ON THE EVIDENCE SUPPORTING THE STUDLAND BAY RECOMMENDED MARINE CONSERVATION ZONE

The Finding Sanctuary Final Report (FSFR) recommends **Recover** designation for the following features in Studland Bay:

Seagrass beds (Habitat FOCI Seagrass beds)
Seahorse (Species FOCI *Hippocampus hippocampus* Short snouted seahorse)
Undulate Ray (Species FOCI *Raja undulata*1 Undulate ray)

The recommended conservation action is control of anchoring of small vessels to prevent (postulated) damage to the seagrass beds.

It is implied that this measure, by protecting seagrass from the postulated damage, will also achieve the conservation objectives for *Hippocampus hippocampus and for Raja undulata.*

The purpose of this discussion paper is to draw attention to shortfalls in the evidence, as perceived by the Boat Owners' Response Group, a stakeholder group.

1. Levels of evidence

Generally this discussion will be guided by the Natural England Technical Protocol F, *Assessing scientific confidence of feature condition*, and will consider published studies and scientific papers. However it is noted that the Finding Sanctuary website states "MCZ identification should take account of local and lay knowledge" (http://www.finding-sanctuary.org/page/goals-and-principles.html). Where informal forms of evidence are referred to in this discussion, in order to develop or illustrate an argument, they will be identified as such.

2. Seagrass Beds

The beds comprise eelgrass *(Zostera marina)*, and are known to have been present for decades. It is argued in the Finding Sanctuary Final Report that the beds are below "Favourable Condition" because of damage caused by boats anchoring in the bay, a practice which has been going on for decades.

Favourable Condition for a habitat is defined by JNCC and Natural England:

For MCZ habitat FOCI and Broad Scale Habitats favourable condition occurs when, **within the site**:

i. Its extent/area is stable or increasing; and
ii. The specific structure and functions, such as ecological and physico-chemical structure and functions, which are necessary for its long-term maintenance exist; and
iii. Biological diversity of its characteristic communities is maintained such that the quality and occurrence of habitats and the composition and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.

According to Protocol F (referred to above) an assessment of scientific confidence that the feature (seagrass beds) condition is less than favourable will require either direct evidence, or a Vulnerability Assessment, indicating that the extent of the seagrass beds is unstable or decreasing, or that specific structure or functions necessary for its long term maintenance do not exist. The extent of the beds would seem to be the most accessible and sensitive measure of condition, and since the recommended conservation measure is to limit anchoring of small vessels, the key determinant must be whether the extent of the beds is affected by anchoring. Zostera marina is known to be sensitive to a number of influences, and control of anchoring would be pointless if any reduction in the extent of the beds were being caused by disease, water turbidity, or localised salinity reduction, for example.

It should be noted that the definition of Favourable Condition does not set any range or limits of stability. However Annex 1, table 3, of Protocol F (referred to above), entitled "Condition scales for the designations within the MPA network", does imply a range within the Favourable condition, Reference Area being placed at the extreme of the range.

Further, the Finding Sanctuary website makes the following statement: "If Marine Conservation Zones are to be viable, they must be capable of delivering clear benefits for nature conservation, whilst minimising the impact to human activities, and they must be broadly accepted and supported by all stakeholders." (http://www.finding-sanctuary.org/page/planning-mpas.html) .Trivial or negligible variations in feature extent should therefore not be relevant, as correcting these would not deliver clear benefits for conservation.

We will now consider whether the conclusions of the Final Report are supported by direct evidence, or alternatively by a credible Vulnerability Assessment.

Seagrass beds: Direct Evidence

The Finding Sanctuary Final Report, p382, *Table II.3.15d*, states the extent of the seagrass beds to be 0.91 sq km (91 ha).

There are no historical survey data on the extent of the beds.

Local knowledge suggests that the trend over recent decades has been an increase in the extent of the seagrass beds. This informal evidence is not included in the FSFR. Two examples:

1. Local residents state that eelgrass has spread inshore in recent years (statement by Nick Warner of the Studland Bay Preservation Association).The intertidal strip of eelgrass off South beach increases each year and the beds to the north of Redend Point now stretch almost to the slipway off Middle beach.
2. Over 500 responses to the YBW website Studland thread confirm that boat owners experience greater difficulty in finding open sandy seabed where it is preferred to drop anchor, with only one owner saying it had not. The author confirms this by his personal observation in Summer 2011, as compared with some years ago.

