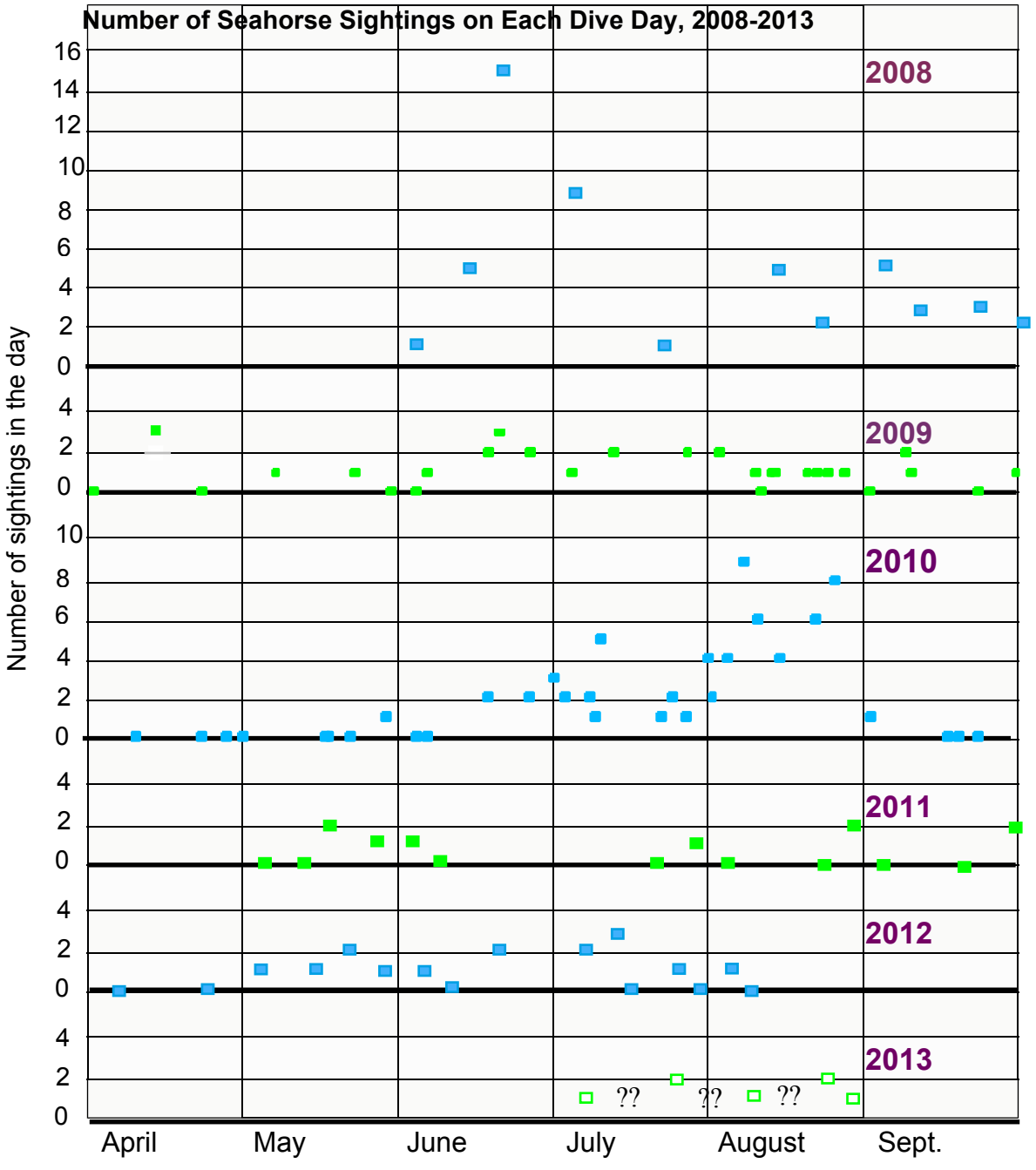
Seahorse Numbers in Studland Bay, 2008 - 2013

An analysis of published data by Michael Simons, for the Boat Owners' Response Group

Summary During four out of six years, the greatest number of seahorses reported on any one day in Studland Bay was just two, except for three days on which three were seen. 2008 and 2010 showed greater numbers, with more than three seahorses observed on 13 days in the two years, but three or less on 30 days. Daily sightings reflect the true population at a given time, and on the great majority of days this was two or fewer seahorses. The presence of seahorses in the Bay was highly variable. Comparisons with other sites are presented, and the abundant eelgrass habitat discussed.

