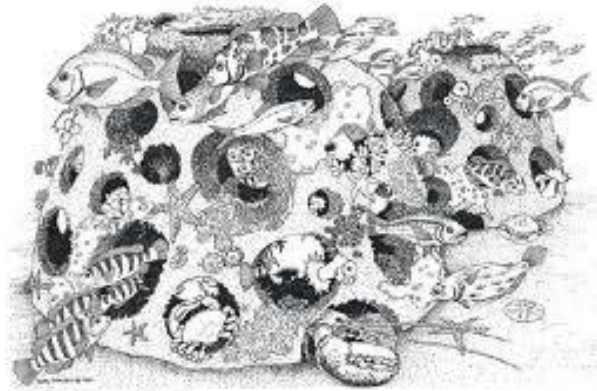


Torbay Reef Creation Project– Draft Plan for discussion (3rd Sept 2012)



1. Project Contact Details

**Rick Parker,
Torbay Reef Restoration Project**

Mobile **07971 276658**

E-mail: jenniferann@deepsea.co.uk

Project Outline

This project will deploy and monitor an artificial reef within the Torbay Harbour limits to create a new, high quality marine habitat for our resident reef species. The reef will be created out of concrete structures using a tried and tested design. Once these structures are deployed, the site will be considered as a marine sanctuary, and the site will only be visited for scientific monitoring purposes during an initial monitoring period. The site will be monitored for a period of three years, after which it will be handed over to the marine community of Torbay who will be responsible for its future stewardship.

This project will raise the profile of the marine environment and local efforts that are being championed within Torbay to address loss and damage to habitat and declines in commercial and leisure fish catches. The project is being delivered in partnership with Keo films, producers of ‘Hugh’s Fish Fight’ and will be featured in the new series. This partnership will ensure that the process from installation to the gradual colonisation of marine life will receive national publicity.

The problem

The seas all around Britain are suffering from the cumulative effects of destructive and intensive human activity, climate change, pollution, development and marine resource extraction. There is increasing evidence that the intensity of these activities has led to the decline of marine species and the degradation and damage of large areas of marine habitats. These changes not only have implications for the UK’s marine biodiversity, but also for the damage to economic wealth and social well-being. In the South West there are a number of factors which have led to pressure on marine biodiversity and resources from commercial fishing to climate change, dumping and point-source pollution.

Direct physical impacts on the marine environment are particular issue within the South West region. The quality and structural complexity of marine habitats around the UK have been impacted by the use of heavy mobile fishing gear, reducing the extent of suitable environments for many marine creatures. The disturbance, often repetitive, of naturally stable seabed habitats through the use of mobile fishing gear, such as scallop dredges, otter trawls and beam trawls damages the natural integrity, structure and stratification of seabed habitats. Benthic habitats in environments which would naturally support delicate epifauna, such as pink seafans *Eunicella verrucosa* on hard substrata, or seagrass beds and infaunal communities in stable sediments are particularly vulnerable.

Over hard substrata, bottom towed fishing gears can disturb species' habitat by displacing large objects such as boulders, and destroying rock or biogenic reefs. Hard substrata can actually be eroded to another physical state. The Exeters' reef at the mouth of the Exe in Devon was denuded over many years due to persistent, repeated dredging from an area of gently undulating sandstone reef to an area where the surface is now dominated by sand and mud (Devon Wildlife Trust 2007).

Although the number of boats has declined since the 1980's; developments in gear and technology have allowed fishermen to reach areas that had previously been considered too rough or hard to get to. These formerly un-fished areas would have been, in a sense 'de facto' MPAs.

As a diver, sailor, angler, coastguard officer and charter skipper living and working in Torbay for the last forty nine years, Rick Parker has seen how boats have had to travel further and further to find fish. Boats that would have previously travelled 5-10 miles for a good day's fishing now have to travel 50 miles to the middle of the channel.

