

**Research Article**

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Studland Bay Marine Partnership: Protecting our Precious Marine Habitats together

Ken Collins^{1*}, Jenny Mallinson¹, Neil Garrick-Maidment², David Brown³, Sarah Coggins³, and Sara Parker⁴¹*School of Ocean and Earth Science, University of Southampton, UK*²*Seahorse Trust, UK*³*National Trust, UK*⁴*Dorset Coast Forum, UK****Corresponding author:** Ken Collins, School of Ocean and Earth Science, University of Southampton, UK**Received Date:** June 01, 2026**Published Date:** June 03, 2026**Abstract**

Studland Bay, Dorset, UK is shallow <5m and sheltered from prevailing SW winds, with an extensive *Zostera marina* seagrass bed, 150ha which supports two species of the seahorse, *Hippocampus hippocampus* and *H. guttulatus*. However, the bay's proximity to local harbours makes it a very popular recreational anchorage. The damaging effect of chain moorings and anchoring has impacted the seagrass habitat which is fragmenting and in danger of complete loss. Since 2008, volunteer divers have documented the presence of the seahorses and the threats to their seagrass habitat.

A wide stakeholder Studland Bay Marine Partnership formed in 2021, subsequently installing 87 eco-moorings at a cost of £500,000 to date. The non-impact of these eco-moorings has been demonstrated by diver quadrat surveys. Seahorse abundance has been measured by timed GPS tracked surveys since 2008 showing a worrying decline initially and an increase in recent years coincident with increased protection. These surveys have also revealed significant evidence of regrowth of seagrass into bare damaged areas, confirmed by annual side scan sonar surveys.

Annually each autumn the eco-moorings are removed for required inspection for liability insurance and replacement of worn components, then replaced the following spring at a cost of ~£100,000, which is only partially met by mooring fees via a custom Sippi mobile phone app. The outstanding value of the diver surveys is in providing the data with photographic evidence to persuade boaters to comply with the bay's voluntary no-anchor zone and to enlist the financial support of donors.

Keywords: Seagrass; seahorses; citizen science; eco-moorings; outreach

Introduction

Studland Bay, Dorset is on the central, south coast of the UK, adjacent to Poole Harbour. It is shallow, <5m and sheltered from prevailing SW winds, making it a popular anchorage for

recreational craft with up to 300 boats during the summer (Figure 1). The shallow, sandy seabed and shelter provide ideal conditions for the seagrass *Zostera marina*. The need to conserve seagrasses is recognized internationally [1] and nationally [2].

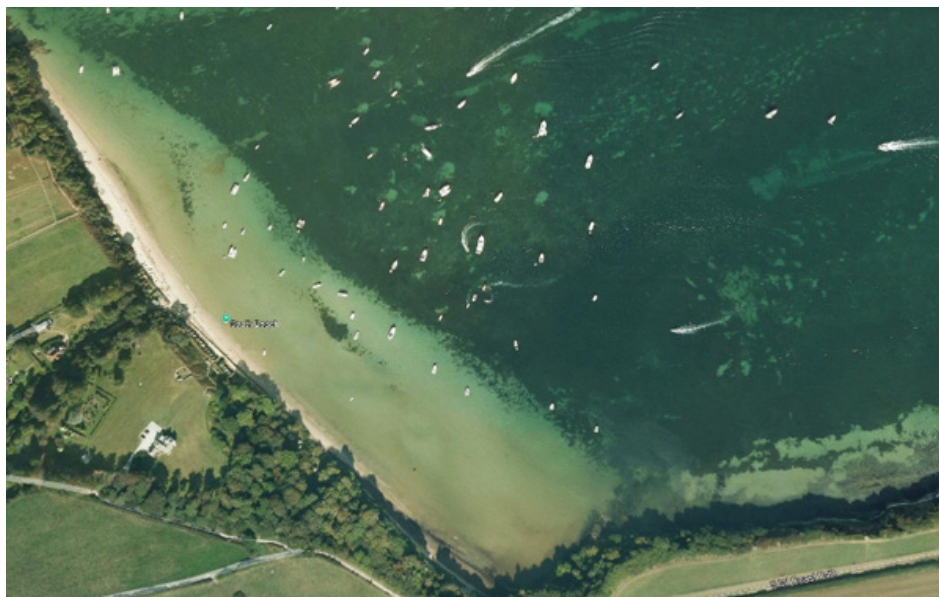


Figure 1: Aerial view of South Beach, Studland Bay, showing the sandy seabed, dark offshore seagrass beds and light scars caused by chain moorings and boat anchoring (Google_Earth 2009).

