North Devon Marine Pioneer

Marine Working Group Meeting

Natural Capital Asset and Risk Register Workshop

Purpose and Structure of the workshop

To support the objectives of the North Devon Marine Pioneer and the Governments 25 Year Plan for the Environment, the North Devon Marine Working Group (MWG) convened on the 17th September 2018 in Ilfracombe, North Devon (Agenda Annex 1). The overall objectives of the meeting were to:

- Update the Marine Working Group on the Marine Pioneer's demonstration projects and how they relate to the original defined goals;
- Progress elements of the Marine Pioneer linked to North Devon's Natural Capital assets, Marine Protected Area (MPA) management and opportunities for sustainable finance; and
- Identify priority actions.

SWEEP Impact Fellows co-designed a **Natural Capital Asset and Risk Register Workshop** to develop a local dimension of a natural capital asset risk register. During the working group four groups were formed to consider the following questions linked to the ecosystem service benefits of 1) Food provision 2) Recreation and tourism 3) Healthy climate and clean water and sediments and; 5) Natural hazard protection. A facilitator led each group and a scribe nominated to take detailed notes of the discussion. Groups were provided with an A2 table to fill in to capture the quantative and qualitative outputs and any key discussion points around the benefit-asset relationship. The key questions were:

- What is the importance of the benefit-asset relationship? (Risk exposure). 3= high importance; 2= medium importance; 1= low importance;
- What is the likelihood that the benefit will change if the quality or quantity of the asset is reduced? (Sensitivity). 3= high; 2= medium, 1= low; and
- What are the warning signals, thresholds, red flags that the benefit-asset relationship is at risk? (Thresholds, community-defined criteria for sustainability). Group were encouraged to quantify their statement (an increase in, a reduction of, more, less, fewer, etc.)

This workshop report provides the results of the group discussions and makes recommendation for the next steps.

Food Provision

The group defined food provision as fish and shellfish targeted by both commercial and recreational fishers. The relationship between food provision and the assets of saltmarsh, intertidal reef, subtidal reef, intertidal sediments (mud) and biogenic reef (mussels) were considered by the group as being highly important in supporting food provision both locally and nationally/regionally (Table 1). It was noted that there is strong evidence that saltmarsh is an important juvenile area for commercially important species of fish and the subtidal reefs (particularly off the west coast of Lundy) support productive and economically important fisheries. The relationship between food provision and these assets were also considered to be the most sensitive to change if the quality or quantity of the asset were reduced and, therefore, have been identified as being the asset-benefit relationships most at risk (Table 1). Key pressures identified that may affect the quality or quantity of the assets are varied (Table 1) and include the physical pressures from commercial and recreational fishing as well as upstream impacts from agriculture (water quality, nutrients) and global drivers linked to climate change.

The relationship between food provision and the assets of subtidal sediments and intertidal sediments were considered by the group as being moderately important in supporting food provision both locally and nationally/regionally (Table 1). Areas of soft muddy sand were noted as being important in supporting species of finfish. Sensitivity to change in these sediment habitats being largely dependent on exposure to pressures across depth ranges (bait digging, fishing, aggregate dredging) and influenced by natural variation in the habitat extent (natural erosion and replenishment). Local pressures that may influence the quantity or quality of the asset were identified as aggregate dredging, fishing pressure and bait digging.

The relationship between food provision and the assets of the water column and biogenic reef (*Sabelleria*) were considered by the group as being of low importance in supporting food provision both locally and nationally/regionally (Table 1). The *Sabelleria* reefs in North Devon are small patches and were considered by the group to have a low importance in supporting the benefit of food provision with a moderate sensitivity to change. Taking into account natural variability in the quality and quantity of *Sabelleria*, poor water quality, microplastics and trampling were considered to be predominant pressures. The water column was considered to be of high local and national/regional importance in supporting food provision, with a low sensitivity to change. Pressures include sediment loading, noise, nuclear, pollution, and mining waste. The group noted that pressures were more obvious in estuarine systems with more tenuous links to the quality of the water column.

The group largely identified ecological thresholds (Table 1) linked to changes (reduction) in the physical extent or changes in species composition/diversity. It was noted for some habitat assets that there is natural variation in extent, e.g. subtidal sandy sediments. So, changes in extent may not meaningfully reflect any loss or gain in natural capital assets.

