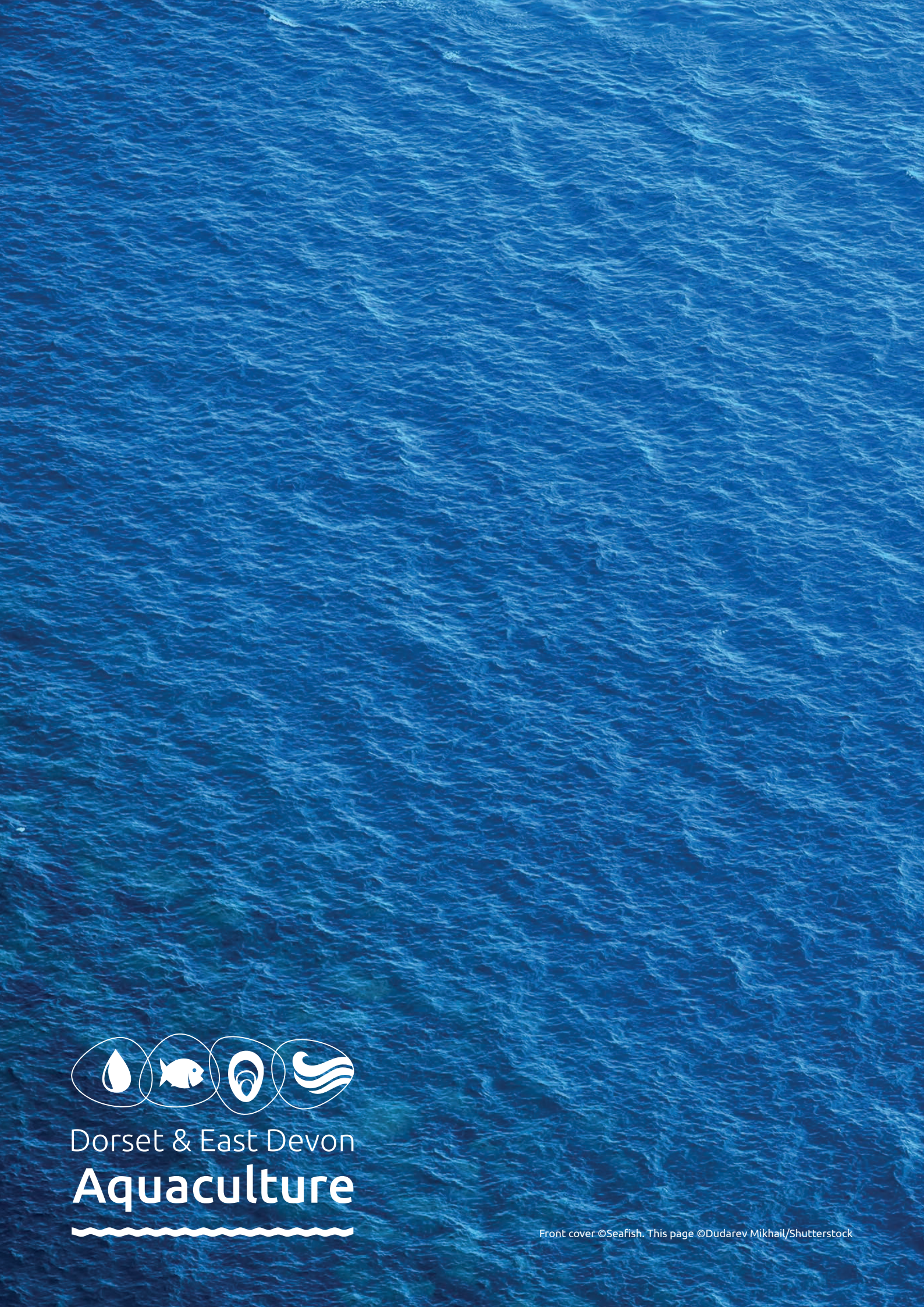
Dorset Mariculture Strategy 2020-2025

Dorset & East Devon
Aquaculture



Dorset & East Devon
Aquaculture

Vision

To have an industry-leading, highly productive aquaculture sector, driven by sustainable production practices and continuous innovation. A sector that delivers a resilient seafood supply chain, contributes to UK food security and brings substantial socio-economic benefits to coastal communities across Dorset.

