2006-2007

Final Project Report On

Saving Seahorses in the Pulai River Estuary, Malaysia

(Save Our Seahorses, SOS)

Authored by:

Choo Chee Kuang

Team Leader

ACKNOWLEDGEMENTS

I am very privileged to have the opportunity to work with a team of people who are committed to this project. All our team members are challenged by having their full time jobs and studies yet they sacrificed their weekends and work late hours to accomplish what are needed to be done. I am also indebted to them for their faith in, and encouragement for me to lead this project. Thanks are due to Ng Wei Soon, Ms Jarina Mohd Jani, Bakhthiar bin Jaafar and Juma't bin Harun. I'm also heartened to welcome our new members to the team: Ms. Khor Hui Min, Sharlifah Norlida and Yeong Yee Ling.

Many volunteers have contributed enormously to this project from assisting with field work to composing song for the SOS. Nicola Bisset and Loke Jin Wong - our long term volunteers, took up the task assigned to them passionately and independently. The marine education programs held at various schools were handled by many creative facilitators. I particularly like to thank Rosnani bt Chen Ismail who assisted with the modules and set up a dugong theatre. My capable undergraduate students helped enormously as facilitators in conservation education.

The funders have been very generous in their support for this project. I would like to acknowledge the Rufford Maurice Laing Foundation, Project AWARE, Yayasan Haji Zainudin and KUSTEM Fundamental Research Grant. I particularly like to thank the Ford Motor Environment and Conservation Grants for their support for two consecutive years and arranging for media groups to highlight this project. Small and in kind donations from volunteers are also greatly appreciated.

Our appreciation also goes to the Seagrass-Watch International for their warm partnership. Special thanks to Len McKenzie and Rudi Yoshida. Ms Cheong Chai Yen (Wetlands International) helped with the indigenous Seletar community profiling. We are indebted to the Johor National Park, notably Lily Tokiman for providing field assistance and help with policies, the Malaysia Remote Sensing Department (MACRES) for providing the satellite image, and to Kathigeyan Veerasamy for help with GIS analyses. On top of that I would like to thank Ms. Kuah Peik Khee for her commitments in many ways.

Thanks are also due to the committee members of the Fishermen Association of Tanjung Kupang who were very supportive to our work. The Port of Tanjung Pelepas has been cooperative and took the initiative to join us in seagrass monitoring. Special thanks to Nizam b. Hairom, Rosli bin Hussein, Anuar, Akim Affandi Ahmad and Derik Basil.

I'm thankful to the following organizations who have invited me to Give awareness talks, public lectures and put up exhibitions for fundraising: DragonNet Diving, Malaysian Society of Marine Science, Malaysian Nature Society, Langkawi UnderwaterWorld, and the Department of Drainage and Irrigation, Fisheries Department. The following non-profit organizations have also helped us in one way or another: thanks to the Malaysian Nature Society, Sahabat Alam Malaysia, Wetlands International. Not least to my university (UMT) for giving me the much needed flexibility to spend considerable time at the project site and loans of various scientific equipments.

SOS research station in the quaint village of Kampung Pendas

PROJECT TEAM MEMBERS

Mr. Choo Chee Kuang
University Malaysia Terengganu
Program Leader
Lecturer
choo@umt.edu.my

Mr. Ng Wei Soon
Technip Volunteers
Coordinator
Engineer
wsng@gmail.com

Ms. Jarina Mohd Jani
University Malaysia Terengganu
Community Officer
Lecturer
jarina@umt.edu.my

Bakthiar bin Jaafar
Tanjung Kupang Primary School
Teacher/Education Officer

Juma't bin Harun
Local Fishermen Guide

Khor Hui Min
Freelance Journalist/Malaysian Nature Society Volunteers Guide

Yeong Yee Ling
Postgraduate Student

Sharlifah Norlida
Postgraduate student

This report can be cited as:

Choo, C.K. 2007. Final Project Report on Saving Seahorses in the Pulai River Estuary 2006-2007. Save Our Seahorses. Project Report No. 1. 39pp.

PROJECT SUMMARY 2006/2007

Save Our Seahorses (SOS) had been focusing on three aspects: research, education and conservation between 2006 and 2007 with funding from the Rufford Maurice Laing Foundation, Ford Motor Environment and Conservation Grants, Yayasan Haji Zainudin, Project AWARE and KUSTEM Fundamental Research Grant. The research carried out was on seagrass, seahorse and pipefish, invertebrates, fish, mangroves and rocky shore communities. The data gathered proved to be very useful and are being applied to aid formulation of protection plans. A total of 208 public volunteers who helped to collect the inventories data had also gained valuable experience through the work and shared it with their friends and colleagues. Substantial public awareness was raised through words by mouth, media, forums and website links. The members of the port community and other NGOs have also participated in the inventories. Site visits were also made by the local policy makers and politicians. Four local schools and one village had undergone the marine education programme and there were a total of 141 student participants aged between 10 and 17. The education programme proved successful and was warmly received not only by the students, but also teachers and parents. Socioeconomic surveys were conducted in the local fishing villages and the indigenous Seletar village. The community profiling, perceptions and additional information are furnished in the report. The participation from the coastal communities in resource inventories has been less encouraging which could be attributed to two factors: 1) The resource monitoring was dominated by the public volunteers and there were difficulties synchronizing the coastal communities with the public members, 2) Our application for community empowerment funding from the UNDP GEF grant was not successful thus there was a shortage of manpower to focus on this component. Nevertheless this aspect will be dealt with in 2007-2008 with funding from the MNS ABN AMRO in collaboration with the Malaysian Nature Society. The project has produced posters, brochures, volunteer's handbook, education modules, T-shirts and badges for use in exhibitions and fundraising events. A number of talks and seminars were also performed to highlight the project at the national and international levels. A series of dialogues and meetings, as detailed in the report, were held with the policy makers aimed at conserving the seahorse and the Pulai River Estuary.

TABLE OF CONTENTS

1 PROJECT BACKGROUND

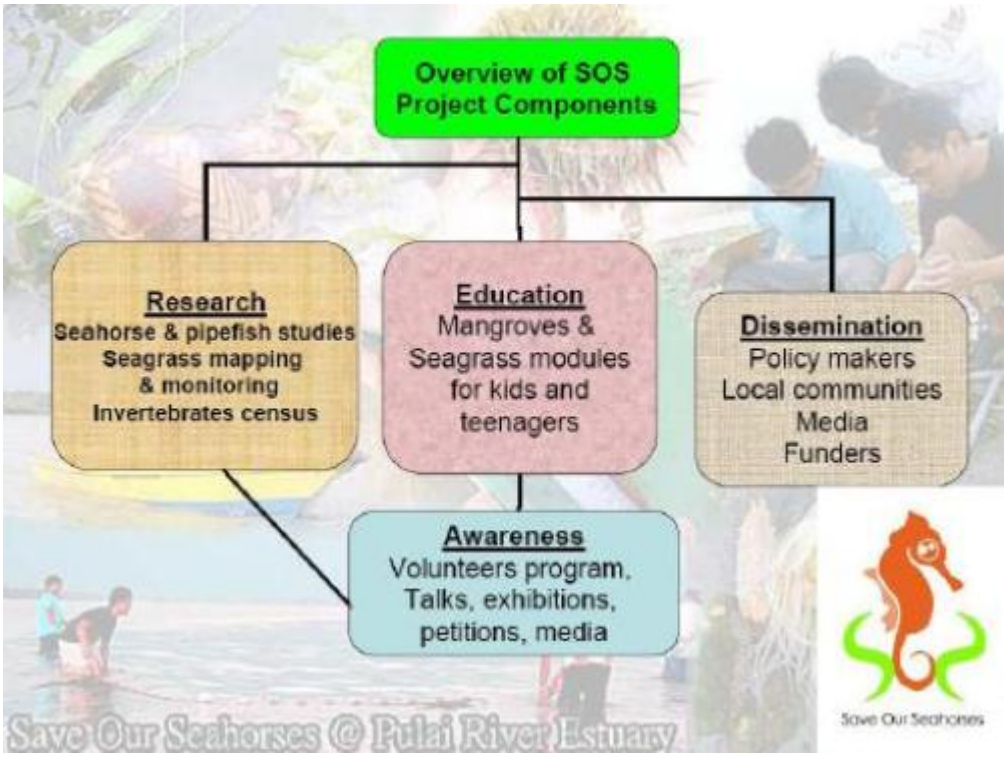
Save Our Seahorses (SOS) is a non-profit group established in 2005 which uses seahorse as a marine flagship species to conserve the rich biodiversity of the Pulai River Estuary in southwestern Johor, Malaysia.

The Pulai River Estuary is the only place in Malaysia found with significant Spotted Seahorse (*Hippocampus kuda*) population. It has the most extensive seagrass bed in the country, large tracts of pristine mangrove forest and some coral reef. Other endangered marine creatures like the dugongs, sea turtles, saltwater crocodiles, pipefishes, and dolphins are also present.

The Pulai River Estuary, located in the southwestern Johor, harbours diverse marine ecosystems and rare marine species (Left: photo courtesy of GoogleEarth).