In 1990, the then operators of the adjacent Wytch Farm oil field [3] proposed extending their drilling range by construction of an artificial island in Poole Bay connected to the mainland operation by a pipeline through Studland Bay. Collins and Mallinson mapped the seagrass and maerl habitats to inform the pipeline route. Subsequently, the island and pipeline were no longer required due to the increasing range of directional drilling technology.

Destructive impacts on seagrass habitats by anchoring and chain moorings have been documented: *Posidonia oceanica*, [4] *Halodule wrightii* [5] and by chain moorings *Zostera marina* [6,7].

The importance of seagrass habitat to fishery species has been described by [8-11]. Garrick-Maidment, director of the Seahorse Trust [12], campaigned for seahorses to be included as protected species under the Wildlife and Countryside Act [13].

In 2008 this Act was amended to include both species of seahorse native to the UK: spiny or long-snouted seahorse (*Hippocampus guttulatus*) and short snouted seahorse (*Hippocampus hippocampus*) as well as their seagrass habitat. That year Julie Hatcher, Dorset Wildlife Trust and Steve Trewehla reported numbers of both species in Studland Bay seagrass to the Seahorse Trust prompting a decade long campaign nationally and in Westminster by Garrick-Maidment for the protection of Studland Bay seagrass and seahorses from the damaging impact of boat activity. The initial local official response was to be asked to prove that the seahorses and seagrass habitat were being impacted, against the spirit of the International Precautionary Principle, Stockholm Declaration (1972) and Rio Declaration (1992) [14], which enables decision-makers to adopt precautionary measures

when scientific evidence about an environmental harm is uncertain and the impacts are high. This principle was finally enshrined in the UK Environment Act 2021 [15].

In the face of initial indifference and vociferous opposition, a series of studies were undertaken: impact of anchoring and mooring [6], seahorse tagging [16] and an extensive study of Studland Bay by [17] with the warning that the seagrass habitat was being fragmented and in danger of total loss. At the same time a decade of stakeholder meetings was chaired initially by the Dorset Wildlife Trust, then the Marine Management Organization. Sadly, these were polarized and acrimonious with vociferous opposition to any protection of the bay from the self-appointed Boat Owners Response Group (BORG) who submitted evidence to Science and Technology Committee [18]. Amongst the arguments advanced during these meetings was that:

- a) There was no evidence that boat activity was damaging the seagrass.
- b) Seagrass benefits from ploughing by anchors in the same way that on land, cereal fields are ploughed up each year.
- c) Holes in the seagrass habitat are caused by freshwater springs.
- d) Eco-moorings would not work, and boat owners would not use them.

MCZ and SBMP

In May 2019 the Studland Bay Marine Conservation Zone was declared [19]. Whilst this was welcome, it was effectively just a

“paper reserve” without any management plan or structure. It was disheartening that it took an intervention by the then Environment Minister to effect this change into a MCZ and so for it to be just a ‘paper park’ was a let-down after the intense lobbying by the Garrick-Maidment, the Seahorse Trust and Collins.

In 2019 the Royal Yachting Association partnered with Natural England instituted a series of meetings on low-impact eco-moorings alternatively referred to as Advanced Mooring Systems (AMS) [20]. In 2020 Michael Prideaux, then director of Boatfolk Marinas Ltd offered the Seahorse Trust funding and assistance in installing 10 elastic rode and helical screw eco-moorings in Studland Bay to break the deadlock described above.

Over winter 2020-2021 the Studland Bay Marine Partnership (SBMP) was formed, chaired by Brown, National Trust using Dorset Forum as a neutral host, providing a secretariat, Parker initially funded by the Environment Agency. This very successfully brought together stakeholders including conservation and boating organizations, academics, community groups and supporting local businesses with the following aims:

- a) Protect and restore seagrass beds and the Marine Conservation Zone (MCZ).
- b) Enable people to access and enjoy the bay sustainably.
- c) Build consensus and involve local communities in a common vision.

