

IDENTIFYING AND MINIMIZING THE NEGATIVE SOCIO - ECONOMICAL IMPACTS ON CORAL REEFS IN VINH HAI - NINH THUAN PROVINCE

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Astract: Vinh Hai coral reef is typical of intertidal coral reef flat of Viet Nam. Although the reef is still in good condition but local socio-economical activity is doing harm to corals. Overfishing, illegal catching techniques, coral exploitation for trading and local use, including insufficient capacity for management of the local community are forcing the reef to be gradually degraded for years.

A local capacity index (LCI) for assessment of coral management has newly been proposed. The result shows that the LCI of Vinh Hai community is very low (0.314) requesting the management capacity need grading up urgently.

For protection of Vinh Hai reef, the Protection Strategy should be closely connected to capacity building for community, for Marine Product Protection Subagency, and to poverty reduce programmes. Ecotourism development should be planned expectantly.

1. INTRODUCTION

Aims of research

Reef corals and related economical fauna and flora are abundant in Vinh Hai coastal water - Northern Ninh Thuan Province. Ninh Hai local community is still poor and their living much depends on natural resources exploitation, of which coral fishes and other species are the main hunting objects of local fishermen. Protection of the coral reefs and reef related species is the most important activity not only for local people living, but for national - wide significance. This research, sponsored by Ninh Thuan DOSTE, aims at local socio - economical impacts on Ninh Hai coral reefs. The impacts mainly relate to:

- Coral exploitation as mineral resources or raw materials
- Reef-related species exploitation
- Wasting (on land or in marine environments) caused by human activities

Discovered local socio - economical impacts then should be calculated in coral reef protection strategy of the province, in training courses offered to local people including local community leaders.

Methodology

PRA (Participatory Rapid Appraisal) is the most useful research tool in this case. For that usage, a question board has been carefully prepared for interview, adapted PRA methodology [1, 2]. 22 interviewees have been selected during a field check by researcher in the end of September and the beginning of October this year. Among them, 10 are local leaders and the others are local people but all of them are fishermen or farmers. Beside interview, researcher has also made field survey throughout the Ninh Hai coast and discussed with some local experts in Department of Fishery and DOSTE of Ninh Thuan, and with some local people in the nearby Tri Hai and Nhon Hai communes.

The question board afterwards has been analysed by SPSS technique. The results of various interview techniques such as official, semistructural, non-official interview, secondary data analysis at last have been summed up into a set of indicators for assessment.

Overview of Vinh Hai coastal commune

Vinh Hai is a coastal commune located in Northern coastal region of Ninh Thuan Province, down to the South of Cam Ranh Bay. The Commune is inhabited by 880 households with about 4500 people, accumulated in 5 isolate hamlets. Local communities contain two ethnic groups: Kinh (91%) and Raglay minority (9%). The last dwelled in Cau Gay and Da Hang hamlets, lived on agriculture and forestry. Kinh people variously earned for living, but mainly by agriculture, fishery and marine product traders (table 1).

Table 1. Economical systems in Vinh Hai commune

N	Economical sectors	Simple Description
1.	Fishery and aquaculture	- Nearshore fishery, the annual output is between 100 and 150 tons
2.	Agriculture	- Cultivating: grape (30ha), rice, spice - Grazing: about 2,500 cattles (cow, goat, sheep)
3.	Forestry	- Forest replanting and non-timber exploitation in the buffer zone of Nui Chua Natural Reservation
4.	Other economical activities	- Small - scaled trading: pesticides, marine products - Small - scaled fishes processing: fishes dry-up, fish sauce... - Tourism services: mainly at Vinh Hy and Thai An hamlets

Most of households are at the poor level, however, caused by economic growth, the rate of the poor in the commune is going down by time (fig. 1).

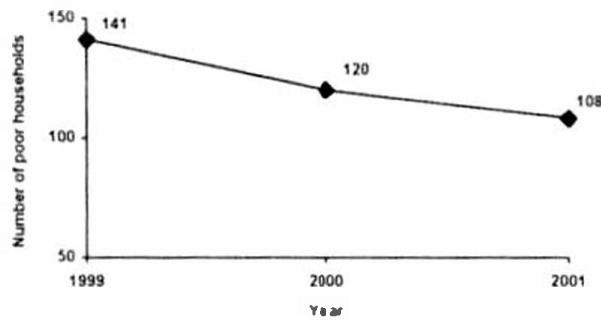


Fig 1. Number of poor households in 1999 - 2001

Almost the poor households are at Cau Gay, Da Hang and My Hoa hamlets.