Written by Dorset Coast Forum 2020

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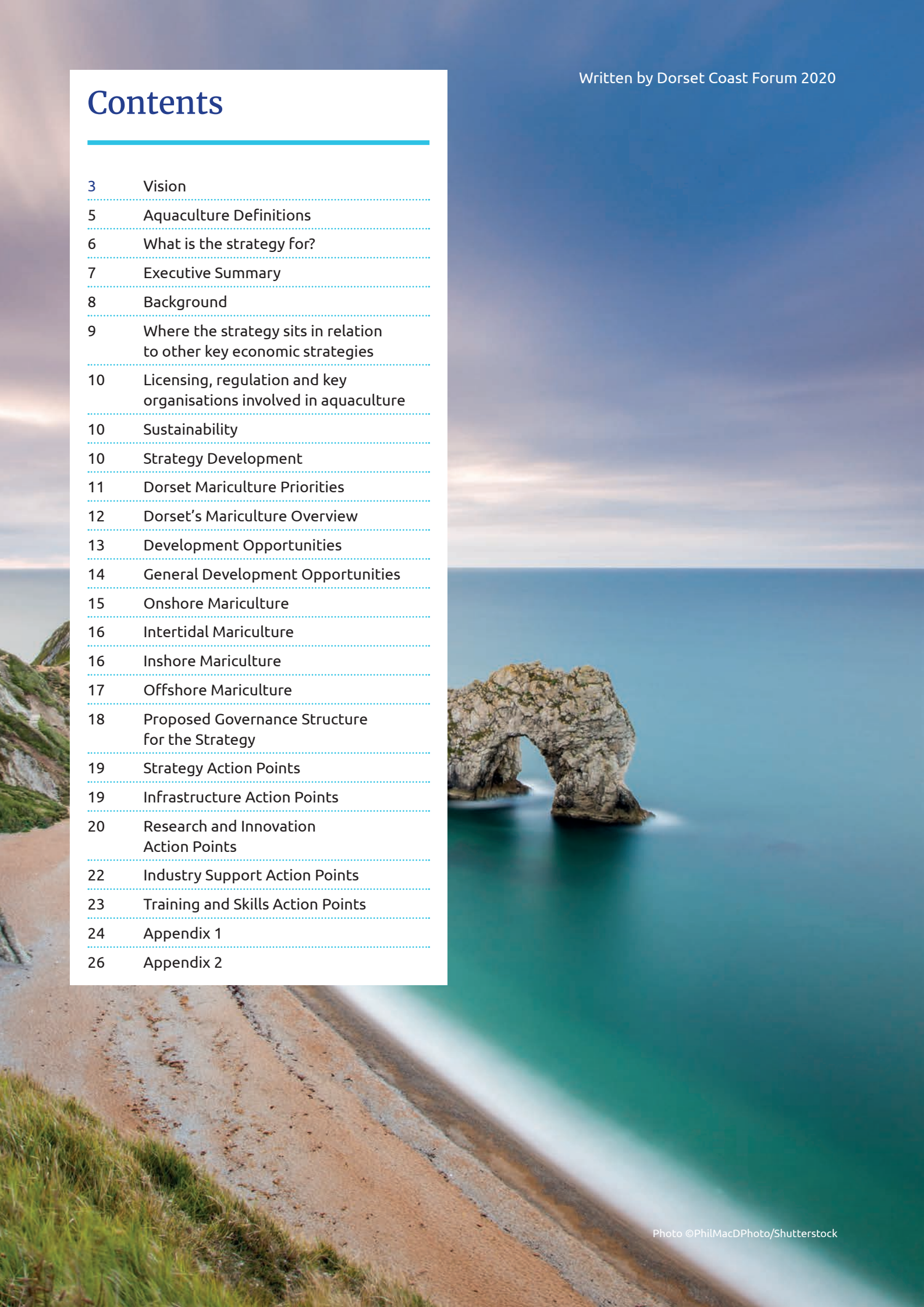

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Aquaculture Definitions

Mariculture is a sub-sector of aquaculture specifically focused on the cultivation of marine organisms either on land in suitable systems or, in situ, in the marine environment.