The Seahorse Trust (SHT) have been publishing their sightings of seahorses by divers in the Bay for the last six years. Their narrative seems focused on showing a decline in annual sightings, supporting their agenda that the anchoring of boats is driving the seahorses away. We present here an alternative analysis based on the data in Figure 1.

Figure 1: This table is based on data published by the Sea Horse Trust (SHT), who published detailed tabulated information on their diving surveys in 2009 and 2010 **(1)**. Data for 2008, 2011 and 2012 were extracted from graphs published in a later report **(2)**. Unfortunately the graphs were line graphs rather than separate plotted data points, and sightings had to be inferred from inflections (kinks or angles) in the lines. Any sightings which coincide with a straight line portion of a graph in reference **(2)** are not visible and therefore do not appear in Figure 1.The only information published by SHT for 2013 is a statement that seven sightings were made that year, and it is known that none were made until July. Thus a few sightings are missing or without detail, but the overall sense remains clear.



Analysis

Daily numbers in different years

The data in Figure 1 show two sorts of seahorse years: the majority, four out of six, in which the observed population was never more than three on a given day, and normally two or less; and two years on which higher numbers were seen.

The number of sightings on a given day is a measure of the seahorse population at that time. In the years 2009, 2011 and 2012 then, the seahorse population observed in Studland Bay was between zero and two seahorses, and on just three days there were as many as three.

The average populations in 2009, 2011 and 2012 were **1.1, 0.6** and **0.9** seahorses per diving day respectively. 2011 showed fewer seahorses and a lower average per day than 2009 or 2012, but the average population per day in 2012 was essentially similar to that of 2009. The number of total sightings in 2012 was lower than in 2009 mainly because diving took place on fewer days, 16 as opposed to 27.

For the most recent year, 2013, published data is sparse, 7 sightings in all, and none before early July, and no information about number of dive days. We are told the 7 sightings comprised 4 individuals, so the population density on any given day is unlikely to exceed those of 2009, 2011 and 2012.

2008 showed higher numbers of daily sightings. Some questions arise over the 2008 data, firstly because, unlike the records of 2009 - 2012, no days with zero sightings are shown. Second, for one day in June 2008, fifteen sightings are recorded. This is a remarkably high number, an unusual seahorse event, but the first and only report of this which we can find was published in 2013 **(2)** , five years later, which begs the question, why the delay in announcing such a significant observation? Thirdly, the technical paper on the Seahorse Tagging Project, Studland Bay, Dorset, UK, by Garrick-Maidment et al **(3)**, published in 2010, reports *"During searches in 2008 some **40** sightings of seahorses (mainly H. guttulatus but also H. hippocampus) in this area provided a unique opportunity to study seahorses at the only known breeding location for both indigenous species in the UK"*. This is much less than the 58 for the year 2008 mentioned in the 2013 report. Further confusion is added by the statement in two places in the British Seahorse Survey 2011 Report **(1)** that there were eleven sightings in 2008. So it is not clear just how many seahorses were sighted in Studland Bay during 2008. (There are no 2008 data for April and May, because the 2008 observations only started in June).

There are good data for the other plentiful seahorse year, 2010. That year had a slow start, with only five sightings before July. For the season as a whole, 24 dive days found three or fewer seahorses, 8 days found more than three. For the period when seahorses were present, between the first and last sightings, 14 days found three or less, 8 days more than three, average sightings per dive day **3.2** seahorses.

Discussion and Conclusions

There is a high level of variability in reported seahorse numbers in the Bay between 2008 and 2013. Peak populations occurred in different months in different years. Two years showed relatively high numbers, but even 2010, the year with the highest number of well documented sightings, had a population of more than three seahorses sighted on just eight dive days. The average population per dive day in 2010 was **3.2** during the 3-month period when they were present, and **2.1** over the period April though September.

