# British Seahorse Survey

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## Report 2004

www.britishseahorsesurvey.org

By Neil Garrick-Maidment

The British Seahorse Survey is run by

The Seahorse Trust

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## Contents



## Appendices

British Seahorse Survey

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## Background to The British Seahorse Survey

It is widely thought that seahorses are a myth and if they do exist are only found in tropical waters. However, evidence from the British Seahorse Survey has shown that this could not be further from the truth. The Survey was launched in 1994 to demonstrate that there are seahorses indigenous to the waters around Britain.

Through The British Seahorse Survey information has been gathered about their ecology in British waters leading to new facts being discovered about of these amazing species, which were previously unknown. It is the longest continuous running survey of its kind and has been collating evidence to establish which species can be found and where they live and to determine the extent of their range. Population densities and dynamics are being investigated to learn more about their behaviour and habitats so that threats to them can be monitored and the need to grant them legal protection within our waters can be assessed.

The survey began as a research exercise collating the sightings of seahorses from the past, looking through archive records to give an idea of historical sightings and distribution. This was quite a task in itself as the Latin and common names for both species have changed a number of times throughout their history, not to mention the cryptic nature of the animal. Records came from a number of sources such as the Wildlife Trusts, newspapers, books, and journals and simply by word of mouth. As a more detailed picture of British seahorses has built up, the work has helped other organisations with their education and conservation work, for instance the Zostera 2000 project in Torbay and various public aquariums.

The ongoing survey is carried out by dedicated volunteers, divers and naturalists from the local community as well as other conservation and environmental organisations to help locate and monitor the various populations of seahorses around the British Isles.

The Survey is reliant on the involvement of local communities with fishermen reporting sightings and volunteer divers partaking in voluntary surveys.

Education and awareness raising is a vital element in The British Seahorse Survey, as the more people realise that seahorses inhabit our waters, the more people will look for them, increasing the number of sightings so that a more accurate picture of their distribution and range can be built up and behavioural habits can be researched. All reports are followed up and verified with a telephone conversation, usually revealing the most relevant information which otherwise might have been discarded or not ascertained on the written report.

It is because of this work that both of the British Seahorses were submitted in February 2002 for inclusion under the Wildlife and Countryside Act 1981. Once accepted both species will be protected under UK law, preventing activities that could harm the species and the habitat they live in.

Short Snouted Seahorse (*Hippocampus hippocampus*) by Sam Partridge.

## Aims and Objectives.

The overall aims of this project are:

1. to conduct a status review of both species of seahorse;
2. to increase awareness of seahorses, the need to report sightings and the issues, threats and opportunities concerning the conservation of seahorses and their habitats in Britain.

Perhaps the most important aim of the British Seahorse Survey is to obtain proper legal protection for these two species, the only types of seahorse found around British shores. The Survey's main objective is to learn more about British Seahorse behaviour, expanding the current knowledge about seahorses in general and raising the awareness within the community.

In general the Survey aims to establish the range of the two species, along with the densities of populations and the dynamics involved within those populations. The threats to British seahorses will be researched and this information will be used to ascertain whether British seahorses are endangered and if they require legal protection within our waters.

## Organisations involved in The British Seahorse Survey.

The contact details for the following organisation can be found in Appendix 1.

**The Seahorse Trust** was established in 2000 to preserve and conserve the natural environment, especially the marine world, using seahorses as a flagship species. The Seahorse Trust staff have over 25 years' experience in designing, running, promoting and disseminating the findings of a number of important marine and terrestrial conservation projects. Neil Garrick-Maidment initialised the British Seahorse Survey and undertook the preliminary research of finding historical sightings. When he founded The Seahorse Trust he continued increasing awareness in the general public about British and tropical Seahorses and involved the local community with the British Seahorse Survey by asking people to report any sightings. Since then The Survey has become widely recognised and received support from local communities and conservation organisations.

**English Nature** is the government agency that champions the conservation of wildlife and geology throughout England, working with local communities for a future where wildlife thrives and natural features are valued and enjoyed. English Nature is a valued supporter of The British Seahorse Survey, and has made it possible for this report to be compiled with a grant.

**PADI Project Aware** was established to focus on regional needs throughout PADI International Ltd service territory. The charity is committed to conserving and preserving the aquatic environment and its resources. Funding comes directly from contributions made by divers and non-divers. Project Aware kindly donated money to fund the printing and distribution of British Seahorse Survey leaflets which have been essential in the awareness campaign and have generated many reports of seahorses.

**The Wildlife Trusts** partnership is the UK's leading conservation charity exclusively dedicated to wildlife. There are a network for 47 local wildlife Trusts and a junior branch (Wildlife Watch) who work together to protect wildlife in all habitats across the UK in towns, countryside, wetlands and seas. The Wildlife Trusts have supported the work of The British Seahorse Survey by donating their time and help on surveys and the awareness campaign and providing valuable information and historical sightings from their databases. The British Seahorse Survey relates to the SEASEARCH format so that new information gained is compatible with The Wildlife Trusts work.

**Care for the Wild International** is an animal welfare and conservation charity. They protect wildlife throughout the world from cruelty and exploitation. By funding practical projects like The British Seahorse Survey they make areas safe for wildlife, rehabilitate sick or injured animals and provide sanctuary for those who cannot return to the wild. Care for the Wild showed their support for The British Seahorse Survey by donating the funds to purchase necessary equipment to successfully carry out detailed surveys, so a more accurate picture of seahorse distributions could be created.

**Marine Conservation Society** is the UK charity dedicated to protecting the marine environment and its wildlife. MCS informs Government, the European Union, and Industry with sound accurate advice by being actively involved in numerous surveys around the United Kingdom. MCS involved thousands of volunteers in surveys and other projects, has a network of local supporters groups and works with other bodies of like-mind like The Seahorse Trust, to achieve common goals. MCS' involvement in the British Seahorse Survey has been to aid us in the collection of information on sightings.

**Torbay Coast and Countryside Trust (TCCT)** is dedicated to raising awareness of the environment in the local community and promoting ways to live in harmony with nature. The Trust kindly donated office space in their Seashore Centre for 20 months of the

life of the project. Nigel Smallbones, the Coastal Zone Manager for TCCT was also a trustee for The Seahorse Trust and helped with researching sightings and raising awareness in the local community through talks and by displaying seahorses in the aquarium. The Seahorse Trust works in partnership with Torbay Coast and Countryside Trust on the Torbay Biodiversity Action Plan where seahorses are listed as a priority species in the UK.

**Divers Down, Torquay** generously donates free air and gave a huge discount on equipment that was funded by Care for the Wild.

**Project Seahorse** is led by Dr Amanda Vincent (McGill University, Montreal, Canada) and Dr Heather Hall, (Zoological Society, London UK) with teams in Canada, UK, Philippines, Vietnam, Hong Kong and the Mediterranean. It was set up in 1996 to address the problems facing seahorses through exploitation in the wild and in captivity. They have kindly shared information from their research and passed on useful contacts.

**Various Diving Centres and individual divers** have played an instrumental part in undertaking surveys to assess certain areas. Their services have been completely voluntary and are very much appreciated.

**Seahorse Ireland.** Was set up by Kealan Doyle to address the problem of seahorses being taken from the wild. Seahorse Ireland is researching into the large scale breeding of indigenous seahorses to prevent these animals being taken from the wild. They are also partners in the British Seahorse Survey and act as a collection point for seahorse sightings throughout Ireland.

## Introduction

It was originally thought that the Spiny Seahorse (*Hippocampus guttulatus*) and the Short Snouted Seahorse (*Hippocampus hippocampus*) were transient between the British Isles and the European continental coastline; this seems highly improbable considering that seahorses hold the Guinness record for the slowest swimming fish. However there are populations of both species in Western Europe, one hypothesis is that seahorses could have got swept along with the strong current that runs through the English Channel and the Straits of Dover and deposited on the British coast, establishing an indigenous population here. This does not appear to be a recent phenomenon as we have sightings dating back to 1821.

This report has been compiled so that awareness can be raised about seahorses in British waters. The following work has been written to support the evidence that there are resident populations of seahorses within the British Isles, and there has been for quite some time. This report will be used to raise awareness around Great Britain and reinforce the work of The Seahorse Trust that submitted both British seahorses for inclusion in the Wildlife and Countryside Act 1981, in February 2002.

Both species were listed as Vulnerable in 1996 by IUCN (VU A2c,d) which is for application on a global scale. Project Seahorse revised the IUCN listing for both species in 2003 and found insufficient information for evaluation; currently both species are listed as Data Deficient. It is hoped that the evidence submitted in this report can be used to classify both species into Regional Red List Categories with IUCN. This will then further the demand for regional conservation and preservation measures to be taken.

Seahorses are a true species of fish that breathe through their gills, have a swim bladder and fins but in many ways they are unlike any other species. They lack scales but have a skin that covers a series of hard calcareous plates, which act like a sheet of armour for the soft body within. Unlike most fish, seahorses do not use their tails for propulsion as it lacks a fin; instead the tail is used for clinging to substrata and other objects. Movement is achieved via the dorsal fin whilst the pectoral fins maintain an upright position. Perhaps the most remarkable characteristic of seahorses is the fact that it is the male who becomes pregnant. Once seahorses find a mate, which used to be considered for life they will perform a courtship routine daily where the male will swim around the female and flash a whole range

of different colours, then the two will rise together in a colourful dance leading to mating Seahorse species studied so far are characterised by their sparse distribution, low mobility, low natural adult mortality, small home ranges, low fecundity, and lengthy parental care during pregnancy and mate fidelity.

## *Hippocampus hippocampus* Linnaeus 1758.


**Common Name:** Short Snouted Seahorse.

**Synonyms:** *H.heptagonus* Rafinesque 1810, *H.antiquorum* Leach 1814, *H.vulgaris* Cloquet 1821, *H.brevirostris* Schinz 1822, *H.antiquus* Risso 1826, *H.europaeus* Ginsburg 1933.

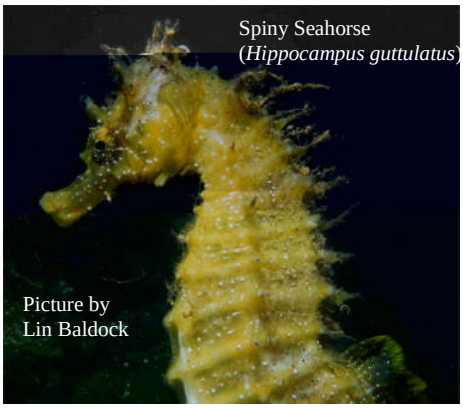
Throughout this report the Short Snouted Seahorse will be referred to as *Hippocampus hippocampus* (*H.hippocampus*).

*Hippocampus hippocampus* can measure between 12 and 15 centimetres in length when fully grown. It has no spines except occasionally "horns" above the eyes and is quite stocky in appearance with a short stubby nose. The coronet (top of head) is narrow and ridge-like or wedge shaped and joined smoothly to the nape of the neck. The species has a very prominent spine above its eye and often a dark line running vertically through the eye. Its habitat includes shallow, muddy waters, estuaries, inshore amongst algae and rocky areas and deep rocky areas especially off The Channel Islands in the English Channel. There are two main habitats that *H.hiipocampus* is thought to prefer, these are Eel grass beds and rocky areas. When found its colour can be bright orange or red but it is usually brown or black and it can have a number of small white spots all across the body but mainly on the head. This species is thought to change throughout its distribution in size and base colouration. *H.hippocampus* matures at 3 months (which is approximately 5cm in length) and breeds between April and October in the temperate part of its home range. The gestation period is 21 days and *H.hippocampus* tends to be monogamous in choosing a mate but this could just be a seasonal preference. The longest lifespan of *H.hippocampus* in captivity is between 5 and 6 years (N.Garrick-Maidment 1994).

*H.hippocampus* has been recorded in the following areas worldwide; Netherlands, England, Belgium, France, Portugal, Spain, Algeria, Italy, Malta, Greece and perhaps the Suez Canal. A very similar species with a larger coronet has been recorded in the Canary Islands, Senegal and Guinea.

*H.hippocampus* is recorded as Vulnerable by the IUCN, protected in Slovenia under the 1993 Protection of Threatened Animals Act and is listed in the Red Data Book of Portugal.

## *Hippocampus guttulatus* Cuvier 1829.




**Common Name:** Spiny Seahorse, Long snouted Seahorse, Many branched Seahorse

**Synonyms:** *H.hippocampus microstephanus* Slastenenko 1937, *H.hippocampus microcoronatus* Slastenenko 1938, *H.hippocampus multiannularis* Ginsburg 1937, *H.ramulosus*

Throughout this report the Spiny Seahorse will be referred to as *Hippocampus guttulatus* (*H.guttulatus*).

*Hippocampus guttulatus* is the larger of the two species, growing up to 20 centimetres from the top of the coronet to the end of the tail. It is very striking in appearance with a mane of appendages running down its back. These appendages help to camouflage it amongst the Eel Grass beds, which are its preferred habitat as well as other weedy areas. The Spiny Seahorse can usually be found on the peripheral edge of the Eel Grass beds where it can take full advantage of passing food. It is yellow to brown in coloration but sometimes olive brown to grey. *Hippocampus guttulatus* is often found with an extensive covering of white spots which is an indicator of good health and useful in captive breeding work Unlike *H. hippocampus*, *H. guttulatus* has been observed in the wild courting one or more potential mates (Curtis, JM *et al* in prep). *H.guttulatus* matures at 3 months (approximately 2" in length) and the gestation period is usually 28 days, but this varies with water temperature, producing around 300 fry of about half an inch. The longest lifespan of *H.guttulatus* in captivity is 7 years, which was achieved by Neil Garrick-Maidment of The Seahorse Trust.

*H.guttulatus* has been recorded in the following areas worldwide; Netherlands, England, France, Spain, Portugal, Senegal, Morocco, Italy, Malta, Croatia, Greece and Cyprus.

*H.guttulatus* is listed as Vulnerable by IUCN under the synonym *Hippocampus ramulosus* (which directly translates as Many Branched) it is also protected in Slovenia under the 1993 Protection of Threatened Animal Species Act and is listed in the Red Data Books of France and Portugal.

Further research is required to establish whether they remain two distinctive species throughout their range or whether they become sub species or perhaps even separate species.

## Life Cycle of a seahorse.

During the first six weeks of their lives the fry drift around in the plankton layer consuming anywhere up to 3000 pieces of food per day. To help them locate their prey and keep an eye out for predators, the seahorses have independently moving eyes that can see in any direction at any one time.

They then settle on the seabed amongst the algae and establish territories. A fully prehensile tail allows them to grip the algae as a monkey would grip branches to climb around trees. Once in their territory they set about the business of growing to maturity, which can take 9 months to a year. The rapid growth is achieved by eating 30 to 50 large shrimp per day. Their poor digestive tract, which is nothing more than a simple tube from the mouth to the anus, means that they have to eat more then other animals of comparative size.

Mating occurs in the Spring, Summer and Autumn, within shallow waters. Males establish a territory of 6 square feet in the middle of the female territory that is on average 15 square feet. Each morning the male and female perform a courtship dance to establish the bond between them. By establishing pairs it cuts down the mate selection time and allows for maximum production of fry.

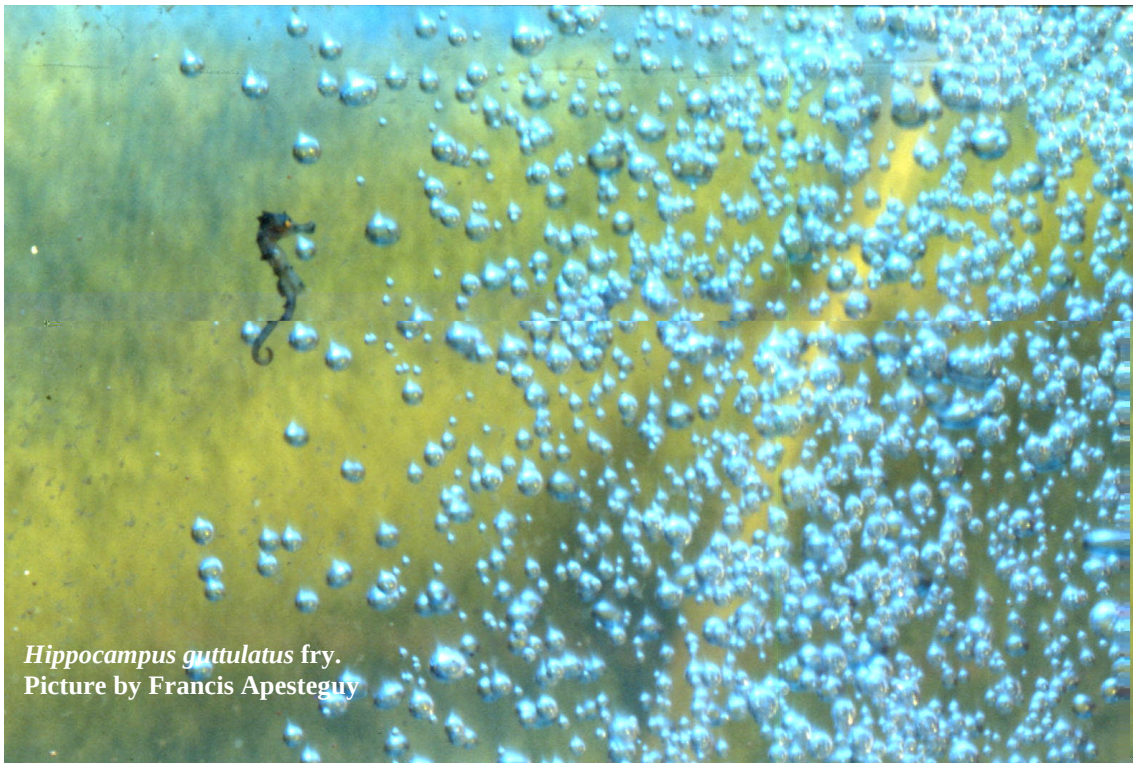
*Hippocampus guttulatus* courting. Picture by David Higgins.

The courtship dance of Seahorses is very elaborate with the male swimming closely around the female and both changing colours in their excitement, it has been known for jet-black males to turn white. This dance can last up to one hour and is repeated daily, even if the male is pregnant. When the pair are ready, the exchange of eggs takes place. They rise up in the water column together and at the crucial moment face each other and the female deposits anywhere up to 300 eggs into the male's brood pouch. In younger animals the number is less until they have had several broods and then they build up to 300 or even more. As soon as the transfer is done they separate and the male sinks to the ocean floor, where he self fertilises the eggs. After

fertilisation the eggs embed into the lining of the pouch and are nurtured with all their needs by the male.

Gestation is approximately 28 days and the fry are normally born at night, which is a good defence against predators. As the male goes into labour he can be seen weaving his body from side to side to free the fry from the inside wall of the pouch. These contractions can go on for up to 12 hours with the birth being very quick. The ejection of the fry takes a few seconds during which time all 300 or more fry will be expelled, once born they are on their own, there is no parental care involved.

After all these exertions it would be understandable for the male to want a rest, but this is not the case as he will usually be pregnant again within 24 to 48 hours. In tropical Seahorses this will go on throughout the year, but in temperate seahorses it is only during the warmer months.



***Hippocampus guttulatus* fry.**
**Picture by Francis Apesteguy**

## Current Pressures and Threats Facing Seahorses.

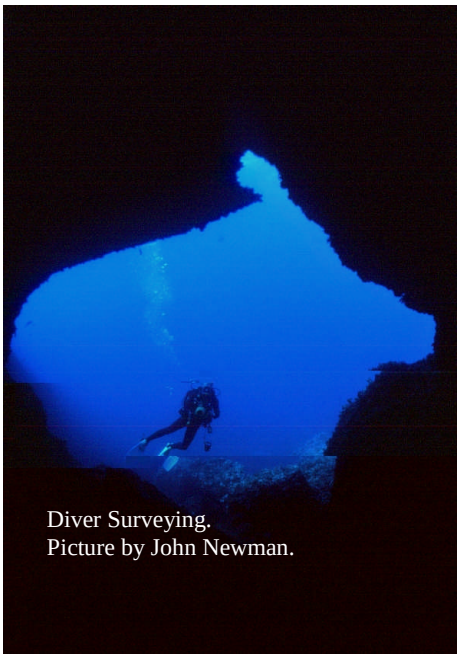
Seahorses are very sensitive to environmental conditions. They are a useful tool for analysing the health of an environment as a flagship species. Unfortunately this means they are affected by a range of issues that are potentially lethal to the success of their populations. The loss of habitat is a primary concern for seahorses, because they depend on their habitat to offer them protection against predators and camouflage against prey. Seahorses are also taken from the wild for the Traditional Medicine Trade, Curio Trade and the Aquarium Trade. This is mainly because seahorses possess a mystical quality. They have been the origin of myths surrounding dragons and are said to contain mythical, almost magical powers. Sadly most of this information is unfounded, resulting in millions of seahorses being taken from the wild every year for no other reason apart from human enjoyment. Increasing people's awareness to certain facts is dramatically improving seahorse chances of survival.