Over the last few years, the general public have become more aware of the declining state of our marine environment. Finding solutions to halt the decline are more challenging, since there the problems emanate from so many different sources and there are many different competing interests. Marine space is now being much more carefully controlled to ensure that uses are not conflicting; and that the marine environment is used sustainably and does not continue to deteriorate. Marine Spatial Planning, Marine Protected Areas and proactive enforcement are all important measures in ensuring that our marine environment can be restored. However, damage to hard reef structures over the past 50 years is irreversible. The use of artificial reefs have the potential to help restore some of this important habitat and regenerate species that live on them.

Artificial reefs

Artificial reefs are structures that are placed in the sea to serve a variety of functions from replacing habitats to mariculture and coastal protection. A wide variety of substrates have been used as artificial reefs ranging from dedicated concrete structures to more opportunistic redundant materials such as tyres, ships and stabilised ash. More than 30 countries have deployed artificial reefs within their territorial waters with a stated primary purpose that is in some way related to fisheries (Jensen, 2002). When used in combination with MPAs, artificial reefs demonstrate an enhanced potential to restore depleted fish stocks (Pitcher et al, 2002). Several studies have

reported positive impacts of increasing the complexity of available habitat on fish abundance and species richness and species diversity (e.g. Fujita et al 1996; Charbonnel et al 2002).

Countries such as China, Japan and Korea have been constructing and installing artificial reefs for more than 100 years. They have been shown to have up to 12 times the abundance of a natural reef. In North America, artificial habitats have been used in particular for supporting recreational fishing and diving; in Hong Kong they have been used in conjunction with MPAs as a way of reversing the effects of overfishing. In Europe artificial reefs are seen as a management tool for sustaining coastal fisheries and compensating for the effects of stock depletion.

Reefs provide habitat for many different species of algae, sponge, crustacean, fish and mollusc. The hard surface and array of nooks and crannies provides protection for many of these species, which are in turn sought out by predators. Charter boats and professional fishermen operating nets, lines and pots will seek out reefs and wrecks since they are known to harbour fish and crustacean species. However, reef areas have now become too degraded to hold healthy populations and the inshore wrecks are too accessible to cope with such a high level of human activity.

It is important to recognise that installing artificial reefs are only part of the solution for restoring the health of the marine environment. They need to be used alongside robust fisheries management, marine spatial planning and marine protected areas. Torbay is already well protected with a designated Special Area of Conservation that is protecting some of the reefs and sea caves, and a recommended Marine Conservation Zone (MCZ) that will protect the seagrass beds within the bay.

The MCZ process has clearly demonstrated how space at sea is limited and resources and usage is often hotly contested between different groups. Trying to identify and agree on Reference Areas or 'No Take Zones'; proved highly contentious since all reef areas in the region are used and highly valued by recreational and commercial fisheries. Rick Parker was closely involved in the process to identify Marine Conservation Zones within the Finding Sanctuary project. In the selection of reference areas he saw how challenging it was to identify areas of reef without impacting on the interests of static gear fishermen or anglers. Creating new, artificial areas of reef would offer a way of protecting these species, whilst avoiding impact to these sectors.

¹ <http://www.fish.wa.gov.au/Fishing-and-Aquaculture/Recreational-Fishing/Pages/Artificial-Reefs.aspx>

The main focus of the Torbay Reef Restoration Project is to create new reef habitat and monitor its progress as new species colonise and grow in and around it. Specially designed concrete structures will be deployed on the seabed and the area will be voluntarily designated and self-enforced as a marine sanctuary for the first four years of its existence. This will allow scientists to monitor its progress as reef animals colonise, grow, breed and establish new communities. At the end of this trial period the reef will be handed over to the community to decide whether it should remain a sanctuary or have part or all of the area opened up for some recreational and commercial use.

Case studies

Alaska

Two types of artificial reef, 'Reef Balls' and 'Fish Havens' were established in Alaska in 2006 as compensatory restoration. They were deployed over a mixed soft sediment and hard bottom with three plots of 30 reefs each. Monitoring took place once a month over two years using two control sites and scuba diving, fish trap, hook and line and drop camera surveys. The surveys found that there were similarities between artificial reef and natural reef community structure. Fish species richness on artificial reefs is comparable to natural reef sites and greater than natural hard bottom sites.