In the four years 2009 and 2011 to 2013 the population **never** exceeded **three** seahorses on a given day, and the average number present on dive days for the four years 2009 to 2012 was just **1.4** seahorses.

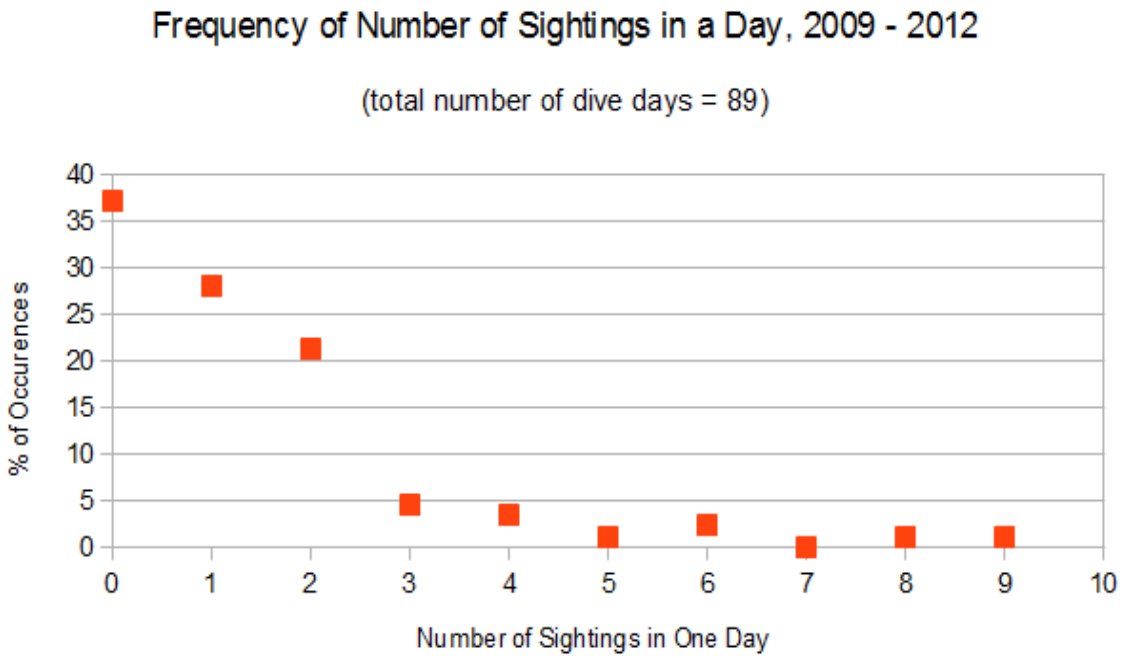
Figure 1 shows a peak population in June in 2008, and in August in 2010, but there is no evidence of a structured migration pattern into the Bay, building to a peak plateau at a regular season and then declining again. Rather, it suggests a random variation in the (low) population during the summer period when seahorses are found inshore.

Little appears to be known about the seasonal movements of seahorses. It is known that they are slow and weak swimmers - their top speed seems to be around 0.1 m/sec, which is one fifth of a knot in nautical terms. Tidal streams around Studland Bay are relatively weak, perhaps 0.5 - 1 kt, except near Poole Harbour mouth and in the tidal race off Old Harry, where they run much stronger. Nevertheless, seahorses could not make ground even against the weak tidal flows, they would be swept backwards. Their progress would be at the mercy of wind, wave and tide, as well as predators such as mackerel, bass and pollack, so irregular and variable progress might be expected, which could be a factor in the variations in population.

A further possible reason for the late appearance of seahorses in 2013 is that May and June were not only unusually cool, they were unusually windy, and the rougher sea state might have delayed the movement iinshore to shallower water, where they would be more subject to wave action.

To describe a varying daily collection of zero, one, two or, rarely, three seahorses as a “colony” would seem a flight of fancy. Rather, Studland Bay seems to be a place where seahorses come and go, and sometimes stay **(3), (4),** in modest numbers, which can normally be counted on one or two fingers.

