Summary of Seahorse Population and Distribution
Koh Rong Samloem
Preah Sihanouk, Cambodia

Report on seahorse demographics and habitats

Marine Conservation Cambodia

October 2012

Photo 1 – Anemone on the Corral MCC 2012

Report By:

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ABSTRACT

This is a follow up on the seahorse population and habitat surveys done in June/July of 2011, Nov/Dec of 2011, and Aug/Sept of 2012 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 28 survey sites during October of 2012. There were a total of 7 seahorses found from a single species *H. spinosissimus*.

Over these surveys we are beginning to form a more complete understanding of the local seahorse populations depth range, migratory patterns, and distribution within our study sight.

Through our long-term continued research we hope to establish a database of the conditions of this diverse and ecologically important area over time.

By establishing relationships in species composition and diversity, depth, preferred holdfasts and holdfast densities, shell cover, sexual demographics and reproductive activity we can more effectively design and implement an effective conservation strategy as well as monitor our success 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 and we are currently undertaking marine surveys around Koh Rong Samloem, this is to monitor the Seahorse populations and the coral reefs, so we can 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), The Seahorse Trust (UK), Save Our Seahorses (Ireland) has proven that MCC is now respected and credited as a leader in conservation and community work in Cambodia.

Special Thanks Too

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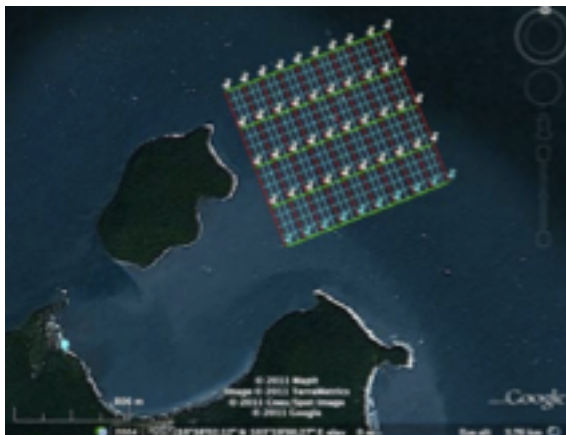CAMBODIA

Introduction

During June/July of 2011 and again in November/December of 2011 and again in August/September of 2012 population assessments of seahorses were completed within a specified area of interest to conservation, in the waters surrounding Koh Rong Samloem Island, Cambodia.

This is the summary of a follow up study done in October of 2012 and is the next step in this ongoing research. 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 on 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 long periods of time. Other trends, such as shifts in the dynamics of the species composition and age structure can also be observed over time. By comparing our previous set of data from a year previous with our new survey data in this report we hope to be able to gain insight into the changing population and distribution demographics, as well as species composition and age structures within our study site.

As more surveys are preformed we will begin to get an increasingly accurate picture of what is really happening at our study site. It is important for us to have a clear understanding of the conditions and number of organisms throughout the 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, so we will 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, over a regularly spaced time period. This is the second set of surveys for 2012 that began on 21/08/2012. These surveys will continue on a monthly basis for the foreseeable future.

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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 of 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.
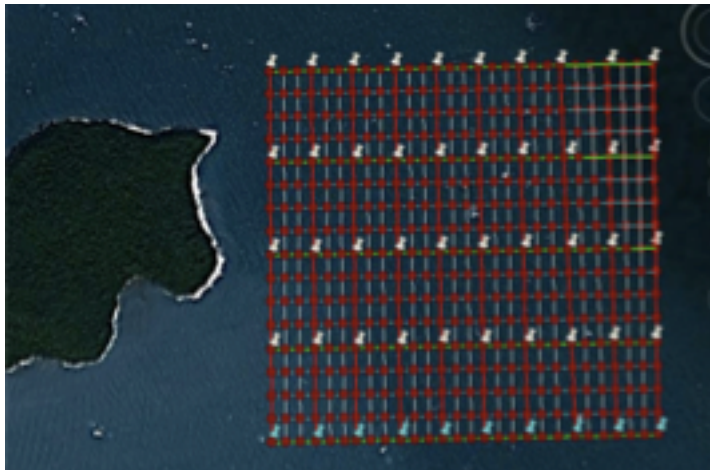

Grid layout of the study area showing its location next to Koh Rong Samleom, this is the site known as the Corral.