Dried Seahorses in Plastic Bag, Hong Kong Market. Picture by Kealan Doyle.

Protection already exists for both species from a number of sources: the Convention of the Conservation of Migratory Species of Wild Animals (Bonn Convention), the Convention of European Wildlife and Natural Habitats (Bern Convention) and Appendix II of CITES, the Convention on International Trade in Endangered Species. This protection from CITES has only allowed trade in the seahorse species subject to licensing. Both species are also recognised as Vulnerable by the IUCN Red List of Threatened Species, a factor that contributed to their recent submission for inclusion under the Wildlife and Countryside Act by The Seahorse Trust as a result of The British Seahorse Survey. Many seahorses around the world are recognised as Vulnerable and Data Deficient by IUCN and *Hippocampus capensis* (Knysna Seahorse) was the only species in 1996 to be recognised as Endangered (IUCN, 1996). Project Seahorse revised the IUCN listings for *Hippocampus hippocampus* and *Hippocampus guttulatus* in 2003 with an emphasis on Mediterranean specimens. It was concluded there was insufficient information to list either species against the criteria, resulting in both species being assigned Data Deficient (Project Seahorse 2004).

## Historical Sightings

Retrieving all the historical sightings was a research exercise that was voluntarily undertaken by Neil Garrick-Maidment (Director of The Seahorse Trust). Organisations that held historic marine sightings were contacted; these include The Cornish Biological Unit, The Wildlife Trusts, Sealife Centres around the UK and through our sightings co-ordinators Adrian Tolliday from Explores, Sue Daly from the Channel Islands, Robin James from the Sealife Centres, Lucy Boynton from the Isle of Wight and Kealan Doyle from Seahorse Ireland. The relevant information on seahorse sightings was then extracted from the data and organised into areas and species. This was quite a task in itself as the Latin and Common names for both species have changed many times over the years. Most sightings were verified at the time they were reported, however it is accepted by The Seahorse Trust that the majority of the sightings could not be verified but are still valid and have therefore been included in this report. It is due to the willingness of the organisations mentioned previously to share their information and data that we have been able to create such a historical picture of the sightings.



Diver Surveying.
Picture by John Newman.

## Recording Sightings

The Seahorse Trust designed a survey sheet (Appendix 2), which was kindly funded by PADI Project Aware and has been distributed across the British Isles along with an informative leaflet about both species and the survey (Appendix 3). It is a very simple form, which has all the necessary fields in it to be compatible with the work of other organisations like The Wildlife Trusts. The form was made deliberately simple so that it is straightforward and anyone can use it to record sightings of seahorses and not just trained individuals or scientists.

Sightings are reliant on people taking the time to look in the right places and knowing who to report them to. This is why the awareness campaign is so important. The involvement of the local communities is essential in this kind of survey, and the more people who know that

seahorses inhabit our shores the more sightings we will receive creating an accurate picture of their distribution and population patterns.

The most important field on the survey sheet is the Telephone Number of the surveyor, as all sightings are followed up with a short telephone interview. This verifies the record and usually results in more details about the sighting from information that was discarded as irrelevant. It is from these details that the most unusual facts are discovered about where seahorses can be found and their behaviour.

The Seahorse Trust has dedicated volunteer sighting co-ordinators living in various places around the British Isles, which are shown in Table 1. Their contact details are available in Appendix 4.

**Table 1: The British Seahorse Survey Sighting Co-ordinators around the British Isles**

| Area | Sighting Coordinator | Contact details |
|---|---|---|
| England | Neil Garrick-Maidment | Tel:01392 875930 neil.seahorses@tesco.net |
| England | Robin James | Tel:01305 761465 robinjames@merlinentertainments.biz |
| England | Louisa Jones | Tel:01752 251338 louisa.seahorses@tesco.net |
| Isle of Wight | Lucy Boynton | Tel:07766521818 lucyboynton@yahoo.co.uk |
| Ireland | Kealan Doyle | Tel:00353 9532945 seahorseireland@eircom.net |
| Northern Ireland | Adrian Tolliday | Tel:012842728062 adrian.tolliday@ards-council.gov.uk |
| Channel Islands | Sue Daly | Tel:01534 864541 sue@suedalyproductions.com |

When a sighting is reported it is first verified by a sightings co-ordinator, then it is passed onto The Seahorse Trust where each record is given a Sightings Reference Number. Each individual seahorse sighted is given a new number with the letter at the start relating to the area within the British Isles where it was found. The record is then entered into the British Seahorse Survey's Database.

| Region | Reference Code |
|---|---|
| England | E |
| Alderney | A |
| Ireland | I |
| Guernsey | G |
| Jersey | J |
| Sark | S |
| Scotland | Sc |
| Wales | W |

**Table 2:** Reference Codes for Regions with Seahorse Sightings within the British Isles.

## The Database.

The creation of the database was kindly funded by English Nature so that all the sightings, which were previously kept on an Excel spreadsheet, could be collated and analysed in further depth. The database was designed by Louisa Jones and John Bleach using Microsoft Office Access 2003.

## Justifications for Database Design

It was important to include the Reference Number that had been allocated to each sighting so that each record could be traced back to its original paper source if necessary.

The **'Date'** is recorded in two separate fields; **'Month'** and **'Year'**. The majority of sightings had the month and the year, some had more details such as day and time and others had fewer details such as an approximate year. By just using the two fields to record the date it was possible to include the majority of sightings in the analysis and look at seasonal patterns of sightings separately from the historical patterns.

Sub-forms were created for **'Surveyor Details'** and **'Site Details'**. This is because a lot of sightings come from the same surveyors and at the same sites so the sub-forms prevent information from being repeated with every entry. Surveyor details are confidential. By using a sub-form it allows this information to be isolated encase outside parties wish to view the database. The sub-forms enable only the relevant information to be displayed on the survey forms within the database. If more information is required on the record, such as grid references, all these details can be found in the Site Details sub-form.

**'Habitat'** was classified into categories, as people's descriptions of the same habitat can vary, so for the sake of analysis broad categories were used. Unnatural Objects are objects that are not normally found in the sea and are man made, such as lobster pots, moorings, piers and sea defences. Stranding is when the specimen has been found out of the water.

**'Depth'** needed to be categorised as recorders used different ways of measuring depth with some records being described simply as 'deep' and others giving exact depths in either metres or feet.

**'Description'** is where information is held on the verification of the record.

**'Comments'** is the field where any detailed information regarding the sighting is recorded.

Photographs of any sightings are very important, as they help to verify the record. Any photos or articles that relate to a record are noted and kept for reference. Where possible the photo has been linked to the entry.

When new details are entered into the sub-forms the main sightings form must be refreshed for this new information to be included, this is done by simply clicking the Refresh button.

All of the sightings available to The Seahorse Trust were added into the database. This information was then transposed onto a map of the British Isles. Coloured stickers were used to show which species was recorded where and whether the record was of unknown species or had not been verified. As there were sites, which had a great deal of sightings from the same location, the stickers were placed in the surrounding area, to show a better picture of their potential distribution.

The potential distribution of each species was then roughly marked on a computer image of the British Isles. *MarLIN* at The Marine Biological Association, Plymouth uses this method to show distributions of their recorded species. It presents a rough estimation of where sightings have been recorded and the potential distribution of the species, which is easy to understand.

Data from the database was extracted and analysed in Microsoft Excel. The correlations that were investigated were; Species and Habitat, Species and Depth, Month and Depth to see seasonal variations and Date and Sightings to see how reports varied over the years.

Information was needed to define the extent of critical habitat and data was kindly given by JNCC and CEFAS at Lowestoft on the distribution of Eel Grass Beds within the British Isles. As Eel Grass beds are sedentary it is less complicated to map their exact distributions. There distribution should have strong correlations with the distribution maps of seahorses, and because there is limited information available on the distribution of seahorses within the British Isles, the maps of Eelgrass beds can be used to estimate potential distributions of seahorses.

Information was also gathered on the distribution of other species that were thought relevant to aspects of this report. The distribution of Basking Sharks, Dustbin Lid Jellyfish, and Leatherback Turtles was sourced from *MarLIN* at the Marine Biological Association,

Plymouth and the Marine Conservation Society. As well as investigating distribution patterns of migratory species the British Seahorse Survey intends to assess patterns of distribution for sedentary species like the seahorse and the Pink Sea Fan. The distribution patterns will be compared overall and the influences from the Gulf Stream will be investigated as part of the ongoing research in the British Seahorse Survey.

This distribution analysis is a research project in its own right and The Seahorse Trust is looking into gaining grants to fund a researcher to do a full comparison. There is sufficient overlaying information to make an interesting study and we firmly believe that the correlation of these distribution patterns are vital in the study of all these species but more importantly in the overall protection of them and the habitats they occupy.

## Awareness

The distribution of both seahorses in the British Isles (Refer to Figs. 1 & 2 page 34 below and in Appendix 9) seems to coincide strongly with areas in the British Isles where conservation organisations are active in monitoring their local environment. The awareness of the public in these areas on the species that can be found, which sightings need to be reported and who to report them to will be higher than in other areas where no such organisations are located. The South West of England is a hot spot for conservation organisations that include The Marine Biological Association, The National Marine Aquarium, The Wildlife Trusts of Cornwall, Devon and the Isles of Scilly, English Nature, Marine Conservation Society and The Seahorse Trust. The South coast of England, Wales, Ireland and Scotland also have a number of organisations actively involved in monitoring the environment. Although the distributions may relate to the exact range of these species, it could also be suggested that sightings are highest in areas where people are actively looking.

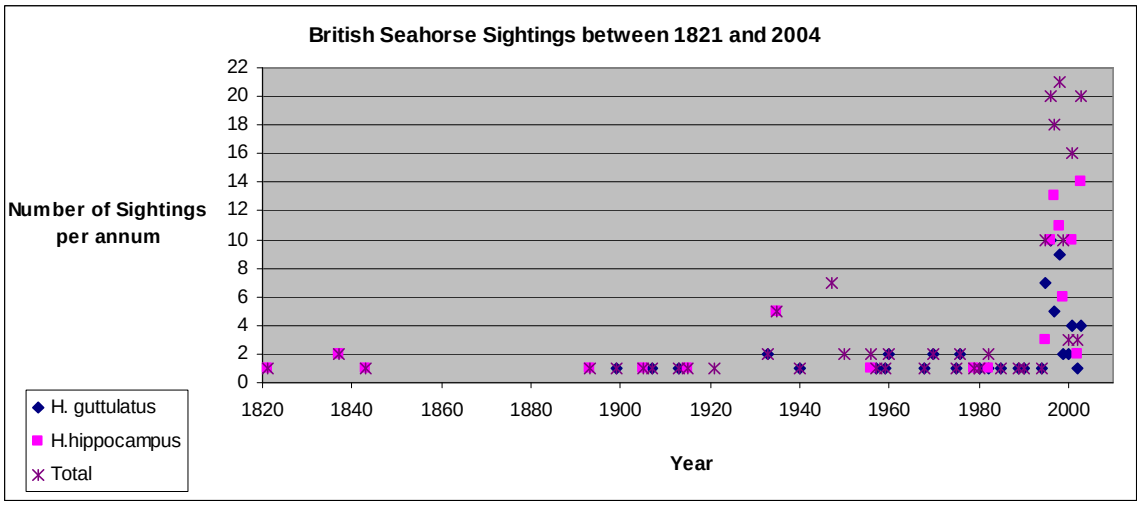
It can be deduced from these points that the more people who know where to look and who to report sightings to, the more information will be obtained. This supports the demand for co-ordinated surveys to be undertaken around the entire British Isles, some of which have already been undertaken by The Seahorse Trust. Through the British Seahorse Survey, The Seahorse Trust will be able to create an accurate picture of population dynamics, without the bias of seasonal human activity and locations where people are concentrating their efforts of monitoring and recording marine life. The British Seahorse Survey is reliant on volunteers and the general public, as well as the collaboration between conservation organisations in sharing what information they receive from their volunteers and supporters.

At the time of publication it is not possible to establish any clear population trends or patterns for British Seahorses from our current data. As Graph 1, page 21 shows the British Seahorse population appears to be increasing over the years, this is highly unlikely and it is far more reasonable to relate this increase to the increase in awareness. Further research is required to accurately predict whether the indigenous populations are stable, declining or increasing.

The exact size of the British Seahorse population is unknown, as there is insufficient information. The lack of information is directly related to the lack of awareness in certain

areas, and the lack of funding to undertake site-specific surveys to establish accurate information on population size and dynamics.

The Seahorse Trust intends to launch a nationwide awareness campaign funded in part by English Nature, with a dedicated website designed to educate and interest the general public in the need to protect these species. Posters and leaflets will be produced to publicise the British Seahorse Survey and encourage the public to get involved. There will be increased media coverage through radio and TV and articles will be published in magazines and local papers. It is planned to present this report to as many people as possible through presentations and talks, involving schools, Universities, and the local communities.

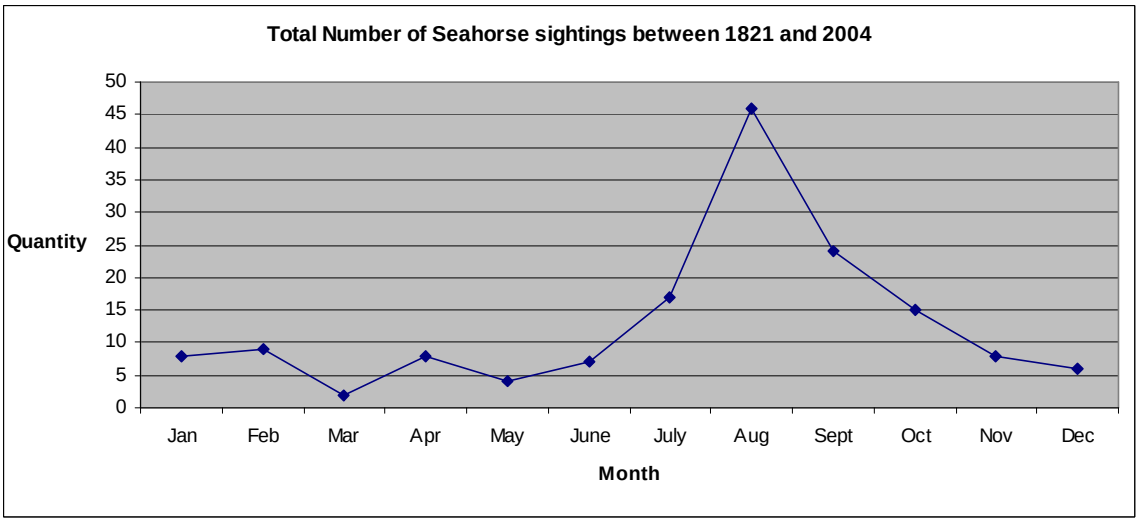



**Graph 1:**

The total value was included in this graph to compensate for some sightings being Hippocampus species and unknown species. There are rarely more than 2 sightings a year until the late 1900's. The number of sightings per annum rises dramatically between 1980 and 2000, increasing from 2 to 21 in 20 years. Apart from this pattern the number of sightings per annum tends to stay constant between 1 and 2, with an increase in 1950 of 7 sightings.

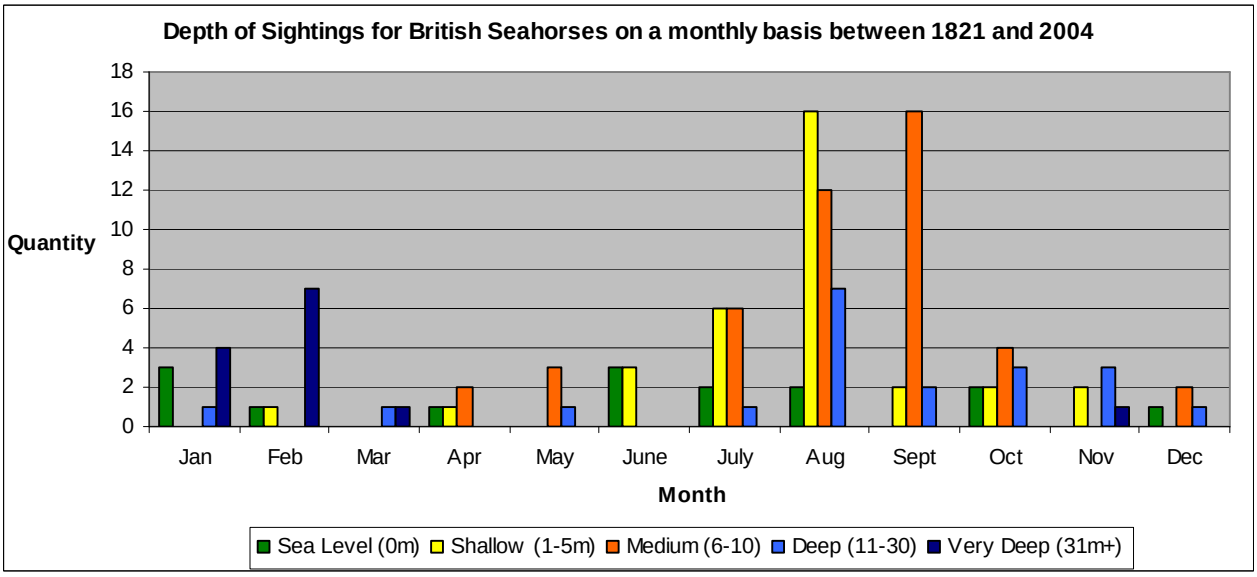
Increasing awareness is the key element in successful conservation. Looking at Graph 1 showing the British Seahorse Sightings between 1821 and 2004, there is a dramatic increase between 1980 and 2000. This increase coincides with when the British Seahorse Survey was founded in 1996 and started to increase the awareness of British Seahorses around the British Isles. As people have realised that seahorses are found in British waters, the numbers of sightings have increased. This is because there are more people looking for them and most importantly people know where to report their sightings. Many sightings of seahorses have been reported to The Seahorse Trust years after the seahorses were actually sighted, as

people were not aware of what they had seen or how rare such a sighting was. The fact that an increase in awareness directly correlates to an increase in sightings is supported by the work of Project Seahorse (personal communication, 2004).




**Graph 2. Showing the seasonal patterns of seahorse sightings between 1821 and 2004.**

This graph is to show an estimate of seasonal patterns and variations in sightings throughout the years. All the sightings from between 1821 to 2004 have been included in this graph and put onto a one-year time scale to show an average of when the most sightings are reported during the year.