In summer 2021, ten eco-moorings were installed in Studland Bay using the well proven, “gold-standard” combined UK [21] and USA [22] system with thousands deployed around the world. In Studland Bay the moorings comprise a 2m long galvanized steel helical screw anchor which is screwed into the seabed to almost its full length, with only a shackle eye a few centimeters above the seabed surface. The direct upward force to remove it was calculated to be in the order of 10 tonnes, much greater than the force to move a conventional chain mooring sinker block. Attached to this is a pair of elastic risers with small buoys to hold them above the seabed plus synthetic rope to a surface buoy with pickup line, the whole system being suitable for 6-15 tonne boats. This approach was chosen above the simpler and cheaper Stirling mooring system [23,24] because the Stirling mooring had been proven to fail if not maintained frequently enough.

As the initial Studland eco-moorings were installed, yachts queued to use them, contradicting the assertions of the MCZ opponents above. One requirement of the license for these moorings was monitoring the seagrass around them by a variety of methods including diver quadrat counts of shoot density and blade length [25]. Romero Saavedra [26] reported significant increases in shoot density 2021 to 2022 to 2023 ($p < 0.05$, $df = 389$). This was not surprising to the divers as no part of the mooring risers touch the seabed and the presence of the eco-moorings effectively blocks anchoring in that area.

An interim voluntary no anchor zone (VNAZ) was declared on 17 December 2021 to protect the seagrass habitat and the species that

it supports, with a second phase 1 June 2022 extending the interim zone [27]. With publicity, the hope was that anchoring within the VNAZ would cease, but if this was not the case then the no-anchor zone could subsequently be made statutory with the possibility of fining offenders. There were several concerns over this as there was no funding for:

- a) Alternatives to anchoring i.e. eco-moorings, other than anchoring outside the VNAZ.
- b) If the SBMP could not raise the funding for annual maintenance of the eco-moorings.
- c) Marking the boundaries of the VNAZ, which have not appeared on electronic navigation charts.

The SBMP Steering Group consists of representatives for recreational boating, marine conservation, academic research and monitoring, the local community, engagement and marine technology expertise - mainly on a voluntary basis. It meets monthly to shape and manage the project with core partners: National Trust, Seahorse Trust, Natural England, Marine Management Organization, Royal Yachting Association, Dorset Wildlife Trust, Boatfolk, Studland Parish Council, and the University of Southampton. To date much of the effort has been devoted to the installation and maintenance of the eco-moorings. Additionally, there are Communications and Outreach plus Research & Monitoring Groups.

From 2023 to 2024 the number of eco-moorings installed was increased to 87, at a total cost in the order of £500K. The SBMP is grateful to the Ocean Conservation Trust who in 2024 funded the installation of marker buoys around the outer perimeter of the VNAZ. One of the lessons learnt for the original 10 eco-moorings was the wear and tear on them when left in the water over winter. In recent years most have been removed by professional divers unshackling the risers from the screw-anchors in late autumn for onshore maintenance, insurance inspection and storage then replaced the following spring. Additionally, the SBMP is now responsible for the maintenance of the VNAZ marker buoys. Both these require the bulk of the SBMP annual budget of £100K.

Funding

As stated above the initial funding by Boatfolk proved the value of and acceptance of the eco-moorings, which in turn sped the formation of the productive SBMP with both local and national sponsors. The remaining 77 moorings have been funded through a combination of a fisheries & seafood scheme (DEFRA) grant, partner contributions, the Crown Estate and multiple donations from individuals and corporate supporters. Brown's role in leading funding applications was pivotable, as was the support he enlisted from the National Trust in effectively underwriting the SBMP operation.