The Corral site is located to the east 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. These species are *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.

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This habitat was observed to be in excellent condition in 2007, but damage from illegal trawling activity has greatly impacted the habitat since, reducing the biodiversity and productivity of the local ecosystem. Field observations from 2007 suggest that seahorse species diversity was previously higher, and has decreased over a very short period of time to strongly favor *H. spinosissimus*. Protection of the habitat has been established in the form of a 300m No Take Zone (NTZ) 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

Grid layout of the study area showing the points of study

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 5m apart, projecting from the starting point in the randomly assigned direction. Two divers swim from the origin side by side on either side of the first transect line, each surveying the 2.5m areas adjacent to tape. At the far end of the tape, the divers would swim to the second tape and survey the 2.5m on either side going the

opposite direction. 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

In 28 surveys there was total of 7 seahorses found all comprised completely of *H. spinosissimus*. Six of these individuals were female and 1 was an unsexed juvenile. There was a distinct lack of males or pregnant males in this survey set. Holdfast percentage was split between 71% pencil urchins and 29% of seahorses that were found in the sand, as seen in Figure 1.
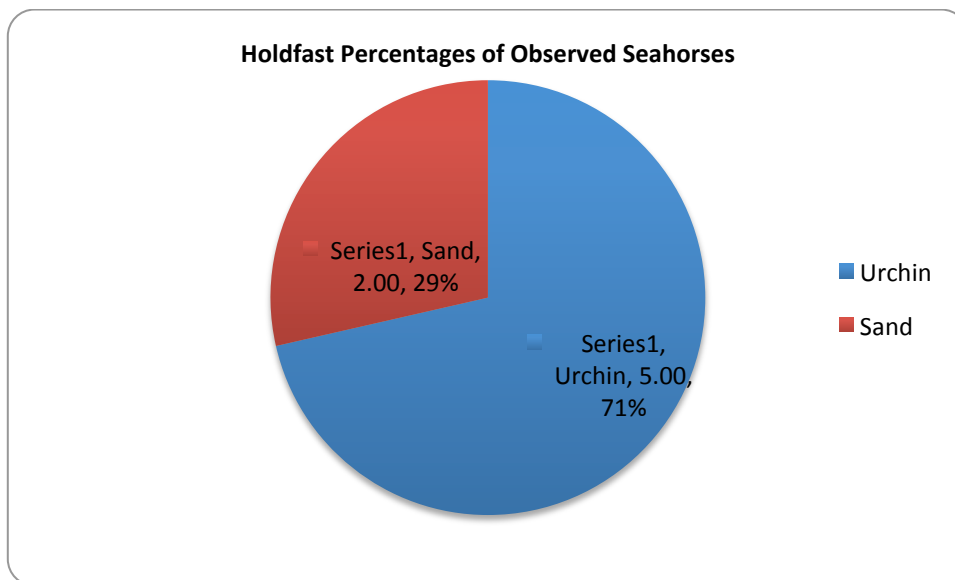

Figure 1: Holdfast selection by seahorses during October 2012

The average depths of observed seahorses can be seen in Figure 2. The average depth

was found to be 15.6m. The average for the 6 females observed was 15.45m and the 1 juvenile was found at 16.3m.
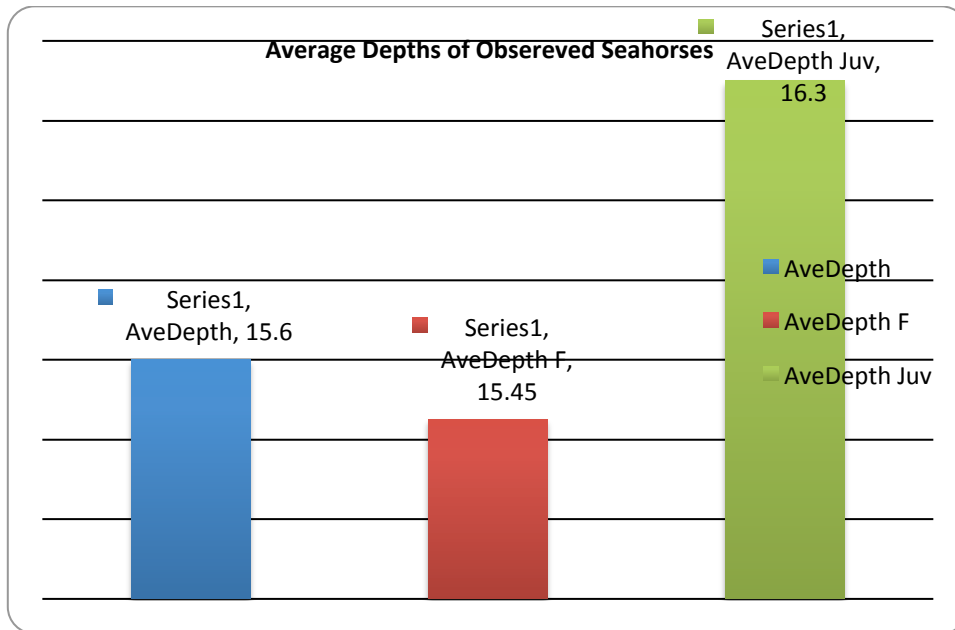