2. IDENTIFYING THE NEGATIVE SOCIO-ECONOMICAL IMPACTS ON CORAL REEFS IN VINH HAI

2.1. Current status and changes of coral reefs and reef - related species in present time in Ninh Hai

Coral reefs in Ninh Hai

Living corals inhabited in shallow water (from 4 to 10 m deep) in good condition. Cover of living corals varies from 20% to 40%, being highest at Hang Rai and Bai Nho. Dead corals take about < 10% in general, but highest at My Hoa (ca 15%). At locality, local human impacts have been recognized such as blast or poison fishing and coral exploitation or mechanic destruction. A total of 197 reef-building coral species have been discovered at the site, of which, at least 14 species are newly recorded for Viet Nam, belonging to at least 5 benthic communities (table 2)[3].

Table 2. Benthic communities of Ninh Hai coral reefs.

N°	Communities	Physical	% cover category
1.	Dead standing coral	Continuous pavement	1 - 10%
2.	Soft coral	Large blocks (diam. < 1m)	11 - 30%
3.	Coralline algae	Small blocks (diam. < 1m)	31 - 50%
4.	Turn algae	Rubble	51 - 70%
5.	Macro algae	Sand	76 - 100%

My Hoa fringing reef is one of few typical wide intertidal reef flat (500 m width) in Viet Nam. In the other sites of Vinh Hai coastal water, corals are small

patches on the sandy bottom between 2 to 10m depth and ranging up to several hundred m offshore.

Coral reefs in Vinh Hai are not only significant reservoir for coral biodiversity, but reef-related species as well. A total of about 250 economic marine species have been reported by local fishermen, of which 14 fish, 5 shell-fish, 3 squid, 3 crab species are highly economical significant (table 3).

All fishing boats of Vinh Hai are of low capacity (less than 45CV), fitted only to shallow water fishing, so that these economical marine species are very important to local living.

Coral exploitation has also been employed by local people since 1988 when Phong Lan Company from HCMC hired local people to exploit corals (both dead and living corals). This job started from then upto present although was prohibited some years ago.

Table 3. Corals and reef-related biodiversity of the shallow coastal water of Vinh Hai [4]

N ^o	Taxonomy	Number of Species
1.	Corals	197 species
2.	Sea grass	3 species
3.	Sea weeds	24 species
4.	Molluscs	9 species
5.	Crustacean	3 species
6.	Echinoderm	2 species

Caused by overfishing (including blast, poison, overlighted and closely-linked net in the past) the marine biotic resources in Vinh Hai coastal shallow water have been degrading by time.

Almost economic species have been little reduced; 4 species much reduced and only one species (Cá Mòi) is totally disappeared. This direction clearly show that the reef biodiversity is gradually degraded by time of the last 5 years (1997 - 2002). However, the existence of Cua Huỳnh Đế (a reef crab), an indicator of healthy reefs elucidates that the reefs of Vinh Hai are still in good reservation.

2.2. Negative socio-economic impacts on coral reefs

Coral exploitation

Coral exploitation started in Vinh Hai in 1998, when Phong Lan Co. in Ho Chi Minh city bought corals from dredging activity. Some local fishermen exploited also living corals outside the dredging lines to get high benefit. Number of coral boats increased from 10 (in 1998) to 30 (2000) (table 4)

Table 4. Illegal coral exploitations

Events	Year				
	1998	1999	2000	2001	2002
Number of Violations	0	2	2	4	No data
Weight of corals (tons)	0	8	4,13	11,7	some tons (**)
Fines (VND)	0	6 mil.	Confiscated all corals	15 mil. and Confiscated 9,7 tons	0

Source: Department of Fishery, Ninh Thuan (6/2000/02)

(*) data from interview

Corals were also exploited as raw materials for Phuong Hai cement factory and some small-scaled lime kilns. In rough estimation, 1000 ha of shrimp ponds in Ninh Thuan consumed 500 tons of lime per year. Many years ago, the lime kilns used both dead and living corals as raw materials. In 2002, the lime producers bought mostly dead corals from Cam Ranh, because the exploitation and trading of living corals has been strictly prohibited in Ninh Thuan. However, some violations for trading living corals may still exist in the region (table 5).