However, development activities are increasing ever since a port has been built at the Pulai River mouth in 1995. Subsequent mega developments include a powerplant, bunkering island, industries, and there are other proposed projects mainly associated with the Iskandar Regional Development undergoing review. As a result of large scale development, the ecosystem in the Pulai River Estuary has been significantly degraded with the loss of seagrass bed, mangrove forest and decline in fisheries. The Ramsar Site, which is located on the upper stream, did not offer fair protection for the estuarine ecosystem especially when areas of high conservation priority are located downstream.

SOS started a volunteer program involving the public and local community in seagrass monitoring and seahorse and pipefish survey. Besides generating awareness, the volunteer program helps to produce data necessary to identify areas of high conservation priority and for change detection. Exhibitions, talks, meetings and video showing are also carried out targeting school kids, coastal fishermen and policy makers.



1.1 Objectives:

SOS embraces the “Saving the seahorse means saving the sea” concept. The specific objectives are:

- To empower the local communities in marine conservation
- To promote conservation awareness among the general public
- To assist policy makers in establishing protection plans for the seahorse as well as for the Pulai River Estuary

2 COMMUNITY AWARENESS AND EDUCATION

2.1 Overview of coastal community profile

The coastal community of the Pulai River Estuary was estimated at 469 people, comprising small scale inshore fishermen and the indigenous Seletar communities. Their fishing grounds ranged from the upper stream of the Pulai River to the river mouth. Since 1995, the size of fishing grounds and fish stocks had been significantly reduced due to the development of a port and its associated shipping activities.

The coastal communities unanimously claimed that their livelihood had been seriously affected by development and that they had been sidelined by the government who failed to provide alternative source of livelihood.

This project was aimed at compiling their socioeconomic profiling, and emphasis was placed on their outlook on development and environment.

2.2 Methodology for socioeconomic profiling

The socioeconomic profiling was carried out on 29 and 30 September 2006 with assistance from ten university undergraduate students. Identification and selection of households were undertaken in the field following random sampling procedures.

Data were collected using face-to-face interview. Three survey questionnaires were used: i) one short questionnaire for the demographics survey, ii) one main questionnaire for the economic status survey, iii) one questionnaire to understand the point of view towards the environment, future prospect and development plans.

2.2.1 Indigenous Seletar Community

The Seletar folks are one of the earliest inhabitants in Peninsular Malaysia. Before they were relocated to Sungai Pulai by Sultan Abu Bakar, they lived along the mangrove creeks of the Johor Straits. The indigenous Seletar Community now resides at Kampung Simpang Arang near Sungai Simpang Arang, one of the tributaries that flow into Sungai Pulai. The majority still depended on fisheries resources while some worked in the oil palm estate, factory workers and as labours.

2.2.2 *Demographics*

Survey results indicate that 30% of the respondents aged between 31-40. Most of the respondents were Muslim (44.8%). A considerable number of respondents did not have any religion (37.9%); these were followed by Christian (10%), Buddhist (4%) and Animism (3%).

Most of the indigenous people at Kampung Simpan Arang did not receive any formal education (79.3%). Only 17.2% had received some forms of primary education. The highest education level obtained was lower secondary level (3.4%).

Household survey revealed several tragedies in large families. These include incest, abuse, fighting and quarrelling among family members. Survey statistic indicates that 28.6% of the households had more than 10 family members.

2.2.3 Economic status

The income level of the sampled population was generally low. Approximately 79% of the population had income lower than RM500 per month, which is below the poverty line of this country. This condition was exacerbated by having large family members. Sometimes the entire households had to eat diluted porridge and potatoes. About 14% of the population received monthly income between RM500-800 and 4% earned between RM800-1100.

The sources of income indicated that the livelihood of Seletar community showed strong dependency on the mangrove and fisheries resources. Mollusc constitutes the main catch (32%) of the income, followed by fishes (26%), crabs (23%), prawn (15%) and charcoal (4%).

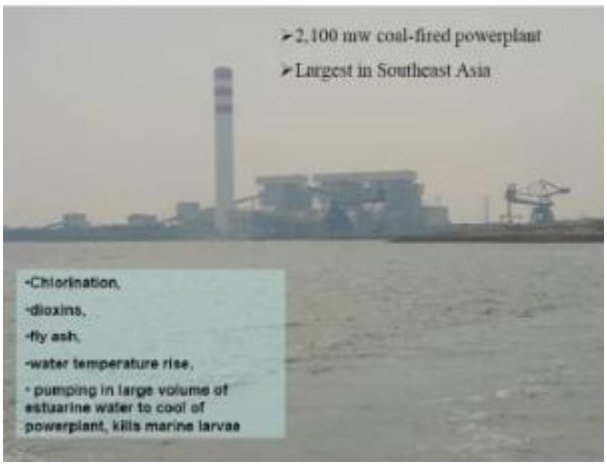
A total of 91.3% of the full time income and 75% of part time income derived from the mangrove and fisheries resources, while 8.3% of the part time income came from boat making and repairing, net weaving and repairing, odd jobs and farming. Other full time jobs were factory worker, labour and bus driver.

When asked about income satisfaction, 72% were unsatisfied by their income level. Ironically, 72.4% of them had no intention to change their source of income in order to improve their quality of life.

2.2.4 Environment Perspectives

From the catches, 80% of the Seletar fishermen had observed that there was significant decline in the natural resources at Sungai Pulai. According to the respondents, the deterioration of the harvest was mainly due to the development projects carried out around Sungai Pulai. These include the water piping project, Port of Tanjung Pelepas and reclaimed mangrove forest by the Marine and Custom Department.

An anecdotal report by the Head of Fishermen, Mr. Tan Khin Thong, claimed that between 1960 to 1980, the indigenous people earned their living at the upper stream of Sungai Pulai, namely Sungai Peradin, Sungai Gelang Patah and Sungai Buloh Kasar. At the time, each fisherman could harvest 6-9 kg of fish, crabs, prawns and mollusc. It was until the 90's that the resources was observed to shrink. These days each fisherman could harvest six times less than what they used to have compared to the 80's.



The powerplant has jutted up at the Pulai River mouth in 2005 despite some protest from the local villagers who were concerned about potential health effects.

The underwater pipes that cut across the Pulai River to provide water supply for the powerplant have damaged fishing gears of the indigenous Seletar community.

a. Indigenous Seletar Fishermen Chief pointed out area affected by development.

b. Conditions of some houses by the river

c. A detailed sketch of resettlement produced by the local community

d. Interviewing the indigenous village chief, Tok Batin

e. Fishermen gathered in protest of the underwater pipeline project that caused damage to their fishing net

f. River not only provides livelihood but also entertainment

2.3 Tanjung Kupang Fishermen Profile

A total of 41 fishermen from three fishing villages (Kampung Pok, Pendas and Desa Paya Mengkuang) were interviewed on the 29 and 30th September 2006. The age structure of the respondents consisted of 41 years old and below (29.2%), between 41-50 years old (43.9%), and 50 years old and above (26.8%). A total of 84.6% of the fishermen were married with an average of 6 kids in each household.

The jetty at Kuala Sungai Pendas. Drift net, gill nets and cast net are the typical fishing gears employed to catch fishes, crabs and shrimps.

Approximately 29% of the fishermen did not receive any formal education and about 50% managed to complete primary school level. Only 21.9% received education to lower secondary level.

All the fishermen interviewed had been fishing for at least 15 years (29.3% had fished more than 20 years; 34.1% more than 25 years). Each fishermen possessed their own boat and outboard. The most common boat was less than 20 feet made from wood and fibre. In terms of fishing gears, about 46% of the respondents fished using drift net, 16.7% using gill nets and 13.3% using cast net.

Other subsistence fishing methods were used occasionally, such as push net (left) and hand collection (middle) which depend on tidal conditions. The wing shells (top right) is a favourite delicacies among the local hand collectors with good retailed market price of RM4.00 per Kg.

The catch of the fishermen composed of prawns and shrimps (40%), crabs (31%) and fishes (29%). Note that target catch varied according to seasonal abundance of the type of resources.

Statistic on household income shows that the income level of the fishermen was fairly low. Only 12.2% of the respondents earned more than RM1, 500 per month, 51% earned between RM500-1000 per month.

Income from fishing made up 60-100% of their primary household incomes as most of them do not have part time jobs.

Most fishermen were aware of the importance of mangroves and seagrass to their livelihood. A total of 68.3% realized the effects of development on their income and living status. The survey statistic also shows that 65.9% of the community supported development as they believed this will lead to the improvement of their livelihood, while the rest resorted to complacency with the government actions thinking t fate.

The two main problems that confront the fishermen are 1) reduced catch 2) algal blooms. The respondents claimed that reduced catch was caused by development of the Port of Tanjung Pelepas that has polluted the water resulting in less and smaller fishes caught. The shipping activities also forced fishermen to seek new fishing grounds. Algae (*Ulva sp*) blooms, which are indicative of eutrophication, had attached to the fishing nets presenting persistent hassle for the fishermen to remove and clean the nets.