Figure 2: Average depth of observed seahorses October 2012

As with our previous surveys we also measured the number of pencil urchins in the area as well as the extant of shell cover on the sea floor. These were then correlated to each other using a paired T-test as well as to the number of seahorses found at each survey sight. The results can be seen in Table 1.   All three relationships were found to be significant.

Relationship	P-value
Pencil Urchin vs Seahorses Observed	1.42586E-06
Shell Cover % vs Pencil Urchins	3.92498E-06
Seahorses Observed vs Shell Cover %	4.14154E-06

Table 1: Relationships between urchin densities, shell cover % and seahorses observed in Oct. 2012. P-value determined with a paired T-test

Discussion

Our seahorse holdfast selection is again composed primarily of pencil urchins with 2 individuals found free in the sand, which is consistent with what we have been finding in

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previous surveys. The lack of a small subset being found on sea pens and shells can be attributed to the low level of seahorses observed. The correlation between pencil urchin density and seahorses found, shell cover percentage and pencil urchin density, and seahorse observed and shell cover percentages were again all found to be significant relationships.

In contrast with our previous surveys the number of seahorses observed during this data set is comparatively quite low having identified only 7 seahorses in 28 surveys over a 1 month period. During our August/Sept 2012 survey we identified 21 Seahorses in 23 surveys (MCC Aug/Sept Demographics 2012). As can be seen in Figure 3, in Aug/Sept we had an average of .91 seahorses observed per survey compared with our new data indicating only .25 seahorses per survey. In Nov/Dec of 2011 we observed an average of 2.4 seahorses over 32 surveys. This data will become more relevant, and a better assessment of a possible population decline can be determined after our November and December surveys are completed later this year.
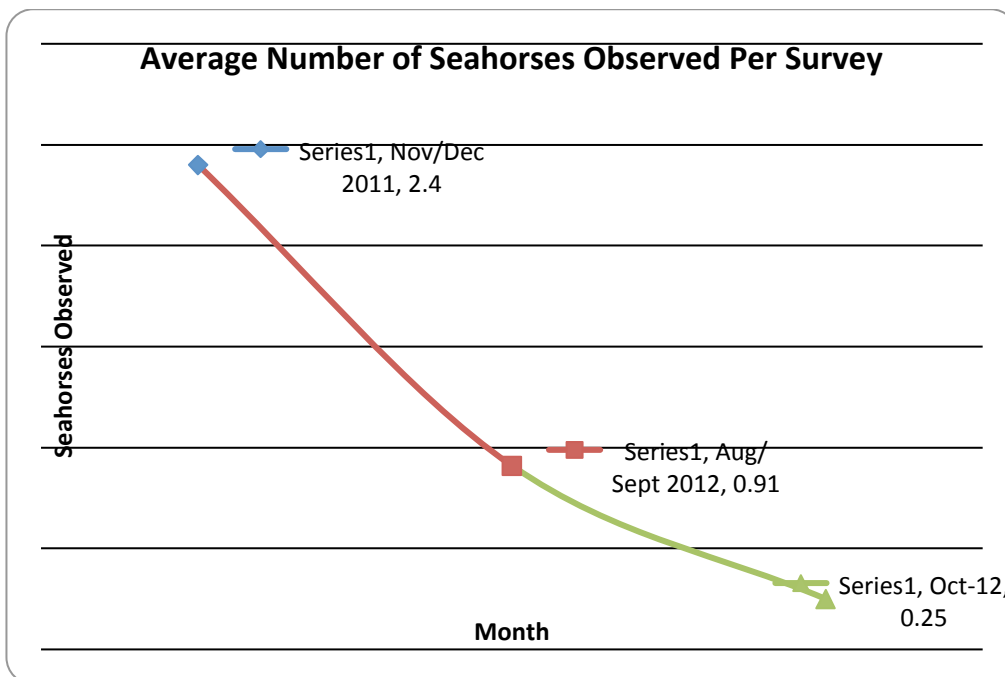

