Summary of Seahorse Population and Distribution

Koh Rong Samloem
Preah Sihanouk, Cambodia

Report on seahorse demographics and habitats

Marine Conservation Cambodia

Nov-Dec 2011

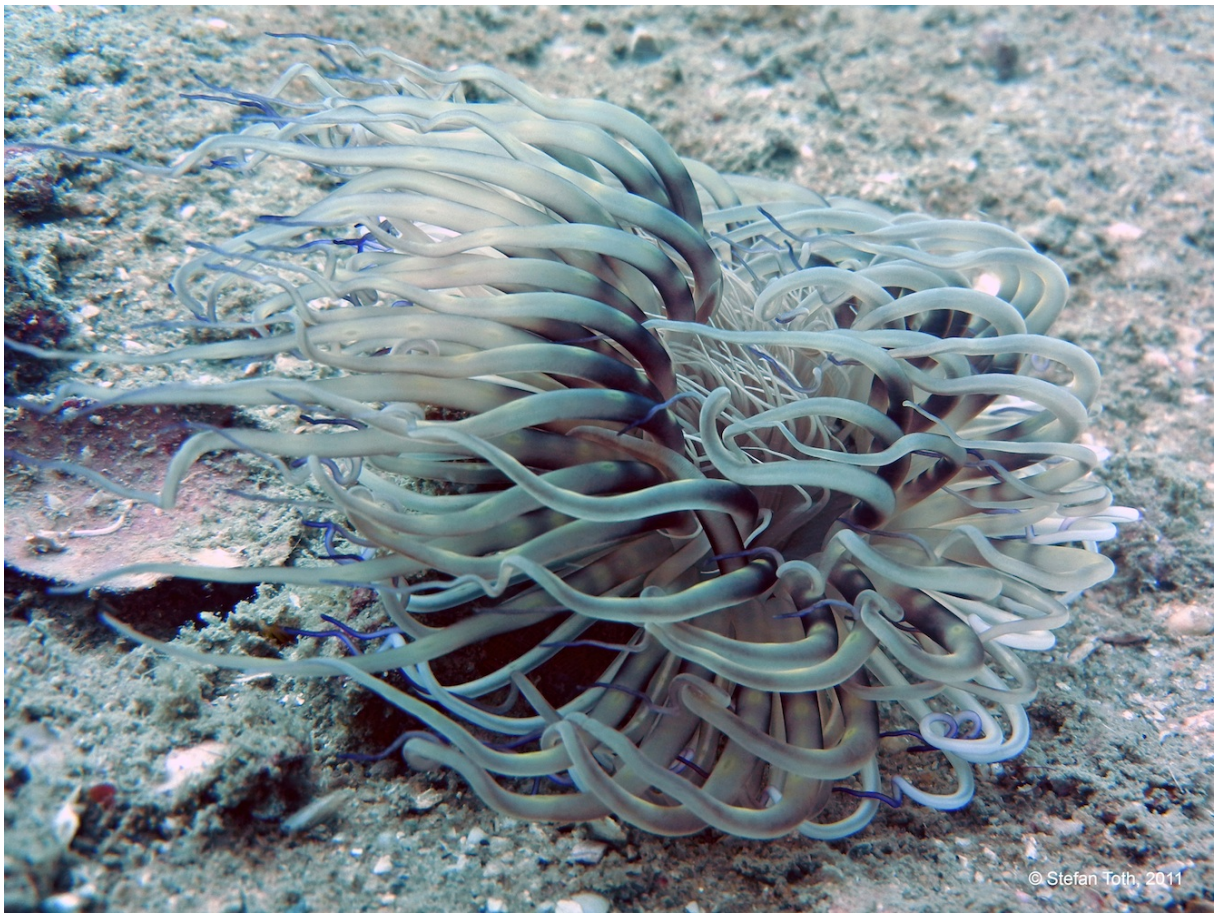

Photo 1 – Anemone on the Corral MCC 2012

Report By:

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ABSTRACT

This is a follow up seahorse population and habitat survey to the one done in June and July of 2011 to access and monitor the changing conditions of a study site, called the Corral, of the coast of Koh Rong Somloem. Our new survey consisted of 32 survey sites during November and December of 2011. There were a total of 76 seahorses found from 4 different known species and one unidentified species. With continued research we hope to be able to establish a database of the conditions of this diverse and ecologically important area over time.