With all the eco-mooring in place, ideally the boat owners would pay for their use of the eco-moorings. However, the SBMP does not own the seabed (owned by the Crown Estate) so cannot demand payment, thus any payment is necessarily voluntary. This depends on publicity/outreach to explain the value of the seagrass

habitat and develop the willingness to support their maintenance. Early in the evolution of the SBMP, the Sippi car parking mobile phone app company offered to develop one specially for Studland Bay [28], which was refined over subsequent years. When a boat picks up an eco-mooring, a QR code on the mooring buoy enables the user to download the app if they have not already done so previously and pay the modest fee for its use (currently £7.50 for 6 hours, £15.00 for 24 hours, less than typical local car parks. The app records the location of the boat and provides information on each mooring's overall use. In 2025 on-water patrols by Studland Watersports' staff started, enabling them to explain the value of the habitat below, directly checking if the mooring fee had been paid and if not collect the fee, as a frequent excuse was inability to use the app. This has markedly increased income. However, even with this, the sum raised from mooring fees is only 20% of the required annual income, which could potentially double if all boat owners paid for their use of the moorings.

In 2025 the Carbon Neutral Britain was the major donor funding the SBMP based on its protection of biodiversity rather than the more usual carbon credit.

Publicity and Outreach

Since 2022 as well as providing the secretariat for the SBMP Parker, Dorset Coast Forum (DCF) has led the outreach and publicity, project webpage hosted by DCF, community surveys and

a wide range of engagement events from local beach 'pop-ups', talks to local community groups and presentations at the Southampton Boat Show.

Partnership members have focused on the importance of appropriate messaging at key times which has identified the right people for the right audience. For instance, Howard Davidson and Jim Atkins both members of local RYA clubs, have regularly visited sailing clubs in the region during the winter months to hold 'peer to peer' talks pre-season, informing them of our activities and converting the skeptical to allies. Having a display Studland Bay eco-mooring available as a demonstration tool (Figure 2) has been an essential and well received element of all our engagement activities and has travelled far and wide from boat launch slipways to scout halls, yacht clubs to hotel lobbies. Where the Communications team elicited specific support, such as a local hotel adding a £1 donation option onto their dinner menu for guests, increased awareness was gained with a short and simple whole staff key messaging session. This ensured that they could then pass their newfound knowledge of seagrass restoration on to their customers increasing the likelihood of donations. In turn, some staff were inspired enough to specifically ask if they could help at events becoming ambassadors for the partnership. In 2025 Communications expanded opportunities for on the water ambassadors by holding a specific online workshop for them sharing the most up to date research and monitoring information and recognizing the impact of their support.



Figure 2: 'Pop-up' event at South Beach, Studland Bay, note the display eco-mooring on the left.

Research and Monitoring

Coggins, Coast and Marine Advisor, National Trust, leads the Research and Monitoring Group producing an annual report available on the SBMP web site [29] particularly noting: boat activity, compliance with the Voluntary No Anchor Zone (VNAZ), moorings usage, the seahorse population and seagrass extent/recovery.

During summer peak periods up to 300 boats moor or anchor in the bay. 2025 was the second year that a high-resolution time-lapse camera was used to monitor boat activity from June-September. Our new team of digital volunteers have been analyzing the images, opening up the research group to those who wish to become involved remotely. This monitoring shows that 73% of boats chose to use an eco-mooring during summer 2025, up 9% from the previous year. Just 8% of boats were non-compliant (anchoring within the meadows), which is a reduction of 2% from last year. On average 88.4% of boats were compliant (either moored or anchored outside). During 2024 mooring payment compliance was poor, with an average of just 26.4% recorded over the sample period and 50% compliance achieved on just 15% of sample days. The camera and payment data for 2025 indicates that average compliance has improved to 34.5%, with 50% compliance being achieved on 25% of sample days. This is a dramatic behaviour change from previous years, and testament to the fantastic awareness-raising and engagement work that many of our partners have done within their networks. The SBMP is hugely grateful to all boat users who have chosen to support the project and played their part in helping to protect Studland's marine habitats.

Two species of seahorse are found in Studland Bay - the

spiny seahorse *Hippocampus guttulatus* and the short-snouted seahorse *Hippocampus hippocampus*. Seahorse monitoring was led by Garrick-Maidment, Seahorse Trust from 2008-2024 then handed over this activity to Collins and Mallinson, University of Southampton in 2025. A dedicated team of 30 volunteer divers have participated in fortnightly surveys from April to October, under a license held by The Seahorse Trust. Pairs of divers slowly swam directed, GPS tracked and timed transects searching for seahorses. To compensate for differences in monitoring hours each season, the number of seahorses encounters per hour was used to compare each year's surveys.