Figure 3: Averaged observed seahorses per survey over time

One possible reason for this drop in seahorses recorded is that our random selected points for this month gave a disproportionate number of deep survey sites. The average depth for our survey points this month was 19.4m with only 5 surveys done below 15m. August

and September's average survey depth was 11.4 meters, with a more varied depth distribution. It is possible that the bulk of the population during this time is found in relatively shallower water. While we cannot confirm or deny this possibility, we have still gleaned some interesting information.

In our Aug/Sept report it was hypothesized that pregnant males (PM) migrate to deeper water to give birth due to the high proportion of PM and juveniles found at an average depth of 15m, compared with adult males and females found at an average depth of ~11.5m. In Figure 4 you can see the average depths of seahorses observed by month, and demographic.

Avergae Depths of Seahorses Observed By Month

Legend: AveDepth, AveDepth J, AveDepth PM, AveDepth M, AveDepth F
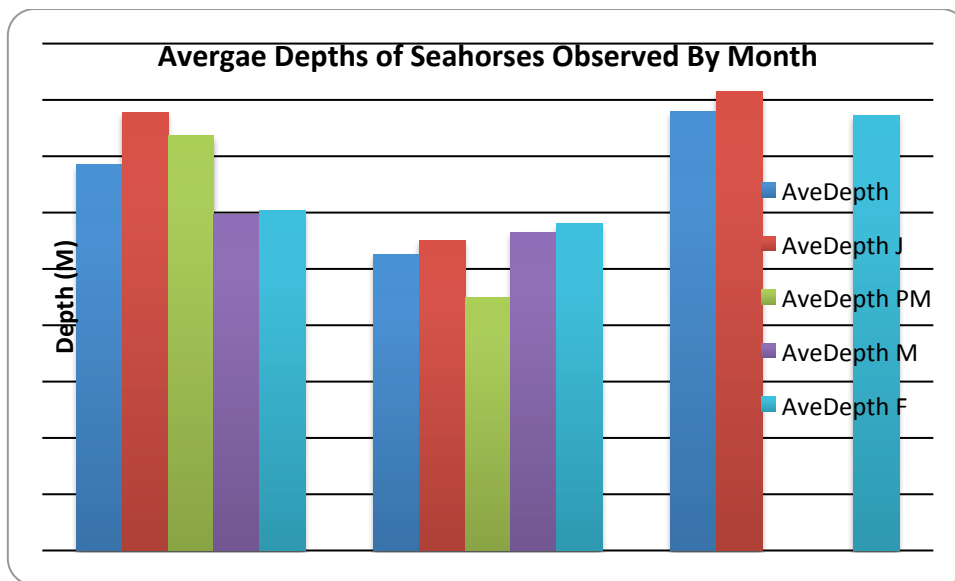
Figure 4: Average depths and distributions by month and demographic

Based on our new data it would appear that the pregnant males (or any other demographic) are not migrating to water much deeper than 15m, if they are at all. There were only 4 surveys carried out between 14-17m this survey set, but those points account for 2 adult females and 1 juvenile (found at 16.3m). There were no pregnant males observed anywhere and only 2 adult females observed deeper than 17m. These were recorded at 23 and 24 meters during the same survey. Our remaining 3 seahorses were found below 15m. Even with a scarcity of shallow depth survey points, it appears that we are beginning to identify the primary depth ranges for our local seahorse population. In Figure 5 you can see the average seahorses observed by sexual demographic and in Figure 6 the same distribution but