In terms of economic thresholds, warning signals that the asset-benefit relationship is at risk were identified as displacement from fishing grounds, changes (reduction) in landings and the decline or disappearance of a marketable product. For saltmarsh in particular, an economic threshold was identified as an associated change in agricultural output. However, the group was not clear as to whether the threshold is linked to an increase or a reduction in output.

Social thresholds that the asset-benefit relationship is at risk were identified as a lack of demand for locally caught shellfish and an increase in health risks linked to eating seafood (loss of consumer confidence).

Table 1: The asset – benefit relationships supporting food production. Overall local or national/regional risk is calculated as Risk Exposure x Sensitivity.

Benefit	Asset	Level of contribution to ES benefit (relative to other features)	The local importance of the benefit-asset relationship? (Risk exposure)	The national or regional importance of the benefit-asset relationship? (Risk exposure)	The likelihood that the benefit will change if the quality or quantity of the asset is reduced? (Sensitivity).	Risk register Local	Risk register National or Regional	Pressures	Ecological thresholds	Economic thresholds	Social thresholds
Food provision	Saltmarsh	Significant	3	3	3	9	9	Hard coastal defences, storms, agricultural run-off, developments coastal squeeze, river flow hydrology, sea level rise	Reduced yields, life history analysis (linking fish stocks to landings is very difficult to prove), reduced extent, change in species composition, change in natural succession	Change in agricultural output	Reduced use, increased use, public perception
Food provision	Intertidal reef	Moderate	3	3	3	9	9	Sediment loading, natural variation, climate change, fishing (recreation and commercial), diving (fishing), gaffing, trampling	Reduced diversity, disease, change in communities	Displacement(fishing), reduced landings, reduced recreation	
Food provision	Subtidal reef	Significant	3	3	3	9	9	Sediment loading, natural variation, climate change, fishing (recreation and commercial), diving (fishing), gaffing, trampling	Reduced diversity, disease, change in communities	Displacement(fishing), reduced landings, reduced recreation	
Food provision	Intertidal sediments (Mud)	Moderate	3	3	3	9	9	Hydrological changes, storm impacts, development, bait digging, pollutants, agriculture, crab tiling	Reduced fisheries yield, reduced diversity, reduced bait diggers	Reduced landings for flatfish	
Food provision	Biogenic reef (Mussels)	Moderate	3	3	3	9	9	Fishing, micro plastics, natural variability, water quality, trampling, unsuitable water quality	Reduced extent (gone)	Market disappears, loss in landings	People are eating less local shellfish, human health risk, loss of consumer confidence
Food provision	Subtidal sediments	Moderate	3	3	2	6	6	Sensitivity depends on exposure, aggregate dredging, natural variability, erosion and replenishment, fishing pressure, bait digging	Species composition, changes	Displacement of fishing effort, reduced bait digging	
Food provision	Intertidal sediments (sand and muddy sand)	Moderate	3	3	2	6	6	Sensitivity depends on exposure, aggregate dredging, natural variability, erosion and replenishment, fishing pressure, bait digging	Species composition, changes	Displacement of fishing effort, reduced bait digging	

Benefit	Asset	Level of contribution to ES benefit (relative to other features)	The local importance of the benefit-asset relationship? (Risk exposure)	The national or regional importance of the benefit-asset relationship? (Risk exposure)	The likelihood that the benefit will change if the quality or quantity of the asset is reduced? (Sensitivity).	Risk register Local	Risk register National or Regional	Pressures	Ecological thresholds	Economic thresholds	Social thresholds
Food provision	The water column	Unknown	3	3	1	3	3	Pollution, sediment loading, noise pollution, nuclear water uptake, heavy metals, climate change, fishing, tidal energy			
Food provision	Biogenic reef (Sabellaria)	Moderate	1	1	2	2	2	Fishing, micro plastics, natural variability, water quality, trampling, unsuitable water quality	Reduced extent (gone)	Market disappears, loss in landings	People are eating less local shellfish, human health risk, loss of consumer confidence.