Before the installation of the eco-moorings in 2021, the most successful year for seahorse numbers was during the 2020 pandemic (Figure 3) when human activity in the area was significantly reduced, suggesting there is some connection, as this declined with the return of boat traffic. During 2025, 28 volunteer divers spent 41 hours looking for seahorses across a series of transects in the bay, having 84 seahorses encounters in total. This was a slightly lower effort to 2024, and yet nearly double the number of seahorses were seen. The results show a significant increase in the number of encounters this season compared to all previous years (Figure 4). Repeat sightings of individual seahorses over multiple years have increased, with distinctive individuals being seen for 3 years in a row. Also, seahorse behaviour appears to have changed, the seahorses showing more natural behaviour when being observed. This is a positive sign for the population in Studland Bay which could be possibly attributed to reduced anchoring pressure on the seagrass beds.



Figure 3: Cropped sample image from the cliff-top boat monitoring camera, showing categorisation of boats in the bay as used for compliance analysis (Image – Sarah Coggins).

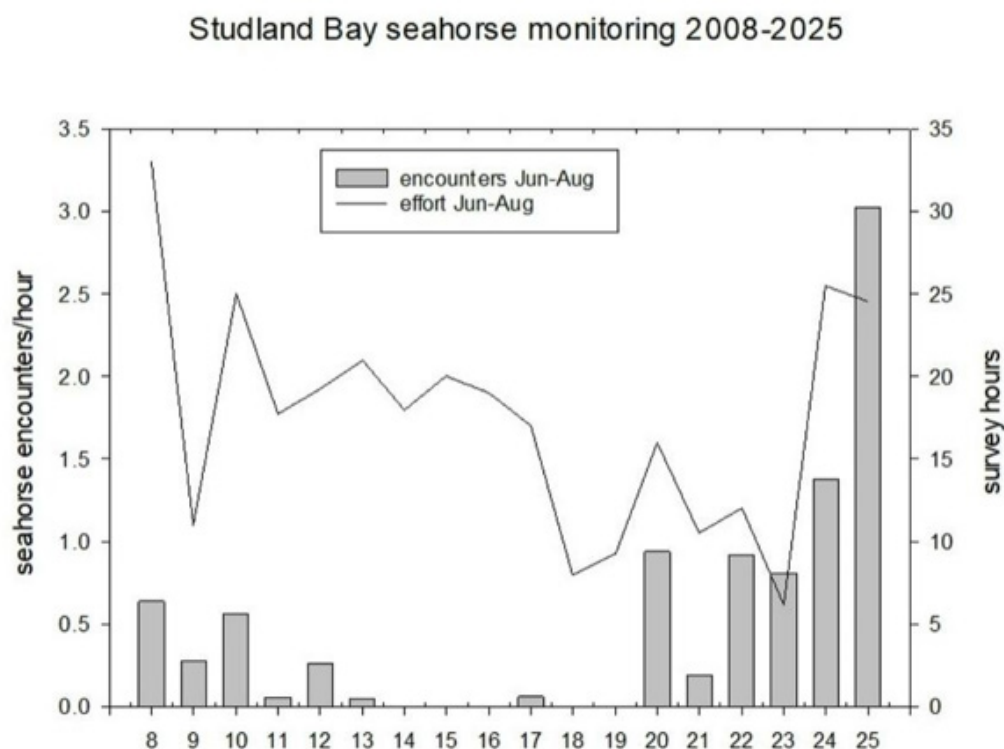


Figure 4: Our monitoring has shown a significant increase in the number of seahorse encounters, with 2025 being the most successful year so far.

However, there could also be other factors influencing this data, such as natural fluctuations, sea and weather conditions, and our volunteers improving their searching skills each season. This is why it is vitally important surveys such as this continue, so that we can build a picture of what is happening beneath the surface. Whilst anchoring has decreased overall there are areas, particularly on the periphery of the seagrass beds, where it is still a regular occurrence. We will continue to work with our partners to understand what impact this could be having on the seahorse population use of this area to feed and breed.

