RESPONSE TO DEFRA PUBLIC CONSULTATION ON STUDLAND BAY r-MCZ

By Michael Simons on behalf of the Boat Owners' Response Group, July 2018

This response will be published online at http://boatownersresponse.org.uk/

Note: this response is concerned with the issue of leisure boat anchoring in the Bay. It is accepted that the ground chains of fixed moorings do create areas, usually circular, of seabed devoid of vegetation. However these are of limited extent, about 0.07% of the area of the seagrass beds, and do not increase in size. In fact, when the moorings were originally laid there was no seagrass in that part of the Bay, so they have in a sense perpetuated the original condition of the seabed. This is an entirely different matter to short term anchoring, which is the main focus of this response.

QUESTION 1. Do you agree that this site and specified features should be designated? Please explain and provide evidence to support your views.

No: I do not agree with designation of the site as described in the Studland Bay Factsheet because

A. It is implied that the seagrass beds are in Unfavourable Condition and
B. The management scenarios imply that recreational craft anchoring may be causing significant damage to the seagrass beds

Neither of these conclusions are supported by evidence, while substantial evidence does exist that the seagrass beds are expanding and healthy. There is a real risk that if designation proceeds on the basis described, that local recreational boating amenity and navigational freedoms will be seriously compromised, significant public expenditure incurred, and the local recreational marine industries will suffer significant loss of business and jobs, all on the basis of a false premise and no proper evidence. It would be all loss and no gain arising from inadequate "science".

There is ample evidence that during recent decades the eelgrass beds have been steadily consolidating and expanding, and are in healthy condition, and that the seagrass beds satisfy the definition of Favourable Condition as defined in existing MCZ Designation Orders:

" —favourable condition"—
(a) with respect to a broadscale marine habitat within the Zone, means that—
(i) its extent is stable or increasing; and
(ii) its structures and functions, its quality, and the composition of its characteristic biological communities are such as to ensure that it remains in a condition which is healthy and not deteriorating;"

Evidence substantiating this view, and evidence relating to the effects of recreational anchoring on the seagrass *Zostera marina* (eelgrass) both within the proposed Zone and as described in the worldwide scientific literature, will be outlined below.

The reasons for the stated assessment of Unfavourable Condition are not made clear in the Natural England (NE) "Advice", or anywhere else we have found, which is in itself a reason for objection. If it is based on the MarLIN MarESA sensitivity assessment at http://www.marlin.ac.uk/habitats/detail/257/zostera_marinaangustifolia_beds_on_lower_shore_or_infralittoral_clean_or_muddy_sand , then I point out that the assessment is not appropriate to pressures arising from recreational vessel anchoring, as the Marlin assessment is based on the far more severe pressure benchmark of heavy bottom fishing gear, such as scallop dredges being dragged across the seabed for hundreds of metres at 2.5 knots. Further, we believe no account has

been taken of the actual area of seabed impacted by anchoring vessels, rendering the assessment unfit for purpose on two separate counts.

The flaws in such an assessment are further examined below.

(i) Evidence on the Status of Eelgrass in Studland Bay

We discount the paper by Collins et al (2010) which studied bare patches in the eelgrass, claiming that they were caused by anchoring but giving no evidence that they actually were caused by anchors. Further, the alleged anchor scars, up to 4 sq m, were implausibly large for the anchors of leisure vessels. Simons (2014) cites five different published studies in which anchor scars (in other species of seagrass) were measured at 0.16 sq m or less. (http://boatownersresponse.org.uk/anchoring-density.pdf)

The only surviving detailed study of the eelgrass in the Bay is Axelsson et al (2012), a report by Seastar Survey. Key results were that whilst there were indications of some differences between a voluntary no-anchor zone and a control (anchored) zone, they were not statistically significant. It reported eelgrass shoot densities of 170 – 190 per sq m, comparable with the range found in the Weymouth / Portland area and suggesting healthy beds of eelgrass.

A series of aerial photographs compiled by Simons for BORG and published online (http://boatownersresponse.org.uk/aerial-images/) shows steady expansion, filling in and consolidation of the eelgrass beds over the period 1972 – 2011, over which period leisure vessels were anchoring in Studland Bay. This trend is continued in a 2017 aerial image on Google Earth. These are submitted as *Evidence: Aerial Images (http://boatownersresponse.org.uk/Aerial-1972-2011.pdf)* as an informal (not peer reviewed) paper.