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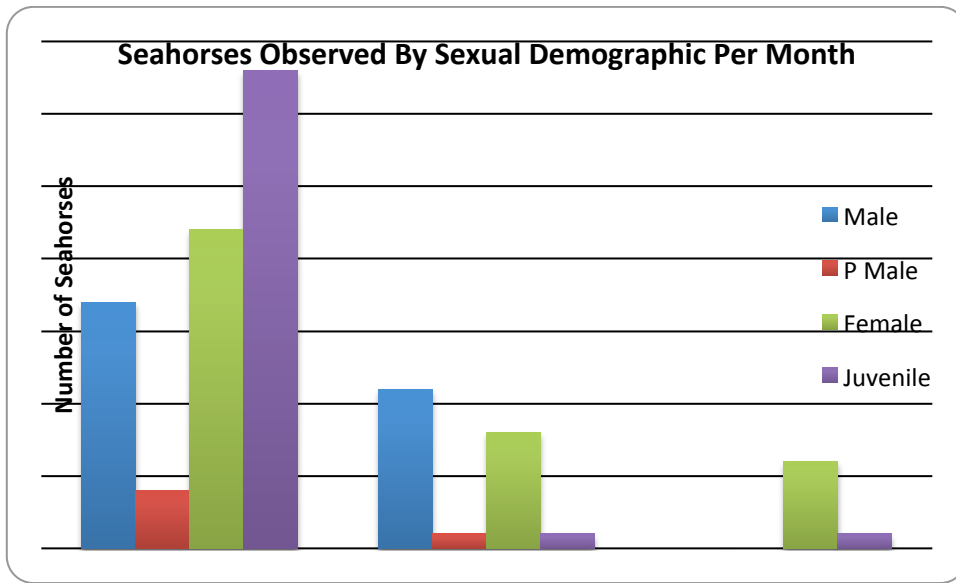represented in percentages of seahorses observed.

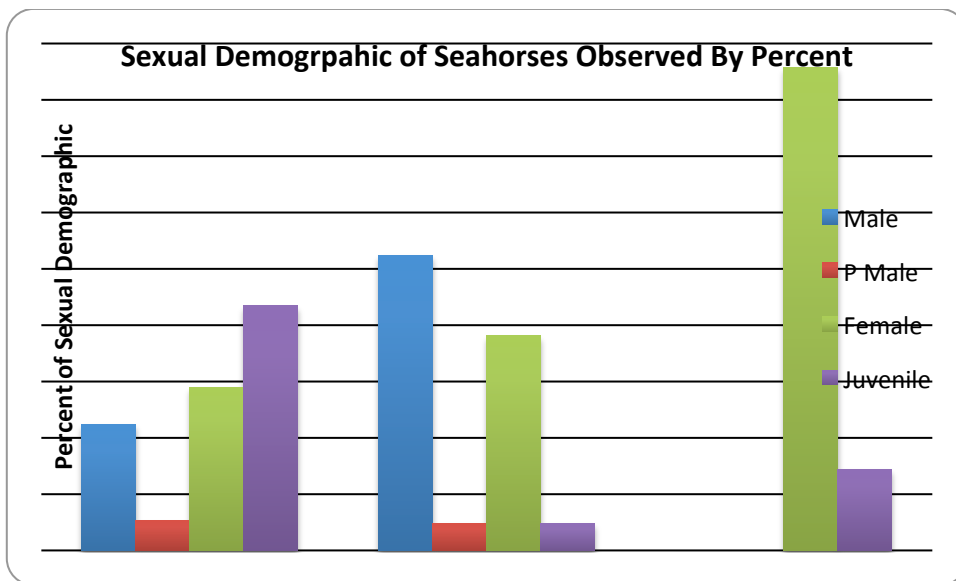Figure 5: Seahorses observed by sexual demographic Oct 2012

Figure 6: Sexual demographic of seahorses by percent Oct 2012

After our November and December studies (which will be more dispersed in our survey depths) we will be able to compare our 2011 data directly and further expand on these findings.

Research partners / advisors

As we have progressed through the life of this survey project we have formed partnerships with a number of individuals and organisations from around the world. This has allowed us to share ideas and experiences with others that have conducted similar research around the world, giving us a wider view of the latest research available. We can also share ideas and thoughts on the techniques, problems and experiences we have throughout our survey. By doing this it is hoped that we fulfill the strictest criteria in our work and achieve the best possible results from the work. It is planned that these partnerships will develop further and we will share knowledge and experiences in both directions, allowing all parties to benefit from this research work, with the main beneficiaries being the seahorses and the marine environment.