2.3.1 Summary of Meetings and Dialogues

The Kampung Ladang/Tanjung Kupang Fishermen Club has 12 people in the committee. In general, the club is fairly established, organized, and motivated. It was able to self-sustain by sourcing for funding from local politicians and government sectors (LKIM), initiate meeting with policy makers and submitted memorandum to appeal for compensation as a result of shrinkage of resources caused by development.

Between 2006/2007, the club's major activities were:

i) Jetty repair and upgrading
ii) Manage a restaurant with profits channelled back to the club
iii) Provide sponsorship for members to undergo training in cage culture
iv) Lobbying for compensation as a result of fish catch deterioration and loss of fishing grounds
v) Venturing into other alternative livelihood source e.g. mariculture, aquaculture

In their memorandum of appeals, the club i) has urged the government to probe into the sacrifice of the livelihood of the Tanjung Kupang coastal communities for the development of the Port of Tanjung Pelepas, ii) provide funding for modernized economic activities as a mean of alternative livelihood.

The memorandum has also outlined in detailed the negative aspects of development. They adopted the stand to go against development provided their livelihood will be safeguarded. They proposed to set up funds to provide for modernized economic activities as a substitute for the loss of income to the fishermen. The funds would be borne by the developers and government.

The compensations requested were:

- RM100, 000 per head to cover the expenses in fish cage culture,
- RM100, 000 per head in the form of shares for elderly fishermen.
- RM5, 000 per head for short term loss

There were 469 fishermen from Gelang Patah district and this added up to a total of RM46,900,000 (compensation for long term loss) and RM2,345,000 (short term loss). Unfortunately, no feedback regarding the appeal for compensation was received until now. Only a couple of fishermen were selected to undergo training in fish cage culture partly funded by the club and the Fisheries Department.

- The Third Annual General Meeting of the Kampung Ladang/Tanjung Kupang Fishermen Club
  Date: 28 April 2007
  Venue: Balai Raya Kg Ladang/Tg Kupang, Taman Rekreasi Sg. Cik Manan.

- Southern Johor PNK 28th Annual Meeting
  Date: 30 May 2006.
  Venue: Dewan Serbaguna, Majlis Perbandaran Johor Bahru Tengah

- The Fourth Annual General Meeting of the Kampung Ladang/Tanjung Kupang Fishermen Club.
  Date: 29 April 2007.
  Venue: Balai Raya Kg Ladang/Tg Kupang, Taman Rekreasi Sg. Cik Manan.

SOS members, Ms. Jarina bt Mohd Jani, Choo and Nicola Bisset were invited as observers during two annual general meetings. They also had the opportunity to give comments and speeches at the end of the meetings.

Abdul Rahman bin Hj Saleh, the Chairman of the Kampung Ladang/Tanjung Kupang Fishermen Club gave an opening speech at the Fourth Annual General Meeting.

On the other hand, the indigenous Seletar communities were less organized in terms of their social structure, level of communication, awareness and concerns for their future. An exception is the indigenous Fishermen Chief, who is of mixed Seletar-Chinese descendant, showed high level of awareness of the adverse impact of development on their livelihood, which he compiled in a portfolio. He had also written letters to the relevant authority, lodged police report when their fishing grounds were intruded, participated in meetings with the local politicians and actively sourcing for alternative livelihoods.

Numerous informal meeting/dialogue between SOS members and the coastal communities had been carried out either monthly or bimonthly. Some important messages which SOS has instilled in, and established rapport with the communities, are as follow:

1. <u>The importance of mangrove and seagrass resources to fisheries</u>.
   The economic value of the seagrass and mangrove resources were highlighted. The fishing communities learned that their resources could be translated to monetary value per acreage, based on extrapolation from scientific literatures. They were also fond to learn that in more developed countries, developers compensated the stakeholders for the loss of these resources or invest in rehabilitation/restoration.

2. <u>Providing updated information on proposed development in the region</u>
   Often enough the updated information on proposed development was not made available or transparent to the rural communities. SOS helped to provide these resources to, and

getting the feedback from the local communities. During the Third Annual General Meeting, the club supported our suggestion that the proposed development along Tanjung Kupang coastline should retain the mangroves as buffer zone. They have voiced this out during subsequent meetings with the government agencies.

3. Arrange for media interviews
The local communities had been interviewed by several local presses and a TV station. In their interviews, the communities had highlighted the threat to the coastal resources, livelihood and urged development to be more sustainable. The media coverage has generated substantial public awareness but was not met by fair government actions.

4. Discussion on alternative source of livelihood
At the initial stage the alternative source of livelihoods that the local communities had in mind (e.g. aquaculture, floating restaurant near island) was non-environmental friendly. SOS opens up a platform for discussion on the possibility of eco-tourism quoting successful examples. But as the local communities became more receptive to the ideas of environmental friendly business, the Government had announced that their village would fall as part of the Iskandar Region Development. If the plan goes ahead, then eco-tourism activities will not be viable.

2.3.2 Fishermen's Perception on the Coastal Environment

The fishermen understand the importance of the link of mangroves, seagrass and water quality to fisheries resources and their livelihood. But at the same time, they were confronted with huge pressures from the proposed mega project development that they could not see much hope in their future as fishermen. They also hoped that their children will embark on more "reputable" careers. In view of the current situation, the number of fishermen around the Pulai River Estuary will be greatly reduced in the next 10-20 years, unless fish stocks can rebound and generate sustainable income.

The perception of coastal communities on environment was secondary to their livelihood, which is understandable. At present, the coastal communities still hold a strong stand in preserving the coastal resources because in the absence or limitations of alternative livelihoods, and lessons learned from previous experiences (disappointments and distrust for the government); resource preservation is still the best bet for their future.

2.3.3 Empowerment in Resource Conservation

The initial plan to involve local communities in resource monitoring was less encouraging. Only few locals were trained who included our guide, his son, a school teacher and secondary school students. There was a general lack of consistencies in the local participants, which can be attributed to several factors:

I. Monitoring activities were strictly tidal dependent. Coastal communities had full time jobs and found it hard to commit.
II. Resource monitoring was dominated by public volunteers who had higher education levels. The strong disparities between the outsiders and the locals might have discouraged their participation.
III. Application for UNDP GEF grants was not successful, resulting in insufficient manpower in SOS to focus on community training.

These lessons will help us to improve the project planning and implementation in the future. This aspect will continue with funding from the ABN AMRO Bank in collaboration with the Malaysian Nature Society. Suggestions for future project improvement are:

I. Initiate a more thorough consultation with coastal communities
II. Identify key players
III. Modify and customize the resource monitoring activities where necessary
IV. Restrict the number of public volunteers and allocate more local participants

3.0 SCHOOL AWARENESS AND EDUCATION

3.1 Overview of Marine Awareness and Education Activities

Between May 2006 and June 2007, there were 141 kids who have undergone these programmes. The kids were from four local schools and one village from Gelang Patah district:

Age group: 10-12 (primary school students)
15-17 (secondary school students)

Name of School/village	Date	No. of students involved
Sekolah Menengah Tanjung Adang	3 Mar 2007	18
Sekolah Menengah Gelang Patah	10 Sept 2006	19
Sekolah Menengah Pei Khoon	1 April 2007	12
Sekolah Rendah Tanjung Kupang	29 May 2006 8 Oct 2006 11 Feb 2007	20 18 24
Indigenous Seletar kids at Kampung Simpan Arang	13 May 2007	30
	TOTAL	141

This type of the marine awareness and education programme has been designed in four areas:

- Mangrove programme
- Seagrass programme
- General marine ecosystem programme
- Estuarine water quality monitoring programme

3.2 Methods

Kids were divided into small groups of 4-5 people and each group was attended by one facilitator. For the mangrove, seagrass and general marine ecosystem programmes, we generally start the talk session using PowerPoint slide projector available in the school classrooms. The contents of the talk encompass introduction, basic biology and ecology, importance, threats and conservation issues. Talks were interspersed with interactive activities such as quizzes, puzzles, drawings, seagrass herbarium making, colouring, theatre performing, singing, origami, plasticine modelling and prize giving.

During the outdoor sessions, students were brought into the mangrove forest to indulge in activities like treasure hunt, explore, mangrove walk, observation and drawing. Secondary school students participated in intertidal seagrass bed monitoring. Estuarine water quality monitoring programme was conducted at Sekolah Rendah Tanjung Kupang and is on an ongoing basis. Certificates of appreciation were presented at the closing ceremony. Token of appreciations were also presented to school teachers/headmaster/club advisors/local community representative for their cooperation.

3.3 Gelang Patah Secondary School (10 Sept 2006)

The Geography club advisor from Gelang Patah secondary school giving opening speech

Facilitators giving slides presentation on seagrass

At the intertidal seagrass bed, students were divided into small group to carry out seagrass monitoring and invertebrates census under the guidance of facilitators.

Group photo session with teachers, facilitators and students.

3.4 Tanjung Adang Secondary School (3 Mac 2007)

(Left): Group photo with student, teachers and facilitators. (Right): Students amazed by the diversity of marine life in exposed intertidal area.