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Acknowledgements

Marine Conservation Cambodia (MCC) has been working on conservation and community livelihoods in collaboration with the Royal Government of Cambodia Fisheries Administration (RGC FiA), local authorities and local communities since 2008. Our Marine Monitoring and Marine Research programs around Koh Rong and Koh Rong Samloem are now well underway: we are currently undertaking marine surveys around Koh Rong Samloem to monitor the Seahorse populations and the coral reefs to assist the FiA in the creation of Marine Fisheries Management Areas (MFMAs), Cambodia's equivalent to Marine Protected Areas (MPAs).

Close collaboration with the FiA and international institutions such as the FAO Regional Fisheries Livelihoods Programme (RFLP) and The UK Seahorse Trust has proved that MCC is now respected and credited as a leader in conservation and community work in Cambodia.

Research Team

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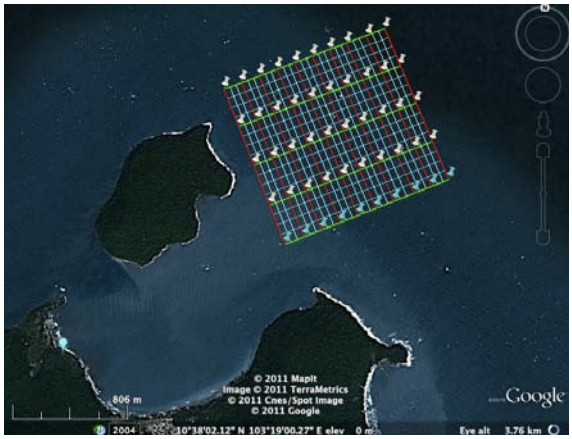
Introduction:

During June and July of 2011 a population assessment of seahorses was completed within a specified area of interest to conservation in the waters off Koh Rong Samloem Island, Cambodia. This is the summary of the follow up study done in Nov and Dec of 2011. Population assessments provide a useful tool for measuring the current condition of a population by allowing for accurate estimates of abundance and structure of organisms within a studied area. Each survey provides us with a static picture of the condition and abundance of organisms and bottom composition for our selected area. When done in comparison to later surveys at the same sites, we can begin to see patterns that will be beneficial to understanding their behaviors, migrations, and distributions. This assessment will therefore allow the seahorse population of the Corral site to be tracked and the effects of disturbance, such as destruction from trawling boats, to be monitored over time. Other trends, such as shifts in the dynamics of species composition and age structure can also be observed over time. By comparing our previous set of data a year ago with our new survey data we hope to be able to gain insight into changing population and distribution demographics, as well as species composition and age structures within our test sight. As more surveys are preformed we will begin to get an increasingly accurate picture of what is really happening at our test site. It is important for us to have a clear understanding of the condition and number of the organisms at our study area, so that we can efficiently implement and design conservation and monitoring strategies. Furthermore, it is vital that we are able to recognize habitat degradation and consequently population decline early on to be able to effectively mitigate and attempt to alleviate the pressures causing it. The only way we will be able to do this is by running continual surveys, such as this one, on a regular timescale.

Study Area:

Koh Rong Samloem Island is located 2 hours West of Sihanoukville, a port city on Cambodia's southern coast. The island's coastline is largely shallow, composed mainly of sand flats, seagrass beds and coral reef habitats. Previous studies have identified 5 geographically separated coastal areas as seahorse habitat, and designated one particular area, the Corral site, as a location for targeted seahorse research, due to its large breeding populations and close proximity to MCC facilities.



