish due to dynamite and fish poison			
*10 fishermen x 3 bom/year x 20 m^3 = 600 m^3 = 600 ton of fish/year			
= 60,000 kg x Rp 1,500 = Rp 90,000,000			
c.Loss of adult turtle due to dynamite and fish poison			
* 1,200 turtle x Rp 150,000	= Rp 180,000,000		
Sub-total forgone loss		**= Rp**	**10,270,000,000**

Table 2
Number of Turtle Eggs and Convert Value

Number of Turtle Eggs	Convert Value (Rp)
A.Eggs to be consumed	
*Sub-green turtle = 4236 individu x 583 eggs	2,522,058 eggs x Rp 800
= 2,522,058	= Rp 2,017,646,400
*Hawksbill = 4236 individu x 423 eggs	1,791,828 eggs x Rp 400
= 1,791,828 eggs	= Rp 716,731,200
B.Eggs to be conserved	
*Sub-green turtle : 252,206 eggs	252,206 eggs X Rp 800 = Rp 201,764,800
*Hawksbill : 179,183 eggs	
Total Cost	**Rp 3,007,815,600**