3.5 Pei Khoon Secondary School (1 April 2007)

(Left): Pei Khoon Secondary School students have fun kayaking after completing seagrass survey.
(Right): Chin, Sing, Luo and Koh acted as facilitators.

a. Using mangrove leaves, the kids disguised themselves as different types of mangroves such as *Avicennia, Rhizophora, Bruguiera* and *Sonneratia*.
b. Colouring and joining a seagrass puzzle
c. Outings in the mangrove forest near the school
d. Group photo session. Len McKenzie, Rudi Yoshida (Seagrass Watch) and Siti Maryam (Team seagrass Singapore) were also present.

3.6 Tanjung Kupang Primary School (29 May 2006, 8 Oct 2006 & 10 Feb 2007) (con't)

e. Kids indulged in the interesting stories on mangroves narrated by facilitator
f. Mangrove leaf samples identification
g. Presenting and explaining the outcomes of group work
h. Group photo session
i. Acting performance on the dugong story
j. Kids ventured into the mangroves to look at the flora and fauna communities
k. Facilitators for the mangrove kids' programme (from left: Yani, Lida, Qilah, Jiha, Atyah and Fong)

3.7 Indigenous Seletar Kids at Kampung Simpang Arang (13 May 2007)

This programme was the first to be held at the Simpang Arang Village. The health care centre hosted 30 kids aged between 9-12, village representatives and facilitators. The programme was also shared by many curious village spectators and parents who cordoned off the windows.

(Top left): The event took place at the village health care centre. Indigenous kids were split into small groups.

(Top right): Plasticine modelling resembling various marine animals

(Middle): from left: Fishermen chief, Choo, village chief, Nicola and Zurina.

(Bottom): Outing and drawing for the indigenous kids handled by Loke Wong Jin.

4 PUBLIC PARTICIPATION IN RESOURCE INVENTORIES

The public volunteers' participation has been overwhelming. Between April 2006 and Aug 2007, a total of 208 volunteers have participated in SOS survey, with 30 volunteers participated in more than one slot. Most of the volunteers were recommended by their friends and peers, while others found out about the programme through media highlights, forums and website links. This phase of the project has also grabbed substantial media attention.

Typically each survey slot accommodates six individuals as the boat capacity was limited. However, exceptions were made to hire additional boat when some groups e.g. port authority and NGOs were on the list. The survey period depended on low spring and neap tides only because this is the only time the seagrass bed becomes accessible. The volunteers made booking online directly from the SOS website (www.sosmalaysia.org).

Prior to May 2007, volunteers were not charged any fee. It was later decided to impose a small fee (RM30 for working adult and RM20 for student) to deter last minute cancellations which have caused us difficulties to find replacement. In return, each volunteer was given a T-shirt, a badge and a certificate of appreciation. They were asked to fill out the indemnity form prior to, and the feedback form, after the trip.

Reminders were given to volunteers via email approximately one week before the survey, reminding them the necessary items to bring, what to expect, how to get there, if there is need for lodging at the research station and if dive booties are required. Additional information was detailed in the volunteers' handbook which was sent via email attachment. On arrival at the research station, volunteers were briefed on the survey methodologies and safety precautions.

The survey activities were divided into:

- Seagrass mapping
- Seagrass monitoring
- Syngnathids (seahorse and pipefish) survey
- Seagrass invertebrates' survey
- Seagrass fish survey
- Mapping of Pulau Merambong
- Pulau Merambong mangroves and rocky shore communities' survey

4.1 Seagrass Mapping and Monitoring

Two seagrass beds were mapped according to the protocols established by the SeagrassWatch International (www.seagrasswatch.org). Mapping on the Merambong seagrass bed was completed in 2006. A new seagrass bed was discovered approximately 200 m in front of the Phase 2 port reclaimation. Mapping was carried out in Feb and Mac 2007 with assistance from the Johor National Park, Port of Tanjung Pelepas and the Johor Branch Malaysian Nature Society. Monitoring is ongoing at both seagrass bed on a quarterly basis.

4.1.1 Preliminary Results

The Merambong seagrass meadow lies between the Second Link causeway (to Singapore) and the Pulau Merambong. From the satellite imagery obtained, the size of this seagrass meadow was estimated at 38 hectares (approximately 1.8 km long and between 50-120 m wide) using ArcView. At low tide, most of the meadows were exposed while some sub tidal seagrass around the periphery remained submerged. The Merambong seagrass meadow is by far the largest known seagrass meadow in Malaysia.

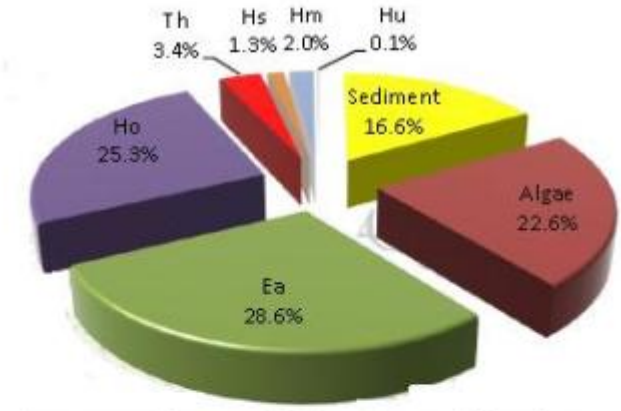
The seagrass bed near the Port of Tanjung Pelepas was estimated at 11.9 hectares. There was an elevated sickle-shape sand dune of approximately 400 m long, sheltering the lagoon. After the initial mapping, new seagrass species e.g. *Cymodocea rotundata* was observed to colonize the lagoon, suggesting rapid species succession.

DIMENSIONS

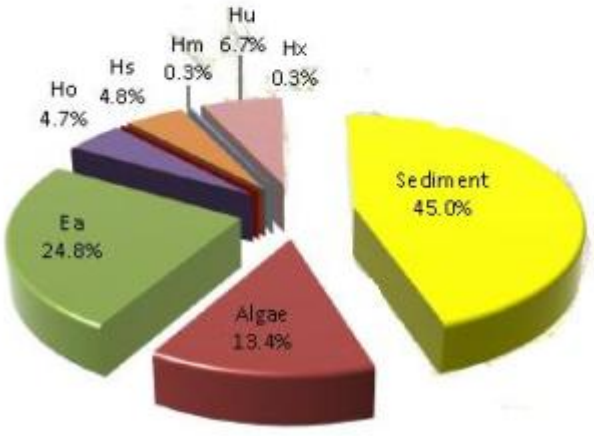
- **1.8km long**
- **50-120m Wide**
- **38 hectares**

(Above): Satellite image INOKOS (courtesy of Malaysian Remote Sensing Department: MACRES) revealed the filtered layer of Merambong seagrass bed with an estimated surface area of 38 hectares. (Below): Port of Tanjung Pelepas staff and the Malaysian Nature Society joined hands in seagrass survey

Inset: Len McKenzie from the SeagrassWatch visited the project site in Oct 06. The seagrass meadow at the Port of Tanjung Pelepas was fairly barren at the time of the visit.



Percent cover of seagrass and other components at Merambong



Percent cover of seagrass and other components at PTP

The percent cover estimate derived from seagrass mapping at Merambong shows that Ea (*Enhalus acoroides*) dominates the meadow with a total of 28.6% coverage. This is followed by Ho (*Halophila ovalis*: 25.3%), Th (*Thalassia hemprichii*: 3.4%), Hm (*Halophila minor*: 2.0%), Hs (*Halophila spinulosa*: 1.3%) and Hu (*Halophila uninervis*: 0.1%).

In total, seagrass species made up 61.1% of the benthic coverage. The other components comprised algae (22.6%) and sediment (16.6%).

At the new seagrass bed at PTP, the meadow appeared to be more barren, as observed by greater proportions of sediment (45%).

The overall seagrass percent cover constitutes only 41.6% and algae were 13.4%.

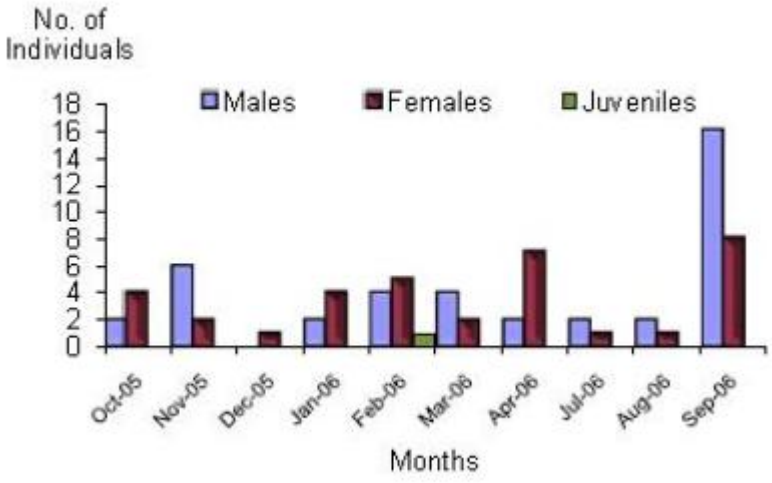
The dominant seagrass species was Ea (*Enhalus acoroides*: 24.8%), followed by Hu (*Halophila uninervis*: 6.7%), Hs (*Halophila spinulosa*: 4.8%), Ho (*Halophila ovalis*: 4.7%) and Hm (*Halophila minor*: 0.3%).