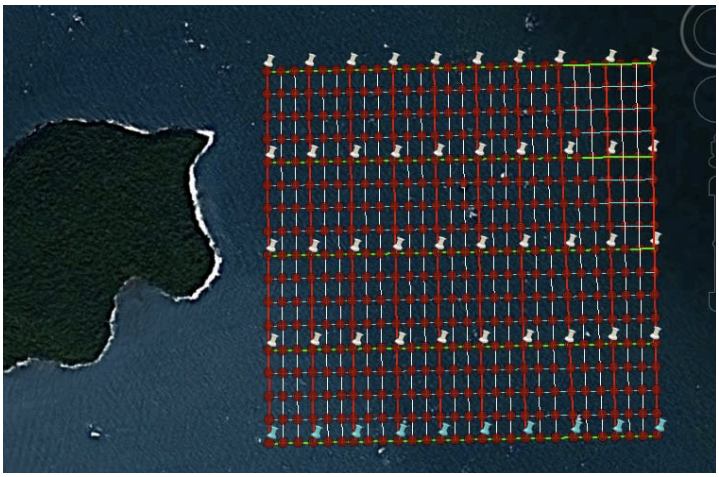
The Corral site is located to the west of Koh Koun, a small island located off the northern coast of Koh Rong Somloem. The area is dominated by sand flats, which slope gradually from the east coast of Koh Koun, with depths ranging between 5-20m. The area supports populations of bivalves, soft corals, hydrozoans and large numbers of pencil urchins (*Prionacidaris spp*), which provide valuable holdfasts for seahorses.

Species diversity of the area has been observed to be unusually high, with 6 species identified from photographic evidence taken at the Corral site (*Hippocampus spinosissimus, Hippocampus trimaculatus, Hippocampus kuda, Hippocampus comes, Hippocampus kelloggi, Hippocampus barbouri*). *Hippocampus spiniossismus* and *H. trimaculatus* have been most commonly found in the area, with *H. spinosissimus* heavily dominating the population.

This habitat was observed to be in excellent condition in 2007, but damage from trawling activity has greatly impacted the habitat since, reducing biodiversity and productivity of the local ecosystem. Field observations from 2007 suggest that seahorse species diversity

was previously higher, and has decreased over time to strongly favor *H. spinosissimus*. Protection of the habitat has been established in the form of a 300m no take zone extending from Koh Koun island. Protection measures are often ignored or circumvented, however, and frequent monitoring is necessary to prevent trawling activity in the area. Regularly conducted population assessments provide the consistent data necessary to measure the recovery of this area, and to make comparisons to its previously observed productivity of the ecosystem.

Methods:



The population assessment was conducted through 32 underwater visual transects that were randomly located within the 1.8km$_2$ Corral study area. The starting point of each 500m$_2$ transect was randomized by a random number generator, which selected numbers that corresponded to specific GPS coordinates within the study area. The direction of transects was also randomized, with a random number generator assigning a value that corresponded to one of eight possible directions (N, NE, E, SE, S, SW, W, NW). Transects were created by laying two 50m lines parallel, spaced 10m apart, projecting from the starting point in the randomly assigned direction. Two divers swim from the origin side by side between the two lines, each surveying the 2.5m area adjacent to the nearest tape. At the far end of the tapes, the divers would turn and survey the 2.5m area to the outside of each of the tapes. The total surveyed area for each transect was 500m$_2$. Seahorse species, demographic class, trunk and snout length, and associated habitat were recorded for each seahorse within the transect area. Juveniles were defined as any seahorse with a trunk length under 2cm, and were not distinguished by sex due to difficulties in differentiating small individuals without fully

developed sexual and species characteristics. Counts of pencil urchins, soft corals, anemones, seagrass, hydrozoans, sea pens and manmade structures were also recorded. Estimates of substrate cover were determined by swimming a $1m_2$ circle with the center at the starting point, and estimating percentage of substrate area covered by benthic organisms.