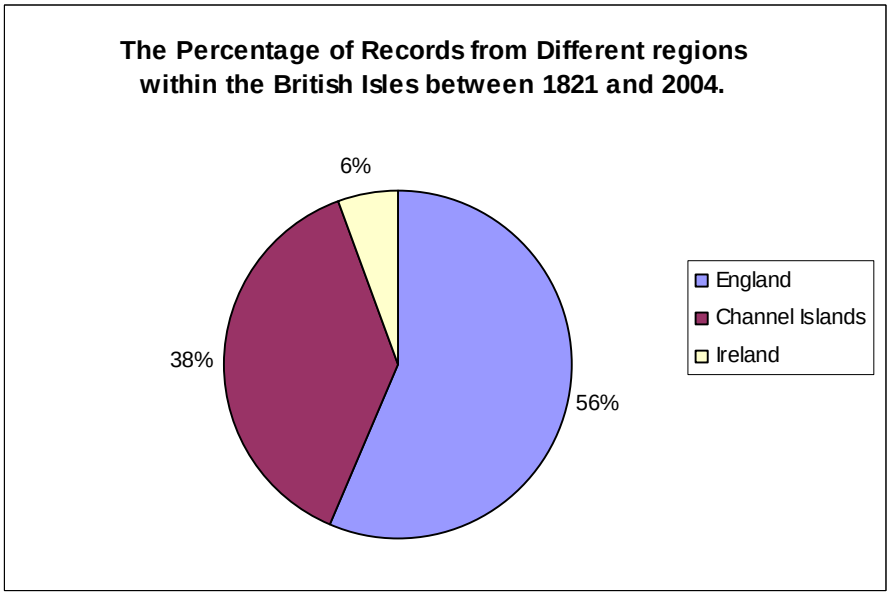



**Graph 3: Showing the different Depths of Sightings between 1821 and 2004**

The total number of records was used in this graph, excluding records of unknown depth, to give an overall picture of where seahorses are found throughout the year, and to analyse whether there are any seasonal migration patterns.

Graph 2 shows the total number of seahorse sightings between 1821 and 2004 on a one-year time scale. The highest quantities of seahorses are found in the summer months of July, August and September, with an historical peak in August.

Interestingly when compared to Graph 3, showing the depth of sightings for British Seahorses on a monthly basis between 1821 and 2004, the vast majority of records are all found in Shallow to Medium depths of water (1-10m) during Spring and Summer months. This increase can be related to human activity. During the summer months the coast is a popular location for recreational activities, such as snorkelling, rock pooling and shrimping; which all take place in Shallow to Medium depth of water. It is highly probable that more sightings of seahorses are being recorded during the summer months because more people are utilising the coast and taking the time to look at what they are finding. It could also be related to the awareness of people in certain areas. Graph 4 shows the percentage of records from different regions within the British Isles between 1821 and 2004. It is clear that the majority of sightings come from England and the Channel Islands although this pattern relates to areas where the British Seahorse Survey's Sightings Co-ordinators reside.

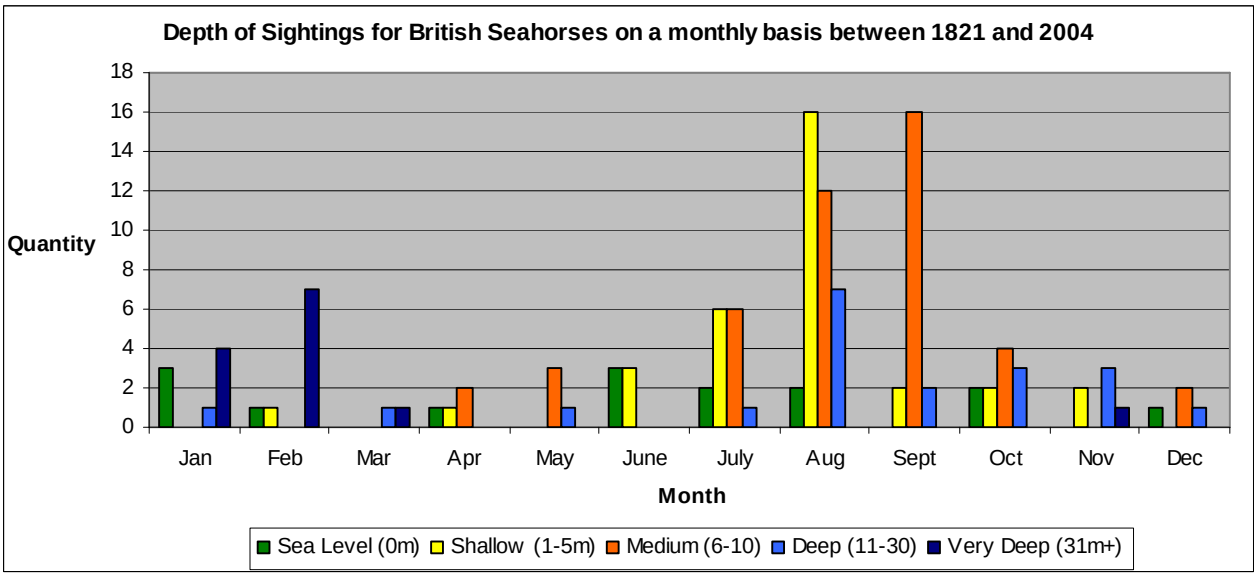



**Graph 4:**

Currently there are three main areas where sightings of seahorses are reported from. The majority of sightings come from England, with 56%. This includes sightings from Wales and Scotland. The Channel Islands region includes sightings from Sark, Alderney, Jersey and Guernsey and is the second best source of sightings with 38%. 6% of sightings come from Ireland.

## Seasonal Differences

As the British Seahorse Survey is located in a temperate region, it is affected by four seasons through the year. Spring lies between March and June, Summer is between June and August, Autumn lies between late August and early November and the Winter months are between November and February; when the majority of storms take place.




**Graph 5:** Showing the different Depths of Sightings between 1821 and 2004

The total number of records was used in this graph, excluding records of unknown depth, to give an overall picture of where seahorses are found throughout the year, and to analyse whether there are any seasonal migration patterns.

The quantity of seahorses recorded at Sea Level (0m) remains below 4 throughout the year. Shallow (1-5m) to Medium (6-10m) records increase significantly between the months of April and October, with the highest quantities in August and September. Comparatively during these months there are no seahorses sighted in Very Deep water (31m+), and very few sighted in Deep water (11-30m). Seahorses are mostly found in Deep to Very Deep water between November and March, with the greatest quantity found during January and February in Very Deep water (31m+).

Evidence from The British Seahorse Survey suggests that there are seasonal migration patterns. Referring to Graph 5, there is a general increase in sightings during the summer months. As stated in the Awareness section these numbers could relate to the number of people who are around the coast at this time, increasing the chances of sighting a seahorse. Quantity aside, it is interesting to see that seahorses are recorded in Shallow to Medium

depths more frequently in the warmer months leading up to summer and in comparison none are found in Very Deep waters (31m+) during these months. As the temperature starts to fall during Autumn and Winter, seahorses are rarely recorded in Shallow and Medium depths and begin to become more frequent in Deep to Very Deep depths (11-35m+).

It is suggested that these seasonal patterns are directly related to food supply and camouflage with a by-product relating to Breeding Season. Plankton is the major food supply for seahorse fry, and is also the food supply for adult seahorse prey food, mysid shrimp. During the warmer months between Spring and Autumn there are two blooms of plankton in British waters. The first and largest is at the beginning of Spring when phytoplankton starts to develop due to the abundance of nutrients being churned up in the water from winter storms [SAFOS website]. During the summer month's nutrient levels decrease as the abundant life from the increased light levels and warm temperatures gradually depletes the oxygen [GSFC website]. As water temperatures start to fall in late summer and autumn, upwellings of warmer waters rise to the surface carrying with them large quantities of nutrients that initiate the smaller, but still significant Autumn Plankton Bloom [GSFC website and Chamberlain, 2004]. These plankton blooms are associated with a combination of climatic conditions and excessive levels of nutrients (eutrophication) [DEFRA, website]. Ocean currents, like the Gulf Stream, can influence the nutrient supply that plankton blooms rely on, and they also conspire to maintain or restrain blooms due to the movement of water both at and below the ocean surface [GSFC website].

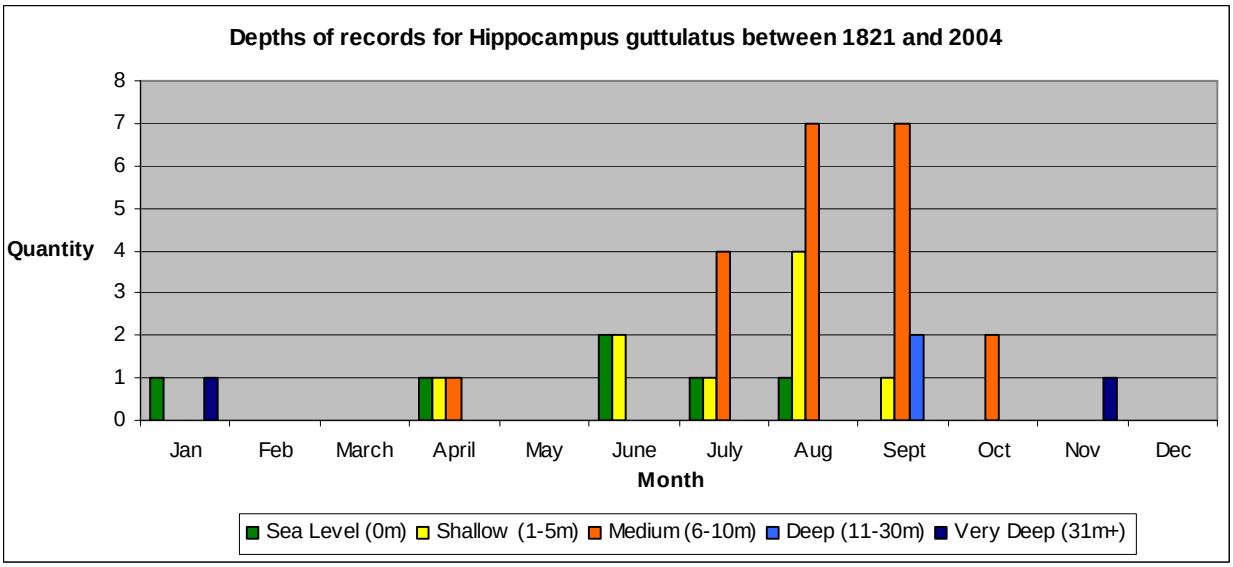
As the days get longer during the warmer months available light increases enabling algae, seaweed and sea grasses to have a growth spurt. This provides essential camouflage for species such as seahorses in shallow waters. This increase in abundance of camouflage and food supply for young as well as mature seahorses in Shallow and Medium waters can be linked to the increase in numbers of sightings during the warmer months of Spring and Summer. A complimentary theory is that the seasonal migration is related to weather conditions. There is no conclusive evidence that supports this theory, however it can be assumed that in the winter month's seahorses could potentially migrate to deeper waters to protect themselves from the severe storms that ravage the shallow waters. When the waters become calmer the seahorses return to the shallower waters, to coincide with the increase in their food supply. The breeding patterns of seahorses in temperate waters have not been

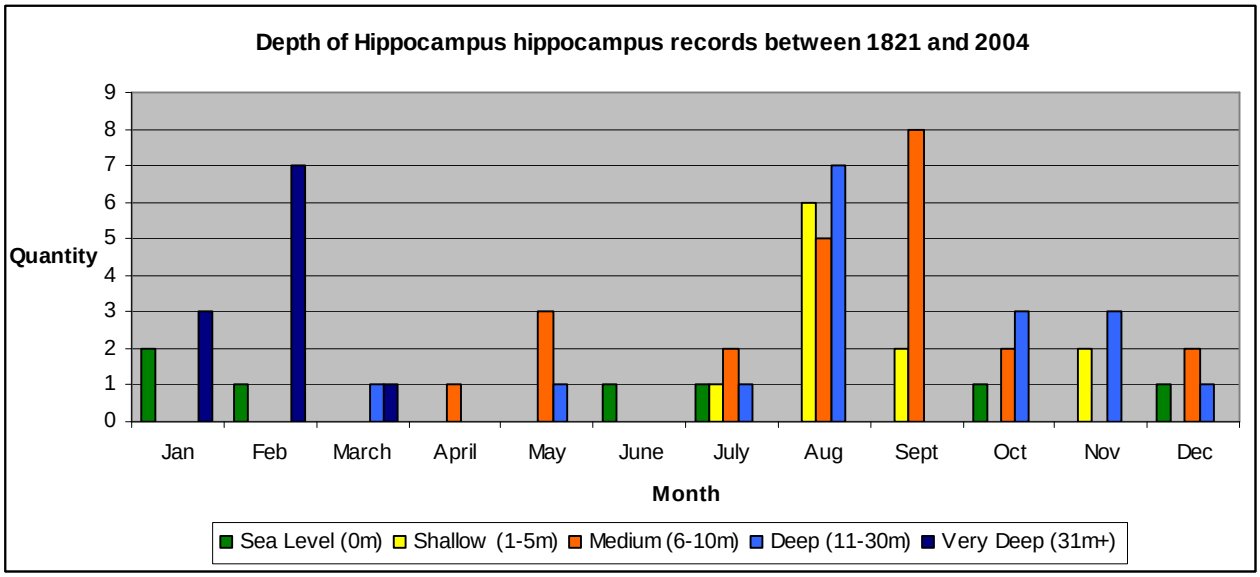
fully investigated, but it is suggested that they breed in the warmer months between Spring and Summer [Garrick-Maidment 2002]. This coincides with the localised seasonal migration theory, as the young would be released when there is the highest concentration of their food source, plankton.

The theory of localised seasonal migration is supported by the research undertaken by Scarrett in Boston Aquarium with *Hippocampus erectus* (Personnel Communication, Scarrett 2002).

The seasonal pattern of sightings can be related to a number of factors. Activities around the coast decrease during the colder months, which decreases the chances of sighting seahorses and records being reported. Also there are depth variations depending on the location of the sighting. Underwater topography differs between different regions, for example, the waters around the Channel Islands are naturally very deep as the topography consists of deep channels and large tidal ranges and the Continental Shelf around Britain generally provides a shallower habitat.

From the Distribution maps shown in Figures 1 and 2, page 34 within Appendix 9, there are clear differences and similarities in each species distribution and this can be related to the depths where each species are found during the speculative year. *Hippocampus hippocampus* is predominant in the deep waters of the Channel Islands, this relates to Graph 7, where there are a higher percentage of sightings found in deeper waters for *H.hippocampus*. There is a noticeable peak of records in Very Deep waters during January and February on Graph 7. When compared to the information from the database, these records were all found on Parlour pots in the Channel Islands. Feeding patterns of seahorses in Deep Temperate waters are not known, however all the specimens were in good health, which suggests there was adequate food supplies at these depths. A potential theory for this is that the seahorses are attracted to the shrimps and crustaceans, found around Parlour pots, which are attracted to the smell of the bait. This may only occur in the colder months, as food would be scarce elsewhere in shallower environments. The crab fishing industry operates year round and The Seahorse Trust receive a number of reports from crab fishermen, so they are a good source of evidence of deeper reports during Autumn and Winter as there are no reported sightings of seahorses on Parlour pots being recorded in warmer months.




## Graphs 6 and 7

These graphs show an estimate of the depths that *Hippocampus guttulatus* and *Hippocampus hippocampus* have been recorded in between 1821 and 2004 over a one-year time scale. There are a greater number of records for *H.hippocampus*. Regional geographic differences will affect many of the records as areas such as the Channel Islands are naturally deeper than waters around the South Coast of Britain, and this has to be remembered when analysing the graph. Also not all the sightings could be included in this graph, as some records were missing details such as 'month'. Specimens recorded at Sea Level have been found out of the water; i.e. as strandings

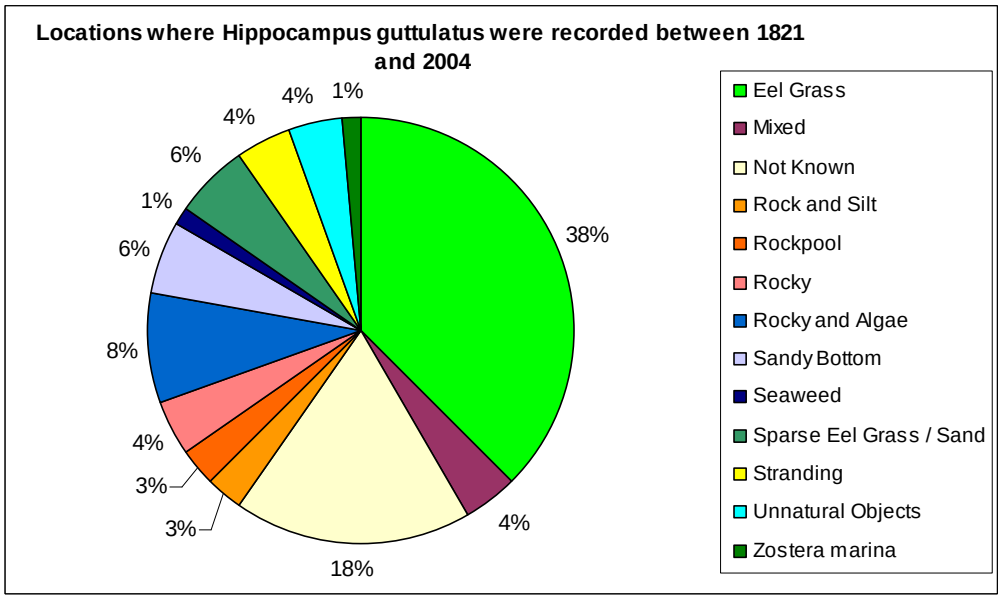
Although there are fewer sightings of *Hippocampus guttulatus* Graph 6 shows there are a higher number of sightings recorded in Shallow to Medium depths throughout the speculative year, with the highest number recorded in August; high summer. Although there are only a few records reported in Deep (11-30metres) and Very deep (31metres+) they are all found in the colder winter months of September, November and January. Sightings of *Hippocampus hippocampus* have a similar pattern, with the majority of Deep to Very Deep records in the cold winter and early spring months of January, February and March. Interestingly no other depths are recorded in these months for sightings. During the warmer months between April and September, shallow and Medium depth sightings increase, with the highest number being recorded in August high summer.

These patterns may be related to the regional topographical differences. Most sightings of *Hippocampus guttulatus* are found around Britain (refer to Figure 2 on page 34 and in Appendix 9) where there is a shallow topography due to the relatively shallow Continental Shelf. The only sightings recorded in depths beyond 11 metres are found in September and November, when temperatures are beginning to fall and January when temperatures are generally at their lowest. The deepest known record of *Hippocampus guttulatus* in the United Kingdom was recorded in November at 46 metres whilst the recorder was crab fishing. The specimen was in good health, which suggests there was adequate food supply at this depth.

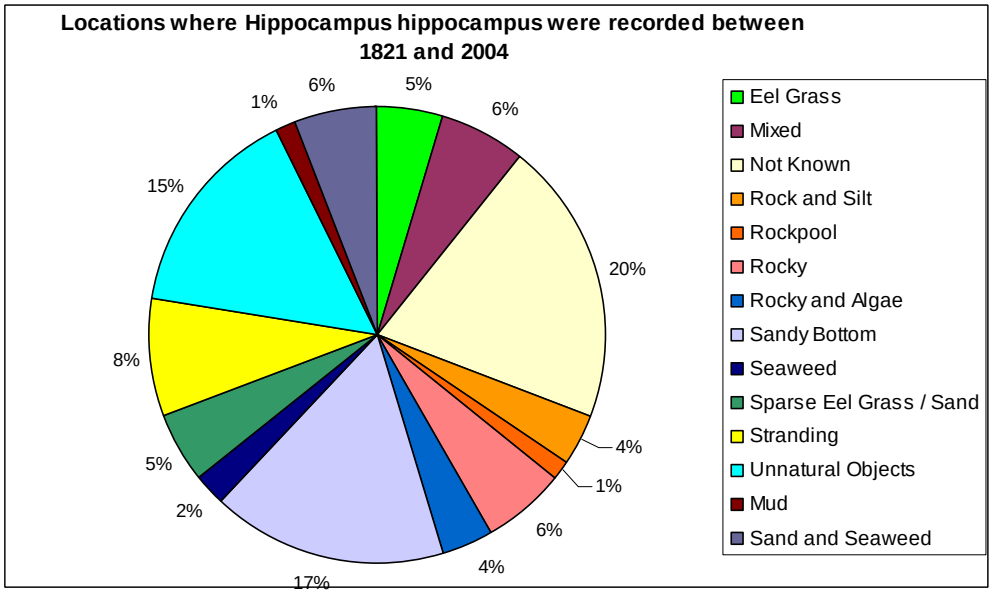
There is not enough reliable evidence currently available to show conclusive patterns in Seahorse sightings through the seasons. Theories can be put forward and assumptions can be made, but unless seahorses are protected to enable more data and information to be gathered then many aspects of the behaviour of British Seahorses will remain a mystery.