(Left): The tape seagrass, *Enhalus acoroides*, was the most dominant species.
(Top): Dugong feeding trails occasionally seen when the meadow was exposed

4.2 Syngnathids Survey

Seahorses were tagged by using Visual Implant Fluorescent Elastomer (VIFE)

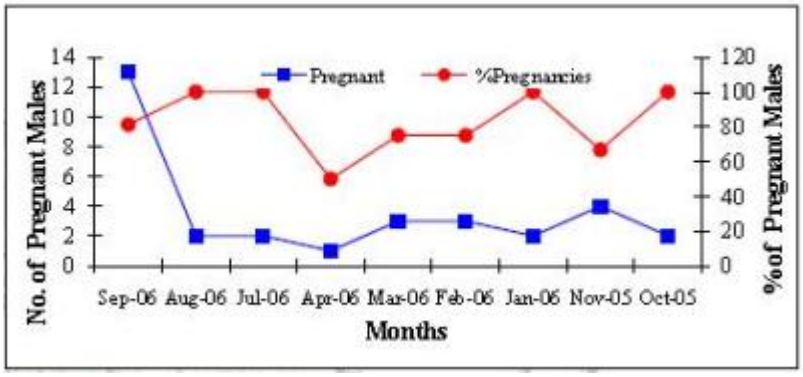
The Spotted Seahorse (*Hippocampus kuda*) and Alligator pipefish (*Syngnathoides biaculeatus*) were surveyed at the depth of 1 m and below during low spring and neap tides. A drag net was employed to tow along the periphery of the Merambong seagrass bed.



Seahorse abundance from Oct 2005 to Sept 06 as surveyed using drag net

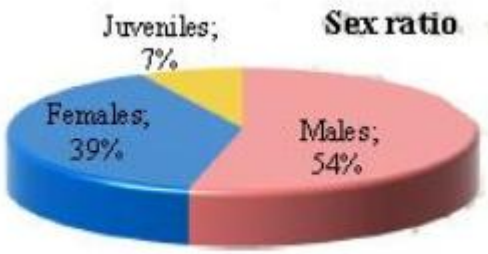
A total of 76 seahorses (40 males and 35 females) were caught and released on the spot.

There were no consistencies in the temporal fluctuations in seahorse abundance. However, we found higher seahorse population densities on the northeastern portion of the seagrass bed. Detailed findings will be published in scientific journals.



Seahorses mated all year round evidenced from the presence of pregnant males.
However, no obvious peak reproductive season was detected.

Compared to the seahorses, more pipefishes were caught using the drag net. A total of 287 pipefishes were caught between Oct 2005 and Sept 2006. There appeared to be significantly more males (n=154) than females (n=112) according to Chi-Square analyses (χ^2=7.39, $p<0.05$, Yates Correction).

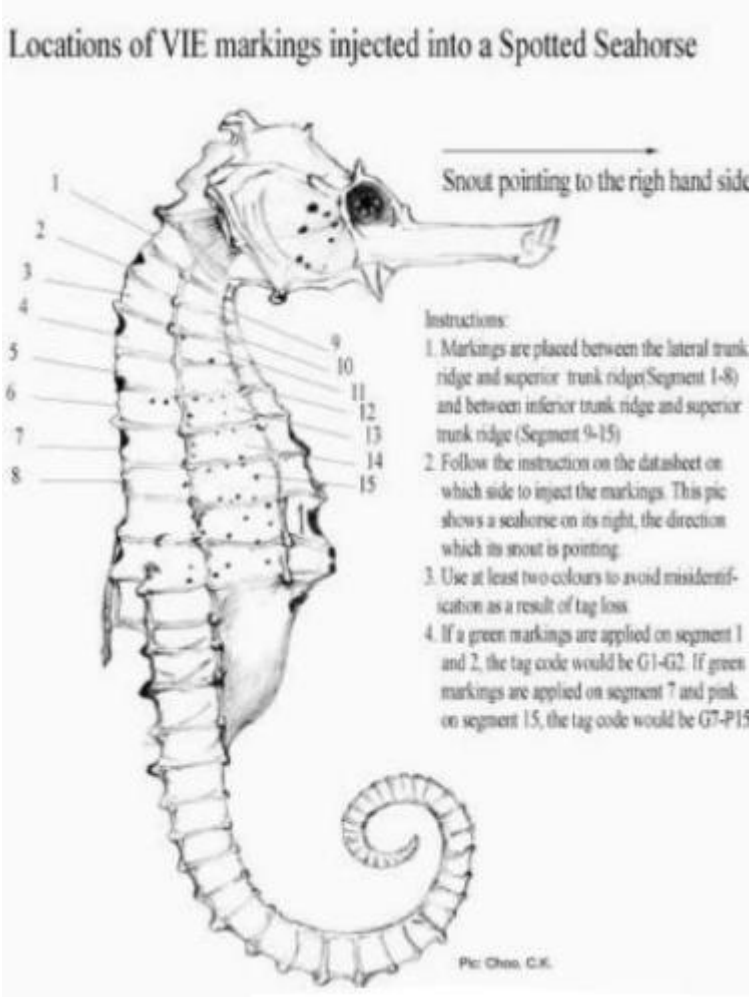


There were no consistencies in the temporal fluctuations in abundance, probably due to an artefact of unequal distribution of pipefishes on the seagrass bed as tow areas were carried out at different sites each month.

The modal length of pipefishes was 22.0 cm, unimodal distribution. Pregnancies occurred throughout the year but peak reproductive season could not be determined.

In March 2007, tagging studies began by using Visual Implant Fluorescent Elastomer (VIFE). Seahorses and pipefishes were visually censured at low tides. Based on the data collected until August 2007, 193 seahorses were tagged. Recapture rate was rather high with 31% tagged seahorses (n=60) encountered more than once. The longest duration of attachment observed was 151 days but only eight individuals had remained on the site for more than 90 days. The tagging study is ongoing.

Male Alligator pipefish are without brood pouch.
The eggs adhered below the abdomen.



A pregnant male trapped among the seagrass and algae at low tide.

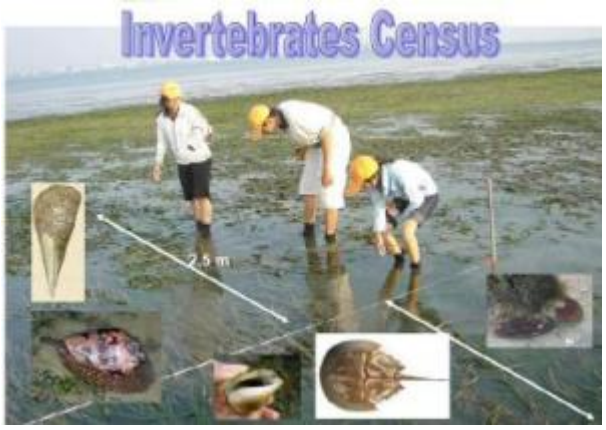
Clipped tail, due to deformities or injuries?

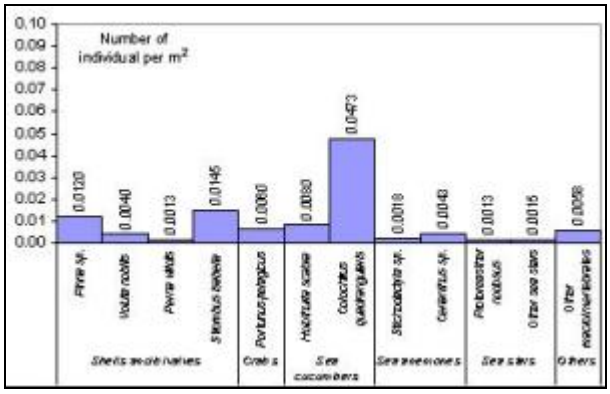
Broken blood veins on pouch

Leeches were rather common on this seahorse population with approximate 50% of the seahorses bearing leeches on their bodies.

4.3 Invertebrates Census

Invertebrates census was carried out on the Merambong seagrass bed along a 50 m transect line. Volunteers were instructed to walk slowly on both sides (2.5 m each) of the transect line and scanned for macro invertebrates. Findings presented below were based on survey from 16 transects.



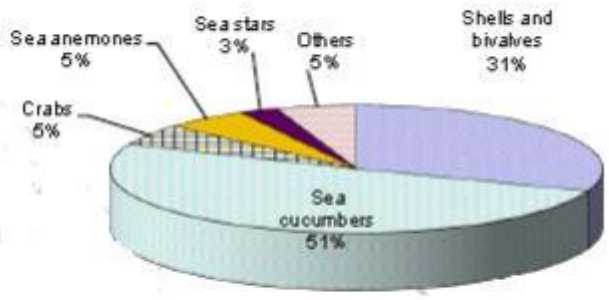


It appears that the dominant macro invertebrate was sea cucumber of the species *Colochirus quadrangularis* which occurred at a density of about 0.05 m-2. This sea cucumber species is about 5 cm long, inedible, pinkish in colour and found attaching to the leaves of the giant tropical eelgrass, *Enhalus acoroides*. The edible type, *Holothuria scabra* occurred in much lower density at 0.008 m-2

Shells and bivalves comprised 31% among other invertebrate groups. *Strombus isabella*, or locally known as "Siput gonggong", was the most common shellfish (density: 0.0145 m-2) and the most sought-after product from this area. This shellfish was collected by hand during low tide and fetched between RM3-5 per kg. In bivalves, the fan shell, *Pinna sp*. Was the dominant type (0.012 m- 2).