Table 5. Results of Interview

Question	Answer (rate of answer)
1. Is there still coral exploitation in present time ?	- Yes (44.4 %) - No (55.6 %)
2. Number of local coral exploiters ?	- just a few (22.2%)
3. Purpose of coral exploitation	- Sell to Phuong Hai cement plant (56%) - Sell to HCMC (22%)
4. Weight of corals exploited	- Some tons (16.7%) - A little (11.1%) - Unknown (11.1%)

Reef - related resources exploitation

Reef related resources are clearly recognized by local people, it can be confirmed that almost local dwellers relied upon these resources for living. Therefore, many illegal catching techniques are still used, this is the most important reason of coral reef degradation (table 6).

Table 6. Violating ways and tools for fishing

Violating ways and tools	Confirmation by local witnesses (rate of answer)
1. Overfishing	- Yes (61.7%)
2. Blasting	- Common (33.3%) - Sometimes (22.2%)
3. Electric stimulating	- Sometimes (16.7%)
4. Poisoning	- Sometimes (27.8%)
5. Closely linked net	- Yes (11.1%)

Overfishing, blasting and poisoning are the main illegal activities, that negatively affected to coral environment. Local witnesses also confirmed that violated fishermen are mainly outsiders (from other provinces, and from south Ninh Thuan region such as Dong - Ba - Hai - Chu) (table 7).

Table 7. Where did the illegal fishermen come from?

Locality of illegal fishermen	Rate of answer/confirmation
1. Outsiders?	- Yes (83.3%)
2. Local dwellers?	- Yes (11.1%)
3. Where did the outsiders come from	- Mainly from Khanh Hoa province and South Ninh Thuan fish villages.

Marine Pollution

There are 2 types of marine pollution being recorded by local fishermen: the 1st is land-based, the 2nd is marine non-identified

- **Land-based pollution sources** related to production and living wastes. All rubbish of the community is put into the sea. In average of 0.5 kg per capita per day, the average of daily rubbish is about 2.3 tons. The main part of the wastes is organic wastes, however, some toxic wastes have also been discovered in various dumpsites on the sea shore such as batteries, pesticide bottles, oozy metals etc. 27.8% of the answers agreed that pesticides used on the farms are leached to the sea and did harm to coral biota. 33.3% of interviewees reported that they met pesticide bottles in the sea, 50% the answer confirmed that rubbish is dangerous sources to the marine life. Hereunder is the list of land-band sources that local people believe to do harm to coral biota (table 8)

Table 8. Land-based pollution sources

The sources	Rate of confirmation by answers
1. Ship building factory	- yes 5,6%
2. Aquaculture (shrimp ponds)	- yes 11,2%
3. Fish harbour Khanh Hoi	- yes 5,6%
4. Fish Dry stations	- yes 5,6%
5. Army harbour	- yes 5,6%

Marine non - identified pollution source

38.4% interviewees reported that they met oil pollution on the coral water, of which, 5.6% said the met very often. Red tides are also met by fishermen, 44.4% of the answers confirmed that they met red tides in summer time (between April to July, yearly). Many times (55.6% answers) they met a lot of dead fishes but they did not know about the reason. During rainy seasons, seawater turn muddy caused by serious erosion somewhere on land.

It is noteworthy that there is totally not any industrial sites onshore that may produce red tide over the sea. Some fishermen thought that the red tides may caused by waste water from Dam Nai shrimp field. About oil film, the fishermen explained that related to marine transportation in and out of Cam Ranh Bay.

Sometime, fishermen met accumulations of cyanur (CN) bottles floating on the water, these bottles may be dropped out by some illegal coral fish catching by unknown people, whom they believe to be outsiders;

Reasons of negative socio - economic impacts on coral reefs

- Community insufficient awareness

Within the framework of the programme "Sea Turtle Preservation", some training courses and environmental communication were offered to local community about the role of coral reefs; violations to corals are gradually reduced by time. In 2002, it can be said that most of violations has been controlled successfully.