In 2016 Simons conducted an underwater video survey of the eelgrass beds using a pole-mounted underwater camera to provide photographic ground-truthing of the presence of eelgrass and to test the assertions of the Sea Horse Trust (SHT) that the eelgrass beds were severely damaged to the detriment of the seahorse population. Over a total linear distance of 300 m it was found that dense, healthy eelgrass was present and that the assertions of the SHT were not true. The videos may be accessed at http://boatownersresponse.org.uk/underwater-videos/ These are submitted as *Evidence: Underwater Images (http://boatownersresponse.org.uk/Studland_Underwater_Videos.pdf)* as an informal (not peer reviewed) paper.

We understand that these may not carry the weight of fully reviewed papers, however the visual evidence is compelling and to a degree self-authenticating, they are consistent with the fully reviewed paper by Axelsson et al (2012), and together the three papers represent Best Available Evidence on the history and status of the seagrass beds in the Bay.

This best available evidence for the state of the eelgrass in Studland Bay strongly contradicts any assertions of decline, and furthermore provides ample evidence that during recent decades the eelgrass beds have been steadily consolidating and expanding, and are in healthy condition, and that the seagrass beds satisfy the definition of **Favourable Condition** as defined above.

(ii) Eelgrass and Anchor Damage in the Worldwide Scientific Literature:

With the exception of Collins et al (2010) we have found no reports of anchor damage to eelgrass beds in the worldwide literature. We have published this finding, and no one has come forward to contradict it.

A clear negative result is given by a recent paper on Nordic eelgrass (CHRISTOFFER BOSTRÖM et al 2014) which surveys the status and health of all the eelgrass in the Nordic countries, up to 2000 sq km of it, in the Baltic and the Norwegian Atlantic coast. The paper runs to 25 pages and cites 113 references. The words anchor or anchoring do not appear once: there is a lot of boating done in those countries, but clearly anchor damage to eelgrass is not an issue, nor is other physical damage. The major factors influencing Nordic eelgrass populations are water quality (high nutrient levels and high turbidity being harmful, salinity is important), phytoplankton blooms, and an appropriate biological balance of epiphytes, epifauna, mesograzers and predators.

(iii) Factors Accounting for the Expansion and Good Health of the Seagrass Beds

There is an understandable presumption that anchors digging into the seabed will damage the seagrass leading to a decline. So how is it that all the available evidence points to expansion and good health of the beds in Studland Bay? The explanation is believed to lie in two factors.

First, there is ample evidence in the scientific literature that eelgrass is resilient, that it can rapidly recover from minor damage. See http://boatownersresponse.org.uk/Eelgrass-Resilience-and-Resistance.pdf - many (eleven) papers describing growth and rapid recovery are cited there. In essence, any area from which eelgrass is removed is filled in by sideways (lateral) growth from surrounding plants, and measurements from a number of places in the world give an average lateral growth rate of about 15 cm or 6 inches a year. A particularly telling study by Boese (2002) shows that plants which were displaced by raking could re-establish themselves very rapidly in a matter of a few weeks, presumably they re-rooted and only minimal lateral growth was required. Displacement of individual eelgrass plants is an obvious possibility during the process of anchoring. Displaced eelgrass plants can survive, while any plants that are removed can be replaced by lateral growth. If an anchor were to remove plants from an area the width of an anchor blade, about 30 cm, they could be replaced by lateral growth from each side within a year, and faster if some plants remained within the area. We submit this review paper as evidence. (The paper itself is not peer reviewed, but the cited studies are).

It is also worth pointing out that the eelgrass beds in Studland Bay are subject to damage from powerful wave action from breaking waves when there are easterly gales, as the Bay is open to the east. To have survived in such a location the eelgrass must have evolved a high degree of natural resilience to physical disturbance, as natural selection will favour phenotypes more resilient to physical damage. High phenotype plasticity is a known characteristic of eelgrass.

The other key factor is just how much of the seabed might be damaged by anchors in the course of a year. This question does not seem to have been addressed anywhere in the literature, so I made and published some estimates (http://boatownersresponse.org.uk/anchoring-density.pdf). The answer is a surprisingly low area. Estimates using observed patterns of anchoring in Studland Bay suggest that just 0.34% of the eelgrass would be directly impacted by an anchor blade in the course of one year. A worst-case scenario of close-packed anchoring, in which boats were anchored as closely together as their swinging radii would allow, gave a theoretical upper limit of just 1.6% of the sea

bed. Our estimate of the area impacted by an anchor is consistent with a number of measurements which may be found in the literature, referenced in the anchoring density paper.