Scotland

The Loch Linnhe Artificial Reef (LLAR) is a multi-modular artificial reef complex constructed over 146ha in Loch Linnhe, on a mixed sand/mud seabed on the west coast of Scotland. Monitoring showed that artificial structures deployed in northern temperate waters can support animal assemblages that are at least equal in terms of abundance and diversity to natural reefs. Increasing the habitat complexity afforded by artificial structures may increase faunal diversity and abundance above levels supported by natural reefs.

Portugal

An artificial reef system was deployed off Faro in 1990 by the Institute of Marine Research consisting of a Protection Reef and an Exploitation Reef. The Protection Reef consists of 735 concrete cubic units (2.7m^3 each), distributed in 21 reef groups, occupying an area of 39ha, at depths that range from 19 to 22m. The Exploitation reef consists of 20 large concrete blocks of two different shapes (130 and 174m^3) occupying an area of 21 hectares at depths from 21 to 35m. A gill net survey carried out over 4 years established that the fishing yield was between 1.86 and 2.28 times that of control sites.

Developing the plan.

The Torbay Reef Restoration Project has been six years in the planning. Over this time period, negotiations have taken place with many different interests in the bay. Preparation work has also taken place to identify the optimum design for the artificial reef and plan for how the structures are deployed.

The reef design

The Torbay Reef Restoration Project has chosen the Reef Ball structures. They are licensed by the Reef Ball Foundation, an international NGO that has deployed over 500,000 Reef Balls in over 70 countries. The project will use a patented mould design to create over 1000 units for Torbay. Reef balls are shaped to optimise protective void spaces for fish and include features such as rough surface textures to enhance invertebrate settlement. Holes designed to create turbulent vortices help bring nutrients to organisms living on the Reef Ball Surface.

The Goliath unit has the following dimensions:

Width at base	1.83m (6')
Height	1.52m (5')
Weight	1,818-2,727kg (4,000-6,000lbs)
Concrete volume	1.19m ³ (1.3yards ³)
Surface area	21.4m ² (230ft ²)
Number of holes	25 – 40



Approximately one thousand units will be deployed on the site. The exact number will be dependent on the size of site that is ultimately selected and whether the reef is developed in phases. If the area of one unit occupies 4m², 1000 units will equate to 4.004km² or 1.166nm².

The Torbay Reef Restoration Project will follow the OSPAR Guidelines on Artificial Reefs In relation to Living Marine Resources (1999-13). In particular, the project will ensure that the proper permissions are in place and that the reefs will be built from inert materials. The reef will be constructed and installed in such a way as to ensure that the structures are not displaced or overturned by force of towed gears, waves, currents or erosion processes. It will also be designed and built in such a way that it can be removed if required.

The reef will be designed to provide maximum variation in depth, tidal flow and exposure and will be guided by expert scientists.

The units will be constructed out of concrete using the Reef ball moulds at a yard in Torbay employing a local workforce. The deployment will be by the Charter vessel Jennifer Ann, with help from the local commercial fishing vessels displaced from the chosen reef area.

Reef Location

Three options have been put forward for further discussion with Torbay Harbour Authority, Torbay Council and local stakeholders. The options are all in the same locality, but with slight variations in size, depth and orientation. Each are presented below. The location has been chosen carefully, with full consideration of the potential impact to navigation, tourism, recreation, fishing, aquaculture, nature conservation and port activities.