Clean Water and Sediments

One group tackled the asset-benefit relationships delivering a 'Healthy Climate' and 'Clean Water and Sediments'. Due to time constraints, less attention was given to discussions regarding clean water and sediments .

The relationship between clean water and sediments (the benefit) and the habitat assets of saltmarsh, intertidal sediments (mud), subtidal sediments, and intertidal biogenic reef were considered by the group as being highly important both locally and nationally/regionally (Table 2). Saltmarsh in particular was noted to reduce the upstream sediment load. Additionally, the benefits associated with mud habitats are closely linked to the scale of the habitat, so mosaics or isolated patches of mud habitats were considered by the group to function less efficiently to deliver the benefits. The relationship between clean water and sediments and these assets were also considered to be the most sensitive to change if the quality or quantity of the asset were reduced and, therefore, have been identified as being the asset-benefit relationships most at risk (Table 2). Key pressures identified that may affect the quality or quantity of the assets were identified as pollution, sea level rise, ocean acidification as well as the physical impacts associated with activities such as dredging, trawling, coastal development and trampling (Table 2).

The group considered the relationship between the water column (the asset) and clean water and sediments (the benefit) as comparatively low importance on both a local and a regional/national scale with a low sensitivity to change. It was noted that mussel beds may have a role in improving the quality of shellfish waters (Table 2).

The group identified a range of ecological thresholds including changes in the extent, structure and composition of the habitat assets. Remote sensing data was identified as being potentially useful in establishing the extent of intertidal sediments (mud). Increased levels of micro and macro plastics both within the water column and the sediments were considered by the group to represent an increase in risk in the sustainability of the asset – benefit relationship. Economic thresholds were linked to both an increase and decrease in farming outputs linked to saltmarsh though no indication was provided by the group as to which scenario (an increase or decrease) would pose the greatest risk. In terms of economic thresholds, warning signals that the asset-benefit relationship is at risk were identified as being linked to the quality of fish for sale and a loss in tourism values due to failures in water quality. An increase in local shellfish sales was considered to be a positive economic indicator that the asset-benefit relationship is functioning. Social thresholds were linked to an increase in public health incidents and an increase in negative (place-based) comments on social media.

Table 2 The asset – benefit relationships supporting clean water and sediments. Overall local or national/regional risk is calculated as Risk Exposure x Sensitivity.

Benefit	Asset	Level of contribution to ES benefit (relative to other features)	The local importance of the benefit-asset relationship? (Risk exposure)	The national or regional importance of the benefit-asset relationship? (Risk exposure)	The likelihood that the benefit will change if the quality or quantity of the asset is reduced? (Sensitivity).	Risk register Local	Risk register National or Regional	Pressures	Ecological thresholds	Economic thresholds	Social thresholds
Clean water and sediments	Saltmarsh	Significant	3	3	3	9	9		Plant structure	Increase or decrease in farming, economies of dredging	
Clean water and sediments	Intertidal sediments (Mud)	Moderate	3	3	3	9	9	Pollution, sea level rise, bait digging, dredging, trawling, development	Remote sensing data, micro plastic content	Number of bathing waters, values linked to tourism, fish quality, aggregate extraction	Increase in the number of public health incidents, negative social media
Clean water and sediments	Subtidal sediments	Moderate	3	3	3	9	9				
Clean water and sediments	Intertidal biogenic reef	Moderate	3	3	3	9	9	Pollution, sea level rise, bait digging, temperature, trampling, ocean acidification, aquaculture	Change in the ecological community	Healthy shellfish (marketable), sustainable yield	
Clean water and sediments	The water column	Unknown	1	1	1	1	1		Micro/macro plastic levels		Increase in the number of public health incidents, negative social media

Healthy Climate

The benefit of a healthy climate was defined within the context of the role of the habitat assets in sequestering carbon. The relationship between a healthy climate (the benefit) and the habitat asset of saltmarsh, was considered by the group as being highly important in supporting the benefit both locally and nationally/regionally (Table 3). The group were interested in how the carbon sequestration rates of saltmarsh compare with other terrestrial habitats such as grassland and oak woodland. Key local pressures on saltmarsh include rising sea levels, coastal development, pollution, algal mats, recreation activity, and agricultural malpractice.

