Marine Conservation Cambodia Report of Protection of Seahorses

December 2007 – April 2010

Figure 1 - Paul Ferber 2008 and Cover Image

In Partnership With:

Report By:

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Acknowledgements

Thanks are due to a great many people for helping to make the project a success. Of prime importance in the establishment and continued work carried out are the Fisheries Administration of Cambodia in Phnom Penh and in Kompong Som for their support and the Community of M'Pai Bei on Koh Rong Samleom who have provided the project with a home.

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Introduction

Seahorses (*Hippocampus sp.*) are benthic creatures, they are included within cities appendix 2 and are classed by sub decree of the royal government of Cambodia 12/9/09 as endangered species within Cambodia. They are a carnivorous predator, feeding upon shrimp, juvenile fish and crabs (Kuiter 2009*)*. The primary research site used by Marine Conservation Cambodia, the Corral, (see fig 2 –community conservation area around Koh Koun) is a seahorse breeding ground that contains five or six possible species of seahorses, out of a possible nine for the whole of Cambodia although independent verification is currently required. The Corral is a diverse benthic habitat with a sandy sea floor sloping away from Koh Koun. The sand flat is between 5 - 14m deep and gradually drops to 30m towards the north end. This habitat is unusual in its abundance of seahorses as they are generally found in and around seagrass beds, estuaries and reef edges (FiA CITES doc Oct 09). The area is open to the currents which can be very strong. There are many species of fish, crab and shrimps in the area including several schools of large Golden Trevally (*Gnathanodon specious)* and several species of sharks and rays. In 2007 a large abundance of seahorses was observed but in the following years numerous vessels, bottom trawling, often specifically for these creatures, have decimated the populations from many areas around Koh Rong Samloem. The data presented below is split into two sections, 2007-2008 and 2009-10. The latter covers the period immediately following the introduction of the community fishing zone and community conservation area (ref FiA) which protects the seahorse breeding ground as a no-take zone. The Data from 2007 till 2009 is limited to random photo surveys whilst the data from 2009 to 2010 was conducted using scientific survey methods.

There has been limited research into seahorses in Cambodia previously, however early indications are that there is an unusually high variety of species and, until recently, were around in healthy quantities. Due to the lack of research locally there is great potential for advances in our understanding of seahorses in Cambodia.

Until now it has been difficult to carry out extensive surveys and data collection on the seahorses and seahorse habitats in Cambodia, this is mainly due to the large amount of illegal and destructive fishing activities within their main habitats not allowing for continuous monitoring of survey areas. As the main seahorse research areas are now protected by the community of Koh Rong Samloem we hope to be able to collect and collate much more accurate studies. This report show the disruption in population numbers around the times of illegal and destructive activities and the slight increase in population numbers since the beginning of regular community patrols and protection.