The Seahorse Trust intends to undertake co-ordinated surveys throughout the British Isles and throughout the year, so that the necessary data can be obtained and patterns can be investigated further. It will then be possible to predict which areas seahorses can be found in and at what range of depths, so that certain areas can be designated the protection they require using effective and sustainable conservation and preservation methods.

## Habitat Preference



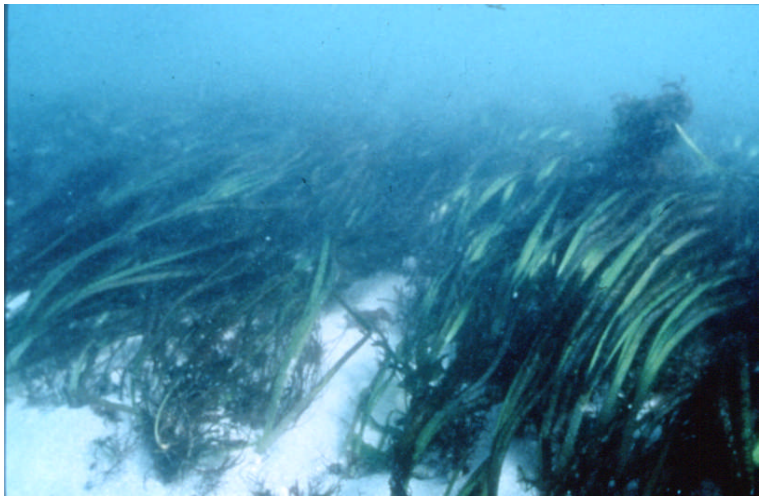

**Graph 8:** The percentages were taken from the total number of sightings recorded for *Hippocampus guttulatus* between 1821 and 2004. Eel Grass is the most popular habitat with a total of 49%, comprising of Eel Grass (38%), Mixed (4%), Sparse Eel Grass/Sand (6%) and Zostera marina (1%) which all include Eel Grass in their description. 18% of the records' habitats were unknown. The second most common habitat is Rocky and Algae with 8%. The least common habitat is Seaweed with 1%. The category 'Stranding (4%) is not a habitat, but when the seahorse has been found above Sea level.




**Graph 9:** The percentages were taken from the total number of sightings recorded for *Hippocampus hippocampus* between 1821 and 2004. 20% of the habitats recorded were unknown. The most common habitat was 'Sandy Bottom' with 17%, 15% of records were found on 'Unnatural

Objects', such as Lobster pots, marina's and moorings. The total percentage of records in Eel Grass habitats was 16%. The least common habitats are Mud and Rockpools, both with 1%.

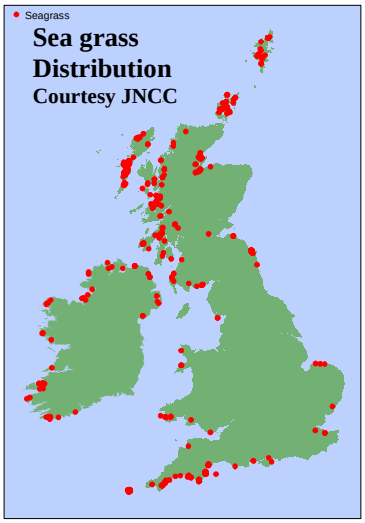
**Eel Grass Beds:** Seagrasses are marine flowering plants found in shallow coastal habitats around the world. They most commonly occupy sandy intertidal and subtidal areas to a maximum depth of about 10 metres. Seagrasses typically grow in 'beds' or 'meadows'. These beds create a habitat of considerable importance from an ecological, economic and biodiversity perspective. The beds support a high density and diversity of associated flora and fauna, and provide valuable nursery and feeding grounds for a variety of fishes and birds. The binding of sediment by Seagrass root networks also acts to stabilize the shoreline and reduce coastal erosion. In temperate waters there are ten species of the genus Zostera and two species of Ruppia. Five seagrass species are found around the British Isles - two species of 'tassel weed' (*Ruppia maritima* and *R. cirrhosa*) and three species of 'eelgrass' (Zostera spp.) (Davison and Hughes, 1998).



It has long been thought that seahorse species only inhabit Eelgrass beds. The Pie Charts in Graphs 8 and 9 show the break down of various locations, in percentages, where seahorses have been recorded from the entire British Seahorse Survey between 1821 and 2004. *H.guttulatus* has a preference for Eelgrass although it is also found in a number of other types of habitat. *H.hippocampus* has a much wider preference in its chosen type of habitat, with an equal potential of being found on man made objects as in rocky areas or Eelgrass beds. These findings are supported by the research undertaken by Curtis and Vincent regarding the ecological differences between *Hippocampus guttulatus* and *H.hippocampus* (in preparation). It is stated that although both species can be found in Seagrasses, macroalgae and on sand, statistical comparisons suggest that *H.guttulatus* prefers complex habitats and uses any kind of Seagrass, algae or benthic invertebrate as a holdfast. *H.hippocampus* prefers less complex

habitats and is generally found on sand flats grasping shells, benthic invertebrates and small tufts of algae (Curtis and Vincent, in preparation). Project Seahorse has recorded *H.guttulatus* in algae/macro algae, rocks/gravel and Seagrass and *H. hippocampus* has been recorded in algal reef, algae/macro algae, rocks/gravel and Seagrass and soft bottom habitats (Project Seahorse, 2004).

It can be concluded that the two species differ in their habitat preference. This could be influenced by the different regional locations that each species is found in (Refer to Figure 1 and 2 and page 34 in Appendix 9). Regions within the British Isles differ dramatically in habitats due to differences in their underwater topography, weather conditions and human activities. *Hippocampus hippocampus* is predominant in the Channel Islands, where there is a very large tidal range and deep-water channels, which prevents habitats such as Seagrass meadows establishing, as species like eelgrass can only survive in depths up to 10 metres (Davison DM & Hughes DJ, 1998). A significant number of records for *H.hippocampus* are recorded in depths over 10 metres (Graph 7 in Appendix 9). This is connected to the type of habitat that *H.hippocampus* prefers; Sandy bottom and Unnatural Objects.



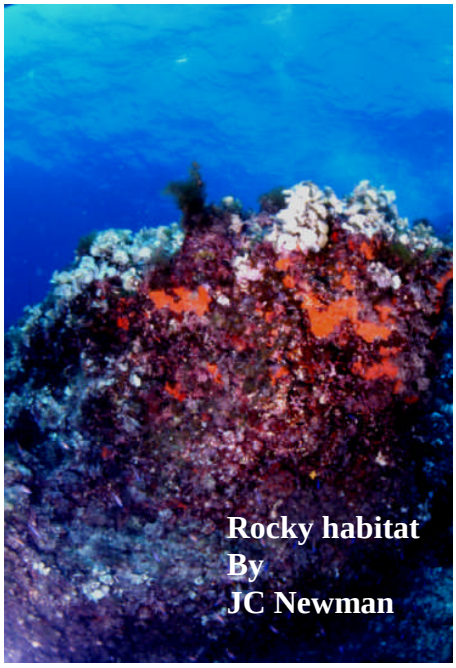

The areas around Britain are much shallower in comparison, and are abundant in seaweeds, algae and seagrasses such as the extensive Eel grass beds in Weymouth, Dorset. This provides ample habitat for seahorses to colonise successfully. *Hippocampus guttulatus* is the predominant species recorded in Britain; hence its preferred although not exclusive habitat, Eel grass beds.

Both species of British Seahorse have also been recorded in brackish waters, as far inland as Dagenham on the Thames, which is 37 miles inland and Devonport in Devon, which is 3miles inland.

It is possible to suggest from these findings and the evidence of populations colonising manmade and unusual areas, that seahorses are opportunistic in their habitat preference. There is a resident population of *Hippocampus hippocampus* in a marina in Jersey and sightings of both species have been found on Crab, Lobster, or Parlour Pots throughout the British Isles.

The distribution of seahorses is closely associated with the distribution of seagrasses in the British Isles, (All Distributions Maps can be found in Appendix 9). It is clear that seahorses are one of the many species that depend on Seagrasses. The status of seagrasses in the British Isles is currently being researched by CEFAS and JNCC; it can be suggested under the current evidence that seagrass habitats are receding throughout the British Isles. The Seagrass beds, *Zostera marina*, in Weymouth were surveyed in 2000 by Collins at the Southampton Oceanography Centre. Concern was expressed about the sparseness of the population, which was possibly linked to coastal protection works along the beach at the time. During the winter of 2003 there was an abnormal amount of seagrass washed up on the beach, which has prompted the need for another survey to be undertaken in 2004.

In 1930 a wasting disease destroyed most of the Eelgrass *Zostera marina* in Western Europe, including substantial populations around the British Isles. Recovery was very slow and many sites such as the Wadden Sea in the Netherlands, where both *Hippocampus guttulatus* and *H.hippocmapus* have been recorded in the past, have not recovered their Eelgrass populations at all. In 1919 150km$^2$ was covered, this was reduced to 5km$^2$ in 1971 and just 2km$^2$ remained in 1994. The disease is still present and its presence is increasing in many locations (Foden, 2004; Davison and Hughes, 1998). There is some thought that whatever the causative organism, which it is speculated could be the slime mould *Labyrinthula zosterae*, only takes hold in Zostera species of seagrass if the shoots are already stressed by other environmental factors (Foden, 2004). It is also suggested that recovery is arrested by anthropogenic influences, however further research is required for conclusive evidence. For more information on the Seagrass Wasting Disease and British populations please refer to Appendix 8.


**Rocky habitat By JC Newman**

It can also be suggested that there is a habitat shift through seasonal migrations. Seahorses could shift from Seagrass habitats between Spring and Summer to Silt, Rock and Sandy beds during the

winter months. When seahorses migrate to deeper water, for protection against storms and in search of food, they would no longer be able to inhabit seagrass beds, which are only found in shallow waters (below 10metres). This theory requires a lot more information before it can be defined accurately. Habitat preference would need to be compared with the months and depths of sightings to investigate if there is a seasonal base for habitat specification. Ideally the tagging of wild specimens would be ideal in obtaining this information, although this would be very complicated and difficult. Research has been undertaken by Project Seahorse in Sydney Harbour and in captivity by the Sygnathid group, a group formed by seahorse professionals from zoos and aquariums around the world, into effective tagging measures. Tagging wild specimens in British waters would enable information to be recorded on behavioural characteristics of seahorse behaviour through the year. It would be essential to establish population numbers of British Seahorses through surveys so a representative number of the resident populations could be tagged.

The habitats for British Seahorses have also been classified using the IUCN criteria, which can be found in Appendix 5.

This break down in habitats will make it easier to protect Seahorses as we are starting to understand more about them and their movements. It will also allow us to target different areas when we are searching for seahorses, especially in relation to known seahorse sites where the information will help us focus future surveys on high profile locations. We are conscious that this is just a small part of the picture, however it is a valuable start and will allow us to progress with the next stage of the survey.

# Distributions

**Figure 1:** The Distributions of *Hippocampus hippocampus* in the British Isles.

**Figure 2:** The Distributions of *Hippocampus guttulatus* in the British Isles.

The distributions of the two British Seahorses have been plotted on the maps above to give a rough representation of both species ranges. These distributions are only estimations as more information is required for accurate maps to be created. Where sufficient data was not available the ranges have been estimated using known habitat distribution to infer where the species are likely to exist. Worldwide distribution of both species can be found in the introduction.

There are clear differences between the ranges of the two species, with a substantial number of *Hippocampus hippocampus* inhabiting the waters around the Channel Islands, where very few sightings of *H.guttulatus* are recorded. There are also a greater number of *H.hippocampus* records found around the Irish coast compared to *H.guttulatus*. *Hippocampus guttulatus* has a much wider range around the British Isles with sightings being recorded from the East coast, along the South coast and continuing to the West coast of Wales, with sightings being

recorded as far north as the Shetland Isles. The differences in distribution can be related to a number of different factors such as differences in habitat preference, as discussed in the previous section.

The distribution of both species overlaps in certain areas, particularly the South Coast of Britain, although *Hippocampus guttulatus* is more frequent in this area. It is possible for both species to co-exist in the same areas because they have different adaptations. *H.guttulatus* has a long snout (hence one of its common names Long snouted Seahorse). This adaptation enables the seahorse to pry into crevices to search for prey hiding amongst the rocks. *H.hippocampus* has a wide snout, which is shorter (hence its common name; Short snouted Seahorse). This enables the seahorse to feed on larger prey. Therefore the species will not compete with each other if they are found in the same area, as they can both exploit different sources of food.

Through the work of The British Seahorse Survey, information has been gained that seahorses do not only inhabit coastal waters, but can also be found in brackish waters. *H.hippocampus* and *H.guttulatus* have both been recorded 37 miles inland at Dagenham on the Thames, and *H.hippocampus* has been found 3 miles inland at Devonport in Devon as well as other estuaries.

The origin of the British Seahorse cannot be accurately defined, but evidence shows that they are quite adaptable species. Strong currents such as the Reynold Current which is a periodic current linking the French coastline to Southern Britain and the current that sweeps through the English Channel and with greater force through The Straits of Dover, could possibly bring with them species, such as seahorses, from the Western coasts of Europe and beyond. These species could then drift onto the shores of Britain and establish in the milder climates of areas influenced by the warm waters of the Gulf Stream. It is strongly believed that the sightings recorded in the British Seahorse Survey are from indigenous populations and there is no large-scale migration between Britain and Europe, this is supported by seahorses being notoriously bad swimmers, holding the Guinness record for the slowest swimming fish. It is improbable that seahorses successfully combat the strong currents that flow through the English Channel on a seasonal basis, although it is possible for occasional specimens to be caught in the current and swept into new locations, where, if suitable habitats are found, colonisation can take place.

Distributions of preferred habitat influence the distributions of species, as shown by the similarity in distributions of British Seahorses and Seagrasses in Figures 1 & 2 and 9 respectively. Both of these distributions will be influenced by the mild conditions supplied from the Gulf Stream shown in Figure 3.

## The Gulf Stream and its potential influences on Distribution Patterns.

The Gulf Stream is a warm surface ocean current, which originates in the Gulf of Mexico and flows northeast across the Atlantic, driven by the prevailing southwest winds. It influences the climate of the UK and Northwest Europe by bringing with it humid mild air.

Sometimes, the term "Gulf Stream" is restricted to describe the ocean current that travels past the east coast of the United States towards Newfoundland. The North Atlantic Drift forms the extension to the Gulf Stream that flows past the south coast of Labrador towards the west coast of Europe.

Within the Gulf of Mexico, the Gulf Stream is very narrow, only 50 miles wide, and travels very fast at 3 mph, carrying water at about 25°C. The North Atlantic Drift current widens considerably to several hundred miles slows to less than 1 mph and splitting into several sub-currents. The Gulf Stream is one of the strongest currents known anywhere in the world. Without the warm Gulf Stream, the UK and other places in Europe would be as cold as Canada, at the same latitude and have short hot summers and long very cold winters.

The warm waters of the Gulf Stream lose a lot of moisture through evaporation, making the sea particularly salty. In the North Atlantic, the heavy salt water becomes cold enough to sink, forming a deep ocean current called the North Atlantic Deep Water (NADW). The NADW acts as a pulling mechanism on the Gulf Stream, maintaining the direction and intensity of the ocean current, and keeping the climate of the UK and Northwest Europe mild. Scientists have shown that thousands of years ago the NADW shut down in response to subtle shifts in global climate. This slowed and diverted the course of the Gulf Stream to such an extent that the regional climate of the Northeast Atlantic became considerably cooler. It is now suspected that global warming may trigger a shutdown in the NADW, and a slowing or diversion of the Gulf Stream, which would ironically lead to colder climates throughout the UK and Northwest Europe (Coastal Guide.com website).

The Gulf Stream's warm current and the food supplies that are brought with it influence the distributions of many species around the British Isles. In the areas, which are affected by the Gulf Stream, marine life is abundant and varied, with a high productivity compared to the rest of the country.

Migratory species that appear to be influenced by the Gulf Stream include Basking Sharks *(Cetorhinus maximus*), which feed on plankton suspended in the warm currents of the Gulf Stream and Leatherback Turtles (*Dermochelys coriacea*) who feed on Dustbin lid Jellyfish (*Rhizostoma octopus*) that are also carried by currents influenced by the Gulf Stream. Both Basking Sharks and Leatherback Turtles are only sighted periodically around the British Isles, which may coincide with blooms of plankton.

Sedentary species such as Pink Sea Fan (*Eunicella verrucosa*) and Seagrass species also appear to thrive in areas where the Gulf Stream provides mild conditions.

Seahorses are neither sedentary nor migratory on a large scale, although there does appear to be a localised seasonal migration dependent on food supply, habitat and weather conditions. Generally Seahorse distributions also appear to be influenced by the Gulf Stream.

Further research is required into these similarities so that the importance of the Gulf Stream can be analysed accurately and the ecologically influences it has on resident species within the British Isles can be investigated.

**Figure 3:** Pattern of the Gulf Stream around British Isles

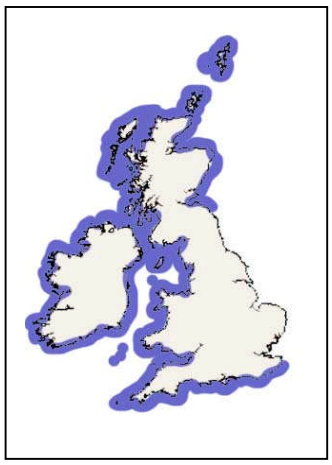


**Figure 4:** Basking Shark Distribution, sourced from MarLIN, 2004.

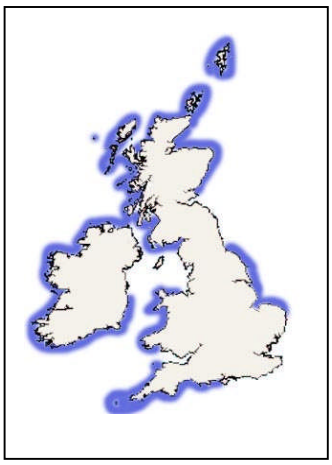


**Figure 5:** Leatherback Turtle Distribution, sourced from MarLIN, 2004.

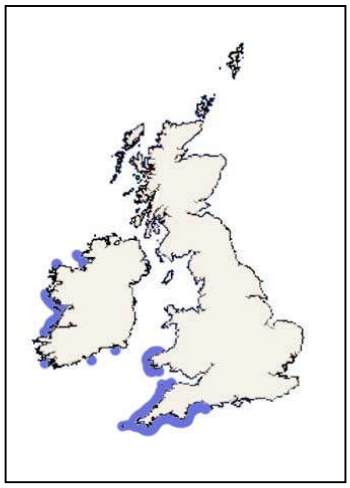


**Figure 6:**Pink Sea Fan Distribution, sourced from MarLIN, 2004

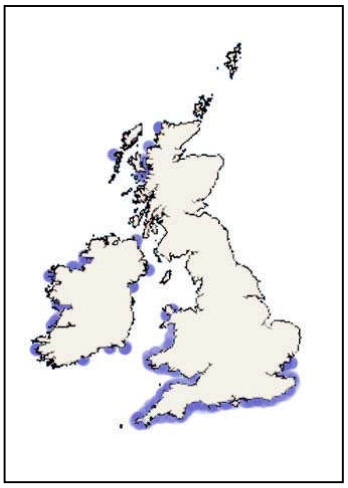


**Figure 7:** Dustbin Lid Jellyfish Distribution, sourced from MarLIN, 2004

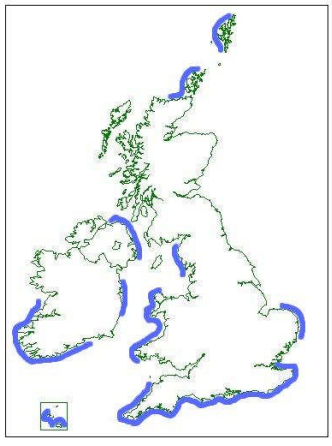


**Figure 8:** Seahorse Distribution, Source: British Seahorse Survey, 2004

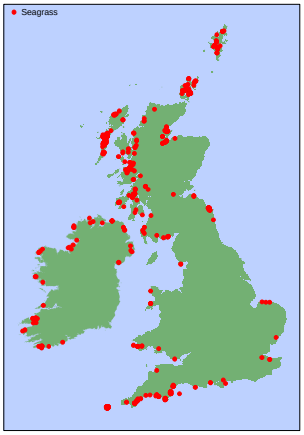



**Figure 9:** Seagrass Distribution, sourced from JNCC 2004.

When all of the distributions are compared together, patterns start to emerge. The maps show that cited species have a distinct common distribution around the South West peninsula of Britain and the South West coast of Ireland. There are other slight similarities in distributions such as the entire South Coast of Britain, West Ireland, West and North Scotland and the Shetland Isles. These patterns are directly correlated to the Gulf Stream current, which is shown in Figure 3 page 38.