The relationship between a healthy climate (the benefit) and the assets of subtidal reef, intertidal reef, the water column, intertidal sediments (mud) and intertidal sediments (sand and muddy sand) were considered by the group as being moderately important in supporting a healthy climate both locally and nationally/regionally (Table 3). However, for the assets of subtidal and intertidal reef the importance of the asset-benefit relationship was considered by the group to be less important at a regional/national level. Pressures were varied and linked to climate drivers (temperature and sea level rise) as well as physical pressures exerted by commercial and recreational activities (e.g. fishing).

The relationship between a healthy climate and biogenic reef (*Sabelleria*) were considered by the group as being of low importance in supporting the benefit both locally and nationally/regionally (Table 3). These comments were linked to a discussion with regard to the limited extent of the current biogenic habitat

The group identified ecological thresholds including changes (a reduction) in species diversity, changes in the number of birds and reductions in the extent and structure habitats as being key ecological markers. Economic thresholds for saltmarsh were identified as changes in the samphire market, a rise in insurance premiums, changes in economic performance of farms and in increase in the number of bird watchers (increase footfall). Economic thresholds linked to reef habitats were identified as landings of reef associated fish, dive tourism and recreation boats. However, no indication was given by the group as to whether they consider an increase or a decrease in these metrics as triggering a red flag that the asset benefit is at risk. Social thresholds were identified as bird watching clubs (no identification of an increase or a decrease), damaged access routes (saltmarsh) and aesthetic degradation. Extractive activities and climate change were identified as the dominant pressures (Table 3).

Table 3: The asset – benefit relationships supporting a Health Climate. Overall local or national/regional risk is calculated as Risk Exposure x Sensitivity.

Benefit	Asset	Level of contribution to ES benefit (relative to other features)	The local importance of the benefit-asset relationship? (Risk exposure)	The national or regional importance of the benefit-asset relationship? (Risk exposure)	The likelihood that the benefit will change if the quality or quantity of the asset is reduced? (Sensitivity).	Risk register Local	Risk register National or Regional	Pressures	Ecological thresholds	Economic thresholds	Social thresholds
Healthy climate	Saltmarsh	Significant	3	3	3	9	9	Rising sea levels, coastal squeeze, development, pollution, algal mats, recreation, agricultural malpractice	Species diversity change, imaging morphology, erosion (vertical and lateral), numbers of birds	Samphire market, Insurance premium establishment, agricultural performance, bird watchers (footfall)	Bird watching clubs, damaging access, aesthetic degradation
Healthy climate	Subtidal reef	Moderate	2	1	3	6	3	Sea level rise, pollution, navigation, dredging, sedimentation, temperature change, aquaculture	Species diversity	Dive tourism, number of boats, fish harvested in that habitat	Local employment related to reef
Healthy climate	Intertidal reef	Low	2	1	3	6	3				
Healthy climate	The water column	Unknown	3	3	2	6	6	Algal blooms			
Healthy climate	Intertidal sediments (Mud)	Moderate	2	2	2	4	4	Pollution, sea level rise, bait digging			
Healthy climate	Intertidal sediments (sand and muddy sand)	Low	2	2	2	4	4	Pollution, sea level rise, bait digging			
Healthy climate	Intertidal biogenic reef	Moderate	1	1	3	3	3	Pollution, sea level rise, bait digging, temperature, trampling, ocean acidification, aquaculture			

Natural Hazard Protection

Natural hazard protection was discussed within the context of the reduction of impacts on the human population from waves, flooding and erosion. In the short term, natural hazard protection was discussed in relation to the impact of storms causing flooding or coastal damage. In the long-term natural hazard protection was discussed in terms of resilience to sea level rise. It was noted by the group that the intensity of storms is increasing, along with predictions for sea level rise, so the current extent or state of an asset may not be resilient in 10 years' time. The group's first query was the reasoning as to why coastal cliffs and sand dunes were not considered in the list of assets for consideration. The SWEEP team clarified the boundary of the Marine Pioneer as Mean High Water Spring (MHWS).