Crabs, sea anemones, sea stars and other invertebrate species added up to only 18% of the whole invertebrate groups' abundance. There were several species of crabs but only one commercial species, the Swimming crab, *Portunus pelagicus* was recorded for the purpose of this study. The horseshoe crab, *Carcinoscopius rotundicauda* previously observed on the shoal, was not encountered in the survey.

Both species of sea anemones, *Stichodactyla sp.* and *Cerianthus sp.*, were rare (density: 0.0018 and 0.0043 m-2 respectively). Interestingly they were harvested by the local communities: the former species was taken as food while the later for aquarium trade. Sea stars were occasionally encountered and the most obvious one being *Protoreasther nodusus*, which could attained 30 cm across. Other starfish species found were *Archaster typicus, Anthenea acuta* and *Astropecten vappa.* Invertebrates species in "Others" category included tunicates, sea hare, nudibranch and fireworms.



Pie chart showing the percentage count of macroinvertebrates censused

(Top left): The pinkish sea cucumber, *Colochirus quadrangularis*, was the most abundant macro invertebrates on the Merambong seagrass bed.

(Top middle): Sandfish, *Holothuria scabra*, or locally known as “labi-labi”, were collected by the locals for sale to Chinese market

(Top right): The ball sea cucumber, a burrower, were only found a few centimetres below the surface

(Bottom left): A predatory shell - Volutes, feeding on clams and mussels

(Bottom middle): A Peacock anemone, *Cerianthus sp*. came in a variety of colours

(Bottom right): Rare invertebrates like the Sea Pen, *Pteroides sp.* were occasionally found.

4.4 Seagrass Fish Survey

Seagrass fish survey was conducted only once due to time constraint. A push net was used to survey the fish diversity and abundance at low tide. However, data are not presented here due to low sample size.

A push net was deployed to survey seagrass fishes at low tide. (Right): A couple of trunk fishes and a school of juvenile catfishes (*Plotosus* lineaetus) landed in the net.

(Left :): Filefish (*Monocanthus chinensis* and *Acreichtys tomentosum*) are the most abundant species in the Merambong seagrass bed.

(Right): A species of high commercial value - a juvenile snapper (*Psammoperca* waigiensis) utilizes seagrass meadow as nursery ground

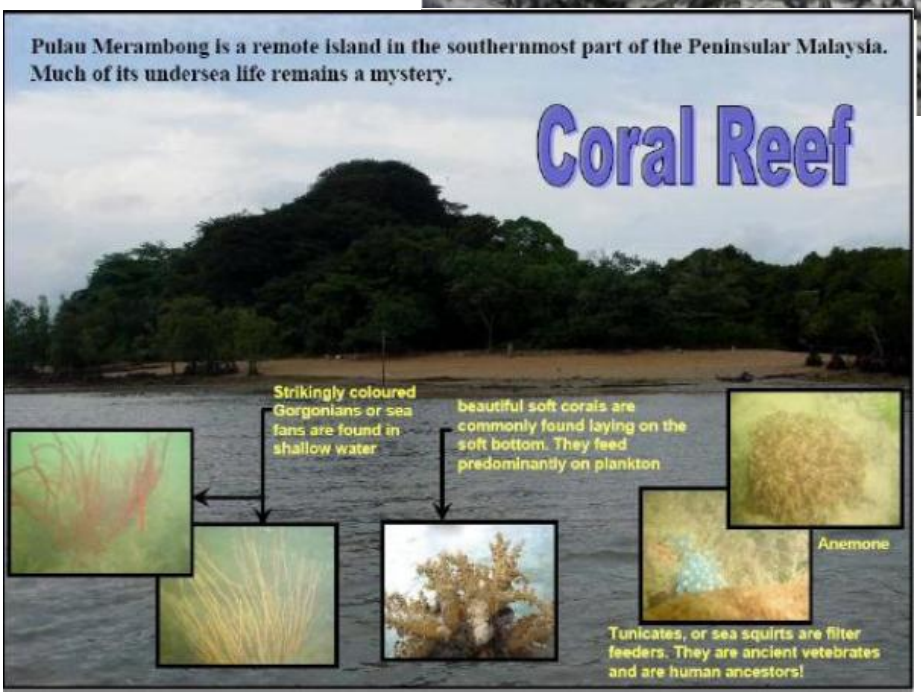
Some data were also collected from local fishermen who deployed other type of fishing gears, notably gill nets.

Fishermen reported that larger fishes were caught outside the seagrass bed, while smaller fishes were caught on the seagrass bed.

The role of seagrass as fish nursery ground is clearly understood.

4.5 Pulau Merambong Inventories

At Pulau Merambong, four genus of mangroves were recorded, namely *Rhizophora mucronata, Sonneratia sp., Avicennia sp. and Bruguiera sp.* The surrounding waters also support a variety of soft coral and rocky



5 PUBLICATIONS

5.1 Brochures

5.2 Poster


SEAHORSE RESEARCH
"Advancing marine conservation"
CONSERVATION
Choo, C.K., Joseph, J.J & Sharifah, N.S.
Investigating areas of high seahorse population abundance
Pulai River Estuary, Johor
Mapping seahorse habitat and understanding habitat preference
Examining health states (parasites, physical injuries etc)
OUTREACH ACTIVITIES
Tagging using visual implant elastomer to monitor seahorse biological parameters
GENETIC STUDIES ON
- MATE FIDELITY
Withdrawing embryos and larval from seahorse, Hippocampus kuda brood pouch (left) and eggs from pipefish, Syngnathoides biaculeatus
Samples are subject to maternity study using microsate DNA
About Seahorses...
What is SOS ?

5.3 Volunteers Handbook

5.4 School Education Modules

5.5 T-shirts and badges

5.6 Project Highlights in the Local Media Press

- NTV7 Edisi Siasat, 8, 14 Sept 2007. Seahorses
- Merdekareview, 3 Sept 07. Seahorses threatened by southern Johor development.
- The Star, 8 Aug 2007. Save Our Seahorses. Letters by Sahabat Alam Malaysia
- New Straits Times, 4 Aug 2007. SOS to save Sungai Pulai
- News Straits Times, 26 July 2007. Fishermen fight to save livelihood
- Malaysian Nature Society Newsletter, Aug 2007. Saving the world, one seahorse at a time
- News Straits Times, Aug 27 2006. Seahorse in perils
- New Straits Times. 10 March 2007. Save Our Seahorses. Focus.
- New Straits Times. 30 Sept 2006. Do: Save our seahorses.
- New Straits Times. 27 Sept 2006. Nation's biggest seagrass area under threat.
- Berita Harian, Sept 9 2006. SOS Kuda Laut
- The Star. 20 June 2006. For the love of seahorse. StarTwo.

SOS has also been featured on a number of websites, forums and blogs thanks to the ex-volunteers.

6 Public Talks, Seminars and Exhibitions

Since April 2006, SOS has been given the opportunity to give a number of public talks and seminars at the national and international levels. Details are as follow:

Date	Topics	Location	Organizer
9 Sept 2007	Save Our Seahorses	Taman Tasik	Raleigh International
2 Aug 2007	Development and conservation of Pulai River	Estuary Skudai, Johor	Suara Rakyat Malaysia (SUARAM)
1-5 July 2007	Conservation of the Pulai River Estuary – an uphill battle	Nelson Mandela University, South Africa	Society of Conservation Biology
3 Mar 2007	Save Our Seahorses	Malaysian Nature Society Headquarter	Malaysian Nature Society
3 Mar 2007	Save Our Seahorses	National Science Centre	Malaysian Society of Marine Sciences
16 Oct 2006	Save Our Seahorses	Bukit Timbalan, Johor Bahru	Department of Drainage and Irrigation
9 Oct 2006	Save Our Seahorses	Universiti Malaysia Terengganu	Malaysian Nature Society Terengganu
27 Aug- 30 Sept 2006	SOS Exhibition	Underwater World Langkawi	Underwater World Langkawi
14-17 Sept 2006	Marine Conservation PADI Project AWARE. Talk and Exhibition	Coral Island Resort	Pulau Redang DragonNet Diving
12 Dec 2006	Ford Motor Conservation and Environment Awards 2006	GlenMarie Hotel, Subang Jaya	Ford Motor Company
12-17 July 2006	Population ecology of the Spotted Seahorse	Sheraton New Orleans Hotel, New Orleans, USA	Society of Ichthyologist and Herpetologist

Choo representing SOS (first from left) as one of the recipients at the Ford Motor Environmental and Conservation Awards 2006.