However, the people awareness about the coral reef values is still poor. There is still a lot of people does not have knowledge enough about coral values (table 9)

Table 9. Insufficient knowledge about coral values

Issues	Rate of answers
1. Corals are useful people living	- Never think about that (5.6%) (agreed: 94.4%)
2. Coral reefs are an important habitats of economic species	- No, false! (5.6%) (agreed: 94.4%)
3. Coral reefs are good barrier to prevent wave attack, to protect the sea shore	- No, it is not true! (44.4%) (agreed: 50%).
4. Coralline rock are useful	- No, it is not true! (70.6%) (agreed: 27.8%).
5. Corals are good for scientific research	- False! (72.2%) (agreed: 22.2%)
6. Coral habitat are good for tourism, attached a lot of tourists to come.	- False! (66.7%) (agreed: 27.8%)
7. Corals are sensitive species that are easily to dye caused even by small - scaled change of environment	- Do not agreed! (38.9%) (agreed: 38.9%) - Never think about that! (22.2%)

The above table shows that people well understand coral reef being habitats of economic species (only 5.6% interviewees opposed). The remained 6 valuable issues are opposed by most of answers. It is easily understand that why illegal activities still exist in the commune.

Poverty

Poverty is still dominating Vinh Hai Commune. There are 12% households are under poverty line. This issue is the main barrier of coral reef protection.

I understand that coral reefs need to be protected. But if there is one who hire me to exploit living corals with high payment, I will do. At the present rate, one coral community weighed of 0.5kg equals to 3kg of rice! I have to feed my children!

One fisherman at My Hoa hamlet

I have to do a lot of thing to get money, to support my family, I have no time to know and to learn about corals

One farmer at Thu An hamlet

This explains while over fishing and illegal catching tools still being used in the commune.

Insufficient management capacity

Table 10. Awareness on legislative document

N ^o	Name of document	Rate of "Unknown" answers
1	All 7 documents	93.93% (only 0,61% knew)
2	Ordinance of aquaresource protection, 1989 (Governmental)	72.2%
3	Decree 48 CP of Government on executive fining violations in aqua-resource protection and development	88.9%
4	Circular 01/200/TT-BTS guiding the application of the Ordinance 1989	94.4%
5	Official Dispatch 572/KT(1999) of Ninh Thuan PC on preventing illegal coral trade	94.4%
6	Resolution 20/2000/CT of the President of Ninh Thuan PC on up grading coral resource management	88.9%
7	Official Dispatch 30/CV/TS (1999) of Ninh Thuan Department of Fishery (DOF) on coral exploitation at Son Hai coast	100%
8	Official Dispatch 40 CV/TS (1999) of Ninh Thuan DOF on upgrading control of coral exploitation	77.8%

The most important issue is that just a few communal leader (ex: president or high ranking leaders of the commune) knew about 7 legislative documents dealing with marine products, and almost local people knows nothing about these documents (table 10).

It is concluded that almost local leaders and people knew nothing about legal framework of marine products, including corals. How can the community and its leaders manage their coral resources?

The provincial Subagency for Marine Product Protection is poorly equipped (lacking enough manpower, budget, equipment). The capacity of Subagency is far to reach its responsibility.

The inspect boat is large but poorly equipped, whenever it sails out to the sea, violent boats well know and have enough time to sail away safely - violent boats are smaller but more powerful, they can get to the shore if can not run away, meanwhile the inspect boat can get to

Fishermen in Vinh Hy and Thai An

Local people well know where the illegal boats come from and what illegal catching tools they used, but they have no responsibility and right to arrest violent boats.

Poorly participatory community

There are 7 steps of participation, from bottom up to top., however, the participation of Vinh Hai community in to coral reef management is still poor (table 11) according to interviewees, during in the previous projects.

Table 11. Level of participation

Participatory steps	Level of participation	
	Not participatory	Good participatory
1. Be invited to join meetings but no role	66.7%	27.8% (0,27 88)
2. Be informed what should be done	55.6%	38.9% (0,39 88)
3. Be interviewed by project experts	22.2%	72.2% (0,72 22)
4. Participated in project for receiving something (ex. money, tools...)	77.8%	16.7% (0,16 77)
5. Participated in project practice (done something)	61.1%	33.3% (0,33 33)
6. Discussed with project leaders, participated in action plans, decision making	66.7%	27.8% (0,27 88)
7. Formulated local initiatives, projects and carried out than with supports from outsiders	88.9%	5.6% (0,05 66)

3. PROPOSED INDEX FOR ASSESSMENT OF LOCAL CAPACITY IN CORAL REEF PROTECTION

Local Capacity Index (LCI) can be calculated by 3 indicators as followed:

$$LCI = (I_1 + I_2 + I_3)/3$$

I_1 : mean rate of local awareness on coral reef values (7 issues, table 9)

I_2 : mean rate of local understand on legal framework (7 documents, table 10)