The FSFR, p385, does include the comment "There is concern about decline of the seagrass habitat along with its associated species (Garrick-Maidment *et al*.2010)". A reading of the cited article reveals this comment to be purely a matter of opinion, no supporting evidence or justification for the statement being given in the cited paper.

There is one single published study which addresses anchor damage to Zostera marina in Studland Bay, *The impacts of anchoring and mooring in seagrass, Studland Bay, Dorset, UK,* by Collins et al, 2010. This study employed seabed towed video sledge, and sidescan sonar, which were used to identify locations for SCUBA diving studies. Apart from an image showing one 20m x 20m area of seabed affected by anchor scars, no data on number and extent of anchor scars over an area were reported, so the proportion of seagrass bed affected remains unknown. In total, the study reports a detailed investigation of just four anchor scars and two mooring chain scars, plus the image of Figure 3 said to be showing anchoring scars. That image is a sonar image, and it is not clear whether it shows the presence and absence of seagrass, or varying heights of seagrass growth, or the topography of the seabed itself. Of the 400 sq m covered by the image, approximately 40 sq m might indicate scarring (author's estimate). It is presumed that this is a "worst case" sample area.

Dr Emma Jackson of Plymouth University pointed out recently to SBPA that eelgrass beds are to be found on the north side of the Bay adjacent to the Training bank. It is noted that similar holes in the beds exist to those observed and attributed to anchor damage in the southern sector beds. Boats rarely if ever anchor in the shallow water of this much more exposed site. Similarly there are sandy holes close in shore to the East West coastline of chalk cliffs where boats do not anchor.

The above seems to be the only published direct evidence of anchoring effects on the seagrass beds at Studland, and it gives no idea as to the extent or frequency of the effects, it merely reports on the six specific small-scale sites.

It should be noted that there is a clear attempt to conflate damage caused by fixed mooring chains, which repeatedly sweep the same area of seabed, and is not disputed by any of the interested parties, with damage caused by anchoring. For example, note the title of the paper by Collins et al, 2010, above. Mooring damage persists because the cause remains in place and the chains move with every tide. Anchor damage, if and when it occurs, is usually a one-off event and the fact that the seagrass beds are still present after decades of anchoring suggests that the seagrass can re-establish itself in a sustainable fashion.

The area affected by mooring chain scouring, on the basis of 30 fixed moorings and 20 sq m of "scour" per mooring would be 600 sq m. The FSFR states there to be 91 ha, or 910,000 sq m of seagrass, and 600 sq m represents just 0.07% of that area.

The mooring chain damage is more obvious than any claimed anchor damage. Yet if just 1% of the 910,000 sq m of seagrass were to show damage from anchoring, there would be 9000 sq m of damage to be observed, or 15 times the area of mooring chain damage. The FSFR (p.385) also mentions over 300 hours of dives studying *Hippocampus guttulatus* . It is surprising that more direct evidence of anchor damage in the form of photographs and area surveys has not been produced, even if the proportion of the habitat damaged were as low as 1%.

Seagrass beds: on Vulnerability Assessment

On the basis of available evidence, on the macro scale the seagrass beds would appear to be in Favourable Condition, on the basis that "Its extent/area is stable or increasing".

At the metre scale, despite the trivial fraction of the whole seagrass feature affected, some might argue that the direct evidence falls into the low confidence category of Technical Protocol F (Description: evidence of minor damage/disturbance. Feature may take months to recover. Scale of impact: evidence of localised/ small scale disturbance restricted to a proportion of the feature). Then a Vulnerability Assessment (VA) might be undertaken.

A key parameter in the assessment is the feature's (sea grass bed's in this case) sensitivity to the pressure (i.e. anchoring in this case), whether it is highly, moderately or less sensitive to the pressure. Under Protocol F, a VA has a default confidence score of low, unless a Recover objective has been recommended, and at the same time the feature is highly sensitive to the pressure, with moderate or high confidence.

Collins et al 2010 does not provide evidence that the feature, i.e. the 91 ha of seagrass beds, is highly sensitive to the pressure of anchoring. It is a study of a single site over a limited period to date. Despite an interesting hypothesis as to how wave action might extend a scar, it is not proven, and in biological systems it is not valid to draw general conclusions from a single limited study.

Does the published literature provide guidance? A Google scholar search reveals that 1780 papers have been published with *Zostera marina* in the title. It appears that none, other than Collins et al 2010, provides evidence of anchor damage to *Zostera marina* beds.