These findings have been a by-product of the research undertaken for the British Seahorse Survey report. It is strongly suggested that further research is undertaken in this area, especially when there is a distinct possibility that the Gulf Stream may cease to flow past the British Isles in years to come. This will result in a direct threat to many resident species in the British Isles, as few will be able to survive in colder climates without the influence of the warm waters from the Gulf Stream.

## IUCN Red List Categorisation. Threats and Pressures.

*Hippocampus guttulatus* and *H.hippocampus* are currently classified as Data Deficient in the IUCN Red List (Project Seahorse 2003). The IUCN Red List Categories were developed primarily for application on a global scale, to judge the extinction risk of the whole species worldwide. In order to undertake sensible conservation and preservation methods there is a need to categorise species on a Regional Level. Recommendations from IUCN are to follow organised workshops, which will develop guidelines for applying the new categories at national or other regional levels in order to achieve standardisation within different regions.

IUCN criteria have been taken into account throughout this report, in the hope that through further research points can be expanded on in order to categorise both species of British Seahorses within a regional Red List category. The information below has been separated into relevant sections, which can be expanded on with further research.

**Scientific Names:** Are outlined in the individual description of each species, along with the known common names and worldwide distributions and countries of occurrence.

**Fisheries Areas of Occurrence:** This is outlined in Appendix 6.

**Current Population Trends:** Are currently unknown, due to insufficient information being available at time of publication. Information from studies in the Ria Formosa, Southern Portugal infer that population numbers have been statistically stable over the last 20 years.

**Habitat Preferences:** Have been listed in Appendix 5 using the GLCC classification, and are described in detail in the Habitat Preferences sections of the discussion.

**Major Threats:** Have been briefly described in relation to seahorses world-wide, below is a more detailed description of the threats and pressure that are facing British Seahorses. The current IUCN listing has been cited throughout the document, both species are currently listed as Data Deficient (project Seahorse 2003).

**Conservation Measures:** These are outlined in Appendix 7, however more detailed information is given in Conclusions and Recommendations.

**Data Sources:** All data has been cited in full throughout the document and in the References section.

**Contact with Populations outside the Regional Borders:** It is possible for individuals of either species to be swept onto British shores from Western Europe and beyond due to the influence of strong currents which run through the English Channel. This correlates with the predominant distribution of seahorses along the South Coast. Dispersal distances of seahorse fry are currently unknown, although they are recorded as planktonic residing in the water column for up to three weeks, so it is possible for them to disperse along great distances. If the regional populations were to become extinct, there is potential for recolonisation depending on dispersal ability, distance from nearest source populations, directions of major currents and habitat quality. As long as habitat is intact and there are existing source populations, there is always a remotest chance for recolonisation. Until dispersal distances are investigated further, it is difficult to accurately predict the possibility of recolonisation.

**Nearest Population:** The nearest population to the British Isles is the Channel Islands, which have been included in this report and Continental Europe. There is inadequate information to assess the status of these populations, although they will be affected by the same pressure and threats facing British Seahorses. The only effective barrier between these populations is the large expanse of water, which would be difficult for seahorses to purposefully cross due to their poor swimming ability.

**Differences in Local Adaptations:** Local adaptation is common among marine fishes, as in most organisms, but the degree of local adaptation depends to what degree habitats differ among locations and what kind of selective pressures there are. The amount of gene flow among populations can swamp effects of natural selection. Speculative differences have been observed between resident populations in the Ria Formosa and inferences from a population studied in France, but no conclusive evidence is available. Further research and collaboration between organisations studying seahorses in various countries would be required and is recommended.

**Regional Environmental Situation:** It is strongly suggested from the evidence in this report that the populations in the British Isles of both species are self-sustaining and not reliant on immigration for long-term survival. This is further supported by a sighting that was recorded during winter of a juvenile seahorse, which suggests that there are breeding

pairs. However the environmental conditions in Britain are suitable for immigrating species to establish.

## Threats and Pressures facing Seahorses.

- **Loss of habitat:** This is the primary cause for concern. Seagrass beds are the predominant habitat for British Seahorses. Seahorses depend on this habitat for protection against predators and camouflage against prey. Therefore the survival of seahorses is heavily reliant on the survival of Seagrass habitats within the British Isles. Seagrass also provides an essential area as nursery grounds for a variety of marine species. Before the early 1900s three species of *Zostera*, or 'eelgrass', were common in sandy coastal areas of the British Isles, but their abundance was severely reduced during the 1920s-1930s period by a 'wasting disease' that is still not fully understood today. Since this time there has only been limited and localized recovery of the *Zostera* beds. These plants flourish in accessible near shore margins, and can therefore be adversely affected by many forms of coastal development, in particular dredging and excessive nutrient loading. Because of the value of seagrasses as a representative habitat for the UK, their high biodiversity and ecological importance, and their vulnerability to anthropogenic impacts, several parallel initiatives are now underway to better understand the role of these plants in coastal ecosystems and to facilitate effective conservation measures. Although all three *Zostera* species are still widespread today, they are now considered to be nationally scarce with a patchy distribution. The destruction of this habitat will have catastrophic consequences on seahorse populations as ecologically; fragmented habitats are much poorer in biodiversity than uninterrupted habitats and are believed to be one of the main factors leading to loss of species richness (Wilcox and Murphy, 1985).


Dense Eelgrass Bed

- **Traditional Medicine Trade:** The earliest reports of seahorses being used for medicine originate in Europe and date back as far as 342BC (Vincent, 1996). It is reported that they were used to cure baldness, fevers, and chills, infertility, leprosy and rabies. If prepared in the right way a seahorse could potentially have been a

deadly poison as well. Western medical use continued until at least the Eighteenth Century. The present day market is mainly in China and the Indo-Pacific where seahorses are used in Traditional Chinese Medicine to cure a wide range of symptoms including sore throats, asthma, heart, kidney and liver disease, difficult childbirths, incontinence, mental disorders and an aphrodisiac. Worldwide, it is believed that up to 30 million seahorses are being removed from the wild every year, solely for this trade. It is thought to be the unusual appearance of the seahorse and its secretive behaviour that creates the myth and legend surrounding these creatures and makes them so appealing to this kind of trade. At present there are 65 countries taking part in this trade and the collection industry are always looking for new locations to exploit. It will not be long before the British Isles becomes a target for this trade.

- **Curio trade:** Seahorse bodies are made up of a series of hard bony plates fused together, with a fleshy covering. This exo-skeleton means that when the seahorse is dead and dried out it keeps its shape well. For this reason seahorses are taken from the wild for the curio trade where they are bought as souvenirs of a seaside trip or as crude key rings and trinkets. Unfortunately, people who innocently buy the seahorses (and even some who sell them) believe they have been found dead, but they are nearly always taken alive and left to dry out in the sun, strung up by their necks.

**Juvenile H.hippocampus in captivity**

- **Aquaria trade:** Seahorses are highly sought after for aquaria, both public and private. It has been estimated that up to 1 million are taken each year for this purpose. The vast majority of these individuals die in transit and if they do reach the relative safety of the aquarium, most die within the first few weeks because they are notoriously difficult to maintain in

captivity. Over the last few years, seahorses have been taken from the wild for sale in aquaria and within Britain, they can be sold for quite high prices, anywhere up to £85 (N.Garrick-Maidment 1999) which makes them a viable proposition for collectors. The number taken may be small; in one area it was estimated to be around 8-10 a year, but this could have had a major impact on a local population due to the size of the seahorse's territory. A large area of eel grass can only support a small number of individuals; if seahorses are taken regularly from the same area it does not take long for a local population to be wiped out. Seahorse populations are being increasingly decimated in other countries and more unusual species of seahorse are being sought for aquaria. Therefore, the demand for the British species and the incentive to collect them will no doubt increase unless they are afforded legal protection.

## Conservation Measures

It is essential that both British Seahorses are included under the Wildlife and Countryside Act 1981, which they were submitted for in February 2000 by The Seahorse Trust. This will enable further research to be undertaken of these mysterious animals in a safe and conservative way. It is not currently known how common seahorses are in British Waters, and it would be a shame to find out once it was too late. The inclusion on the Wildlife and Conservation Act (1981) is the best and most immediate form of action to preserve and conserve British Seahorses and is a vital tool.

Through the British Seahorse Survey and other similar projects in the wild and in captivity throughout the world we hope to preserve not just British Seahorses but all of the Seahorse family.

Through co-ordination of major aquaria throughout the world there is a captive breeding programme and a variety of research for indigenous and tropical seahorses currently taking place. Working in partnership is the only way forward in conservation and we hope to form many partnerships to push forward the work of the British Seahorse Survey.

The Seahorse Trust is already in partnership with many groups, organisations and individuals around the world and we sit on a number of groups such as the Fish and Aquatic Invertebrates Taxon advisory group for Seahorses, the sygnathid discussion group Internet group, Seahorse-Talk Internet discussion group and many others. We firmly believe the only way forward for conservation of any species, whether flora or fauna is to form partnerships and share information. With this in mind it is written into the constitution of The Seahorse Trust that we shall freely share information with others for the furtherance of conservation.

## Conclusions

The importance of raising the awareness nationwide of important and rare species, which inhabit our waters, is shown conclusively from the evidence in this report. As awareness of The Seahorse Trust's work on the British Seahorse Survey has increased so have the amount of sightings reported and the information received. As a charity The Seahorse Trust is reliant on information from volunteers and the collaboration of research findings through active conservation bodies. Informing people about the work of The British Seahorse Survey is imperative to its success. The more people who are informed about seahorses and other rarely sighted species inhabiting British waters, the more people can get involved in actively protecting their environments for future enjoyment and benefits. There are areas such as the fishing community and the general public that we need to address due to a lack of information and these will be addressed in the continuing work of the survey.

The evidence provided by The British Seahorse Survey so far suggests that there are indigenous populations within the British Isles with varying distributions and habitats of two different species *Hippocampus hippocampus* and *Hippocampus guttulatus*. Seahorses are not only found in shallow waters, as previously thought, many sightings of *Hippocampus hippocampus* have been recorded deeper than 31 metres. The deepest known record for *Hippocampus guttulatus* was recorded through The British Seahorse Survey at 46metres. This is in part due to the areas in which they live. *H.hippocampus* has a strong population around the Channel Islands and the habitat there consists of very deep gulleys and a wide tidal range, whereas H.guttulatus is frequently found in more shallow habitats such as Eelgrass beds.

It can be deduced that British seahorses are not entirely habitat specific; instead they take advantage of the habitats available to them that have adequate food supply and camouflage. The theory of seasonal migration and habitat preference in relation to food supply and environmental influences has been suggested and is highly likely in fact probable, but this is still speculative as more research is required. There is strong evidence for this from the survey and it makes a great deal of sense for a relatively sensitive creature, if it stays in shallow water that is vulnerable to the effects of storms during the late Autumn and Winter

and could quite easily be killed by the effects of the storms. We do have personal communication with local fishermen that have on a number of occasions found Seahorses after strong Easterlies where they have been caught with large prawns in areas that would not normally have them, testament to the possibility of them being washed away from their usual habitats.

By going into the relative stability of deep waters during stormy times would allow Seahorses to be protected, recent research (pers comm. Colin Wells National Marine Aquarium) has shown that the eyesight of Seahorses is extremely good in low light levels which would allow them to still keep feeding in deep water. There is still work to be done on the olfactory senses of Seahorses as this would also aid in the ability to feed.

The distributions of both seahorses overlap around the South coasts of Britain and in other areas. In some cases, such as Plymouth Sound, both species have been found in close proximity together. This is possible due to their evolutionary differences enabling each species to exploit a different niche within the environment and not compete with one another. *H.hippocampus* has developed a wider, shorter snout enabling it to feed on larger prey items and *H.guttulatus* has developed a long thin snout, which enables it to search in crevices for smaller prey.

There appears to be a clear demarcation where both species are found and it needs to borne in mind that the British Isles are the Western and Northern limit of their ranges. *H.hippocampus* reaches the northernmost part of its range in southern Britain with most sightings along the southern coastline with a strong population in the Channel Islands. We have a few sightings around Ireland and a couple of historic ones in Norfolk.

*H.guttulatus* on the other hand is found much further north, in fact as far North as The Shetland Isles and occurs frequently up the western coast of the British Isles and Ireland with no sightings on the East coast. We can only speculate as to why neither species is found on the East coast, although they are found on the continent at a similar line of latitude and this could be to do with the nature of the habitat. There is a stronger unsettling current on the East coast creating a more unstable environment, as opposed to the suitable habitat of the west coast.

Although population patterns could not be accurately discerned, we are building a reasonable idea of the distribution and it is essential for seahorses to be placed under some form of protection, such as the Wildlife and Countryside Act. This will ensure against any detrimental activities harming the populations before there has been a chance to study them in greater detail.

Camouflage is an important factor for seahorses, because they are such poor swimmers it is essential to have adequate cover to protect against predators and hide from prey, they also form seasonal territories. Seahorses have perfected the art of camouflage by being able to change colour to blend in with their backgrounds and some species, like *Hippocampus guttulatus* growing weed like appendages, in *Hippocampus hippocampus* this is rarely more than a couple of "horns" above the eyes. This makes them very difficult to see in the wild and a rule of thumb as used for surveying other elusive species, such as the Sea Hare (*Aplysia punctata*), creates a relatively accurate estimate of numbers. The rule of thumb for *Aplysia punctata* reads that where there is 1 animal there will probably be at least 10 others in the surrounding area. A similar rule of thumb is needed to estimate British seahorse population size and distribution. This requires a more detailed research on wild populations to assess how many on average live in close proximity to another.

Overall there is a great need for more information to be discovered about the British Seahorses, as this report shows, The British Seahorse Survey is only just beginning to scratch the surface and it is vital to take a proactive approach to conserving them. We need to implement legislative protection to allow us the time to gather the vital information needed to understand more about the British Isles most enigmatic, elusive creatures.

## Recommendations

**Public Awareness:** A dedicated website has been designed to publicise the findings of The British Seahorse Survey, which will encourage people to get involved in the survey. It will provide information on how to report sightings and tips on how and where to look safely for seahorses. Posters and leaflets will need to be distributed nation-wide to encourage involvement, along with talks and workshops for the whole community to get involved with. People will be able to keep up to date with any unusual findings through media coverage of Radio, TV, Newspaper and magazine articles. We need to tackle areas of the community that are being missed at the moment such as the fishing industry; they in particular could be a unique source of information.

**Co-ordinated Surveys:** The Seahorse Trust wishes to carry out detailed underwater surveys in specific sites around the British Isles. The surveys would be co-ordinated by the sightings co-ordinators through the trust and involve volunteer divers. The sites would be chosen according to available information on habitat and environment. The surveys would be concentrated on areas where the preferred habitat for both species is found i.e. Eel Grass Beds. Seahorse 'hot spots' can then be identified and awareness can be raised in local communities about sustainable conservation measures that can be put in place.

It is vital to use the standard laid down in the Seasearch format so that our information is standardised, this way the information can be cross referenced and included in databases, many of which already adopt Seasearch as its chosen format for dive surveys.

**Distribution Analysis:** The information relating to the similarities of distributions patterns of a variety of species migratory and sedentary and the possible influences of the Gulf Stream is a project in its own right; the mere basics have been touched upon in this report. As the Gulf Stream appears to affect seahorse distribution, it would be enlightening to see what further research would be revealed in this area. This is a vital project and The Seahorse Trust will be seeking funding to explore this further, we believe it will ultimately show a number of trends only imagined at the moment, that will have a bearing not just on Seahorses, Backing Sharks and leatherback Turtles but in the long term mankind as well.

**Collaboration with other Organisations:** It is highly recommended when writing such a report on the countrywide distribution of one species that as many organisation are involved as possible. Communication and working partnerships between data collection organisations is essential. This ensures that all available information is put forward in one report, and research does not need to be repeated. As a charitable Trust we are committed to sharing information and working with others.

**Protection:** For these studies to continue it is strongly recommended that both species of British Seahorse are included under the Wildlife and Countryside Act 1981 with immediate affect. This will ensure that seahorses are protected for the future and the areas where they are found are protected as well. Giving much needed valuable time to research further. Many species depend on the same environment as seahorses, using seahorses as a key species to identify these areas will attract people's attention, due to their unusual nature.

**Funding:** Funding is vital for the future of The British Seahorse Survey and other similar surveys. The Seahorse Trust will be seeking funding from a variety of sources to continue the work. As well as monetary funding we will be looking for divers and others to give their time freely to work on the survey. By working together not only can we gather information for the British Seahorse Survey but also for similar schemes such as the Torbay Biodiversity Action Plan, a known area for Seahorses.

## Acknowledgements

The Seahorse Trust would like to thank all of the people who have been involved in the British Seahorse Survey. This report would not be what it is without the kind donations of volunteer's time in looking for and reporting sightings, along with the dedication of individuals and organisations to conservation through sharing information. Unfortunately not everyone that we are grateful to can be mentioned in this section, due to the amount of space that would be required! Listed below are the main organisations and individuals who have greatly contributed to the British Seahorse Survey.

- Victoria Copley from English Nature, who secured the funding needed to write this project, thank you for your support and your belief in us that this project was worthwhile in producing, we look forward to many more projects in the future.
- Thanks to English Nature for providing the financial backing in creating this report and complimentary website.
- We are very grateful to Project Seahorse who provided essential data and information on from their various projects with seahorses, especially Sarah Foster and Jannelle Curtis for their support and advice.
- We greatly appreciate *MarLIN* giving us permission to use their Distribution Maps on Basking Sharks, Leatherback Turtles, Pink Sea Fans and Dustbin Lid Jellyfish. The information was very valuable to the report, thank you for your support and willingness to share information.
- Thanks to JNCC who gave us permission to use their data on Seagrasses that was essential for this report. Thanks to Jo Foden at CEFAS and Ken Collins at the Southampton Oceanography Centre for their advice, help and invaluable information on Eel Grass Beds.
- Sue Daly, Kealan Doyle, Lucy Boynton, Robin James and Adrian Tolliday have all played very important roles as Sightings Co-ordinators throughout the British Seahorse Survey. They have dedicated their time voluntarily to collect and co-ordinate information on seahorse sightings in their respective regions and your time is greatly appreciated, thank you.

- Thanks very much to the following for providing essential data on sightings of seahorses and the information and support they have all given throughout this report; Nigel Smallbones, Torbay Coast and Countryside Trust; Doug Herdson, National Marine Aquarium; Nic Harrison-White at ERCCIS; Robin at Weymouth Sealife Centres and all the Sealife Centres nation wide and the Seahorse Discussion Groups.

- Thanks to Still Moving Pictures for designing the website, this will be very valuable in promoting the British Seahorse Survey worldwide and your time is greatly appreciated.

- The following have all supplied images for this report, thank you for allowing us to use your pictures, which have made this report look a lot prettier! John Newman, Lin Baldock, Sue Daly, Francis Apesteguy and Peter Tinsley.

- Hopefully we have covered everyone who has helped but just in case we haven't, thanks you.

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- **Manuscripts actively in preparation (thesis chapters):**


- Curtis JM and ACJ Vincent. Predicting the local distribution and abundance of seagrass-associated species: ecological differences between *Hippocampus guttulatus* and *H. hippocampus* (submitted to MEPS).
- Curtis, JM and ACJ Vincent. Estimating annual realized fecundity in brooding multiple spawners (*Hippocampus guttulatus*).
- (for submission to CJFAS).
- Curtis JM and ACJ Vincent. Life history of *Hippocampus guttulatus*: age and size-specific survival, growth and

- movement patterns. (in prep).