7 POLICY DEVELOPMENT AND CONSERVATION ACTIONS

12 Aug 2007
Presented to the members of the Suara Rakyat Malaysia (SUARAM) regarding the proposed industries development, prompting discussion and suggestion.

Aug 2007
Drafted numerous letters addressing the concerns of proposed petrochemical station and maritime industries to the Pulai River Estuary ecosystem. Letters were addressed to the State Minister, Economic Planning Unit, Department of Environment, Ministry of Natural Resources, Seaport Worldwide (project proponent), EIA consultant, various NGOs.

Distribute photocopied reports on Comprehensive Environmental Impact Assessment the local communities who had limited access to the information.

In the wake of the proposed development of petrochemical and maritime industries, SOS has launched petitions to save the seahorses at Pulai River Estuary on 29 July 2007. (http://www.thepetition.com/2 /help-save-the-seahorse. About 3,000 people worldwide rallied to sign the petition.

23 July 2007
Meeting with the Fisheries Department pending establishment of protection policies for seahorses.

18 July 2007
Presented to the Port of Tanjung Pelepas entitled “Green Port”. The purpose of presentation was to provide background knowledge for the port community to integrate environmental initiatives into their corporate mission.

May 2007
Submitted draft proposal for designation of the Merambong Seagrass bed as RAMSAR site on request by the Johor National Park after the Director and Deputy director’s visited the Merambong seagrass bed and Pulau Merambong on 16 April 07

14 April 2007
In depth discussion with the Indigenous Seletar Fishermen Chief on various development issues that affect their livelihood,

19 Mar 2007
Meeting with the Johor Bahru City Development Authority. Obtained information on the Iskandar Region Development (IDR).

6 Oct 2006
Discourse on seahorse conservation at Sungai Pulai, Meeting Room, Department of Drainage and Irrigation, Department of Drainage and Irrigation,

June 2006
Called by the Majlis Perbandaran Johor Bahru Tengah for hearing on previous comments on proposed development at Tanjung Kupang district. On request for more information, an impromptu PowerPoint presentation was made. The Johor Bahru City Development Authority had later requested some data for preparation of development planning.

…….
Numerous dialogues/discussions were held with the local communities on plans for the Pulai River Estuary conservation and possible alternative source of livelihoods. These are ongoing.

8 PROPOSED PROJECT ACTIVITIES 2007-2008

The present project activities will be continued through 2008, focusing on research, education and conservation. Emphasis will be given to development of skills among the local community in resource inventories. In addition, a handbook on the Pulai River Estuary will be produced.

Program Activities	2007			2008								
	Oct	Nov	Dec	Jan	Feb	Mac	Apr	May	Jun	July	Aug	Sept
Seagrass Workshop, Mapping and Monitoring												
Recruitment of, rapport and consultation with, the local community members												
Workshop on seagrass assessment techniques and *in situ* training for local community												
Workshop on data analyses, interpretation and discussion on management options for local community												
Seagrass mapping												
Seagrass monitoring												
Syngnathids Survey												
Seahorse and pipefish tagging survey												
Marine education and awareness at local schools												
At Sek Kebangsaan Tanjung Kupang X 30 students												
At Sek Men Tanjung Adang X 30 students												
At Sek Men Gelang Patah X 30 students												
Production of Marine flora and Fauna Handbook of Sungai Pulai												
Photography, identification and description												
Photos compilation, writing and editing												
Proofreading and reviewing												
Printing and publication												
Report writing and submission												

9 Budget and Expenditure (April 2006 – Aug 2008)

	Items	Detailed explanation of expenditures	RM$	Sterling £
Capital Costs	Rental of research office	Conduct briefing for volunteers and education centre	4800	738.5
	Furniture and basic facility extension	Mattress, fans, kitchen, tables and chairs	800	123.1
	Global Positioning System	Measuring field survey coordinates	1800	276.9
	Digital Camera	Photos taking and records	1600	246.2
	Binoculars		200	30.8
	Walkie talkie X 4	Group coordination during field work	750	115.4
	Subtotal		9950	1530.8
Travel Accommodation	Land transport	Fuel, travel allowance, vehicle use	15000	2307.7
	Airfare	Budget air travel – meeting and giving public lectures	800	123.1
	Lodgings	For project staff & coordinators	3000	461.5
	Boat rental	Carry out field inventories (8 volunteers per pax)	8000	1230.8
	Food and beverages	Community and school events	5000	769.2
	Students' field visits	Boat+transport arrangement	3000	461.5
	Subtotal		34800	5353.8
Research Materials	Handouts and manuals	Given to volunteers during briefing	300	46.2
	Seahorse tags (using visual implant elastomer)	Monitoring abundance, movement, reproduction and growth	2500	384.6
	Herbarium materials (plant presser, chemicals and mounting)	Preparation of seagrass and algae for research, exhibition, education purposes	600	92.3
	Dive booties X 12	Field work	800	123.1
	Stationeries		300	46.2
	Subtotal		4500	692.3
Education Materials	Posters, brochures, newsletters	Awareness raising	2000	307.7
	Badges	Awareness raising, gift for volunteers	500	76.9
	Education modules	Marine environment education for school kids	1000	153.8
	Stationeries	Drawing and colouring materials, souvenirs and gift	800	123.1
	T-shirts X 300	Awareness raising	3000	461.5
	Printing and photography	Printing inventory report, management plan, certificates etc	1500	230.8
	Subtotal		8800	1353.8
Others	Phone calls/fax/courier		900	138.5
	Miscellaneous		1200	184.6
	Subtotal		2100	389
	GRAND TOTAL		**60150**	**9253.8**

APPENDICES:

Date	Time	Calendar Activities	Volunteers/Facilitators
2006			
APRIL			
28	0600-0800	Seagrass mapping	Kuah Peik Khee
			Tan Hong Wai
			Berney Cheong Swee Aun
			Tan Chen Kang
			Teng Wei Khoon
			Ma Choo Thye
			Nadia Yap
29	0600-0800	Seagrass mapping Syngathids survey	Kuah Peik Khee
			Kuah Peik Khee
			Cheng Shu Ian
			Ong Eu Juan
			Hai Zheng Hao
30	0600-0800	Syngnathids survey	Cheah Lye Heng
			Hing Kwee Eng
			Tan Hong Wai
			Berney Cheong Swee Aun
			Teng Wei Khoon
			Ma Choo Thye
			Tong Tuck Kong
MAY			
28	0600-0800	Seagrass mapping Merambong mangroves survey	Low Poh Chuang
			Chan Kok Leong
29	0630-0830	Syngnathids survey Seagrass mapping	Gwee Poh Ping
			Indra Farid bin Idris
	1400-1800	Mangroves Conservation Education at Sek Tanjung Kupang	Nurul Zulikha bt Zakariya
			Aziana bt Ahmad Pauzi
			Mohd Nur Nazaqul Hakimi
			Hing Kwee Eng
			Hilary Chiew
JULY			
27 28	0630-0800 0700-0900	Seagrass mapping Syngnathids survey	Nadia Yap
AUGUST			
12	0700-0930	Syngnathids survey	Tan Chong Lii
			Nadia Yap
13	0730-0930	Syngnathids survey	Nadia Yap
			Tan Chong Lii
25	0700-0830	Seagrass mapping Syngnathids survey	Maizah bt Mohd Abdullah
			Busra bt Ibrahim
			Farah Diyana bt Mohd Fathi
SEPTEMBER			
9	0630-0900 1700-1900	Seagrass mapping Syngnathids survey	Chong Kok Kit
			Wong Wai Kong
			Lim Teng Han
			Teou Ming Ming
			Leonard Chee Sze Kok
			Chee Pooi Ling
			Tay Lay Pheng
			Murugasundaram Annamalai
10	0630-0900	Seagrass mapping Syngnathids survey	Chong Kok Kit
	1700-1900		Wong Wai Kong
			Lim Teng Han
			Teou Ming Ming
			Leonard Chee Sze Kok
			Chee Pooi Ling