Collins (Collins et al 2010) does provide a useful review of papers which discuss anchor / mooring damage to seagrass beds, but none of those references discuss damage to *Zostera marina*. For instance, he mentions Montefalcone et al., 2008, who studied damage to the Mediterranean seagrass *Posidonia oceanica,* a slow-growing species. Further, the Mediterranean being essentially non-tidal, unlike Studland, the seagrass there will not have the benefit of tidal flows to assist the re-colonisation of damaged areas through pollen and seed distribution, and the spread of vegetative fragments.

Zostera marina is widely distributed in the cooler waters of the northern hemisphere, for instance all around Britain including the Scilly Isles, the Baltic Sea, and the western seaboard of the USA, from Alaska to California. Sailing of leisure boats is widespread in these areas, and *Zostera marina* flourishes in conditions of sheltered shallow water which are also favoured for anchoring. If *Zostera marina* were highly or even moderately sensitive to anchor damage, it is unlikely that this would not have been observed and studied. There is then no published evidence of which we are aware that *Zostera marina* is highly or moderately sensitive to anchor damage, and the lack of published articles is a strong indication that it is actually NOT highly or moderately sensitive.

Seahorses

The Seahorse Survey 2007 (Garrick-Maidment 2007) gives a breakdown of habitat in which seahorses have been recorded in Britain. Only 3% of records for the short-snouted seahorse *Hippocampus hippocampus* were in an eelgrass habitat. It is difficult to see, if the vast majority of the seahorse population is in habitats other than seagrass, how the seagrass beds in Studland Bay can be of importance to the conservation of that species. If, for the sake of argument, the extent of the seagrass beds were to decline, perhaps through disease, by as much as 25%, the effect on the overall population of *H. hippocampus* would be insignificant. (25% of 3% = 0.75%).

A study of seahorses in Ria Formosa, Portugal (Curtis & Vincent, 2005) is consistent with this finding:

"At a landscape scale, *H. guttulatus* abundance was positively correlated with an index of habitat complexity, the percentage of substrate covered by flora and sessile fauna. Conversely, *H. hippocampus* used more open and less speciose habitats that were subjected to greater oceanic influences. At microhabitat scales**, both species significantly preferred grasping holdfasts over barren surfaces**, but the species differed in holdfast preferences: *H. guttulatus* grasped all prospective holdfast types with equal probability while ***H. hippocampus*** **significantly avoided both fauna and flora that formed large colonies or tracts of dense vegetation**." (Author's emphasis).

This is a clear finding that, at least in the Ria Formosa, dense tracts of vegetation were not the preferred habitat for both species, but especially so for *H. hippocampus*.

Consistent with these Ria Formosa findings is the account of a pair of spiny seahorses, *H. guttulatus* in Studland Bay who "*lived in and around a mooring scar known as the 'gully', which has been used by other pairs before in previous years. It is assumed that the* ***preference for this site*** *is due to many reasons including thick seagrass to hide in and fragmented areas of seagrass to search for food and conduct courtship displays*." (Garrick-Maidment et al, 2011). In the report, a photograph of the "gully" showed the scar to have a clear sandy surface, cf the preferred "barren surfaces" referred to in Curtis & Vincent, 2005.

These various findings do not support the hypothesis that dense areas of seagrass are important to these two species of seahorse, and do not support the hypothesis that unvegetated scars in the seabed are unfavourable to seahorses.

Indeed, a counter hypothesis could be advanced, that the open areas of seabed in the mooring chain scars adjacent to tracts of seagrass provide a favourable habitat for seahorses, and that conservation action which eliminates these open areas might make the habitat less favourable and so decrease the seahorse population.

What is known is that under present conditions and usage the bay supports a seahorse population which is of interest. It would be unwise to undertake action which would change the existing habitat without a proper understanding of the likely consequences on the seahorse population. (As a corollary, it is noted that human activity is not necessarily harmful to marine life. Manmade structures such as piers, jetties, shipwrecks and artificial reefs provide rich well-populated habitats for a wide diversity of marine life).

A further reason to question that the extent of the eelgrass beds is a determinant of the seahorse population in Studland Bay is the low level of occupation by seahorses of the available area. Garrick-Maidment et al, 2011, show that a pair of spiny seahorses occupied a territory of some 200 sq m, or 100 sq m per seahorse. At such a population density, the 910,000 sq m of seagrass could theoretically support 9100 individuals. The maximum number sighted in any one year is 40, and generally much less than that, which is less than one two thousandth of 9100. A factor of 2000 is a clear indication that seagrass area is not a limiting factor in the seahorse population. If the area of seagrass were to increase by 10%, or decrease by 10%, it would not affect the number of seahorses present. The population must be controlled by other factors. These could include migration dynamics, winter survival, and predation, and skates and rays, present in the bay, are generally believed to be amongst the predators of seahorses.