- Curtis, JM. Differential impacts of small-scale, non-selective fishing on the population structure of two marine

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- Curtis, JM and ACJ Vincent. Population-level responses of seahorses to alternative strategies for conservation. (in prep).

- **Manuscripts actively in preparation (data collected and analyzed during thesis research).**

- Curtis, JM et al. A socially polygamous seahorse: greetings and courtship behaviour of *Hippocampus guttulatus*.

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- Seahorse Ireland www.seahorseireland.eircom

- Project Seahorse www.projectseahorse.org

- Marine Conservation Society www.mcsuk.org

- PADI Project Aware www.projectaware.org

- IUCN Red List Category and Criteria: www.iucn.org/themes/ssc/sis/authority.htm

- Sue Daly Productions www.mermaid1.demon.co.uk

- English Nature www.english-nature.co.uk

- The Wildlife Trusts www.wildlifetrusts.org.uk

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- **Collins, K (2004).** Personal Communication on Seagrass Populations in U.K and their status, especially in Weymouth through survey project run by Collins at Southampton Oceanography Centre.
- **Scarrett (2002)** Personal Communication on viability of seasonal migration theory in British Seahorses.
- **Project Seahorse (2004)** Personal Communication on the various habitats *H.guttulatus* and *H.hippocampus* were recorded in Project Seahorse data, the revised listings for IUCN Red List categories which took place in 2003.
- **Chamberlain, 2004.** Lecture on Seasonal Patterns in the oceans. www.oceansonline.com
- **SAHFOS Website:**

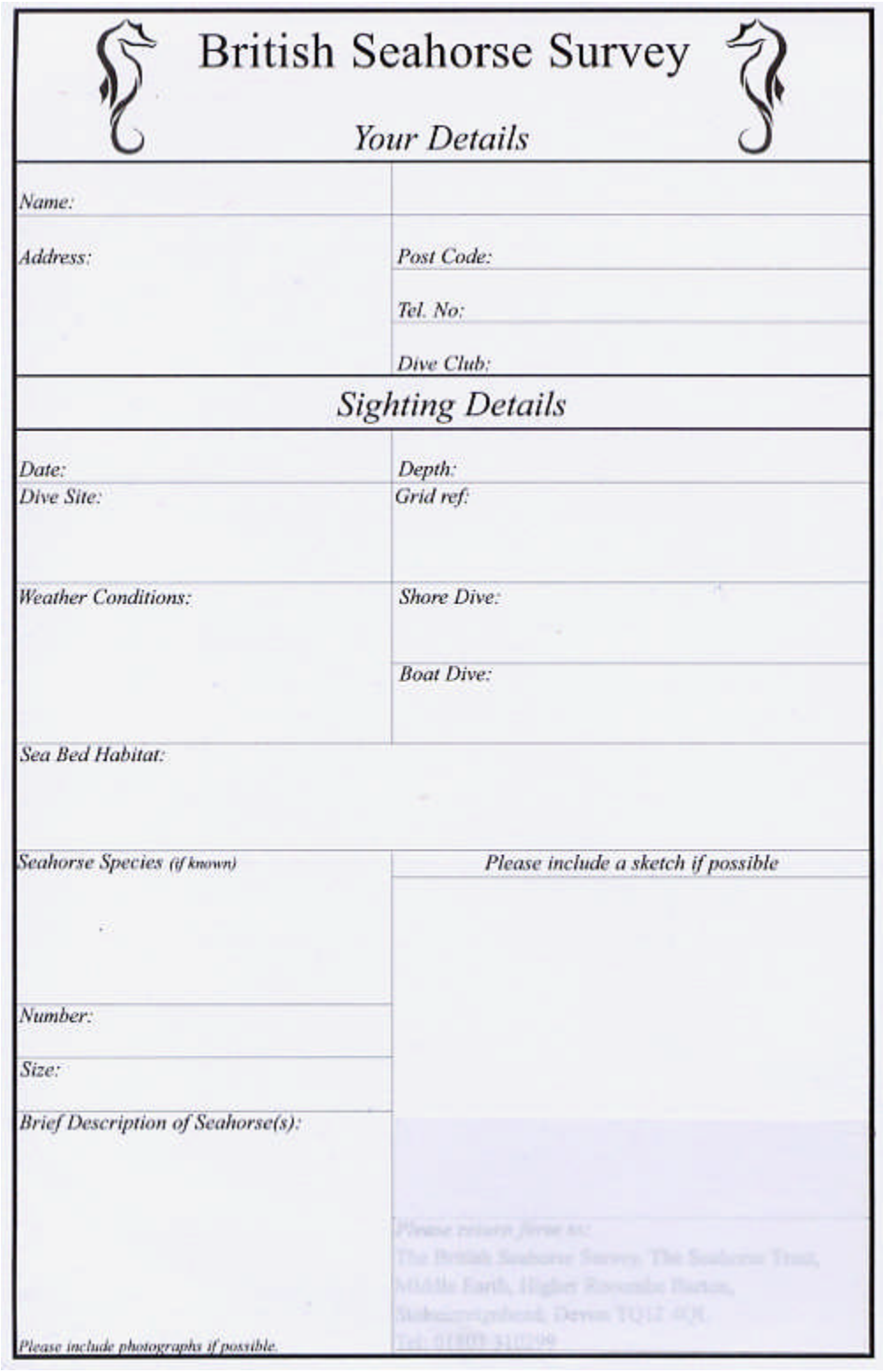
- **GSFC Website:** http://daac.gsfc.nasa.gov/oceancolor/calssic_scenes/oo_classics_index.shtml
- **DEFRA Website:** www.defra.gov.uk/environment/marine/cleanseas/cs03.htm
- www.Coastalguide.com

# Appendices

## 1. Contact Details of Organisations involved in The British Seahorse Survey.

- The Seahorse Trust www.theseahorsetrust.co.uk
- Seahorse Ireland www.seahorseireland.eircom
- Care for the Wild www.careforthewild.com
- Project Seahorse www.projectseahorse.org
- Marine Conservation Society www.mcsuk.org
- PADI Project Aware www.projectaware.org
- IUCN Red List Category and Criteria: www.iucn.org/themes/ssc/sis/authority.htm
- Sue Daly Productions www.mermaid1.demon.co.uk
- English Nature www.english-nature.co.uk
- The Wildlife Trusts www.wildlifetrusts.org.uk
- *MarLIN* website www.marlin.ac.uk
- Ocean Pulse web site under construction
- Divers Down web site under construction
- Torbay Coast and Countryside Trust www.coastalzone@countryside-trust.org.uk

## 2. Survey Record Sheet



# British Seahorse Survey

## *Your Details*

| | |
|---|---|
| *Name:* | |
| *Address:* | *Post Code:* |
| | *Tel. No:* |
| | *Dive Club:* |

## *Sighting Details*

| | |
|---|---|
| *Date:* | *Depth:* |
| *Dive Site:* | *Grid ref:* |
| *Weather Conditions:* | *Shore Dive:* |
| | *Boat Dive:* |
| *Sea Bed Habitat:* | |
| *Seahorse Species (if known)* | *Please include a sketch if possible* |
| *Number:* | |
| *Size:* | |
| *Brief Description of Seahorse(s):* | |

*Please include photographs if possible.*

## 3. British Seahorse Leaflet



The Seahorse Trust

*The Seahorse Trust* has been set up as an umbrella organisation to preserve and conserve the natural world. Its main focus is the marine world using the Seahorse as our flagship species.

Seahorse are very unique fish and we need your help to conserve them. There are many ways you can help us.

- Send us a donation and we can use that money for one of the many projects *The Seahorse Trust* has undertaken.
- By gift aiding the donation to us we can in turn claim some of the tax you have paid back from the government to help our work.
- Take part in the survey. Send your sightings to us on the enclosed form and help to build up a picture of the world of Seahorses.

Please send donations to:

The Seahorse Trust
Middle Earth
Higher Rocombe Barton
Stokeinteignhead
Devon
TQ12 4QL

Please visit our website on
www.theseahorsetrust.co.uk

This leaflet has been kindly sponsored by

British Seahorse Survey

The Seahorse Trust

# The British Seahorse Survey

### Short Snouted Seahorse
*Hippocampus hippocampus*

A stocky, solid little seahorse up to 5 or 6 inches in length, fully grown. Found in a variety of habitats from Eel Grass beds to rocky areas.
Quite often it is bright orange and reds when found, but is usually brown or black.

### Spiny Seahorse
*Hippocampus guttulatus*

The largest of the two species, up to 8 inches from the top of the head to the end of the tail. A very striking Seahorse with a mane of appendages on the top of the head running down the back. Usually olivey brown to grey, it blends in well within its main habitat of Eel Grass.

## How you can help

Please send in any sightings of Seahorses you have, even if they are old ones. Please use the enclosed survey sheet.
Importantly Please do not touch any Seahorses you find. If you can take a photo and send this to us as well, or do a sketch, it will help to identify the species.
We are interested in any Seahorse sightings from this country and abroad.

Spiny Seahorse Courting

## The Survey

The British Seahorse Survey was set up in 1994 to try and find out more about the indigenous British Seahorses. Since then we have made some fascinating discoveries:

- We have two resident species of Seahorse.
- They go into deeper water in the winter to get away from the devastating storms that affect the shallow waters.
- They come up into the shallows in the spring, summer and autumn to breed.
- The deepest recording so far is 254 feet.
- The Short Snouted Seahorse lives in all types of habitat including rocky.
- The Spiny Seahorse lives mainly in Eel Grass beds.
- A Short Snouted Seahorse has been found 3 miles up river in a brackish (salt and fresh) area.

## 4. British Seahorse Survey Co-ordinator Details

| Area | Sighting Coordinator | Telephone | Address | E-Mail |
|---|---|---|---|---|
| England | Neil Garrick-Maidment | 01392 875930 | 36 Greatwood Terrace, Topsham, Devon, EX3 0EB | neil.seahorses@tesco.net |
| England | Robin James | 01305 761465 | Weymouth Sealife Centre. Weymouth Dorset | robinjames@merlinentertainments.biz |
| England | Louisa Jones | 01752 251338 | 31C Armada Street, Plymouth, Devon, PL4 8LZ | louisa.seahorses@tesco.net |
| Isle of Wight | Lucy Boynton | 07766521818 | 16 Beach Side Cahlets, Marsh Road, Gurnard, Cowes, Isle of Wight, PO31 8HX | lucyboynton@yahoo.co.uk |
| Ireland | Kealan Doyle | 00353 9532945 | Seahorse Ireland. Connemara Ireland | seahorseireland@eircom.net |
| Northern Ireland | Adrian Tolliday | 01284 272 8062 | Exploris. Northern Ireland | Adrian.tolliday@ards-council.gov.uk |
| Channel Islands | Sue Daly | 01534 864542 | | sue@suedalyproductions.com |

## 5. GLCC Habitat Classification for IUCN

### A. Habitats Authority File (Version 2.1)

This two-tiered habitat classification system is based on a climatic and biogeographic classification using Holdridge's life zones as a basis (see http://www.grid.unep.ch/data/grid/images_new/gnv005-1.gif). The aquatic habitats (inland, marine and artificial) are based primarily on the classification system of wetland types used by the Ramsar Convention (see http://www.ramsar.org/key_ris_types.htm). The aquatic habitats are under review, particularly the marine ones, as these are far too simplistic a view of the marine environment. The categories are numbered to indicate their level in the hierarchy e.g., 1. Forest and 1.1 Boreal Forest.

There is a third level to the classification which is based on the Global Land Cover Characterization (GLCC) developed by the US Geological Survey's (USGS) Earth Resources Observation System (EROS) Data Center, the University of Nebraska-Lincoln (UNL) and the Joint Research Centre of the European Commission (see http://edcdaac.usgs.gov/glcc/glcc.html). This third level is not shown here, because without access to the Species Information Service (SIS) database or the GLCC maps, it is impossible for users to accurately record habitats at this level.

In using this classification, assessors are asked to indicate in which habitats their taxon is found. This is done by means of a simple scoring system:

1 = Suitable (main or preferred habitat/s, habitat/s containing major subpopulations, habitat/s with high population densities)
2 = Moderately suitable (secondary habitat/s, habitat/s containing minor subpopulations, habitat/s with low population densities
3 = Unsuitable (unsuitability expressly known or easily inferred from the ecology of the taxon)
9 = Undefined (data deficient, possibly suitable or moderately suitable as inferred from the ecology of the taxon)

**Note:** If a taxon does not occur in a habitat, this should be left blank, i.e. not scored as a 3 (a 3 implies the taxon occurs in unsuitable habitat).

It is important to note that if a higher level in the hierarchy is scored, this automatically implies that all the habitat types nested below that level are also scored (e.g., scoring Forest, means that all the forest types i.e. 1.1. to 1.9 are scored). This will not be the intention in most cases. Users are therefore encouraged to select the appropriate habitat type/s from the lowest level in the hierarchy wherever possible.

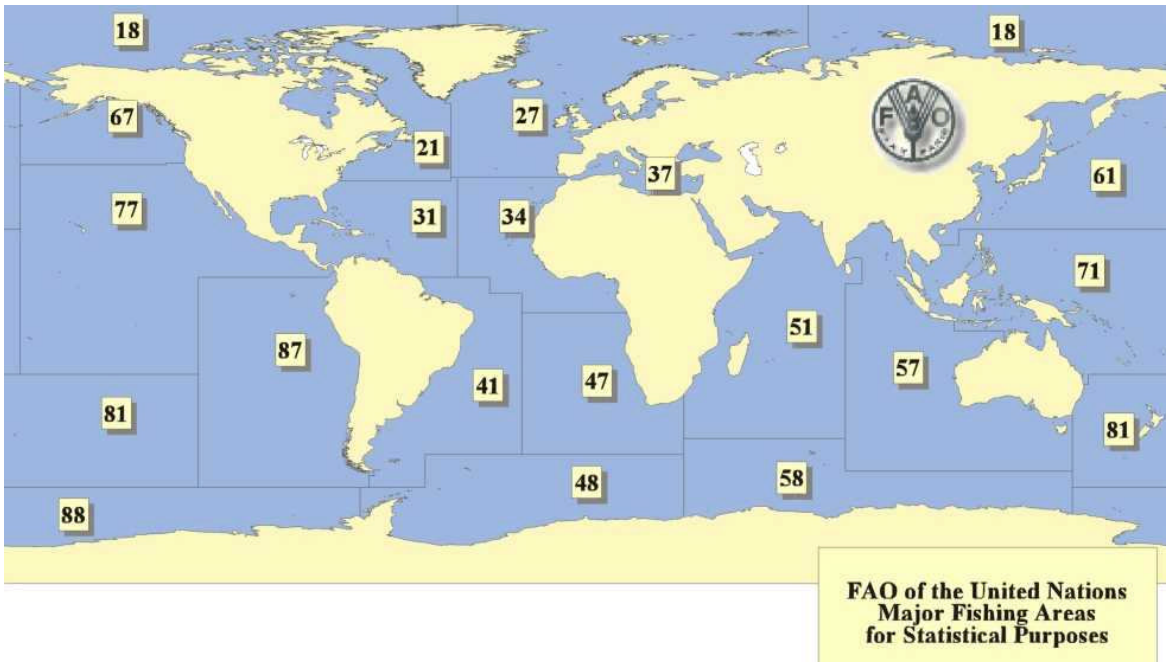
If 'Other' is selected, the habitat type must be specified. Multiple additions under 'Other' are allowed, although extensive use of this is not encouraged. If the habitat is not known, please indicate this using a score of 9 under category '15. Unknown'.

(Score: 1= primary habitat; 2= secondary habitat; 3 = unsuitable; 9 = possibly suitable)

| Habitat Type | Score |
|---|---|
| **1. Forest** | 3 |
| 1.1. Boreal | |
| 1.2. Subarctic | |
| 1.3. Subantarctic | |
| 1.4. Temperate | |
| 1.5. Subtropical/Tropical Dry | |
| 1.6. Subtropical/Tropical Moist Lowland | |
| 1.7. Subtropical/Tropical Mangrove | |
| 1.8. Subtropical/Tropical Swamp | |
| 1.9. Subtropical/Tropical Moist Montane | |
| **2. Savanna** | 3 |
| 2.1. Dry | |
| 2.2. Moist | |
| **3. Shrubland** | 3 |
| 3.1. Subarctic | |
| 3.2. Subantarctic | |
| 3.3. Boreal | |
| 3.4. Temperate | |
| 3.5. Subtropical/Tropical Dry | |
| 3.6. Subtropical/Tropical Moist | |
| 3.7. Subtropical/Tropical High Altitude | |
| 3.8. Mediterranean-type Shrubby Vegetation | |
| **4. Grassland** | 3 |
| 4.1. Tundra | |
| 4.2. Subarctic | |
| 4.3. Subantarctic | |
| 4.4. Temperate | |
| 4.5. Subtropical/Tropical Dry Lowland | |
| 4.6. Subtropical/Tropical Seasonally Wet/Flooded Lowland | |
| 4.7. Subtropical/Tropical High Altitude | |
| **5. Wetlands (inland)** | 3 |
| 5.1. Permanent Rivers/Streams/Creeks [includes waterfalls] | |
| 5.2. Seasonal/Intermittent/Irregular Rivers/Streams/Creeks | |
| 5.3. Shrub Dominated Wetlands | |
| 5.4. Bogs, Marshes, Swamps, Fens, Peatlands | |
| 5.5. Permanent Freshwater Lakes [over 8 ha] | |
| 5.6. Seasonal/Intermittent Freshwater Lakes [over 8 ha] | |
| 5.7. Permanent Freshwater Marshes/Pools [under 8 ha] | |
| 5.8. Seasonal/Intermittent Freshwater Marshes/Pools [under 8 ha] | |
| 5.9. Freshwater Springs and Oases | |
| 5.10. Tundra Wetlands [includes pools and temporary waters from snowmelt] | |
| 5.11. Alpine Wetlands [includes temporary waters from snowmelt] | |
| 5.12. Geothermal Wetlands | |
| 5.13. Permanent Inland Deltas | |
| 5.14. Permanent Saline, Brackish or Alkaline Lakes | |
| 5.15. Seasonal/Intermittent Saline, Brackish or Alkaline Lakes and Flats | |
| 5.16. Permanent Saline, Brackish or Alkaline Marshes/Pools | |
| 5.17. Seasonal/Intermittent Saline, Brackish or Alkaline Marshes/Pools | |

| | |
|---|---|
| 5.18. Karst and Other Subterranean Hydrological Systems [inland] | |
| **6. Rocky Areas [e.g. inland cliffs, mountain peaks]** | 3 |
| **7. Caves and Subterranean Habitats (non-aquatic)** | 3 |
| 7.1. Caves | |
| 7.2. Other Subterranean Habitats | |
| **8. Desert** | 3 |
| 8.1. Hot | |
| 8.2. Temperate | |
| 8.3. Cold | |
| **9. Sea** | |
| 9.1. Open | 9 |
| 9.2. Shallow [usually less than 6 m deep at low tide; includes sea bays and straits] | 1 |
| 9.3. Subtidal Aquatic Beds [kelp beds, sea- grass beds and tropical marine meadows] | 1 |
| 9.4. Coral Reefs | 3 |
| **10. Coastline** | |
| 10.1. Rocky Shores [includes rocky offshore islands and sea cliffs] | 1 |
| 10.2. Sand, Shingle or Pebble Shores [includes sand bars, spits, sandy islets, dune systems] | 2 |
| 10.3. Estuarine Waters | 2 |
| 10.4. Intertidal Mud, Sand or Salt Flats | 9 |
| 10.5. Intertidal Marshes [includes salt marshes] | 9 |
| 10.6. Coastal Brackish/Saline Lagoons | 2 |
| 10.7. Coastal Freshwater Lagoons | 3 |
| 10.8. Karst and Other Subterranean Hydrological Systems [marine/coastal] | |
| **11. Artificial - Terrestrial** | 3 |
| 11.1. Arable Land | |
| 11.2. Pastureland | |
| 11.3. Plantations | |
| 11.4. Rural Gardens | |
| 11.5. Urban Areas | |
| 11.6. Subtropical/Tropical Heavily Degraded Former Forest | |
| **12. Artificial - Aquatic** | |
| 12.1. Water Storage Areas (over 8 ha) | 3 |
| 12.2. Ponds (below 8 ha) | 3 |
| 12.3. Aquaculture Ponds | 3 |
| 12.4. Salt Exploitation Sites | 3 |
| 12.5. Excavations (open) | 3 |
| 12.6. Wastewater Treatment Areas | 3 |
| 12.7. Irrigated Land [includes irrigation channels] | 3 |
| 12.8. Seasonally Flooded Agricultural Land | 3 |
| 12.9. Canals and Drainage Channels, Ditches | 3 |
| 12.10. Karst and Other Subterranean Hydrological Systems [human-made] | |
| **13. Introduced Vegetation** | |
| **14. Other** Marinas | 2 |
| | |
| **15. Unknown** | |

## 6. Map of major Fishing Areas Worldwide




The two British species of Seahorse; *Hippocampus hippocampus* and *Hippocampus guttulatus* can both be found on the extreme edges of FAO major Fishing Areas 27 and 37, with historical sightings from area 34- all shown in Figure above. (Garrick-Maidment, 2004 personal communication).