The relationship between natural hazard protection (the benefit) and the habitat assets of intertidal sediments (mud) and intertidal sediments (mud and sand) was considered by the group as being highly important in supporting the benefit locally. The benefit was considered to be localised so less importance was assigned to the asset-benefit relationship at a national/regional scale (Table 4). The extent of the habitat (particularly the width) was noted by the group to have more impact on reducing wave energy. The group considered intertidal sediments as being more important than saltmarsh habitat in supporting the benefit of natural hazard protection due to differences in the extent of each habitat (more sediment habitat). Pressures that may reduce the extent (width) of these habitats were linked to maintenance dredging and storms.

The relationship between natural hazard protection (the benefit) and the habitat assets of saltmarsh and subtidal sediments were considered by the group as being moderately important in supporting a healthy climate at a local scale. Less importance was assigned to the asset-benefit relationship at a national/regional scale due to the localised benefits of natural hazard protection (e.g. property, agricultural land). Subtidal sediments were considered to have equal importance to intertidal sediments due to their dynamic role in sediment replenishment at a regional scale. Though subtidal sediments were considered to be less sensitive to change (than intertidal sediments) as there are large tracts of subtidal sediments off the North Devon coast. A reduction in the extent or quality would have a marginal impact on the benefits associated with natural hazard protection. The benefit of natural hazard protection from saltmarsh were considered to be limited in the local North Devon area. This is largely due to the limited extent of the current saltmarsh and the current quality of the saltmarsh which was considered by the group as not sufficiently vegetated to act as a coastal defence structure. Further clarification is needed on the properties and agricultural land currently protected by the saltmarsh. It was noted, that sections of the Tarka Trail are currently protected by the saltmarsh and therefore too are the economic and well-being benefits associated with recreation activity on the trail.

The relationship between natural hazard protection and biogenic reef and subtidal reef were considered by the group as being of low importance in supporting the benefit both locally and nationally/regionally (Table 4). These comments were linked to a discussion with regard to the limited extent of the current biogenic habitat and noting that subtidal reefs need to be close to the surface to disrupt wave energy.

The group identified ecological thresholds including changes to the extent of sediment habitats and changes to seal populations. Economic thresholds were linked to changes in the recreation use of the habitats. A social threshold was highlighted as a metric linked to a community sense of resilience to deal with flooding events and adapt to sea level rise.

Table 4 The asset – benefit relationships supporting Natural Hazard Protection. Overall local or national/regional risk is calculated as Risk Exposure x Sensitivity.

Benefit	Asset	Level of contribution to ES benefit (relative to other features)	The local importance of the benefit-asset relationship? (Risk exposure)	The national or regional importance of the benefit-asset relationship? (Risk exposure)	The likelihood that the benefit will change if the quality or quantity of the asset is reduced? (Sensitivity)	Risk register Local	Risk register National or Regional	Pressures	Ecological thresholds	Economic thresholds	Social thresholds
Natural hazard protection	Intertidal sediments (Mud)	Low	3	1	3	9	3	Reduction in the width of beaches, heavy storms, maintenance dredging	Extent, seal populations	Changes in tourist numbers, lower catch for anglers, beach visits reduced	
Natural hazard protection	Intertidal sediments (sand and muddy sand)	Moderate	3	1	3	9	3	Reduction in the width of beaches, heavy storms, maintenance dredging	Extent, seal populations	Changes in tourist numbers, lower catch for anglers, beach visits reduced	
Natural hazard protection	Saltmarsh	Moderate	2	N/A	3	6		Natural erosion, tidal currents	Loss of birdlife (numbers and type), change in flora and fauna, reduction in extent	Fewer tourists, birdwatchers, oysters	Community sense of resilience
Natural hazard protection	Subtidal sediments	Low	3	2	2	6	4	As there is a greater extent sediment are less sensitive to small change, extraction activities		Lower catch for anglers and reduction in beach visits	
Natural hazard protection	Intertidal reef	Significant	3	2	1	3	2	Sea level rise, More pressure than on intertidal reef	Changes in physical extent	Lower catch for anglers and reduction in beach visits	
Natural hazard protection	Intertidal biogenic reef	Moderate	1	N/A	1	1		Water pollution, fishing		Reduction in tourism, lower catch for anglers, reduction in beach visits	
Natural hazard protection	Subtidal reef	Moderate/ Low	1		1	1	0		Changes in physical extent	Lower catch for anglers and reduction iin beach visits	