Results:

On 32 surveys we observed a total of 76 seahorses over a total survey area of $16000m^2$. There were 4 species identified during our surveys; *Hippocampus spinosissimus*, *Hippocampus kuda*, *Hippocampus trimaculatus,* and *Hippocampus kelloggi*. There was also one unidentified species that was described, as being completely "black with prominent back spines and no apparent eye spine" however, sadly there was no photo taken for later identification. As can be seen in Figure 1 the observed population was predominantly H. *spinosissimus* comprising 90.78% of seahorses surveyed, and *H. trimaculatus* 5.26%. The other three seahorses each making up 1.32% of the population observed.

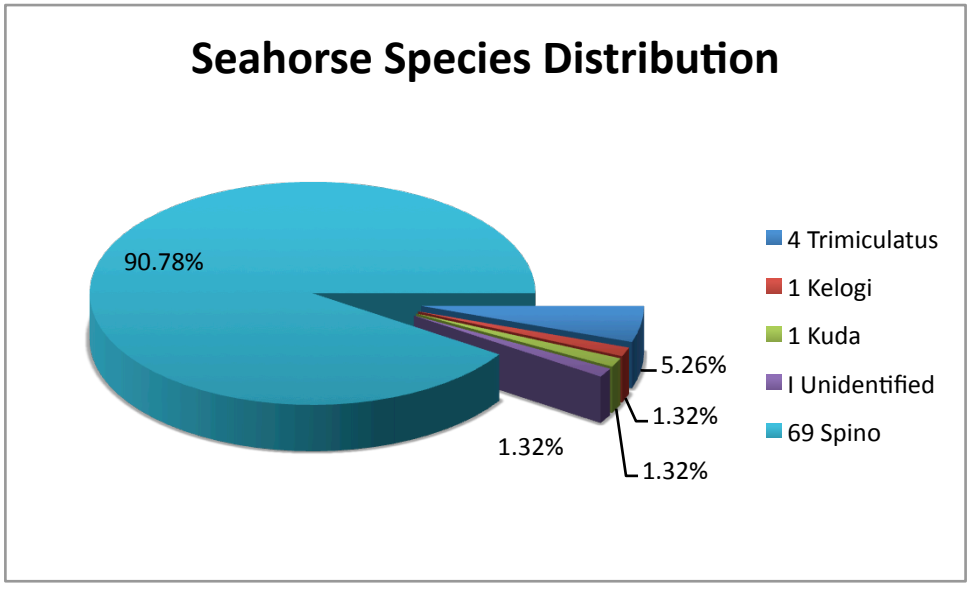


Figure 1: Seahorse species distribution at the Corral Nov-Dec 2011

The seahorses observed were split evenly between males and females, and a majority proportion of juveniles that could not be sexed. In figure two you can see that males (17 non-

pregnant and 4 pregnant) made up 27.62%, females made up 28.94%, and juveniles the remaining 43.42%.