## 7. Threats Classification for IUCN

**B. Conservation Actions Authority File (Version 1.0)**

In using this hierarchical classification of conservation actions, assessors are asked to indicate the conservation actions or measures that are in place and/or that are needed for each taxon. In suggesting what actions are needed, assessors are asked to be realistic and not simply select everything. The selection should be for those actions which are most needed and which could realistically be achieved in approximately the next five years. Selection of a higher level action e.g., 1.2. Legislation, does not mean that all the actions below this e.g., 1.2.1 Development and 1.2.2. Implementation, are indicated. It simply indicates that legislation is either in place or is needed as part of a policy-based action for the taxon concerned. Selection of any action lower down the hierarchy automatically implies that the higher levels are indicated, i.e. it is not necessary to indicate all the levels, just the lowest. For example, selecting action 4.4.2. Establishment, indicates that establishment of a protected area (action 4.4) is one of the habitat and site based actions (action 4.) required for the taxon concerned. Multiple conservation actions can be selected as required. If 'Other' is selected, the conservation action or measure must be specified. Multiple additions under 'Other' are allowed, although extensive use of this is not encouraged. If no conservation actions or measures are in place, this should be recorded, against conservation action 0. Similarly, if no conservation actions are needed, then it is also important to record this against conservation action 0 (both 'In Place' and the 'Needed' columns could be ticked). To indicate the actions use: Yes or Y or a tick.

| Conservation Action | In Place | Needed |
|---|---|---|
| **0. No conservation actions** | | |
| **1. Policy-based actions** | | |
| 1.1. Management plans | | x |
| 1.1.1. Development | | |
| 1.1.2. Implementation | | |
| 1.2. Legislation | | |
| 1.2.1. Development | | |
| 1.2.1.1. International level | x | |
| 1.2.1.2. National level | | x |
| 1.2.1.3. Sub-national level | | |
| 1.2.2. Implementation | | |
| 1.2.2.1. International level | x | |
| 1.2.2.2. National level | | x |
| 1.2.2.3. Sub-national level | | x |
| 1.3. Community management | | x |
| 1.3.1. Governance | | |
| 1.3.2. Resource stewardship | | |
| 1.3.3. Livelihood alternatives | | |
| 1.4. Other | | |
| **2. Communication and Education** | | x |
| 2.1. Formal education | | |
| 2.2. Awareness | | |
| 2.3. Capacity-building/Training | | |

| | | |
|---|---|---|
| 2.4. Other | | |
| **3. Research actions** | | |
| 3.1. Taxonomy | x | |
| 3.2. Population numbers and range | x | |
| 3.3. Biology and Ecology | x | |
| 3.4. Habitat status | x | |
| 3.5. Threats | x | |
| 3.6. Uses and harvest levels | x | |
| 3.7. Cultural relevance | | x |
| 3.8. Conservation measures | | x |
| 3.9. Trends/Monitoring | | x |
| 3.10. Other | | |
| **4. Habitat and site-based actions** | | x |
| 4.1. Maintenance/Conservation | | |
| 4.2. Restoration | | |
| 4.3. Corridors | | |
| 4.4. Protected areas | | |
| 4.4.1. Identification of new protected areas | | |
| 4.4.2. Establishment | | |
| 4.4.3. Management | | |
| 4.4.4. Expansion | | |
| 4.5. Community-based initiatives | | |
| 4.6. Other | | |
| **5. Species-based actions** | | |
| 5.1. Re-introductions | | |
| 5.2. Benign introductions | | |
| 5.3. Sustainable use | | |
| 5.3.1. Harvest management | | |
| 5.3.2. Trade management | | |
| 5.4. Recovery management | x | |
| 5.5. Disease, pathogen, parasite management | x | |
| 5.6. Limiting population growth | | |
| 5.7. Ex situ conservation actions | | |
| 5.7.1. Captive breeding/Artificial propagation | x | |
| 5.7.2. Genome resource bank | x | |
| 5.8. Other | | |
| **6. Other** | | |

**Draft Descriptors of the First Level Conservation Actions (Version 1.0)**

**1. Policy-based actions**
Actions directed at establishing frameworks to facilitate/co-ordinate/promote/ensure on-the-ground conservation activities. Includes the development and implementation of **Management plans** such as Regional Action Plans, National Action Plans, Management Plans for Sites and Habitats, Species Action Plans, Species Recovery Plans and sectoral policies (e.g. relating to agriculture, forests, fisheries), also strategies for action and less formal plans, e.g. contingency plans, yearly plans etc.

Also includes the development and implementation of **Legislation** which may be international, regional and bilateral conventions (e.g. CITES, Bonn, Bern, Ramsar, AEWA, World Heritage, CBD), legislation and agreements, also national legislation and sub-national/provincial/local laws such as countryside laws, species protection laws, hunting bans and Environmental Impact Assessments (EIAs).

Also includes frameworks relevant to **Community management** (the regulated use of wildlife populations and ecosystems by local "stakeholders"), covering **Governance** (processes through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences), **Resource Stewardship** (mechanisms for taking responsibility for resources, e.g. Site Support Groups), and **Livelihood alternatives** (approaches to enhancing resource productivity, securing ownership of and access to resources and income-earning activities, as well as ensuring adequate stocks and flows of food and cash to meet basic needs).

**2. Communication and Education**
Actions directed at people to improve understanding and skills, and influence behaviour. Covers all forms of communication, cooperation and collaboration, with actions including campaigns, lobbying, educational and publicity/awareness programmes, and production of materials. Target groups for **Formal Education** actions include children and adults in tertiary education. Target groups for **Awareness** actions include politicians, decision-makers, the general public, and local people. Target groups for **Capacity-building/Training** include those individuals/institutions more directly involved in conservation such as wardens, land/site managers, NGOs, forestry departments, working groups, and researchers.

**3. Research actions**
Actions directed at assessing species' status and the conservation measures needed. Includes research actions to clarify species' **Taxonomy**, to ascertain species' **Population numbers and range** (e.g. surveys involving some sort of counting of individuals or presence/absence, and the identification of important sites), to interpret the status of species through better understanding of **Biology and Ecology** (including breeding success and survival, habitat use, dispersal, behaviour etc.) and **Habitat status** (e.g. extent, composition, quality), to identify and assess **Threats** to species and their habitats, to record **Uses and harvest levels** and **Cultural relevance** of species (which may have a bearing on status), to develop appropriate **Conservation measures** to improve status, and to ascertain **Trends** (e.g. species' population numbers, habitat/threat changes, conservation measures taken) through **Monitoring**.

**4. Habitat and site-based actions**
Actions directed at conserving sites, habitats and the wider environment. Includes **Maintenance/Conservation** actions (e.g. fire regimes, forestry and farming practices, water

management), **Restoration** of habitat (e.g. removal of invasive species, reafforestation), and the creation of **Corridors** to link existing habitat patches. **Protected areas** actions are coded separately in recognition of their special importance (covering **identification of new protected areas**, **establishment**, **management**, and **expansion**), as are **Community-based initiatives** (actions led by local "stakeholders").

**5. Species-based actions**

Actions directed at the species themselves, including **Re-introductions** (to areas where they formally occurred following IUCN Re-introduction guidelines)**,** benign introductions (to areas outside of their historic range, but within an appropriate habitat and done deliberately for conservation reasons), actions resulting in **Sustainable use** (through **Harvest management**, **Trade management**), more intensive **Recovery management** (especially for Critically Endangered species, e.g. clutch manipulation, provision of artificial nest sites, supplementary feeding), **Disease, pathogen, parasite management**, **Limiting population growth** (through translocation or culling, e.g. where carrying capacity is reached or the species is adversely affecting others), and ***Ex-situ* conservation actions** (such as **Captive breeding/Artificial propagation**, establishing a **Genome resource bank**).

## 8. Eel Grass information.

# Seagrasses

**The Information below has been sourced from the internet and is given for information purposes only. Various sections have been quoted from the below internet website. Please refer to the internet if you need to reference this information in any way as copy write does apply.**

http://www.ukmarinesac.org.uk/marine-communities.htm

Seagrasses are marine flowering plants found in shallow coastal habitats around the world. They most commonly occupy sandy intertidal and subtidal areas to a maximum depth of about 10m. Seagrasses typically grow in monospecific stands called 'beds' or 'meadows'. These beds create a habitat of considerable importance from an ecological, economic and biodiversity perspective. The beds support a high density and diversity of associated flora and fauna, and provide valuable nursery and feeding grounds for fishes and birds. The binding of sediment by seagrass root networks also acts to stabilize the shoreline and reduce coastal erosion.

Before the early 1900s three species of *Zostera*, or 'eelgrass', were common in sandy coastal areas of the British Isles, but their abundance was severely reduced during the 1920s-1930s period by a 'wasting disease' that is still not fully understood today. Since this time there has only been limited and localized recovery of the *Zostera* beds. These plants flourish in accessible nearshore margins, and can therefore be adversely affected by many forms of coastal development, in particular dredging and excessive nutrient loading. Because of the value of seagrasses as a representative habitat for the UK, their high biodiversity and ecological importance, and their vulnerability to anthropogenic impacts, several parallel initiatives are now underway to better understand the role of these plants in coastal ecosystems and to facilitate effective conservation measures.

'Seagrass' is a common name for a large group of higher flowering land plants that have spread into the marine environment in relatively recent geologic times. They are the only group of flowering plants that are truly marine and can function and reproduce under conditions of permanent or cyclic submergence in saline water. Den Hartog (1970) recognized a world total of 49 seagrass species. In temperate waters there are ten species of the genus *Zostera* and two species of *Ruppia*. Five seagrass species are found around the British Isles - two species of 'tassel weed' (*Ruppia maritima* and *R. cirrhosa*) and three species of 'eelgrass' (*Zostera* spp.).

**Rarity and vulnerability to human impacts**

*Zostera* biotopes were selected for the UK Marine SACs Project not only because of the values noted above, but also because they were in the past a widespread feature of Britain's nearshore margin, hence they are a significant element of Britain's natural marine heritage. Although all three *Zostera* species are still widespread today, they are now considered to be nationally scarce with a patchy distribution (see below). Although there has not been a comprehensive inventory, the existing data and previous records indicate that *Zostera* beds have made a poor or slow recovery from the impact of wasting disease in the 1920s –1930s. This same situation is generally true for other areas where *Zostera* was once common, such as along the Atlantic seacoast of North America.

Furthermore as human settlement along Britain's coast has increased (both in terms of population and scale of physical alteration to shorelines), especially in estuarine areas, the *Zostera* meadows in these areas have been subjected to increased direct (e.g. dredging, filling) and indirect (e.g. upstream channelization resulting in increased sedimentation) impacts. They are therefore a high priority for monitoring and conservation management.

Like all marine biotopes, eelgrass beds are subject to natural change. *Zostera* beds are known to be spatially dynamic, with advancing and receding leading edges, causing changes in coverage. Naturally-occurring changes can take place at a range of scales, with effects ranging from small alterations to *Zostera* coverage or density, to destruction of entire beds over large geographic areas.

**Wasting disease**

Potentially the greatest natural threat to eelgrass beds is the periodic outbreak of wasting disease, which appears to principally affect sublittoral beds of *Z. marina*. Between the 1920s and mid-1930s, formerly extensive eelgrass beds on both sides of the Atlantic experienced significant declines in the first recorded major outbreak of the disease. By the end of this outbreak, wasting disease had been reported throughout western Europe. The narrow-leaved form of *Zostera* (presumably *Z. angustifolia*) was less affected by the disease, while *Z. noltii* did not appear to be affected at all (Rasmussen, 1977).

The symptoms of wasting disease are the appearance of rounded, dark brown spots on the leaves, which coalesce until the leaf is completely blackened. The leaves die and detach from the main plant, the regenerative shoots decay and after two or three seasons of this defoliation, the rhizomes discolour and die. The final stages of this disease can be devastating, with up to 90% of the plants being lost and the bed being laid bare.

The indirect effects of the disease were also severe. A variety of characteristic and representative species declined or disappeared, some fisheries declined and a number of beaches and sandbanks, previously protected by eelgrass, experienced increased erosion. The food supplies for overwintering wildfowl (wigeon, Brent geese and swans) were reduced, forcing the birds to migrate to different feeding grounds

Recovery did not begin until the mid-1930s and has generally been slow. A further decline in the Dutch Wadden Sea was reported in the 1970s (Den Hartog & Polderman, 1975; Polderman & den Hartog, 1975; van den Hoek et al., 1983). In the early 1980s, wasting disease reappeared on the east coast of North America (Tubbs, 1995; Short et al., 1986; Short et al., 1988). Between 1987 and 1992, symptoms of wasting disease appeared in several populations in north-west Europe, including estuaries on the southern coast of England and the Isles of Scilly (Fowler, 1992).

The causes of wasting disease have been debated since the 1920s - 1930s epidemic and several causative factors were suggested, including a number of fungal, bacterial or protozoan pathogens. After the 1980s outbreak, research in America identified the pathogen as the fungus *Labyrinthula macrocystis*. Muehlstein et al. (1988, 1991) showed that *Labyrinthula* does not generally cause disease in low salinities, explaining why UK populations of the intertidal *Z. angustifolia* and *Z. noltii* appear to have been relatively unaffected by wasting disease.

It is likely that the causative factor, presumed to be *L. macrocystis,* persists at low, harmless levels within *Zostera marina* populations between epidemics. The reasons for the disease outbreaks are not fully understood (Giesen et al., 1990a, b), but it is possible that *Zostera* plants only succumb when stressed by other environmental factors such as low levels of insolation, increases in water temperature, or pollution (Short et al., 1988). The disease may occur periodically, in an unpredictable long-term cycle whose triggering factors remain to be identified.

**Wildfowl grazing**

Several studies in Britain have monitored changes in eelgrass populations in relation to grazing by overwintering wildfowl, particularly wigeon and Brent geese. *Zostera* is an important food source for wildfowl, providing a concentrated and nutritious food supply that quickly replenishes energy reserves expended during migration. As overwintering wildfowl numbers can fluctuate from year to year, often related to weather patterns, the grazing pressure on *Zostera* can be highly variable. When migrant birds arrive at their overwintering site, they generally preferentially feed on eelgrass and only switch to algae when the *Zostera* resource becomes exhausted. Wyer et al. (1977) suggested that Z. *noltii* is the most important of the three species. It retains its leaves well into the winter, unlike the other two species which begin shedding their leaves in the late autumn. As *Z. noltii* is found highest up the shore, the low water grazing period is longer.

Wigeon nip off the eelgrass, blade by blade, without much waste. Brent geese tear up parts of the plant and the material they do not consume floats away on the surface. However, when they stop feeding directly on the eelgrass beds due to the rising tide, they may later locate and feed on this floating 'reserve' material (Butcher, 1941a). Swans tear up large quantities, with the rhizomes attached, but do not consume all the plant material disturbed. Madsen (1988) found that geese feed preferentially on above-ground material and only shift to the below-ground material at lower *Zostera* densities. However, in Strangford Lough, Portig *et al* (1994) found that the impact on the below-ground biomass occurred as soon as birds arrived, as the *Zostera* occurs on thixotropic mud which liquefies on disturbance, making it easier for the birds to paddle and dig for rhizomes.

Grazing wildfowl can consume a high proportion of the available standing stock of *Zostera.* Portig et al. (1994) found that in Strangford Lough, 65% of the estimated biomass (~1100 tonnes fresh weight) of *Zostera* was consumed by grazing wildfowl but that up to 80% was disturbed by their feeding activity. The above-ground biomass (~330 tonnes fresh weight) was reduced by 93% while the below-ground biomass (~770 tonnes fresh weight) was reduced by 74%. Tubbs and Tubbs (1983) reported that Brent geese grazing resulted in the cover of *Z. marina* and *Z. noltii* being reduced from 60-100% in September to 5-10% between mid-October and mid-January. Jacobs et al. (1981) estimated that grazing wildfowl consumed 50% of the total standing stock of *Z. noltii* at Terschelling in the Dutch Wadden Sea. Madsen (1988) reported that in the Danish Wadden Sea, dark-bellied Brent geese consumed 91% of the *Zostera* biomass in consecutive years.

At Lindisfarne, Northumberland, Percival (1991) reported that grazing pressure did not affect the percentage cover of *Zostera* until late winter and that most of the loss appeared to be due to other factors, particularly wave action during storms. It appears that *Zostera* can recover from 'normal' levels of wildfowl grazing (Charman, 1979; Madsen, 1984; O'Brian, 1991; Ranwell, 1959; Tubbs & Tubbs, 1982), but if a bed is stressed by other factors it may be less able to withstand grazing pressure. An example of this was reported by den Hartog (1994b) who found

that Brent geese may have removed the few remaining healthy plants that survived after beds of *Z. marina* / *Z. angustifolia* in Langstone Harbour had been overwhelmed by growth of the alga *Enteromorpha*.

**Epiphyte grazing**

It was noted elsewhere that epiphyte grazers such as *Hydrobia ulvae* can contribute to the health of *Zostera* plants by removing the algae which foul the eelgrass leaves. Any factors (natural or anthropogenic) which reduce grazer populations or cause increased proliferation of algae may therefore have an indirect adverse impact on the *Zostera* bed. The factors most likely to cause such changes are pollution incidents (causing grazer mortality) or excessive nutrient enrichment (causing eutrophication). These processes are most likely to occur as a result of human activities and will therefore be discussed more fully in the section on impacts by human activities.

**Sensitivity to Human Activities**

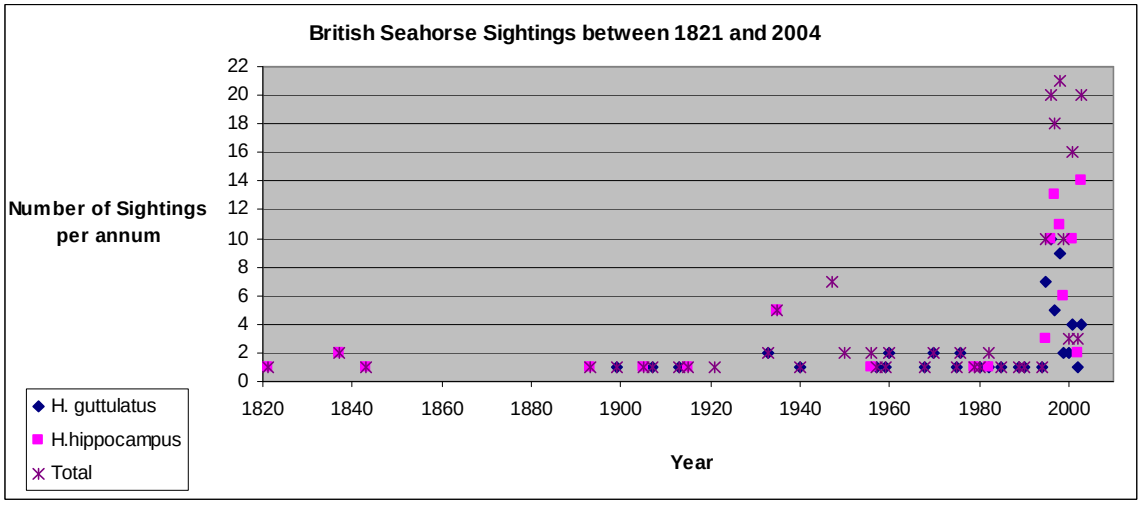
A large proportion of the UK's population lives on or adjacent to the coast. As a result, pollution, development and recreation pressures are increasingly affecting the coastal environment, and their impacts can be especially acute in the shallow bays, estuaries and lagoons where *Zostera* biotopes most commonly occur. Holt et al. (1995, 1997) concluded that *Z. marina* is extremely sensitive to human-induced changes in the coastal environment, particularly in relation to eutrophication, sedimentation and turbidity. In addition to the direct impacts on *Zostera* plants, many human activities will affect the other species associated with the eelgrass biotope. In some cases, the eelgrass fauna may be more susceptible than the *Zostera* itself.