The combination of the recovery of most anchor-impacted areas within a year, plus the fact that in reality less than 1% of the eelgrass would be impacted in a given year anyway, can account for the ongoing consolidation and expansion of the eelgrass beds in Studland Bay.

We submit the paper as evidence, and point out that any competent person can verify the working in the close-packed anchoring case, as the mathematics involved is straightforward and simple.

Any theoretical assessment of the sensitivity of the eelgrass beds to anchoring pressures which fails to take account of regrowth over the relevant distances, and fails to take account of the actual area impacted, is in the author's view **negligent** and **not fit for purpose**.

(iv) What is the Basis of Natural England's Advice that the Eelgrass is in Unfavourable Condition?

NE's advice is based not on observation or actual evidence but on an "assessment", developed we understand from the MarLIN MarESA assessment. However we have not been able to find any account of how or why that assessment was made, which is an extraordinary situation given the serious socio-economic consequences and cost to the public purse which could follow designation as an MCZ. Is there evidence behind this assessment, or is it merely someone's hunch? We also draw attention to the fact, given in the NE supporting documentation, that the confidence in the "condition of feature" is only listed as Moderate.

If the NE assessment is based on the MarLIN MarESA assessment **, then the application of that assessment is not appropriate to the case of leisure boat anchoring**. The MarLIN MarESA assessment specifically refers to "The deployment of fishing gears" and "The mechanical harvest of shellfish damaging the sub-surface of the sediments", see http://boatownersresponse.org.uk/Marlin-Maresa-Eelgrass-Review.pdf p2. Application of that particular assessment to leisure boat anchoring would fail to distinguish between the impact of a single anchor blade 30 cm wide, deployed and withdrawn once, and a 4-gang scallop dredge 400 cm wide dragged along the seabed for hundreds of metres at 2.5 knots. In the author's view, this is ludicrous, and cannot in any way inform on the condition of the seagrass beds in Studland Bay in respect of leisure boat anchoring. Heavy bottom fishing gear is not, as far as we are aware, used in Studland Bay. It is not possible to simply scale down the impact in a simple spatial sense, because the sensitivity of eelgrass to physical damage, and especially the resilience, is dependent on the width of the area impacted. Small areas have high resilience.

To develop this point further, recovery of eelgrass from physical damage on or below the seabed occurs by lateral growth of rhizomes from surviving plants, as mentioned above. There are many instances in the literature of lateral growth rates for eelgrass of 15 cm or more per year. A damaged area 30 cm wide, the width of an anchor blade, would be expected to recover within 12 months through lateral growth from each side. This, as discussed in Simons' (2014) review of eelgrass resilience and resistance at http://boatownersresponse.org.uk/Eelgrass-Resilience-and-Resistance.pdf , indicates HIGH RESILIENCE and LOW SENSITIVITY to damage over such a distance. Many reported examples of recovery on such a timescale are given in Simons' review. On the other hand, a 4m wide scour from scallop dredges would be expected to take 13 years if no viable material was left within the scour, indicating Low Resilience and High Sensitivity.

The assessments given for eelgrass in the MarLIN MarESA document, specifically stated to be for the case of heavy bottom fishing gear, are Low Resilience and High Sensitivity, which is not appropriate for anchor-scale damage.

It is also not clear that NE's Advice takes any account of the actual area of seabed impacted in the course of a year – as far as I can tell it does not. A valid assessment must take account of the Sensitivity of a feature (itself a function of Resistance and Resilience, neither of which are assessed for small-scale impacts such as leisure boat anchors in the MarLIN MarESA assessment) and the actual area impacted. As described in section (iii) of this submission, our estimates show that the area of seabed impacted is small, less than 1% per year.

Physical damage is not like a contagious disease that spreads, and the speculation in the paper by Collins at al (2010) that scars will progressively enlarge is not borne out by aerial photographic evidence nor by our underwater video survey. If the speculation were true it would lead to progressive enlargement of holes in the seagrass beds, in fact the very opposite is true, for as the years pass the gaps have filled in. Our underwater video paper, submitted as evidence, shows still images across the width of a patch which is bare of seagrass, and there is no sign of an edge which exposes the "rhizome mat" to erosion. The whole video run of 300 linear metres shows virtually no sign of anchor scars, whereas if the Collins speculation were true the seabed would have a significant number of expanding scars. These are just not present.