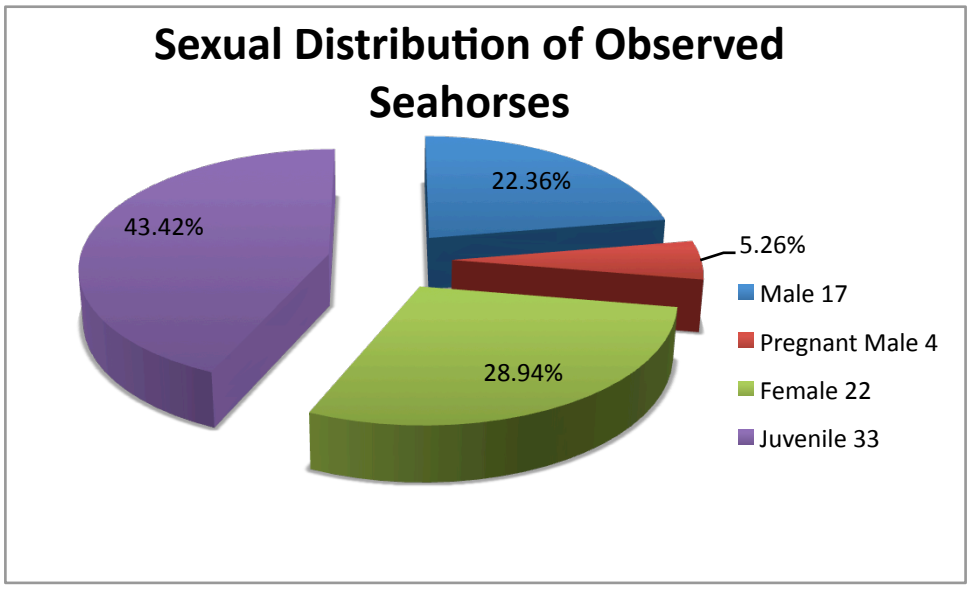


Figure 2: Sexual composition of seahorse population observed Nov-Dec 2011

Because *H. spinosissimus* made up over 90% of seahorses surveyed it is worthwhile to monitor the sexual dimorphism and number of juveniles of this species alone. Do to low population density of the other seahorses observed more study will be necessary to achieve the sample size necessary to draw meaningful conclusions. As shown in Figure 3 *H. spinosissimus* follows roughly the same pattern as all of the seahorses combined, which was to be expected making up ~90% of the previous total. Due to H. spinosissimus dominating the population of our study sight it is going to be particularly important to monitor their densities and reproduction rates in the future to be able to accurately and effectively create and implement a conservation strategy as well as to be aware of any disruptions to their natural behavior or habitat.

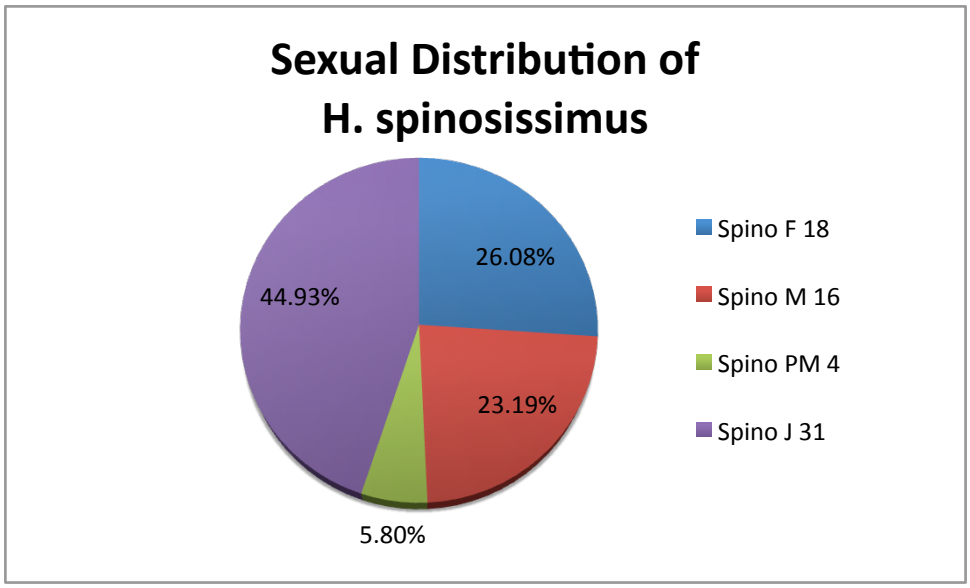


Figure 3: Sexual composition of *H. spinosissimus* observed Nov-Dec 2011

During this survey set we also observed what the seahorses were using for their holdfasts and the results can be seen in Figure 4. The most popular holdfast in our study area is the Pencil Urchin (*Prionacidaris spp)* with 84.21% of seahorses observed being actively attached to one. Shell was the next highest total with 6.58%, and this is not unexpected as the study sight has large areas with significant shell cover. There were also 4 seahorses observed free swimming in the sand, interestingly all 4 were full grown males (1 was pregnant). It may be possible they were looking for, or on their way to meet a mate.