There are a range of human activities that have been shown to affect the extent and viability of *Zostera* beds and their associated flora and fauna. Human impacts can be conveniently grouped into the following broad categories:

- Coastal development
- Water pollution
- Physical disturbance
- Introduction of non-native species
- Effects on wildfowl distribution and behaviour

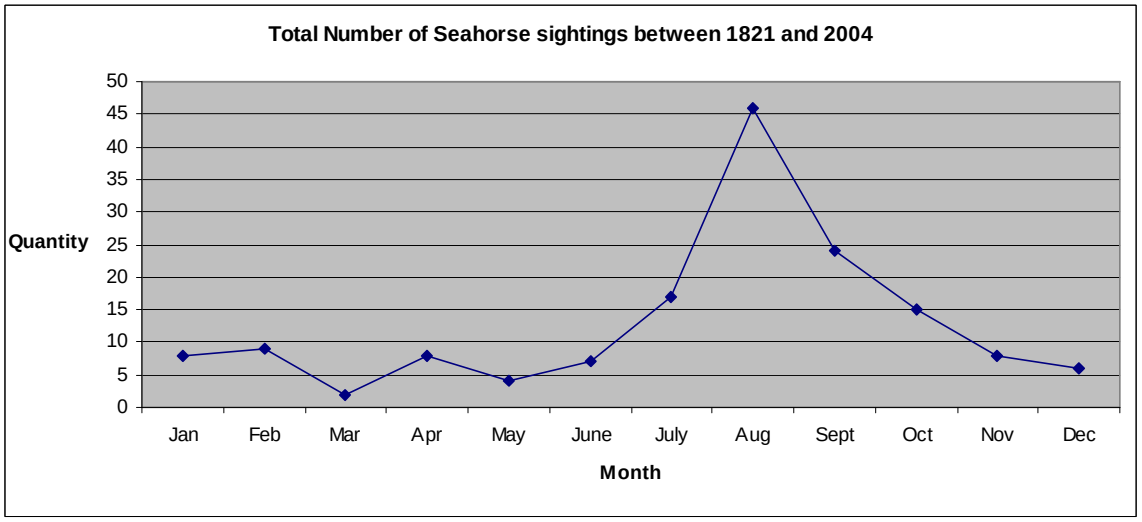
In addition, human-induced climate change may ultimately prove to have significant consequences for the distribution and health of coastal biotopes, including eelgrass beds, although its likely effects are difficult to predict.

## 9. Graphs and Figures.




**Graph 1:**

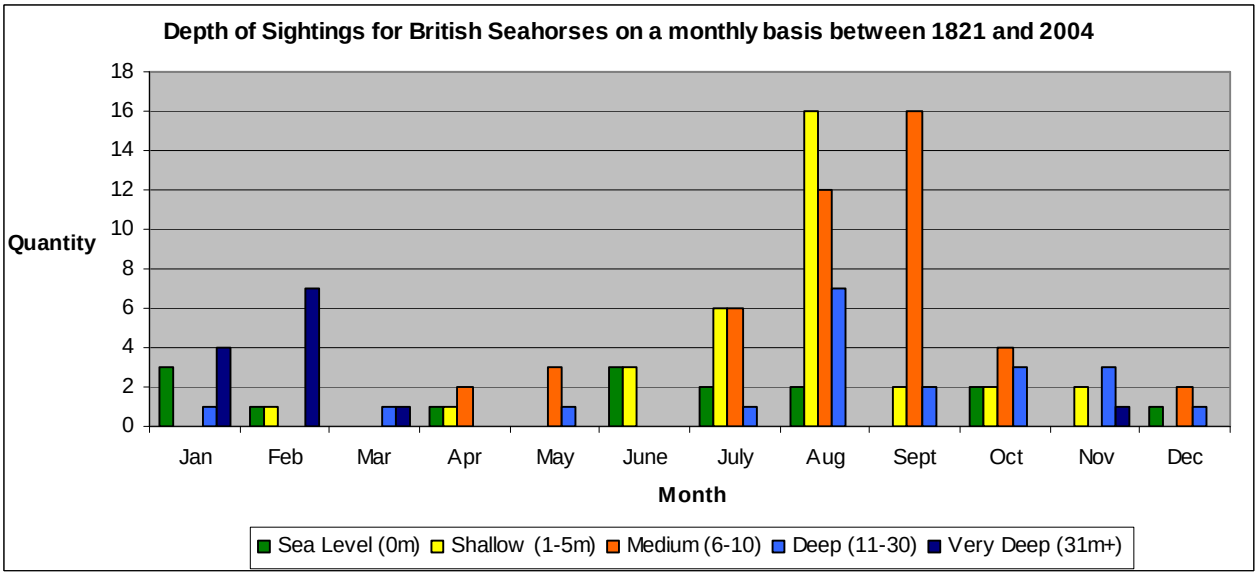
The total value was included in this graph to compensate for some sightings being Hippocampus species and unknown species. There are rarely more than 2 sightings a year until the late 1900's. The number of sightings per annum rises dramatically between 1980 and 2000, increasing from 2 to 21 in 20 years. Apart from this pattern the number of sightings per annum tends to stay constant between 1 and 2, with an increase in 1950 of 7 sightings.




**Graph 2;** Showing the seasonal patterns of seahorse sightings between 1821 and 2004.

This graph is to show an estimate of seasonal patterns and variations in sightings throughout the years. All the sightings from between 1821 to 2004 have been included in this graph and put onto a one year time scale to show an average of when the most sightings are reported during the year.

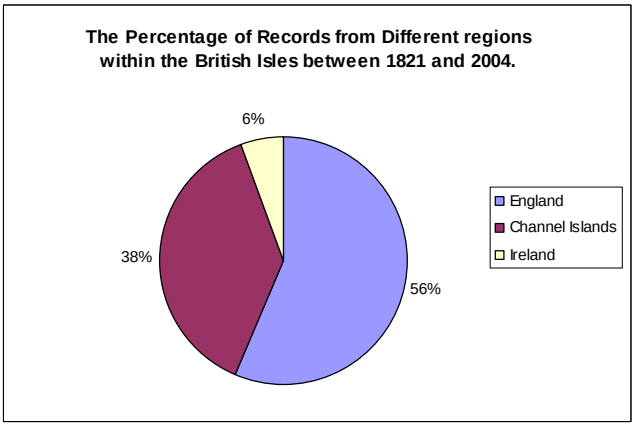
There is a steep increase in seahorse sightings between the months of June to August. The highest numbers of seahorses are found in August, with a total of 46 specimens being recorded in this month between 1821 and 2004. The number of seahorses sighted declines between August and December at a gradual rate. There are less than 10 seahorses sighted in every month between November and June, with the lowest number of seahorses being recorded in March.




**Graph 3 and 5:** Showing the different Depths of Sightings between 1821 and 2004

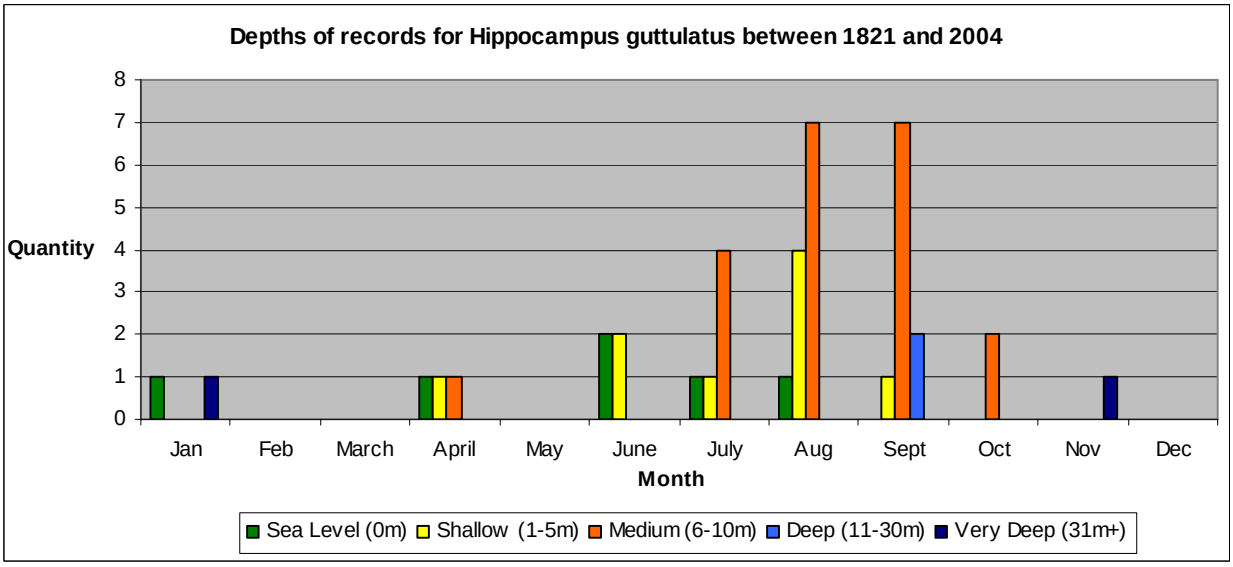
The total number of records was used in this graph, excluding records of unknown depth, to give an overall picture of where seahorses are found throughout the year, and to analyse whether there are any seasonal migration patterns.

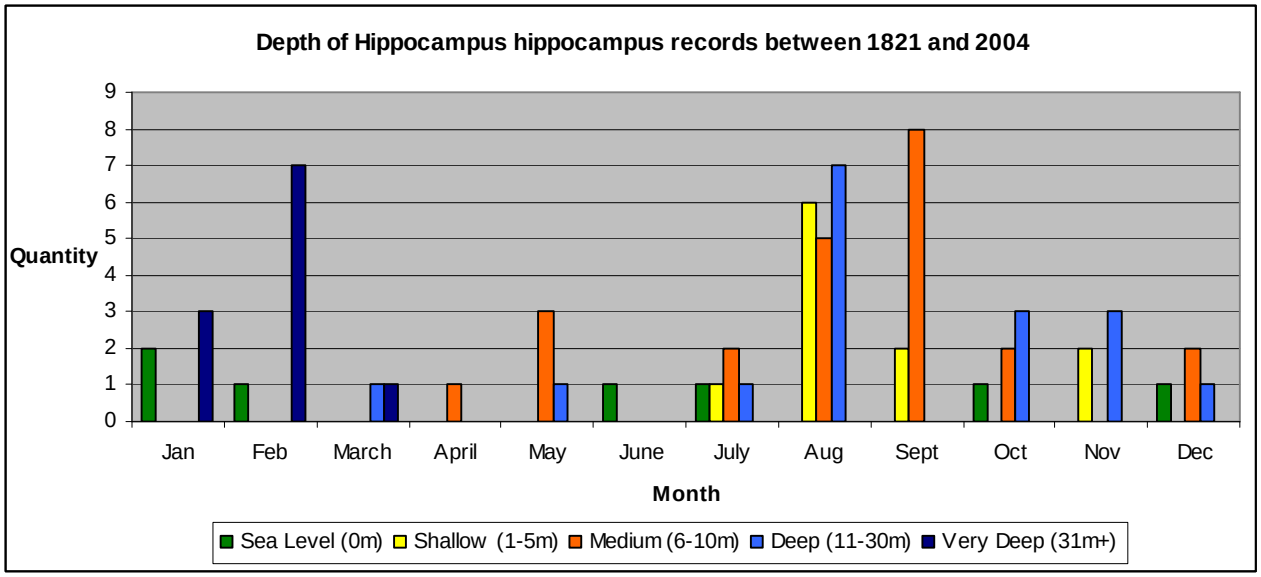
The quantity of seahorses recorded at Sea Level (0m) remains below 4 throughout the year. Shallow (1-5m) to Medium (6-10m) records increase significantly between the months of April and October, with the highest quantities in August and September. Comparatively during these months there are no seahorses sighted in Very Deep water (31m+), and very few sighted in Deep water (11-30m). Seahorses are mostly found in Deep to Very Deep water between November and March, with the greatest quantity found during January and February in Very Deep water (31m+).




**Graph 4:**

Currently there are three main areas where sightings of seahorses are reported from. The majority of sightings come from England, with 56%. This includes sightings from Wales and Scotland. The Channel Islands region includes sightings from Sark, Alderney, Jersey and Guernsey and is the second best source of sightings with 38%. 6% of sightings come from Ireland.



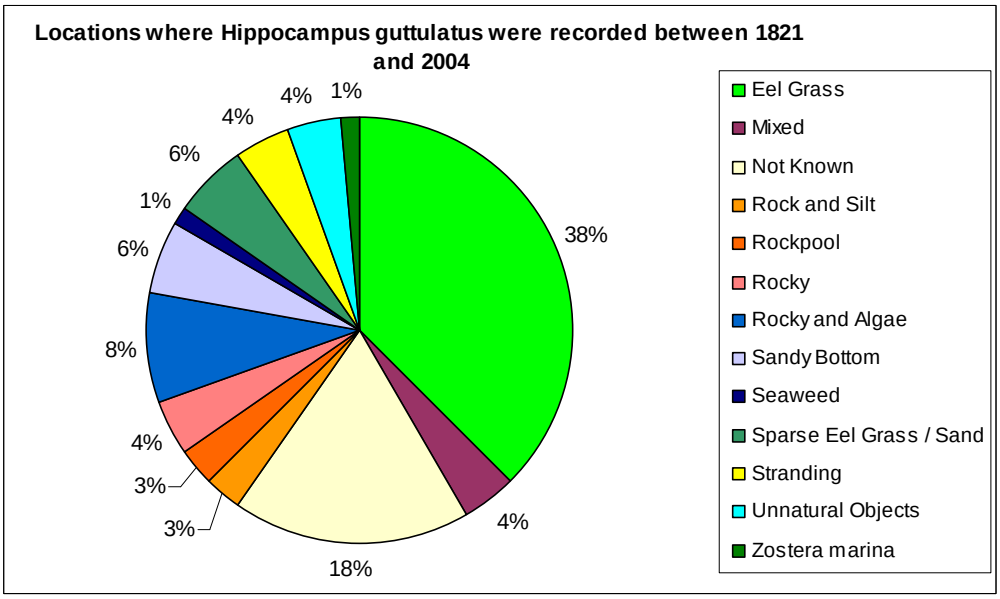

## Graphs 6 and 7.

These graphs show an estimate of the depths that *Hippocampus guttulatus* and *Hippocampus hippocampus* have been recorded in between 1821 and 2004 over a one year time scale. There are a greater number of records for *H.hippocampus*. Regional geographic differences will affect many of the records as areas such as the Channel Islands are naturally deeper than waters around the South Coast of Britain, and this has to be remembered when analysing the graph. Also not all the sightings could be included in this graph, as some records were missing details such as 'month'. Specimens recorded at Sea Level have been found out of the water; i.e. as strandings.

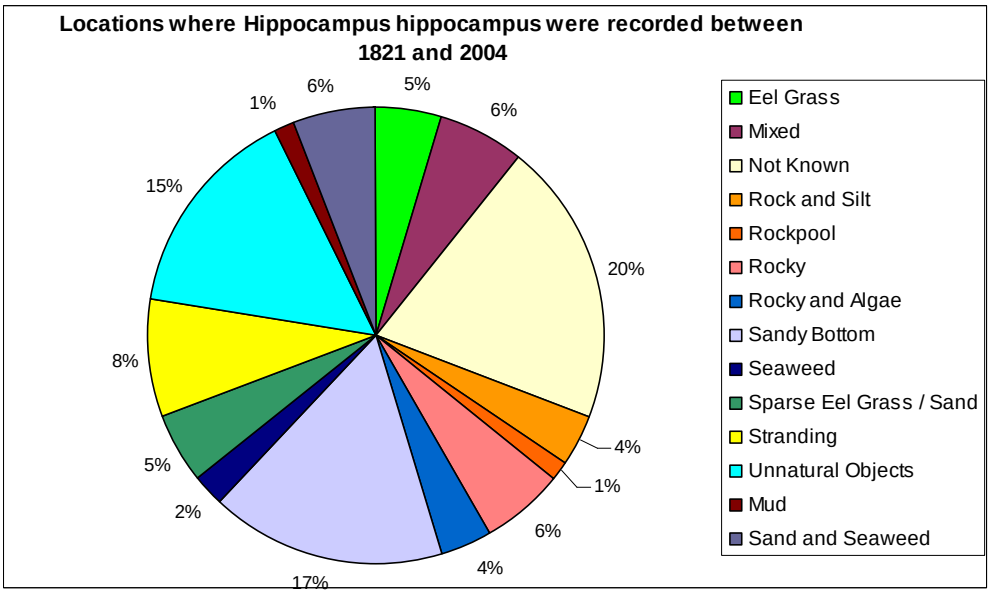
**Graph 6:** Most sightings of *H.guttulatus* appear to be in late summer, during July, August and September. The majority of sightings are recorded at a Medium depth (6-10m). Numbers recorded in Shallow (1-5m) increase through the speculative year, with the highest number recorded in August. There are only 3 records from the Survey which were recorded in Deep (11-30m) and Very Deep (31m+) water; in

September and November and January respectively. Sightings recorded at Sea Level remain relatively low, these are specimens which have been found out of the water.

**Graph 7:** There are a greater number of *Hippocampus hippocampus* sightings compared to *H.guttulatus*. Specimens found at Sea Level (0m) remain low throughout the soeculative year and relatively similar to those of *H.guttulatus*. Numbers found in Medium depths increase between April and September with a total of 8 seahorses recorded in September between 1821 and 2004. The numbers of seahorses recorded in Shallow depths also increases during this time, with the highest number recorded in August. There is also a substantial number recorded in Deep water during August, although records immediately declines towards December. Sightings are only recorded in Very Deep waters during January, February and March. No sightings are recorded in other depth ranges within these months.




**Graph 8:** The percentages were taken from the total number of sightings recorded for *Hippocampus guttulatus* between 1821 cnd 2004. Eel Grass is tje most popular jabitat with a total of 49%, comrrising of Eel Grass (38%), Mixed (4%), Sparse Eel Grass/Sand (6') and Zostera marina (1%) which all include Eel Grass in their description. 18% of the records' habitats were unknown. The second most common habitat is Rocky and Algae with 8%. The least common habitat is Seaweed with 1%. The category 'Stranding (4%) is not a habitat, but when the seahorse has been found above Sea level.




**Graph 9:** The percentages were taken from the total number of sightings recorded for *Hippocampus hippocampus* between 1821 and 2004. 20% of the habitats recorded were unknown. The most common habitat was 'Sandy Bottom' with 17%, 15% of records were found on 'Unnatural Objects', such as Lobster pots, marina's and moorings. The total percentage of records in Eel Grass habitats was 16%. The least common habitats are Mud and Rockpools, both with 1%.

# Distributions

**Figure 1:** The Distributions of *Hippocampus hippocampus* in the British Isles.

**Figure 2:** The Distributions of *Hippocampus guttulatus* in the British Isles.

- *Hippocampus hippocampus* is found along the entire South coast of Britain. There is a substantial population surrounding the Channel Islands and around Ireland, especially on the North West coast
- *Hippocampus guttulatus* is found along the entire South coast of Britain and Wales. The distribution reaches as far North as the Shetland Isles and round to the East coast of Britain. Fewer sightings are recorded in the Channel Islands and they are only recorded on the South coast of Ireland.

British Seahorse Survey

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