Throughout this strategy the four main types of mariculture are defined as:

Onshore

The use of onshore facilities to grow marine species. This can be in tanks or recirculation systems where filtration serves to remove waste and temperature is controlled. Recirculating Aquaculture Systems (RAS) can have a lower demand from water but a higher demand for energy. This need could be supplemented with renewables such as solar or wind power.

Intertidal

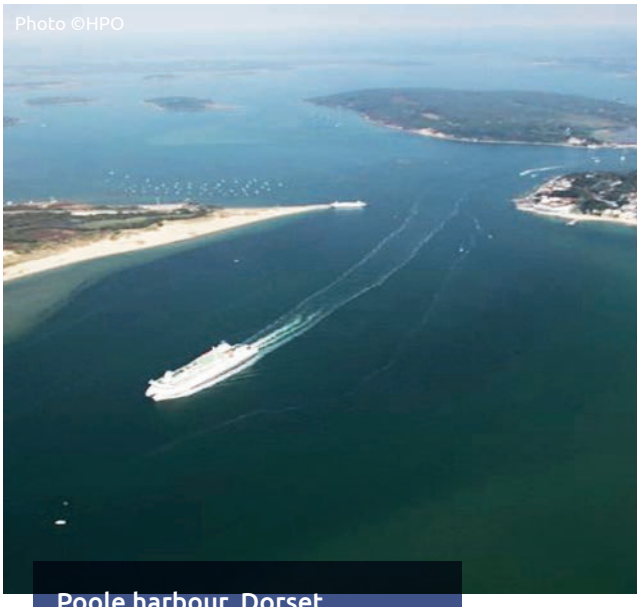
Using the area between High and Low Water Spring tide marks to cultivate species such as Pacific oysters. Depending upon the species cultivated this can be achieved either on the seabed, on trestles or other similar structures.

Inshore

Operating in sites which are sheltered from extreme environmental conditions such as small bays or in the shelter of a structure or island using suspended culture between fixed points. This includes species such Pacific oysters, mussels and seaweed.

Offshore

Operating in exposed areas of sea where there is little protection from extreme conditions using suspended culture. This can require advanced marine anchoring and technology. Currently there is nothing offshore in Dorset waters but there is a large mussel farm in adjacent Devon waters.



Poole harbour, Dorset

What is the strategy for?

This key document will be used to:

- Promote and encourage sustainable development of mariculture
- Provide a shared ambition and a collective voice for the sector
- Provide guidance on the needs of the sector and how to meet those needs
- Encourage investment
- Provide an overview of the issues, challenges and opportunities
- Provide key action points that explore and drive mariculture development, especially in relation to research
- Link to and support other key strategies including the Local Industrial Strategy, Dorset Council Economic Growth Strategy, National Aquaculture Strategy, Dorset and East Devon Fisheries Local Action Group Community-Led Strategy and the Southern Inshore Fisheries and Conservation Authority Annual Plans

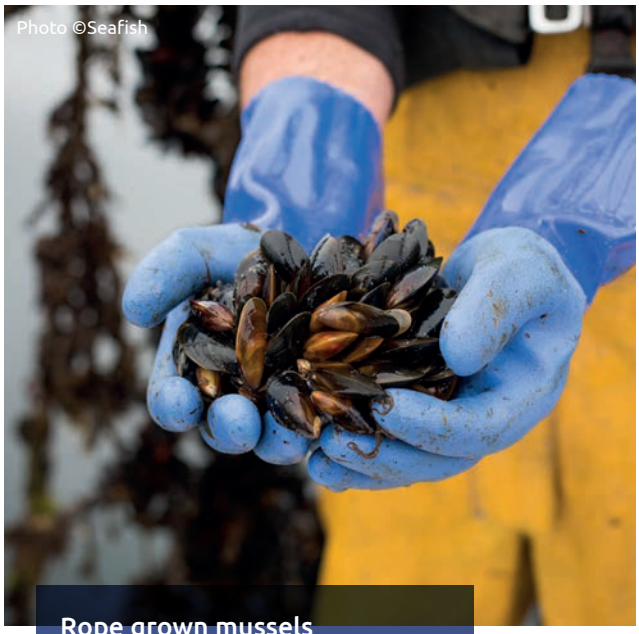
It is important to note: This strategy does not inform or influence any policies or regulations for the sector and is not an endorsement of any operations which fall outside of current legislation.