Because of the possibility of re-counting the same individual seahorses on different days, a total annual count of sightings does not reflect the number of animals actually present in the Bay. The tagging project data show that of 33 recorded sightings of seahorses in 2009 **(1)**, 29 sightings in mid season were accounted for by just **five** tagged individuals **(3)**: there were then not 29 seahorses, during that period there were 5 - the maximum number seen on any one day being 3**.** Annual totals also depend on the number of dive days, which were highest in 2009 and 2010, then declined. The numbers sighted per dive day are a more meaningful measure, and a frequency plot of daily sighting numbers for the four years 2009 - 2012 is shown in Figure 2.



Comment :

A recent report **(5)** estimated there to be 95 hectares (ha) of dense eelgrass in Studland Bay. The paper on the seahorse tagging project **(3)** estimated the greatest “home range” of the seahorses which they had they studied to be 400 sq m. On that basis, a single hectare (10,000 m^2) would provide enough eelgrass habitat for 25 seahorses. The 95 hectares of the bay as a whole could then in principle support over 2000 seahorses - per day, not per year. Two conclusions can be drawn from these estimates: (a) the observed population is a just tiny fraction of the notional maximum for the available habitat, and (b) any suggestion that a decrease in the already small population of seahorses in a given year is due to a lack of habitat caused by anchoring boats lies firmly in the realms of pure fantasy.

Another perspective is given by international comparisons. If the average daily sightings at Studland Bay are assumed to be in the 75 x 75 m area mentioned in reference **(3)**, that equates to an average population density of **0.25** seahorses per 1000 m^2 for the years 2009 - 2012, and **0.6** per 1000 m^2 for the period when seahorses were present in the peak year 2010.

A recent survey of the seahorse populations in the Ria Formosa, Portugal, **(6)** reports an average density for *Hippocampus guttulatus* of **60** per 1000 m^2, two orders of magnitude or 100x greater than Studland. Interestingly, one of the six areas in the Ria Formosa study, which is described as having **no seagrass** present, has an even higher density, of **75** per 1000 m^2. It seems then that the **complete absence of seagrass** is no problem to the thriving population of *H. guttulatus* in areas of the Ria Formosa.

The fact that such a large population of the seahorse *H. Guttulatus* can exist in the complete absence of seagrass presents a further challenge to the SHT's claim that (unsubstantiated) minor changes to the truly abundant eelgrass beds in Studland Bay can "wipe out" the minor population to be found there.

A recent paper on the abundance, distribution and habitat preference of seahorses (*H. Hippocampus and H. Guttulatus*) in Southern Italy **(7)** describes population densities similar to those in the Ria Formosa. There the only seagrass habitat described was of *Cymodocea nodosa,* a fine Mediterranean seagrass, which was less preferred than some non-seagrass habitats in the area. Again, these non-seagrass habitats supported population densities some two orders of magnitude greater than the Studland Bay eelgrasss beds:

Habitat	Description	Seahorses / 1000m^2
SSB	soft bottoms with scattered bioconcretions: bivalve and gastropods shells, small stones and artificial hard substrates,colonized by sabellids and solitary ascidians. etc.	22
CYNOD	*Cymodocea nodosa* beds: a fine Mediterranean seagrass	5
CLIN	*Chaetomorpha linum* beds: filamentary algal seaweed	4
ULVA	*Ulva* beds: sea lettuce, an algal seaweed	58
PWSB	pools with soft bottom : complex colonisation, bivalves, fan worms, sea anemones, sponges, macro algae, etc.	55
AHS	Artificial hard substrates: colonised by macro algae, bivalves, gastropods, sponges, etc.	19
MUDS	Muds	0

Another population density estimate is available for a site in Greece **(8)**, which had an estimated **4.3** seahorses per 1000 m^2, about one order of magnitude, 10x, larger than the Studland average.

Comparison with overseas sites of different topography and much warmer waters is interesting but may not be entirely valid. We do however suggest that the observed presence on average of less than two seahorses in a day, and one or less per day in several years, raises questions about the "special" nature of Studland Bay as a seahorse habitat, and whether other sites along the coast would show similar populations if extensively dived for seahorses in the way that Studland has been. We await with interest publication by the SHT of their findings, including proper estimates of population density, for Poole Harbour, Swanage, and the undisclosed "compare and contrast" site situated some ten miles from Studland.

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