Locations Map

Below is a map which shows both the current research area, the Corral, and sites surveyed over the past two years which have the potential to be very successful as Seahorse Breeding Grounds around Koh Rong Samleom, Koh Koun and Koh Rong.
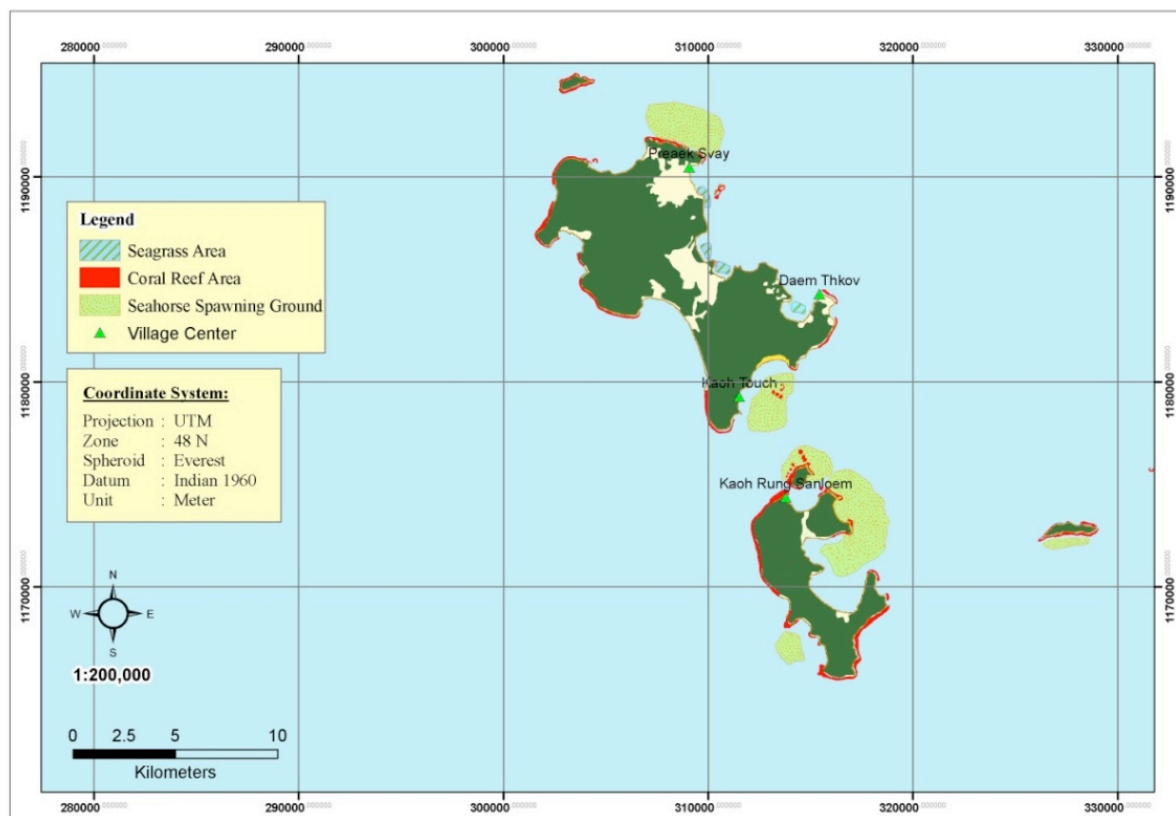
Figure 2 - Map of Seahorse Breeding Grounds

Methods

Species and Abundance

We are currently using two different survey methods in our seahorse research:
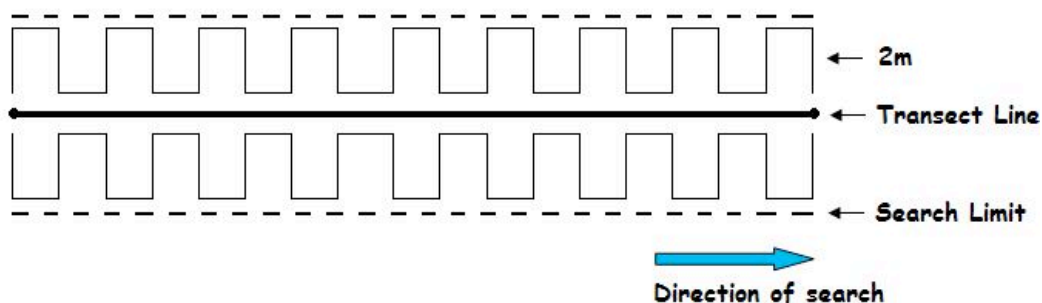
Transect diving – A 30m line is laid out along a previously determined bearing within a certain depth. Two divers explore 2m either side and record any seahorses located. Photographs are taken where possible and a dive master is present for safety and to try and ensure nothing is overlooked.
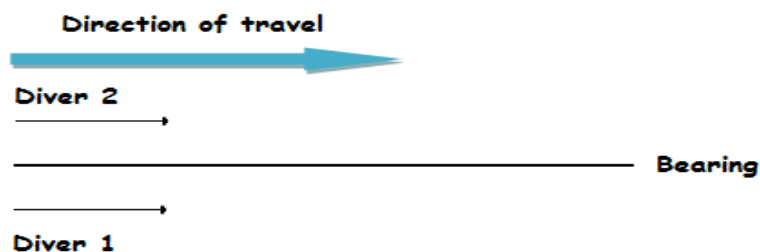
Random stratified sampling – The dive area is randomly selected allowing the divers freedom to search without the limitations of a more structured search.

On finding a seahorse, measurements are taken to show:

- Depth
- Sex
- Species
- Lengths of trunk and tail
- Substrate type

When possible photographs are taken to help with accuracy in measuring and species identification.

Figure 3 - Measuring the head length (Stuart Simpson 2009)

Repopulation and Recovery Research

Using the survey methods as above with specific attention focused on the recording of any pregnant individuals and any juveniles. This information will assist with helping to monitor the recovery rates and the current population.