Recreation and Tourism

The relationship between recreation and tourism (the benefit) and the habitat asset of intertidal sediment (sand and mud) and the water column were considered by the group as being highly important in supporting the benefit both locally and nationally/regionally (Table 5). The group highlighted that Westward Ho! is not included on the ecosystem service map and that the beach at Clovelly has to be 'rebuilt' each year so it should not be included as an asset. The relationship between recreation and tourism (the benefit) and the habitat assets of saltmarsh and biogenic reef were considered by the group as being moderately important in supporting the benefit. It was noted that the Tarka Trail is a very important component of recreation and tourism activity in North Devon. The saltmarsh and associated birdlife along the trail is a key feature. Reefs and intertidal sediments (mud) were considered by the group as having low importance in supporting recreation and tourism. Key pressures identified that may affect the quality or quantity of the asset are varied including fouling and disturbance from dogs (saltmarsh and intertidal sediments), upstream pollution and impacts linked to climate change (Table 5).

The group identified ecological thresholds including changes to bird populations, water clarity and habitat extent as being important. Petrol pollution incidents linked to water-craft was noted as a pressure to the water column with no obvious management to reduce or prevent spills. Economic benefits may be impacted by increase in litter and a reduction in the number of visitors who are drawn to specific habitats, e.g., divers, anglers, artists. It was noted that charter boat operators are often asked to take groups out to sites that are not accessible by foot. It is only though local knowledge of sensitive bird communities that disturbance is avoided. Social thresholds are linked to a loss of well-being benefits (sense of place) and a reduction in the number of places that provide environmental education services.

Table 5 The asset – benefit relationships supporting Recreation and Tourism. Overall local or national/regional risk is calculated as Risk Exposure x Sensitivity.

Benefit	Asset	Level of contribution to ES benefit (relative to other features)	The local importance of the benefit-asset relationship? (Risk exposure)	The national or regional importance of the benefit-asset relationship? (Risk exposure)	The likelihood that the benefit will change if the quality or quantity of the asset is reduced? (Sensitivity)	Risk register Local	Risk register National or Regional	Pressures	Ecological thresholds	Economic thresholds	Social thresholds
Recreation and tourism	Intertidal sediments (sand and muddy sand)	Significant	3	3	3	9	9	Dog walking (fouling and disturbance), fish farms (increase in litter and waste), Pollution (run off, mining, nuclear), crab tiling, bait digging, Severn barrage	Bird populations	Loss of beaches through erosion. Increase in litter	Loss of well being benefits (sense of place)
Recreation and tourism	The water column	Unknown	3	3	3	9	9	Pollution, water temperature, climate change (increased stirring up of sediments), Trawlers also stir up sediment, angling, seaweed (broken up in storms)	Changes in water clarity	A reduction in the number of artists, divers, anglers	
Recreation and tourism	Saltmarsh	Significant	2	2	3	6	6	Climate change, pollution, dog walking (fouling and disturbance), coastal squeeze, abandoned boats, agricultural reclamation	Loss of habitat (already low)	Loss of birdwatching, artists do not visit, reduced footfall for local businesses (numbers v pressures)	A reduction of places for environmental education
Recreation and tourism	Intertidal biogenic reef	Low	2		2	4	0	Pollution, climate change, increased storms change sediment type, water temperature	Bird populations		
Recreation and tourism	Subtidal reef	Moderate	3	3	1	3	3	Climate change, increased sea level, Severn tidal range			
Recreation and tourism	Intertidal reef	Low	3	3	1	3	3	Climate change, increased sea level, Severn tidal range			
Recreation and tourism	Intertidal sediments (Mud)	Low	3	3	1	3	3	Dog walking (fouling and disturbance), fish farms (increase in litter and waste), Pollution (run off, mining, nuclear), crab tiling, bait digging, Severn barrage	Bird populations		

Conclusion

The participants of the North Devon Marine Working Group discussed the risk to the asset-benefit relationship within the context of the North Devon Marine Pioneer. Table 6 provides a summary of the results and demonstrates in the first instance that the marine habitat assets function to deliver ecosystem service benefits (Table 6). When the risk scores are summarised saltmarsh, intertidal sediments (mud) and intertidal sediments (mud and sand), and subtidal sediments are the habitat assets subject to the most risk (Table 6). However, it must be noted that all habitats were assigned a degree of risk with the least risk assigned to biogenic *Sabellaria* reefs. This low score was attributed to the small patches of biogenic reef in North Devon and this score does not downgrade their status as an ecologically important habitat. The benefits of clean water and sediments, food provision and recreation and tourism considered by the group to be the most locally important benefits (Table 6).