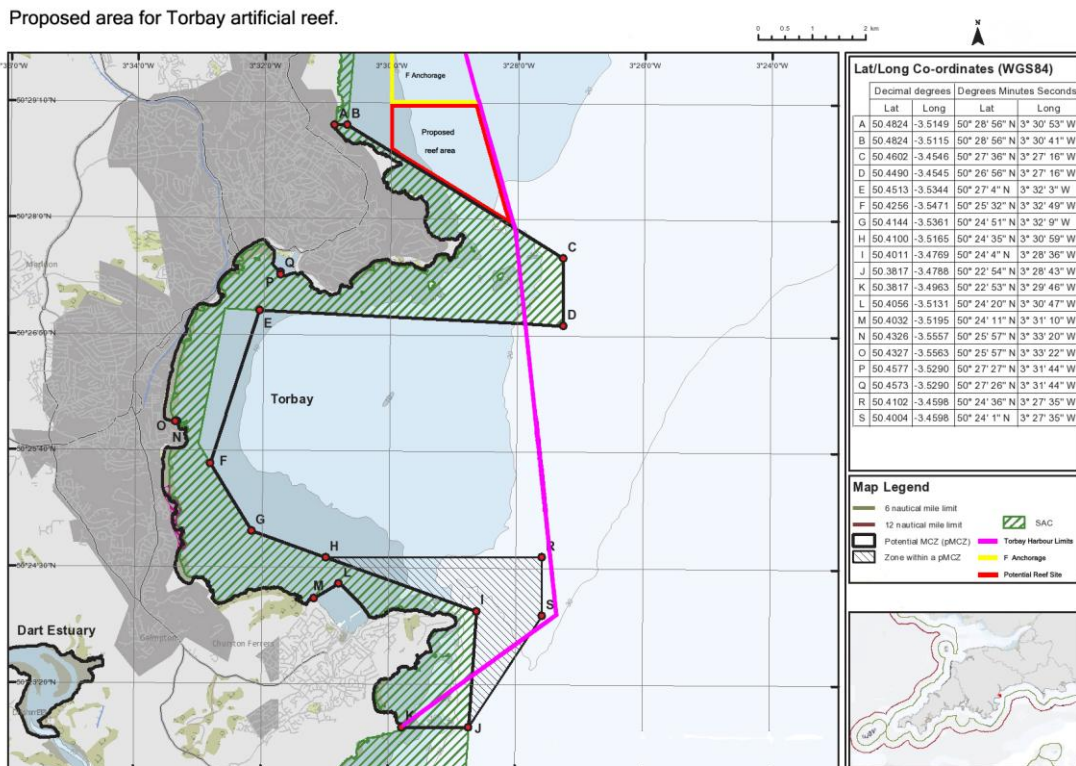
The general location of a northern area of the Torbay Harbour limits was chosen for several reasons:

- It was important that the area did not overlap with the SAC or the rMCZ as these zones were chosen to protect several types of feature and marine life. Although there are gaps within the SAC that could be utilised it is hoped that

the rMCZ will cover those gaps to protect other features, habitats and marine life.

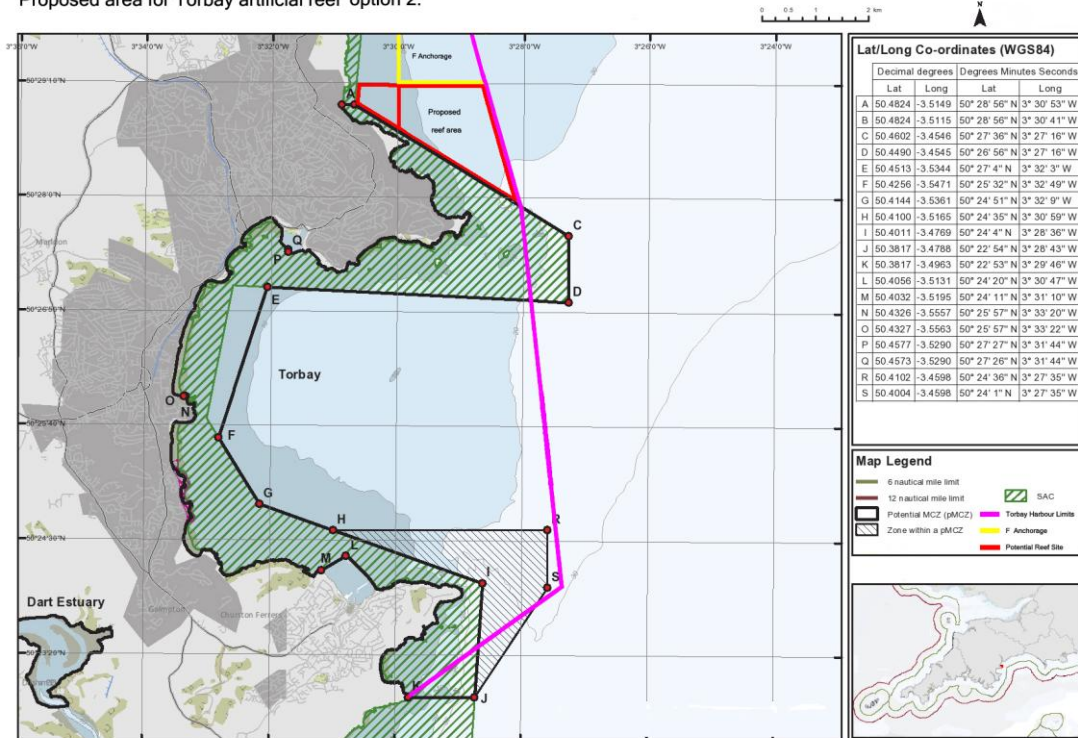
- The depth of the water and the protection from Hope's Nose will give the site more protection from storms and reduce the amount of turbulence that would impact on some delicate reef species.
- The amount of fishing activity in this area is known to be low. The primary fishing activities are scalloping, whelking and some general trawling. Mapping work undertaken for Finding Sanctuary and consultation with Devon and Severn IFCA provides further detail of fishing activities here.
- Angling and diving activities do not take place in this area, so there will be no impact to these sectors.
- This area is not part of the northern commercial anchorage zone (F anchorage); although it borders this zone the majority of activity is normally concentrated to the northern end of the area. This has been confirmed by Kevin Mowat Torbay Harbour Master.
- From land, the area offers an excellent opportunity for the public to watch the deployment process.