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Results

A total of 236 seahorses have been observed and reported on research dives conducted throughout September 2009 and through to the end of March 2010, since research was intensified following the introduction of the Community Conservation Area. These results are taken from data collected by volunteers given prerequisite training in survey methods and seahorse identification.

Seahorse Microhabitats

Seahorses were found primarily attached to sea urchins (Cidaridae), abandoned fishing nets, rocks or sea pens (Fig. 4). Two percent of the seahorses sighted were free swimming over the sandy substrate (Fig. 4).
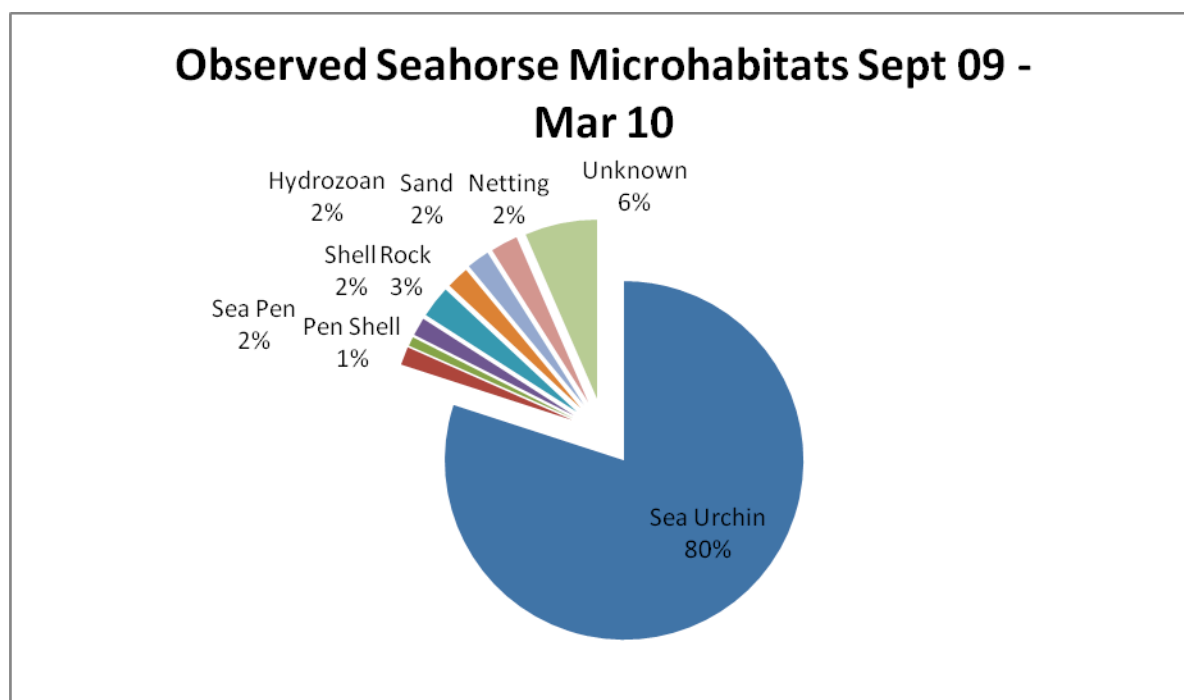
Figure 4 - Seahorse attachment sites shown by percentage. Data collected from September 09 to March 2010.

Research conducted over a longer period shows that seahorses attach to a wide variety of habitat types (Fig. 5). Sea urchins (Cidaridae) are still shown to be the primary microhabitat that the seahorses attach to as well as being sighted on rocks, discarded fishing nets, hydrozoans, sponges and swimming over sand.