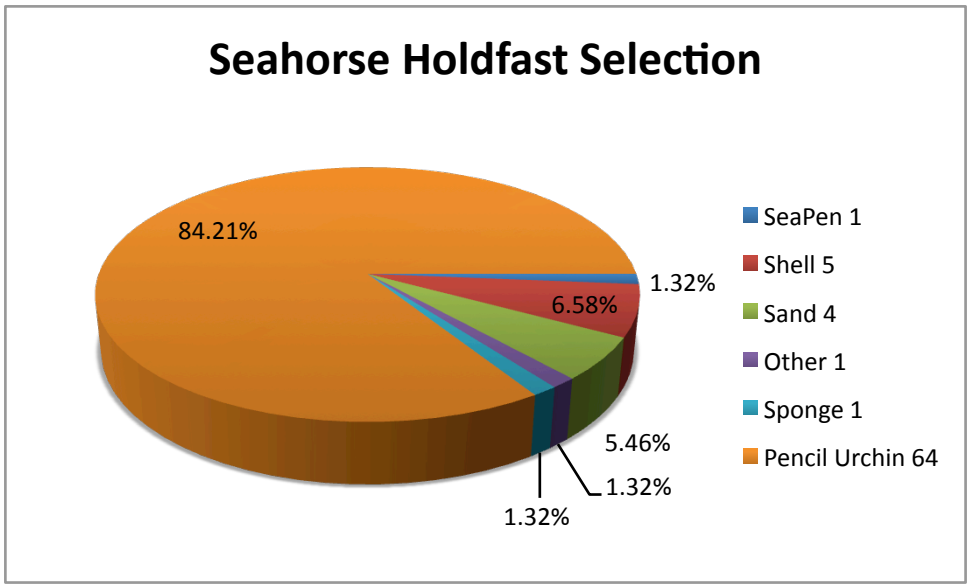


Figure 4: Observed seahorse holdfast choice Nov-Dec 2011

The relationship of pencil urchins densities to seahorse densities was then calculated using a paired t-test and was found to be highly significant with a p-value of 1.80514E-05. The association of shell cover percentages to urchin densities was then also found to be highly significant with a paired t-test, p-value 1.02678E-05. And finally a significant relationship was found between shell cover percentage and seahorse density, p-value 1.582E-06.

Comparison	P-value
Pencil Urchin vs Seahorse Density	1.80514E-05
Shell Cover % vs Urchin Density	1.02678E-05
Seahorse Density vs Shell cover %	1.582E-06

Table 1: Analysis of urchin, seahorse, and shell cover density. P-value determined by paired t-test

The average depth of each demographic was also determined and can be seen in Figure 5. The average depth for all seahorses regardless of sex was found to be 13.7 meters. The non-pregnant males and females were below this average and the pregnant males and juveniles where above it. The average depth for juveniles is 15.6 m and pregnant males

14.775m, while the average depth for females and males was 12.06m and 11.95m respectively.