In each map, the site its self is shown on the diagram in red. The green shaded area is the Special Area of Conservation (SAC) and the black line marks the recommended Marine Conservation Zone (rMCZ). The purple line denotes the extent of Torbay Harbour jurisdiction and the yellow box shows the northern most commercial anchorage within the harbour limits.



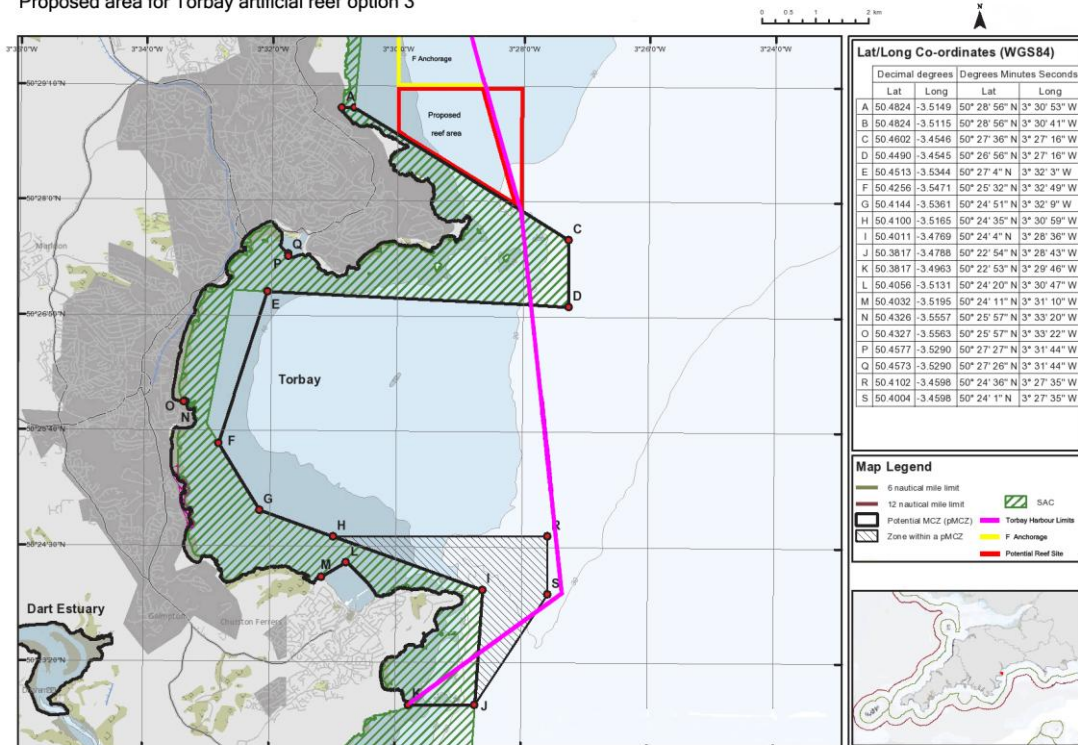
The estimated size of Option 1 is 2.714km² or 0.790nm²