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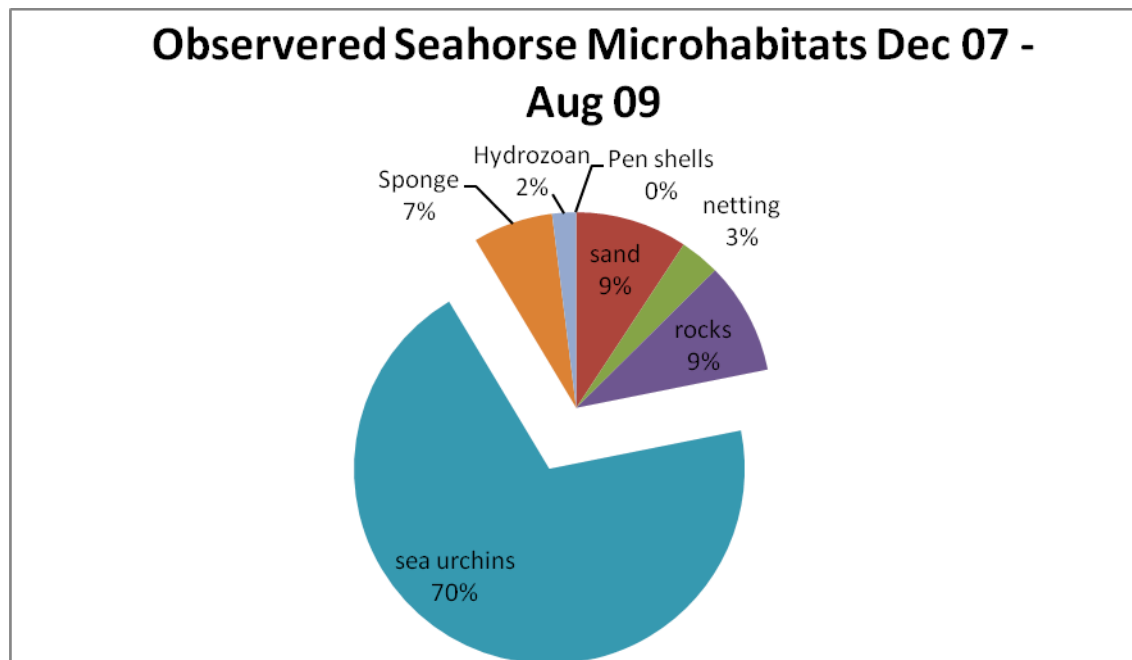
Figure 5 - Seahorse attachment sites indicated in percentages. Data collected from December 2007 to August 2009

Gender Diversity
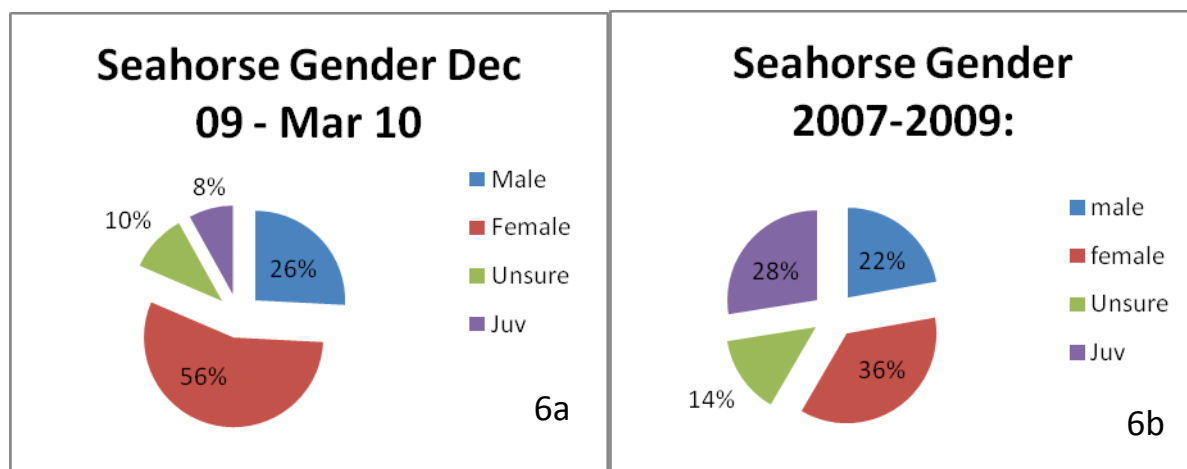
Figure 6 - Percentage ratios of male and female seahorses sighted. Juveniles are marked down separately as it is hard to determine sex. Figure 3a data collected September 09 through to March 2010. Fig 4b data collected from Dec 2007 through to Aug 09

The seahorse population is heavily skewed towards a female bias when compared to males (Fig. 6). The 10% (Fig. 6a) and 14% (Fig. 6b) where gender had not been determined was due to the size of the seahorses, as some found were only 10-20mm