The lack of transparency, indeed the obscurity, behind the assessment of the condition of the eelgrass beds, the merely Moderate confidence in condition of the feature, the possible use of inappropriate aspects of the MarLIN MarESA assessment, the probable failure to consider the area actually impacted, and indeed the failure to collect actual evidence in the shallow waters of Studland Bay, which is quite readily done, constitute in the author's view remarkably inadequate "science" which would be easily challenged at law if the question should arise.

(v) Can the Eelgrass be affecting Seahorse Numbers?

Some lobbyists have asserted, without providing evidence, that "damage" to the eelgrass beds has somehow caused a reduction in observed seahorse numbers in the Bay, although all the evidence is that the eelgrass area is increasing, and that it is in good health.

The area over which a pair of seahorse ranges (Seahorse Trust data) is about 100 square metres, so 100 sq m of eelgrass is enough for two seahorses. In Studland Bay there are nearly 100 ha, or 1 million square metres of eelgrass. 1,000,000 / 100 = 1000 pairs or 2000 seahorses. There is enough seagrass for 2000 seahorses, but the greatest number ever counted in one day in the Bay was 4. To claim that there is not enough seagrass, or that it is anywhere near a critical level, is plain ridiculous.

A Seahorse Trust report shows that eelgrass is not essential anyway. Only 3% of short-snouted seahorse sightings were in eelgrass, and for the spiny seahorse, 43%, less than half. (https://www.theseahorsetrust.org/pdf/British_Seahorse_Survey_Report_2007.pdf p17)

In 2010, the year of the highest spiny seahorse population in Studland Bay, the population density in Studland Bay might have been 0.6 seahorses per 1000 m^2 (http://boatownersresponse.org.uk/Studland-Seahorse-Population.pdf).

By way of contrast, Correia et al (2011) report that in a part of the Ria Formosa, Portugal, spiny seahorse densities of 75 per 1000 m^2 , over 100x the highest Studland density, were found in an area with no seagrass at all.

So seagrass is not a uniquely essential habitat for the spiny seahorse, but the Bay does happen to contain enough for 2000 or more seahorses. Supply of the seagrass habitat exceeds demand by around three orders of magnitude (1000x), and minor or even moderate changes in the seagrass extent, in either direction, are unlikely to have any influence at all on the seahorse population dynamics.

(vi) A Question of Sustainability

The scenario we present is of a strictly limited area of seagrass being impacted by anchoring in a given year, with rapid recovery of viable plants which although displaced, remain within the impacted area, and with infilling from lateral rhizome growth from adjacent undisturbed areas.

We submit that this is a sustainable situation, as evidenced by the continuing increase in eelgrass cover throughout the years, and is analogous to a sustainable fishery in which individual fish are caught, but in such numbers that a viable ongoing population is maintained. The human requirement, in the one case for food, in the other for recreational amenity, can be successfully balanced with the environmental requirement to sustain the species or environments concerned. The two are not necessarily mutually exclusive.

QUESTION 3. Is there any additional evidence to improve the scientific data certainty for features within this site? If yes, please provide evidence using the data submission form.

Yes: the aerial image and underwater video papers referred to in Section (i) above, together with the paper of Axelsson et al (2012), together provide strong evidence of the expansion and filling in of the seagrass beds (Axelsson provides ground truthing for areas of the Bay, while the underwater videos provide visual evidence of the presence and condition of the seagrass in the areas identified).

We are not aware that our aerial and underwater video evidence has been considered at all by Defra or Natural England, which raises the question why not? We will formally submit this evidence along with this response.

QUESTION 5. Do you have any new information on costs to industry not covered in the Impact Assessment that would be directly attributable to these MCZs, as opposed to costs stemming from existing regulatory requirements? If yes, please provide evidence.

Potential Cost to the Leisure Marine Economy in the Poole / Studland Area:

The Defra Factsheet for the Tranche 3 consultation cites a possible socio-economic cost of £171,000 in the event of "Scenario 3" designation, associated with displacement of vessels from the region. Our analysis http://boatownersresponse.org.uk/Marine-economy-Poole.pdf estimates the local annual leisure marine turnover for the 6000 vessels in the area to be in excess of £13.5 million. If just 2% of local boats were to be displaced the cost to the economy would be £270,000. A 5% displacement would be £675,000 and 10%, £1.35 million. The latter two seem more likely. Our estimate is submitted as evidence. All data in our analysis is from verifiable sources, the factor which is not quantified is the proportion of boats which might be displaced by the various management scenarios, so we have suggested three displacement ratios as examples.