Proposed area for Torbay artificial reef option 2.

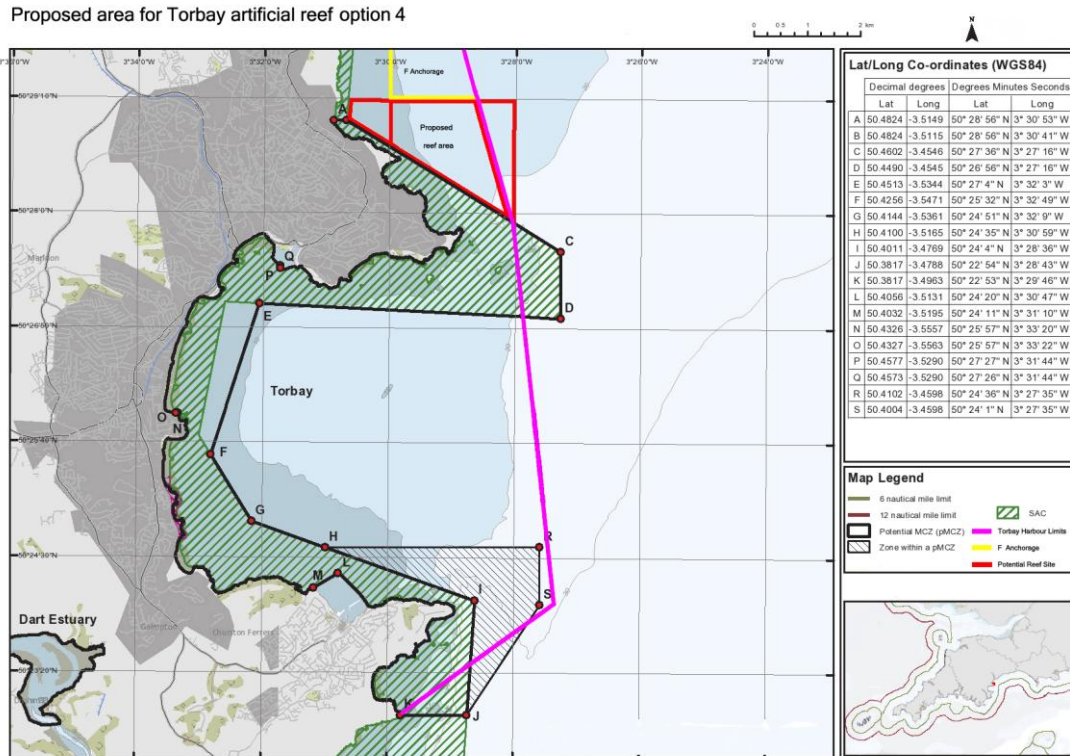


Option 2 is an extension to the west which would obviously increase the original footprint and also give it a shallower section of seabed. This also has the advantage of making the reef working area far more visible from the Babbacombe Downs. Disadvantages are an increased loss of trawling area and possible disruption to existing static gear activity. The estimated size of this site is 3.202km² which is 0.932nm²

Proposed area for Torbay artificial reef option 3



Option 3 is an extension to the east which again would increase the size of the original footprint and include a deeper section of seabed. The larger area will provide greater recovery potential for the site. This option again will have the disadvantage of conflicting with some mobile fishing activity. The estimated size of this site is 3.689km² or 1.074nm².



Option 4 is both an east and west extension which would increase the footprint of the site. The larger area will provide greater recovery potential for the site. This option again will have the disadvantage of conflicting with some mobile fishing activity. The estimated size of this site is 4.177km² or 1.216nm².