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Population Recovery Data
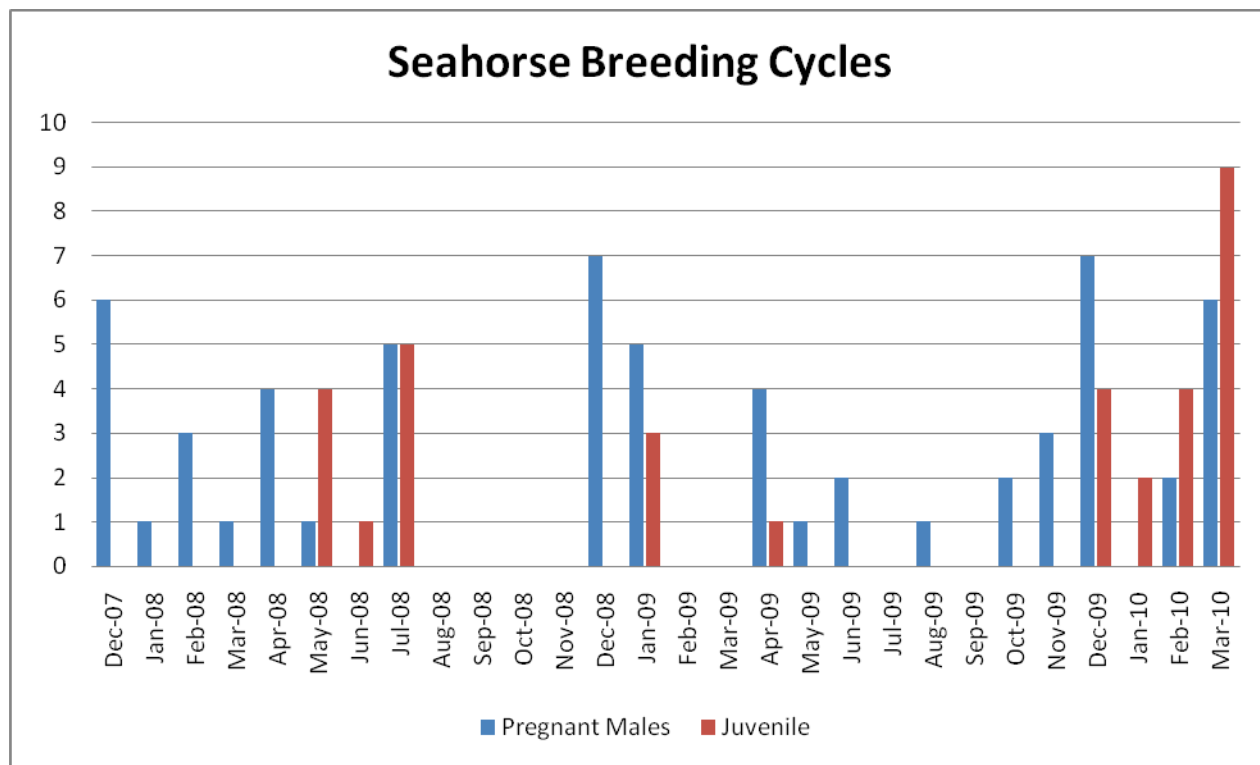
Figure 7 - Number of individual seahorses observed comparing pregnant males and juveniles found during the period Dec 07 to Mar 10

Both juveniles and pregnant males are present throughout most of the year (Fig. 7), however pregnant males have been observed in greatest numbers December, with the highest levels of juveniles observed March 2010 (Fig. 7)

Figure 8 - Pregnant Male Seahorse (Paul Ferber May 2008)

Monthly Seahorse Averages
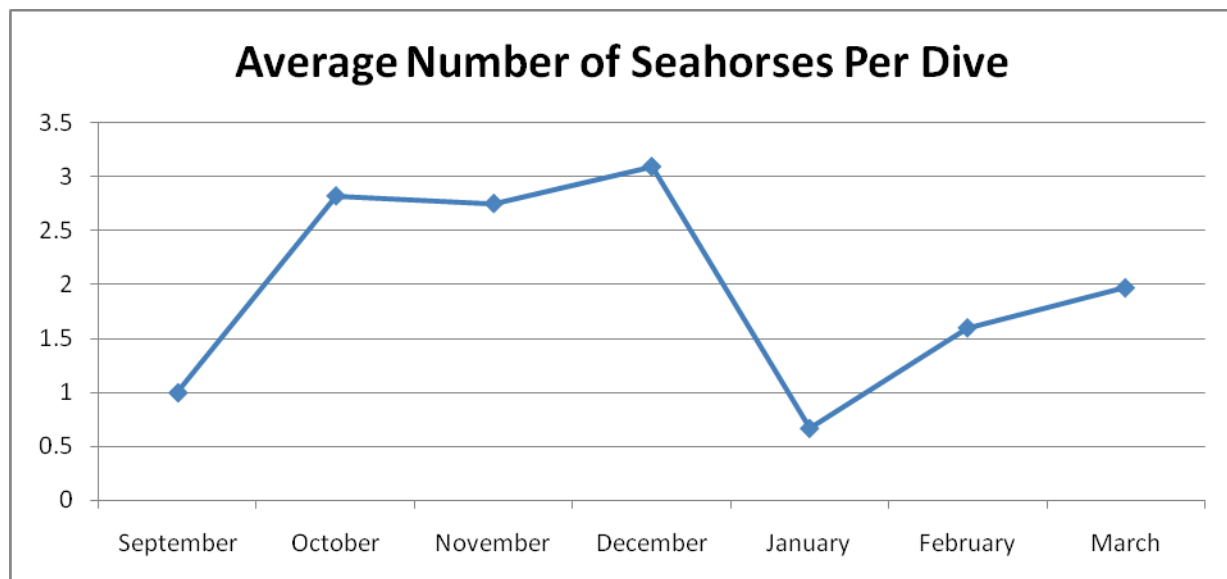
Figure 9 - average numbers of seahorses observed Sept 09 to March 10