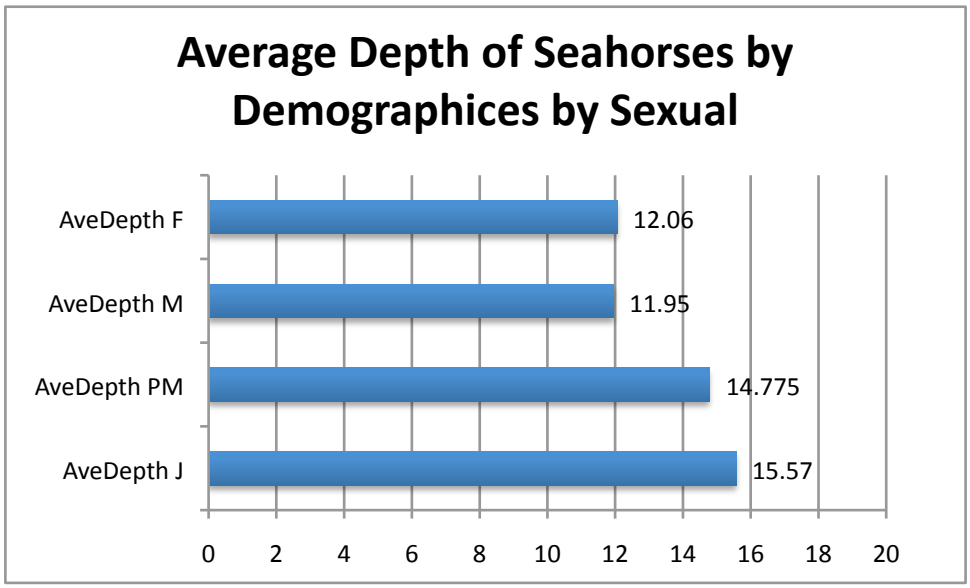


Figure 5: Average depths of seahorses by sex

Discussion:

As this was only our second survey in what has become a series of ongoing assessments much of the data from the first survey is nearly identical to this one. *H. spinosissimus* still dominates the population. The other seahorses found in the previous assessment (*Hippocampus trimaculatus, Hippocampus kuda,)* are still present in lower densities, but still present with the addition of one *H. kelloggi*. And in 32 surveys 76 seahorses were observed compared with 62 seahorses in 35 seahorses from our original assessment.

The sexual distribution also remains relatively unchanged. Males and females making up roughly 30% each of all seahorses observed, and unsexed juveniles making up the approximately the remaining 40%. When more long-term data is available, I am hopefull that more meaningful patterns will emerge.

The breakdown of the average depths of the seahorses is very interesting. The male and female have an average depth of ~12 m, while the pregnant males and juveniles have an average depth of ~15m. This makes since intuitively that the juveniles would be close to other pregnant males if they had just been born, and males and females need to be in the same area to breed. The interesting thing is that for many species of seahorse the male and female

will remain in close proximity and "meet" everyday to confirm their pair bond. The Corral is a long sloping bottom so a difference of only 3m of depth can equal a distance of several 100m. This is a long way for a seahorse to swim everyday. Is it possible that in this area the pregnant male will abandon his partner in favor of deeper, calmer waters? Is it possible that this behavior is the result of an area with strong currents and preferred holdfasts that are mobile making this pair bonding very difficult? What effect does this have on their breeding behavior? More research and a larger sample size is needed to confirm or deny this possibility, but it is interesting.

It is also important to note that the pencil urchin, *Prionacidaris spp,* is the preferred holdfast choice for seahorses in our study area, making up 84% of all holdfasts observed This information is particularly valuable when trying to design and implement a conservation plan. The Corral has been, and to a lesser degree still is, being subjected to very damaging trawling practices. This kind of trawling will not only catch many seahorses as by catch but remove large percentages of shell cover and critical holdfasts (urchins) in huge numbers leaving the remaining seahorses nowhere to rest, eat, or mate. This kind of stress and disruption could lead to the large-scale decline of population and juvenile survival rates.

Seahorse densities are greatest at sights where there are high densities of urchins present, and urchin densities are highest in areas where there are still relatively large percentages of bottom shell cover. Consequently seahorse densities are also high where shell cover is high. That being said we do find low levels of urchins in areas where there is minimal or no shell cover, and on those urchins we do find seahorses. This suggests that seahorses need the urchins, and the urchins need the shell cover, so indirectly seahorses need shell cover also. It also shows that future seahorse monitoring efforts can be allied to pencil urchin populations and shell cover percentages as a possible early warning system, a facet of choosing future study sights, or an alternative way to estimate population densities or carrying capacity.