Across all the benefits a range of pressures were defined linked to localised pressures (e.g. trampling, dredging), upstream pressures (e.g. farming) and pressures associated with predicted global change (e.g. sea level rise, storms).

The next steps to consider are how the current management underpins the asset-benefit relationships, how do the assets perform against policy targets and if any of the ecological, economic or social thresholds can be defined by available indicators. Subsequent analysis may further prioritise action. Overall, it is necessary to consider how a 'net gain' may be achieved when benefits and assets are closely linked. Thought may be directed as to how to support a reduction in risk across the suite of asset-benefit relationships in order to underpin the resilience of the whole system.

Table 6: Summary table demonstrating the asset-benefit relationships and the overall risk register scores (local) as determined by the North Devon Marine Working group. Risk was calculated as risk exposure x sensitivity. Shading indicates risk as red = high, orange = moderate, yellow = low

	Saltmarsh	Intertidal reef	Subtidal reef	Intertidal sediments (Mud)	Intertidal sediments (sand and muddy sand)	Subtidal sediments	Biogenic reef (Saballaria)	Biogenic reef (Mussels)	The water column	Total risk by benefit (Sum of
Food provision	9	9	9	9	6	6	1	9	3	6.8
Natural hazard protection	6	3	1	9	9	6	1	1		4.5
Healthy climate	9	6	6	4	4		3	3	6	5.1
Clean water and sediments	9			9		9	9	9	1	7.7
Recreation and tourism	6	3	3		9		4		9	5.7
Total risk by habitat asset (Sum of risk score/number of asset-benefit relationships)	7.8	5.25	4.75	7.75	7	7	3.6	5.5	4.75	

Next Steps

The results of the workshop will be integrated with the information derived from the development of a Natural Capital Asset Register for the North Devon Marine Pioneer. Improved knowledge of risk associated with natural capital assets and benefits will inform the development of a Natural Capital Plan for North Devon.

Agenda

17th September 2018
Pavillion Rooms, Landmark Theatre, Promenade, Ilfracombe EX34 9BZ

Overall objectives:

- To update the Marine Working Group on the pioneer's demonstration projects and how they relate to your original goals
- Using all the information collected through the mapping exercise, we will need your help to decide on the next priority actions - where to direct our time, energy and resources.

start time	Activity
09:30	Sign up and Tea and Coffee.
10:00	Welcome and introduction to the day – Chrissie Ingle
10:15	An update on the Marine Pioneer and other projects in North Devon. Short presentations:
- An overview of the Marine Pioneer – Aisling Lannin, MMO - Fisheries Research and Management Plans – Libby West, D&S IFCA - Bristol Channel Herring Project – Adam Rees, Blue Marine Foundation - UK SEAS update – Jenny Oates, WWF - North Devon Marine Natural Capital Plan – Chrissie Ingle, ND Biosphere - Natural Flood Management, saltmarsh project – Katrina Davies, University of Exeter - Plastic Free North Devon – Claire Moodie, Surfers Against Sewage - North Devon Surfing Reserve & Watersports Survey – Dominie Dunbrook, NDC - Marine Pioneer PhD research – Beth Wills, University of Surrey	
11:15	TEA BREAK
11:15	Presentation: North Devon's Natural Capital assets – Sian Rees, University of Plymouth
11:45	Activity: What are the risks to our natural assets and the benefits that they provide us with?
13:00	LUNCH
14:00	Presentation: Preliminary results from the MPA survey – Penny Nelson & Sarah Young, WWF
14:15	Activity: 'What next for management of the marine environment?
15:15	TEA BREAK
15:30	Presentation: Opportunities for investment – Toby Roxburgh, WWF
15:40	Feedback, final thoughts, and thank yous – Chrissie Ingle, BR
16:00	Finish