Fig (9) shows the number of seahorses seen during a month averaged out per dive at the seahorse breeding grounds. This allows for a representation which, despite differences in numbers of dives due to weather and other considerations beyond project control, gives an accurate picture of seahorse numbers.
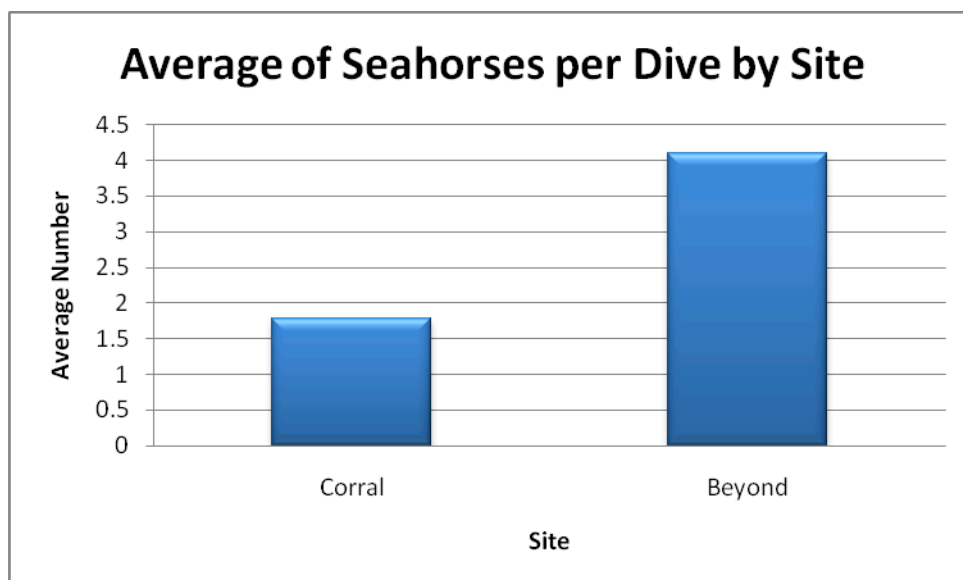
Figure 10 - average seahorse numbers comparing two main dive sites.

Fig (10) gives the average numbers of seahorses found per dive at the original, protected breeding ground, the Corral and the new site, Beyond, showing that Beyond is currently the more consistent for finding seahorses.

Conclusions

Breeding and Habitats

It appears that there is a trend for seahorses to breed throughout the year (Fig.7) indicated by both the amount of juveniles and the months when pregnant males are sighted. With continuing research into the breeding trends throughout the year and general seahorse behaviour in Cambodia, it will be determined if different species are breeding at certain times of the year or if some species tend to breed all year round. In addition, with more in-depth research into the species in Cambodia it should be possible to see if there is any inter-breeding of species and whether or not these couplings are sterile or produce genetically diverse offspring.

The most common habitat for seahorses appears to be on sea urchins (Cidaridae). This favouring of sea urchins (Cidaridae) over other objects has been a consistent trend over several years. There are two possible reasons for this:

1) It gives them a secure anchor stopping them drifting away from their territory in strong currents (Kuiter, 2009).
2) It provides them a significant level of protection, shielding themselves from predators with the spines from the urchin (Kuiter, 2009).
3) Potentially the movement of the sea urchins disturbs small benthic species allowing for more feeding opportunities on these creatures by the seahorses (as observed during dives at the Corral).