QUESTION 6. Do you have any new information on the monetised or quantified benefits of designation? If yes, please specify site and provide evidence.

As explained in our response to Question 1, designation and implementation of management measures is not likely to increase the quantity or quality of the seagrass beds to any significant extent, therefore in our view the quantified benefits will be zero, or very close to it.

"Seahorse tourism" is unlikely to prove of any benefit, because

(a) There is abundant seagrass present, the low seahorse numbers observed are due to other factors which are not currently understood, although with a total of about 14 sightings of the spiny seahorse in the whole of the UK last year, low numbers may in fact be the norm. So designation will not increase the low frequency of seahorse sightings.
(b) Seahorses are a protected species, any organised "Seahorse tourism" with the purpose of seeking out seahorses is likely to disturb such specimens as may be present, and to therefore to be illegal.
(c) Only 4 seahorses in total have been seen in Studland Bay in the last 4 years, so any "Seahorse tourism" is likely to prove an ongoing total disappointment to people hoping to catch a glimpse of a seahorse

The underwater scenery, with a flat seabed in shallow waters offering indifferent visibility, comprises monotonous tracts of seagrass which further restrict the view of any fish which may be present. It is unlikely to become a draw for divers in general. Eco-tourism seems an unlikely future for the Bay, and would be insignificant next to the established beach and boating activities in the Bay, which currently draw over a million visitors each year, according to the National Trust website.

References:

(additional to those given above as URL's)

Axelsson, M., Allen,C. and Dewey, S. (2012). Survey and monitoring of seagrass beds at Studland Bay, Dorset –second seagrass monitoring report. *Report to The Crown Estate and Natural England by Seastar Survey Ltd, June 2012*

Boese, B L. 2002 Effects of recreational clam harvesting on eelgrass (zostera marina) and associated infaunal invertebrates: in situ manipulative experiments*. Aquatic Botany. Elsevier Science BV, Amsterdam, Netherlands,* 73:63-74.

CHRISTOFFER BOSTRÖM[a,*], SUSANNE BADEN[b], ANNA-CHRISTINA BOCKELMANN[c], KARSTEN DROMPH[d], STEIN FREDRIKSEN[g], CAMILLA GUSTAFSSON[a], DORTE KRAUSE-JENSEN[e], TIIA MÖLLER[h], SØREN LAURENTIUS NIELSEN[i], BIRGIT OLESEN[f], JEANINE OLSEN[j], LEIF PIHL[b] and ELI RINDE[k], Distribution, structure and function of Nordic eelgrass (Zostera marina) ecosystems: implications for coastal management and conservation *Aquatic Conserv: Mar. Freshw. Ecosyst*. 24: 410–434 (2014)

COLLINS, K. J., SUONPÄÄ, A. M. & MALLINSON, J. J. 2010. The impacts of anchoring and mooring in seagrass, Studland Bay, Dorset, UK. *Underwater Technology: The International Journal of the Society for Underwater Technology* 29: 117-123

Correia, M., Koldewey, H. & Andrade, J.P. (2011). "Human influences on seahorse populations in the Ria Formosa lagoon, South Portugal". *Poster presented at 2nd International Marine Conservation Congress (IMCC2), held in Vancouver, Canada (14-18 May 2011)*. Downloadable from http://www.ccmar.ualg.pt/fbh/documents/posters.html

Evidence to submit:

Aerial Images (http://boatownersresponse.org.uk/Aerial-1972-2011.pdf) as an informal (not peer reviewed) paper

Underwater Images (http://boatownersresponse.org.uk/Studland_Underwater_Videos.pdf as an informal (not peer reviewed) paper.

Eelgrass resilience and resistance literature review paper
http://boatownersresponse.org.uk/Eelgrass-Resilience-and-Resistance.pdf

Anchoring density analysis paper: (http://boatownersresponse.org.uk/anchoring-density.pdf

http://boatownersresponse.org.uk/Marlin-Maresa-Eelgrass-Review.pdf

http://boatownersresponse.org.uk/Marine-economy-Poole.pdf