Project Management aims and objectives

The creation of the Torbay Artificial Reef will be overseen by a Charity, 'The Torbay Reef Restoration Project', which will be overseen by Director Rick Parker. He will be responsible for ensuring that the project delivery is running on time and to budget and for reporting to funders and key stakeholders. Rick will oversee the manufacturing and deployment of each Reef Ball module and ensure that this process is undertaken to the necessary technical standards and requirements.

Charitable Trustees will include members from Torbay Council, Keo films and key stakeholder groups. They will meet on a quarterly basis to monitor progress.

A Working Group will also be set up within the SeaTorbay forum, to create a greater like to the community's marine stakeholders. They will also meet on a quarterly basis to monitor progress.

The selected area has been leased from the Crown Estate to Torbay Council as part of Torbay Harbour and permission is being sought from to change its use to install the Artificial Reefs.

Behind the project

Rick Parker is the skipper of Jennifer Ann, a 10.5 metre dive boat that operates out of Torquay Harbour. Rick has been running dive charters out of Torbay and Dartmouth for the last 30 years and is one of the most knowledgeable skippers in the area. He was also coxswain for Totnes BSAC, the Torbay Coastguard boat and the Torbay Harbour patrol rib. Rick is passionate about the marine environment and his involvement in Finding Sanctuary, Sea Torbay and the Torbay Reef Restoration Project has been driven by his desire to actively stop the decline of our seas. This passion took hold when he learnt to dive 27 years ago reaching BSAC Advanced Diver level, Rick and his wife have dived most of the South Devon coast and wrecks. At present apart from the reef project he is Vice Chair of SeaTorbay, on the board of directors for the Professional Boatman's Association (PBA) and helping to map and monitor the seagrass in Torbay.

A partnership approach

To achieve our goal of an artificial reef that will create an oasis of untouched marine life we need the support and buy-in from as many marine sectors as possible. This will ensure strong compliance and self-enforcement. Each sector has different values and needs, and efforts have been made to address each of these in turn with key representatives.

Diving

Diving is generally a benign activity, but in divers can cause a small amount of disturbance to marine growth. Some divers also harvest crabs, lobsters and fish. However, the majority of divers are very ecologically minded and are aware of the benefits of reef restoration. Although they would initially be restricted from this area, they would not be losing any diving sites, since the artificial reefs are deployed on a location that is not currently dived.

Discussions have taken place with the following dive clubs within the Torbay area:

Angling

Angling has the potential to remove fish from the area, damage the reef through anchoring and disrupt the food chain through the use of bait. The creation of the reef has the potential to improve angling success around the area through the effects of overspill.

Discussions have taken place with the following angling clubs within the Torbay area:

Commercial fishing

Fishing is not compatible with the artificial reefs since it would remove developing populations, and damage the reef structures. The area is currently used on an occasional basis by scallopers, general trawling and whelk pots. Establishing an artificial reef in a 4km² area would disrupt these activities, but overall it would have a minimal economic impact on these activities. Although the reef will never be used for commercial fishing, the extra life it homes will spill out into other areas and create a more productive area.

Discussions have taken place with the following commercial fishing organisations:

Commercial shipping and pleasure boats / yachts

Anchoring would damage the units and disturb colonisation. The approach to collaboration on the commercial side is relatively easy, as there is an anchorage to the North of the chosen site. With the pleasure boats and yachts, although the RYA states that any vessel has the right to anchor for safety issues, there are no direct dangers close to the reef area. The option to anchor within the reef restoration area would always remain open if a vessel was in danger.

Discussions have taken place with the following port and leisure boating organisations:

Monitoring

The monitoring of the reef will start with baseline surveys in August 2012 and will continue on a monthly basis at least until August 2016. Changes in habitat cover and numbers of reef species will be monitored and recorded in partnership with Plymouth University. They will establish robust techniques that will allow us to assess the extent to which the artificial reef is successful in re-colonising reef species. The monitoring will extend to control sites and other reefs in the area. Natural England and Devon & Severn IFCA have shown an interest in getting involved with the project planning and assisting with the monitoring work.