The removal of this favoured microhabitat by either dredging or trawling can cause catastrophic consequences to the seahorse populations. Seahorses that escape being caught in the same nets are left defenceless, without protection from natural predators and strong currents. This removal of sea urchins (Cidaridae) and the other microhabitats has been damaging to the entire unique ecosystem of the Corral.

From August through to November 2008 there was a lack of underwater seahorse sightings despite research dives continuing to be carried out. In this period the Community stopped a Vietnamese fishing boat which had illegally caught 74 seahorses and other

Figure 11 - (Lawrence Alex Wu, MCC, 2009).

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members of the Syngnathidae family *Syngnathoidae* and were destined for sale

During dives at the beginning of 2008, it was possible to observe anywhere between 35 and 55 seahorses. Although observing these large numbers was not standard at the time, it was not unusual to see significant numbers (over eight) each dive (Paul Ferber, MCC, 2009). However targeting by vessels using bottom weighted trawl nets, and removal of seahorses by supplied air fishermen meant that the numbers have been dramatically reduced (Job *et al.,* 2002). Now, at the end of 2009, the maximum seen on a single dive has been 14 seahorses, between several survey groups. During the continuing research, there are some indications that the populations are starting to recover (Figs.7 and 9) and there is reason for an optimistic outlook due to the numerous pregnant males sighted in December 2009 and March 2010.

Fishing and destruction caused by trawling boats is a non selective pressure not discriminating between male, female or juvenile seahorses (Giles *et al.,* 2005 Job *et al*., 2002). The establishment of the Community Fishing Area and Community Conservation Area in June has allowed for a total ban of fishing on the Corral. It was introduced to help protect the breeding grounds as seahorse numbers had dramatically declined, and continuing observation will show a slow, but steady recovery of numbers as the community patrols with the support of the Sangkat and Marine Police keep any illegal activity to a minimum.

Abundance

During the last seven months, close watch has been kept on the numbers of seahorses which have been found on each dive at not only the Corral, but other sites where Seahorses are known to be found. To present an accurate figure, the average number of seahorses found per dive were charted. It can be seen in (fig. 8) that there was a sharp decline in number in January, possibly due to the reappearance of the fishing vessels which target seahorses. The added protection this year from the community patrols and a number of anti-trawling devices however did not allow for a long period of intensive trawling and fishing so it appears that the numbers have made a good recovery.

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There are two primary seahorse zones currently under study. The Corral and a site locally known as Beyond Out There, the latter of which is a deeper site (18-22m) with a rockier substrate. The difference in the numbers of seahorses at the two sites as observed in March 2010 appears to be indicative of the fishing pressure on the Corral. At Beyond Out There, it has so far been standard to see up to nine seahorses on a single dive, with an average of 4.7 per dive as opposed to the 1.48 average found at the Corral. This difference would become more pronounced if dive times were also taken into account as the added depth at Beyond Out There only allows for dives to a maximum of 35 minutes whereas standard dives at The Corral take 60 minutes.

As stated previously, it has been observed that The Corral is targeted by fishing with both supplied air and bottom trawling and this has had a large impact on the seahorse population. It appears that Beyond Out There escapes the high level of fishing and so is reasonably healthy. Reasons for this lack of attention are believed to include the presence of many large boulders near to the habitat making trawling difficult and potentially very damaging to the trawl gear and primarily the fact that it has so far not come to the attention of the fishing communities as somewhere to search for Seahorses.

With this information in mind it would be well worth considering making Beyond Out There into a no-take zone similar to the Corral as it would both protect the still relatively intact habitat that is already there as assist with the repopulation of The Corral due to the close proximity of the sites as new seahorses spread out to find their own territories. Furthermore a big concern is the number of large trawling vessels which still operate in the water between Koh Koun and Koh Rong could do large amounts of damage in one sweep as an accident. This has already happen in recent months to nearby area which were showing positive signs of recovery but now have mainly blank sand. As the site Beyond Out There is included within the Community Fishing Area, it will be up to the Community as to how they choose to best manage and protect this fragile environment.