			Tay Lay Pheng
			Murugasundaram Annamalai
	1400-1900	Seagrass Conservation Education 1400-1900 at Sek Men Gelang Patah	
29	Whole day	Fishermen and indigeous 29 whole day Seletar socioeconomic survey	Yap Lee Chuen
			Asar Zaim b. Ishak
			Mohd Masrul Masduki
			Aimi Farhana Noor bt Ahmad Zaini
			Nor Azmaliza Salleh
			Mohd Zahid b Moh Sabri
			Yusuf Shuaib b Ibrahim
30			Chan Gyn Ghee
			Mohd Asrul b Mohd Azmi
			Adam Malik
			Mohd Zaid b Hamzah
			Syed Mohd Danial
			Nurul Atifah
			Mohd Zulfaizal b Suhaimi
OCTOBER			
7	1400-1700	Seagrass Conservation Education at Sekolah Rendah Tanjung Kupang	Mohd Luthfi Omar
			Daniel Hafiz Mohd Hamdan
			Nor Alfadhilah Abd Ghani
			Nurulnadia Mohd Yusof
			Siti Mawami Murat
			Fatthima Hussain
			Noor Azlin Othman
			Noor Maiza Mohd Razali
8	1400-1800	Mangroves Conservation Education at Sekolah Rendah Tanjung Kupang	Yeong Yee Ling
			Mohd Fahmi bin Mohd Zam Zam
			Mohd Faizal b Mohd Nadzari
	1700-1900	Seagrass bed visit: SeagrassWatch International and TeamSeagrass	Len McKenzie
			Rudi Yoshida
			Siti Maryam Yaacob
2007			
FEBRUARY			
1	1700-1900	Visit newly established seagrass bed Seagrass mapping Seagrass monitoring Seagrass invertebrates survey	Rosli Hussein
			Nizam Hairom
			Zuriana
			Lily Tokiman
		With assistance from: Port of Tanjung Pelepas Johor National Park KUSTEM undergraduates	Noor Syazwani Baharuddin
			Noraine Salleh Hudin
			Nurhidayah Ishak
			Noorsakinah Md Noor
			Wan Farah Hanim Wan Muhamad
			Shuhada Ahmad Shukri
			Salwa Kamisan
			Nor Faizaitul Akma Bt Kamaruzzaman
			Nor Zulaikha Bt Che Mat
			Roshila Bt Riduan Shah
			Siti Nurashriah Bt Solahudi
11	0900-1500	Marine education and awareness for local school kids (seagrass and mangroves module) Participation of 24 school kids from Sek Tanjung Kupang	Saidatul Atyah Mohd Apendai
			Nurul Alyani Yusof
			Chang Kew Fon
		Facilitators from KUSTEM undergraduates	Sharifah Norlida Saidati
			Najiha Sudin
			Aqilah bt Mohd
			Siti Badariah Jemain
			Norzaliza Usali
			Cheku Akmar Che ku Othman
			Sharmile

			Suhaitah
			Zaila
			Sri Shasita
MARCH			
1	1630-1900	Visit to seagrass at muddy bank Seahorse and pipefish survey Seagrass mapping	Choo Thye Ann
			Ti Say Kwan
			Neoh Gaik Ping
2	1700-1900	Seagrass monitoring for Sek Men Tanjung Adang Facilitators from KUSTEM undergraduates Seagrass fish survey	Idayanti Ishak
			Effarina Mond Faizal
			Asuar Ayunni Anuar
			Zatul Himmah
			Nur Shela
			Amelia Baizatul Raiha
			Mimi Aida Norsuriana
			Chan Siao Ee
			James Chue Tze Wen
			Lim Su Ping
			Or Oi Ching
			Tan Khee Boon
			Long She Ling
3	1200-1300	SOS talk at Malaysian Nature Society Head Office, Jln Kelantan, Selangor	MNS members
	1500-1600	SOS talk for Malaysian Marine Science Society (MMSS), Pusat Sains Negara	MSMS members and public audience
16	1600-1800	Seahorse and pipefish tagging	Ong Ay Shin
			Louis Cheng Hao Qian
			Liew Li Lian
			Cheong Kai Liang
			Hilary Chiew
			Louisa Ponnampalan
17	1630-1830	Seahorse and pipefish tagging	Kuah Peik Khee
			Kick Lee Yee
			Je Chze Hao
			Louisa Ponnampalan
18	1700-1900	Seagrass mapping PTP seagrass bed): with assistance from the Johor Branch Malaysian Nature Society and the Port of Tanjung Pelepas	Dr. Ng Bee Khoon
			Dr. Lum Wei Wah
			Zalinah Sarpan
			Derik Basir
			Azam Muda Sulaiman
			Muhamad Nizam Hairom
			Akim Affandi Ahmad
30	1600-1830	Seahorse and pipefish tagging	Noorsalwati Nordin
			Chong Chew Hoon
			Ho Jian Chyuan
			Lim Seng Jwee
			Lee Jin Min
APRIL			
1	1700-1900	Seagrass walk Seahorse and pipefish tagging	**Education tour for Sek. Men. Pei Khoon**
			Jefferty Yong
			Boon Siew Ung
			Teo Ai Ling
			Ng Shing Yun
			Kwek Li Pang
			Tee Wei Ting
			Low Hui Fen
			Wee Hian Kuan
			Loh Song Xin
			Teo Zhen Zhuo
			Evelyn Chong Zi Ting
			Yeo Tong Song
			Chai Chin Peak

			Public volunteers/facilitators:
			Chin Wee Yan
			Sing Cheu Leng
			Lua Song Ying
			Koh Kai Chun
15	1700-1900	Pulau Merambong coastal biodiversities inventories	Luo Song Ying
			Koh Kai Chun
			Irene Tan
			Nicola Bisset
16	1700-1900	Seagrass mapping (PTP seagrass bed): participation from the Port of Tanjung Pelepas, Yayasan Anak Warisan Malaysia, Johor National Park	Nicola Bisset
			Muhamad Nizam Hairom (PTP)
			Akim Affandi Ahmad (PTP)
			Derek Basil (PTP)
			Azura bt Shariff (YAWA)
			Lily Tokiman (Johor Park)
			Zurina (Johor Park)
20	0630-0900	Seahorse and pipefish tagging	Teng Nong Tee
			Ariati Sari Ibrahim
			Syahar Amir A. Gani
			Toh Chih Kang
			Low Boon Keat
			Nicola Bisset
21	0700-0930	Seahorse and pipefish tagging	Kuah Peik Khee
			Teoh Siow Mei
			Ariati Sari Ibrahim
			Syahar Amir A. Gani
			Toh Chih Kang
			Nicola Bisset
29	2030-2300	Tanjung Kupang Fishermen Association Meeting	Closed session
MAY			
13	1400-1800	Marine Education Program for Indigenous Seletar kids at Kampung Simpan Arang, Gelang Patah	Kuah Peik Khee
			Zurina Jaafar
			Bakhtiar Jaafar
			Nicola Bisset
18	0630-0830	Seahorse and pipefish tagging	Leong Zi Ping
			Yeow Kar Hui
			Ng Zhen Yee
			Siow Lip Khai
			Tan Jie Ru
			Pee Lu Kar
19	0700-0900	Seahorse and pipefish tagging	Dave Won Choon San
			Lau Ching Fong
			Lee Hui Hui
			Kelven Lee Chen Chin
			Melisa Pang Jiun Shan
			Yong Kuan Yew
20	0730-0930	Seahorse and pipefish tagging	Khoo Men fun
			M. Matsumura
			Choo Wooi Sing
			Tey Meei Shya
			Khoo Shinvy
			Melisa Pang Jiun Sha
JUNE			
16	0630-0830	Seahorse and pipefish tagging	Cheah Hooi Giam
			Iveen Tan
17	0700-1000	Seahorse and pipefish: volunteers from Malaysian Nature Society (Selangor Branch, Marine Group)	Khor Hui Min
			Lilian Khoo
			Lim Eng Hoo
			Lee Wai Ngan, Lisa
			Andrew Paul Raj

			Chong Lee Ai
			Lim Siew San, Susan
			Lim Siew Hoon, Tammy
			Yong Su Mei
			Wendy Chin
			Hoe Pek Ch'ng
			Guoy Lee Le
			Juliana Solomon
			Murali Pillai
			Balakrishna M Pillai
			Aimi binti Mohd. Fahmi
18	0700-0930	Seagrass mapping and monitoring	Syafidatul Azua Shafi'i
			Gwee Poh Ping
			Muhamad Nizam Hairom
			Rosli bin Hussein
			Hanuar
	1100-1230	Dialogue with Port of Tanjung Pelepas	Syafidatul Azua Shafi'i
			Gwee Poh Ping
			Sharifah bt Suraini
JULY			
3	0730-0930	Seahorse and pipefish tagging	Gwee Poh Ping
			Loke Jin Wong
			Cheong Peck Chuan
			Fang Pei Fen
			Law Shea Nye
4	0800-1000	Seahorse and pipefish tagging	Yeong Yee Ling
			Loke Jin Wong
5	0830-1030	Seahorse and pipefish tagging	Yeong Yee Ling
			Loke Jin Wong
16	0630-0900	Seahorse and pipefish tagging	Loke Jin Wong
17	0700-0900	Seahorse and pipefish tagging	Loke Jin Wong
			Syafidatul Azua Shafi'i
18	0730-0930	Seahorse and pipefish tagging	Loke Jin Wong
			Syafidatul Azua Shafi'i
AUGUST			
1	0630-0900	Seahorse and pipefish tagging: Filming by NTV7	Gwee Poh Ping
			Saidatul Atyah
2	0700-0900	Seahorse and pipefish tagging: Filming by NTV7	Gwee Poh Ping
			Saidatul Atyah
3	0730-0930	Seagrass monitoring: participation from Port of Tanjung Pelepas	Nizam b Hairom
			Akim Affandi Ahmad
			Rosli bin Hussein
14	0630-0830	Seahorse and pipefish tagging	SOS members
15	0630-0830	Seahorse and pipefish tagging	Sunita S Sothi
			Ravichandran Sinnappah
			Priya Darshini