Further experimental scientific work will be assessed by the Working Group.

Seasearch monitoring will also take place with help from Sally Sharrock, which includes a plan to increase Seasearch survey divers within the bay with training.

Key Milestones

2007	The initial idea for the project
2008-2010	Research into artificial reef design and development of project plan
2011	Initial discussion with stakeholders
July 2012	Local organisations, businesses and groups etc signed up to support the project. Approached by Keo Films to go into partnership. Recruitment of volunteer divers.

Sept 2012-Mar 2013 Stakeholder meetings, consents and project initiation.

September 2012	Presentation to Harbour board to request lease of seabed. Proposed site and baseline surveys carried out
November 2012	Majority of licensing agreements in place, Keo Films start filming and fundraising.
December 2012	Manufacturing site chosen and agreed, manufacturing equipment sourced and purchased
February 2013	Manufacturing training completed
July 2013	Reef deployment starts.
August 2013	Monitoring begins
August 2016	Monitoring completed
September 2016	Handover of reef to community and development of future management and legacy plan
October 2016	End of project

Intended impact

The Torbay Reef Restoration Project will leave Torbay with a thriving reef environment that will bring back vibrant marine life to our area.

The end product will be a restored and resilient reef which will benefit marine life in the Torbay area. The reef will protect rare and important reef species. Anglers, divers and commercial fishermen will benefit from spill over effects.

Documenting the story from beginning to end will bring national awareness of the importance of providing better protection for our marine environment and how one motivated stakeholder and a local community have come together to ensure that reefs are left in a better state for future generations.

Setting up a comprehensive monitoring programme from pre-deployment until three years after the reef is deployed will provide valuable data on how artificial reefs can act as havens for marine life and help to restore vibrant marine communities.

Legal Consents

The following consents are required before the deployment of the artificial reef can proceed:

Crown Estates	Lease of seabed
MMO	Licence consent
DEFRA / MACU	FEPA Licence
CEFAS	FEPA
CPA	
EA	
Torbay Harbour Authority	Lease of seabed

Publicity

Publicity for the project will begin once the consents and approvals are in place. Our partnership with Keo films will mean that the project will be given a high profile. However, this agreement also means that they will be granted exclusive rights to document the project.

Although there have been other reef projects in the UK, none have been setup for the specific enhancement of the marine environment. This coupled with the television programme aspect will mean huge amounts of publicity.

The English Riviera Tourism Company (ERTC) has also offered their help with publicity, which in turn will help raise the public profile of Torbay.

Project Supporters will be kept up to date on project progress through update e-mails and newsletters.

Supporters of the project to date:

Torbay Harbour Master	Kevin Mowat
Torbay Coast & Countryside Trust	Dominic Acland
Torbay Coast & Countryside Trust	Alex Scholefield
English Riviera Tourism Company	Caroline Custerson
English Riviera Tourism Company	Lydia Stone
Living Coasts	Elaine Hayes
Finding Sanctuary	Tom Hooper
Marine Energy Matters	Colin Cornish
Plymouth University	Martin Attrill
Devon & Severn IFCA	Tim Robins
Devon & Severn IFCA	Sarah Clark

References:

Charbonnel, E., Serre, C., Ruitton, S., Harmelin, J-G., and Jensen, A. 2002.

Fujita, T., Kitagawa, D., Okuyama Y., Jin Y., Ishito, Y., and Inada T. 1996.
Comparison of fish assemblages among an artificial reef, a natural reef and a sandy-

mud bottom site on the shelf off Iwate, northern Japan. *Environmental Biology of Fishes*, 46: 351-364

Jensen, A.C., Collins, K.J., and Lockwood, A.P.M. (Eds.) 2000. *Artificial Reefs in European Seas*. Kluwer Academic, Dordrecht. 532 pp.

Pitcher, T.J., Buchary, E.A., and Hutton T. 2002. Forecasting the benefits of no-take human-made reefs using spatial ecosystem simulation. *ICES Journal of Marine Science*, 59: 17-26

DRAFT