Gender Diversity

There is a heavy bias towards females in the seahorse populations as can been seen from the research from September through to the March 2010 (Fig. 6a). There are nearly three times more females than males. Possible explanations for this significant gender bias include the fact that males can sometimes die after pregnancy (www.allthesea.com). Reasons for this higher mortality rate is the process of putrefaction of unborn babies and from starvation by not eating during the birth period which, in extreme conditions can last for one or two days (www.allthesea.com). Further to this seahorses in the wild are believed to be monogamous (Lourie *et al.,* 2004, Kuiter 2009) and relatively sedentary. Therefore, there is very little movement of individuals into or out of their home ranges (Lourie *et al.,* 2004). It

can take some time before males lost during pregnancy are replaced by new ones moving into the region, or for juveniles to reach sexual maturity.

Although the difference in male and female numbers in the 2007-2008 study is not as significant, there is still a female bias in the population. The length of the two study periods must also be taken into account. The study in 2009-10 has only been ongoing for seven months compared to the two year study period prior to the protected community fishing zone being established. With further research in the coming months the data collected may reflect a much more balanced gender ratio in the population. Further research is needed to determine if the current trend towards a female bias is a natural reflection of seahorse populations or if over time we will see populations reach equilibrium in the absence of anthropogenic impacts, following the monitoring and patrols of the Community Conservation Area.

In the future with continuing survey efforts we will be able to build up a very complete data set and draw stronger conclusions relating to sex ratios as well as breeding times.

The most promising outlook for the future is working with the community protecting the seahorse breeding grounds and inhibiting many illegal activities at the Corral and any other new Seahorse sites, including trawling and mooring. As discussed by the Fisheries Administration of Cambodia in their CITES document of 2008, *"In Cambodia, preserving habitat of seahorses and other endangered species is being implemented by fishery administration under the collaboration with other concerned institutions, development partners, NGOs and local community. The protection of seahorse's habitat includes protecting and preserving seagrass, coral, growing mangrove and creating fishing communities. However, these activities still face many challenges due to the limited technical skill of the fishery administration and lack of resource in filling the duties."*

At this point in time the research conducted by the current stakeholders seems to be creating a positive contribution to the recovery of the area and the seahorse population.

Recommendations of Cambodia Government Fisheries Administration

Protection and conservation of endangered species, specifically seahorse, must be implemented at once for the benefit of marine ecosystem and local community. Below are recommended activities:

1. Educate the public, especially local community in where there are seahorse, about laws, norms and IEC materials to increase awareness of seahorses' importance.
2. Fishery laws for preventing the illegal catch and trading of seahorse locally and internationally.
3. Study about physical description, identification of seahorse, population and important habitat of seahorses for it's a basis in creating seahorse protection and conservation area.
4. Mobilize finance for regular monitoring seahorses to learn about their changes and to set out appropriate measure on time in managing and preserving seahorse.
5. Prevent the destruction of seahorses' habitat like seagrass, coral and mangrove and set out protecting measures to prevent the fishing and bycatch.
6. Build the capacity of the local community for contributing to preservation work and help develop the livelihood of the local community to reduce the fishing which can affect seahorse resource.
7. Increase the collaboration with both internationally and locally involved institutes for preserving the habitat of seahorses as well as the exchange of information.

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Appendix A

Suspected Hippocampus Species in Cambodia
Complied by Paul Ferber, Marine Conservation Cambodia

Confirmed Species

Hippocampus Spinossisimus   (confirmed in Project Seahorse ID guide 2004 suspected after Photo survey Paul Ferber 2008/2009)

Hippocampus Trimaculatus   (confirmed in Project Seahorse ID guide 2004 & confirmed by Photo survey Paul Ferber 2009/2010)

Hippocampus arnei   (Confirmed by Photo survey Paul Ferber 2008/2009/2010)

Hippocampus semispinosus   (confirmed by Photo Survey Paul Ferber 2008/2009/2010)

Hippocampus Kuda   (confirmed in Project Seahorse ID guide 2004 & suspected after photo survey Paul Ferber 2009)

Hippocampus Mohnikei Mohnikei   (Listed as suspected by project seahorse ID guide 2004 Confirmed after Photo Survey 2009/2010)

Possible Suspected Species

Hippocampus Histrix   (Listed as suspected by project seahorse ID guide 2004 Suspected after Photo survey Paul Ferber 2009)

Hippocampus Kellogi   (Listed as suspected by project seahorse ID guide 2004)

Hippocampus Barbouri   (Listed as suspected by project seahorse ID guide 2004)

Hippocampus alatus   (Suspected after Photo Survey Paul Ferber 2009)

Hippocampus taeniopterus   (Suspected after Photo Survey Paul Ferber 2008/2009/2010)