It is therefore difficult to understand why the FSFR designates the seagrass habitat as of conservational importance to *H. hippocampus*. Neither would there be strong reason to consider the seagrass habitat as of conservational importance to *H. guttulatus*.

At the same time, one could note that Studland Bay is a particularly favourable site for the study and observation of seahorses, being sheltered, having shallow but clear water, modest tidal streams, good access, and being conveniently close to Southampton University. It is unclear to the author whether the comparatively large number of sightings of seahorses in the bay are because of a relatively high population, or because of the large number of dives undertaken to observe and study them. I am indebted to Jon Reed, of the Boatowners' Response Group, for the following comments:

"Garrick-Maidment comments that lack of sightings in likely habitats may well be due to the fact nobody has looked there yet for this elusive species. (SHT website). SHT species distribution maps round the UK show a known colonisation round the entire W and S coasts of the UK. Garrick-Maidment has been willing to copy to me his private SHT diving log for the summer 2011 period, which shows that SHT has carried out over 110 dives in Studland this year, and Trewhella claims over 300 hours on this one site. SBPA have recorded more than 280 divers looking for the Seahorses this summer including the SHT dives. With that level of study here what other sites have had anything more than very nominal investigation? G-M also says the major populations tend to be 'further west'.

It seems clear to me Studland is favoured not because it is a prime area for the species, but because it is the most easily accessible for study of a known colony. It remains the only known breeding ground by default. There appears to be no follow up of a pregnant specimen reported in Southampton Water earlier this year, for example.

Finally, as you know I have received many reports of seahorse sightings between Brighton and Plymouth, Salcombe, Exe Estuary, Portland, many in Poole Harbour itself and most of its Marinas, also Brighton Marina and St Petersport marina in CI, as well as firm reports from inshore fishing fleets from Weymouth, Purbeck dSAC area, Poole, West Solent, Portsmouth, Chichester, Langstone, and Bracklesham Bay. These simply because this is where I happen to have contacts who have chosen to mention it unasked. Even a brief systematic survey of the area would undoubtedly produce many more.

SHT has undoubtedly produced much interesting and valuable data about this little known species working as it must with limited resources, funding and manpower. Given these limitations an intensive study of one site is their best course, but it leaves much of the UK coastline without any systematic evaluation, data collection, or any substantive data on population densities and habitats. Most sightings reported to me are in areas well away from seagrass, for example."

Summary:

There is evidence that the beds of seagrass (Zostera marina) are damaged by the scouring action of the chains of the 30 fixed moorings. However this damage is limited to a fixed maximum area, that area which is scoured by the chains, and that area comprises approximately 0.07% of the 91 ha of seagrass beds. This might be considered a trivial fraction of the whole.

There are reports of six areas where damage has been ascribed to anchoring. These areas are much smaller in extent than the mooring chain areas, and comprise an even less significant fraction of the seagrass beds.

There seem to be no peer-reviewed papers worldwide which describe significant anchor damage to beds of *Zostera marina*.

There is no evidence of overall reduction in extent of the seagrass beds over many decades of boat anchoring in the bay. There is ample evidence from local witnesses that the area has remained stable or even increased over the years. There is no reason to expect any large increase of the number of boats in the bay in the future. Fears of a significant future reduction in the area of seagrass due to boat activity seem to be without rational basis.

There is no evidence that the extent or health of the seagrass beds are of conservational importance to the seahorses, especially *Hippocampus hippocampus*. The beds seem to hold a population far below their theoretical capacity. The Seahorse Survey reports that only 3% of sightings of *Hippocampus hippocampus* were in seagrass habitats, so 97% were not found in seagrass. Studies in Portugal and Studland suggest that seahorses prefer more open areas over densely vegetated seagrass which does not have areas of open seabed.

The claim that Studland is a uniquely important site for seahorses seems to rest on the uniquely high number of dives which have been carried out there in search of seahorses. Seahorses have been reported in many areas around the British coast, and it may well be that many other sites would be found to have "important" seahorse populations if diving were conducted at a similar intensity.

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