I_3 : community participation level in coral protection (7 steps, table 11)

In Vinh Hai case study, the I_i indicators are as following:

$$I_1 = (0.944 + 0.944 + 0.50 + 0.278 + 0.222 + 0.278 + 0.389)/7 = \mathbf{0.507}$$

$$I_2 = 1 - (0.722 + 0.889 + 0.944 + 0.944 + 0.889 + 1.000 + 0.778)/7 = \mathbf{0.119}$$

$$I_3 = (0.278 + 0.389 + 0.722 + 0.167 + 0.333 + 0.278 + 0.056)/7 = \mathbf{0.317}$$

$$LCI = (0.507 + 0.119 + 0.317)/3 = \mathbf{0.314}$$

Category of LCI: 0.00 → < 0.40 : low capacity

0.40 → < 0.60 : problem

0.60 → < 0.80 : good capacity

0.80 → < 1.00 : excellent capacity

LCI of Ninh Hai community is 0.314, being in very low capacity.

4. CONCLUSION AND SOLUTION

4.1. Conclusion

- Vinh Hai coral reefs are significant reservoir for coral biodiversity and typical intertidal reef flat in Viet Nam. The coral reefs here are highly useful for scientific research, ecotourism development, biodiversity conservation and important marine resources for local people living. By all prices, the reefs should be protected for present and future generations.

- Cause by overfishing and use of illegal catching techniques for years, coral reefs and reef related species in Vinh Hai gradually degraded, although the current status of the reefs is still in good condition. According to the local witnesses, marine pollution including oil spills, red tides, wastes, dead fish accumulations, illegal coral exploitation for trading to HCMC and for lime kilns etc... have been recorded by time. These events on the one hand, reflect land - based pollution sources and on the other, relates to non-identified pollution origins.

- Up to present time, local community understood somewhat of coral reefs, but the awareness be still low-levelled. Lacking knowledge of legal framework enough, with low capacity for reef management and no way to control the fishing boats of the other regions coming and using illegal methods to exploit the marine products (including blast, poison, living coral collection etc...), local people striving for reef protection seems to be unsuccessful, if not to be in despair.

4.2. Solution

- The highly urgent solution is grading - up the LCI by: offering training courses and communication to local community not only Vinh Hai but other fishing communes in the province as well, dealing with awareness on coral values, legal framework and participatory approach.

- Connecting the strategy of coral protection to poverty reduce programmes (approval of the buffer zone economy by ecotourism development, and other suitable economical programmes).

- Capacity building - up for Marine Product Protection Subagency of the province, enough to well running its responsibility, establishing some marine product protection organization of community - level. These groups should well coordinate with the Subagency.

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XÁC ĐỊNH VÀ GIẢM THIỂU TÁC ĐỘNG TIÊU CỰC CỦA HOẠT ĐỘNG KINH TẾ XÃ HỘI LÊN RẠN SAN HỒ Ở VĨNH HẢI - TỈNH NINH THUẬN

Nguyễn Đình Hoè

Khoa Môi trường, Đại học Khoa học Tự nhiên, ĐHQG Hà Nội

Rạn san hô ở Vĩnh Hải thuộc loại điển hình cho kiểu rạn phẳng vùng triều của Việt Nam. Mặc dù rạn còn được bảo tồn tốt nhưng hoạt động kinh tế - xã hội đang gây hại cho rạn. Đánh bắt quá mức, sử dụng kỹ thuật đánh bắt hủy diệt, khai thác đá san hô để bán hoặc sử dụng tại địa phương, cùng với năng lực quản lý chưa đủ đáp ứng của cộng đồng địa phương trong nhiều năm qua đang dẫn rạn san hô đến suy thoái.

Chỉ số Năng lực Địa phương (LCI) dùng cho đánh giá khả năng quản lý rạn san hô lần đầu được đề xuất. Kết quả cho thấy LCI của cộng đồng Vĩnh Hải rất thấp (0,314), đòi hỏi năng lực quản lý phải nhanh chóng được cải thiện.

Để bảo vệ rạn san hô Vĩnh Hải, Chiến lược Bảo vệ phải gắn chặt với việc tăng cường năng lực cho cộng đồng địa phương, cho Chi cục Bảo vệ Nguồn lợi Thủy sản, và gắn kết với các chương trình xoá đói giảm nghèo. Phát triển du lịch sinh thái cũng cần được đưa vào quy hoạch.