Monitoring overall Studland Bay seagrass extent is difficult largely due the turbidity of the water. Whilst aerial photography could provide data (Figure 1), it requires calm seas and water transparency. Examination of the Google Earth [30] time series shows few years with useable imagery and only then in the shallow parts of the bay. Tomsett [31] undertook a drone survey of the VNAZ

with partial success.

Collins and his research students have used diving, towed seabed video, single beam echo sounder aquatic vegetation height and particularly side-scan sonar to monitor the size of scars/holes in the seagrass habitat [32]. Figure 5 shows significant (Mann-Whitney Rank Sum Test $P = <0.00$) recovery of 25 seagrass scars around the original 10 eco-moorings, a total of 6010m² reducing to 1160m² over three years from immediately before the moorings' installation.

Rhizome growth and extension of the seagrass into the bare areas is very evident to divers and a video demonstration this is available on the SBMP website. This recovery is continuing to be recorded by Kira Dunn, University of Southampton both around the original eco-moorings and inshore off South Beach.

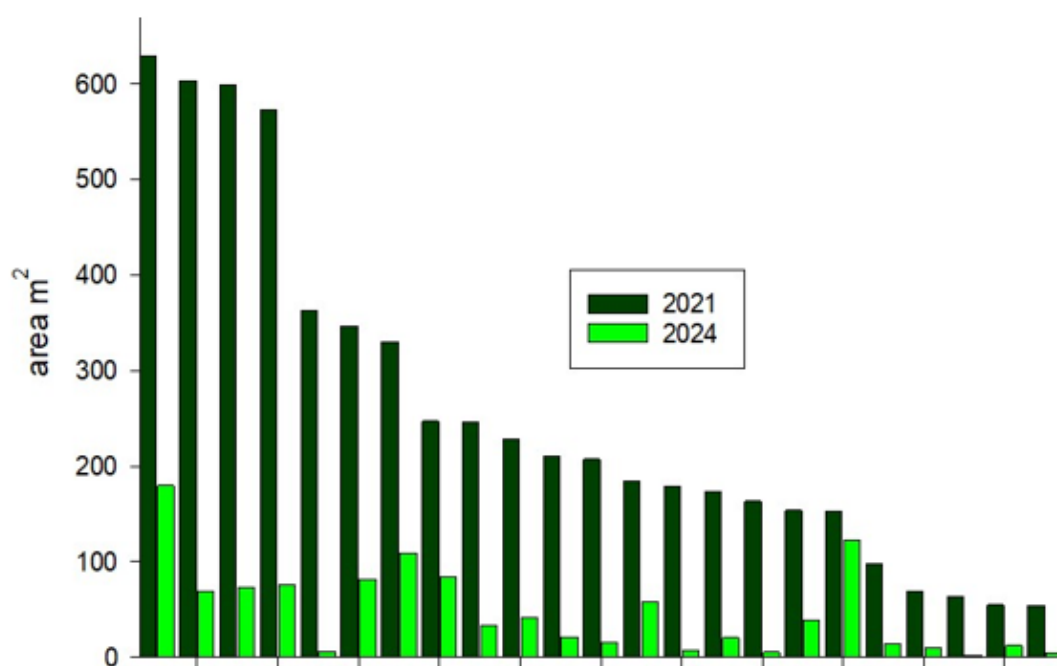


Figure 5: Reducing area of 25 individual seagrass scars/holes near the original 10 eco-moorings from 2021 to 2024, measured from side scan sonar surveys (Bibra 2024).

Conclusions

The protection of Studland Bay's seagrass habitat from the damaging effect of boat anchoring and chain moorings has been a long struggle in which the initial deployment of 10 eco-moorings and the formation of the Studland Bay Marine Partnership have been pivotal. Behaviour has changed and understanding of the value of the marine habitat has increased. We have significant evidence of seagrass recovery with reduced anchoring pressure and a strong indication of the increase in the seahorse population. However, the cost of maintaining the eco-moorings is a continuing concern. It is unlikely that SBMP can simply increase the eco-mooring fees to fully fund their maintenance. Other long term funding sources need to be secured. The Crown Estate has worked with over 200 cross-sector experts to develop 'High-Integrity Marine Natural Capital Markets in the UK – A Roadmap for Action' which presents a pathway to securing new sources of finance to protect, restore and sustainably manage marine and coastal ecosystems [33].

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