Marker buoys

Executive Summary

Dorset has a highly designated coastline and inshore waters, demonstrating a diverse range of habitats and species, some of which are subject to varying degrees of protection. The range of Marine Protected Area (MPA) designations include Ramsar sites, Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs), and Marine Conservation Zones (MCZs). Mariculture development along the Dorset coast and within its inshore waters would have to ensure that impacts on these nationally and internationally important habitats are minimised and compatible with regulations and licensing conditions.

The strategy considers options to promote and encourage the sustainable cultivation of a variety of marine species onshore, intertidally, inshore and offshore by using a variety of methods but is not necessarily an endorsement of specific development. Each opportunity would need to be explored further against a variety of considerations including climate change, sustainability, impacts on habitats and species, impacts on other marine users and sectors and changing policies as new science and research are undertaken. Changing economic circumstances would also influence the viability of any development.



Rope grown mussels

The strategy was collated through engagement and consultation with aquaculture industry stakeholders to listen to the challenges they face, the potential opportunities to explore and how they can be capitalised on. Regional, national and international conversations were also held to support the development of this work. From these consultations, four main strategic priorities were developed:

- **Infrastructure** - including buildings, land, ports, vessels and equipment.
- **Research and Innovation** – research and studies that support new markets, opportunities and technology.
- **Industry Support** – support with licensing, permissions, funding, promotion and project development.
- **Training and Skills** – ensuring the work force has the skills and development prospects to help the sector.

While this document is primarily for Dorset, the strategy could be relevant both regionally and nationally as similar action points could be replicated or collaborated on to see the sector develop across the South West as well as on a national scale to maximise the benefits and produce economies of scale.

Background

Seafood 2040 states that sustainable aquaculture offers substantial potential to grow revenue and increase the sector's current contribution to the UK economy. As a vital protein source, farmed seafood can contribute to domestic food production and thereby meet the requirements of both the health and food security agendas. Mariculture is also one of the few industries in a position to provide growth in both rural and coastal communities, a fact recognised worldwide by governments, scientists and industry[1]. England has the third longest coastline in the EU, after Scotland and Greece. Mariculture, therefore, theoretically, offers the greatest opportunity for expansion of seafood output, yet English aquaculture accounts for only 4% of the total 214,345 tonnes of UK farmed seafood production[2]. Future seafood production will be a mixture of farmed and wild capture, so aquaculture needs to be recognised as an integral aspect of future food production.

At a national level, the Seafood 2040 Strategic Framework is intended to help develop a thriving seafood sector in England, with aquaculture identified as a priority for support. Seafood 2040 coordinates the Aquaculture Leadership Group (ALG), on which, at the time of writing, the Dorset Coast Forum (DCF) is represented by the Aquaculture Development Officer (ADO). The Sea Fish Industry Authority (Seafish) commissioned a research project "Size of the Prize" to help estimate the extent to which aquaculture could be developed in the UK under differing growth scenarios and the English National Aquaculture Strategy is due to be completed in 2020.

The Government has designated Dorset as England's High Potential Opportunity area in aquaculture, with Dorset leading the way in developing on-line and physical infrastructure to assist aqua-farming and aqua-tech companies to locate and manage their businesses. The Great South West partnership acknowledges the potential for Aquaculture to be a key part of our regional economy.

Dorset's Local Industrial Strategy recognises that the next phase of the aquaculture productivity story needs to be planned, managed and accelerated. Aquaculture is the world's fastest growing food production sector (producing 110.2 million tonnes valuing $243.5bn in 2016[3]) and Dorset and its border counties are uniquely placed to capitalise upon the opportunity.

The Dorset Sustainable Mariculture Strategy not only links with relevant initiatives and strategies but provides a way to implement changes by detailing some actions and initiatives designed to address local issues. This will enable targeted support to the sector as well as helping to attract new investment and increase productivity. It is essential that the aquaculture sector in Dorset continues to have its voice heard at a national level and is recognised as a leader in the industry.

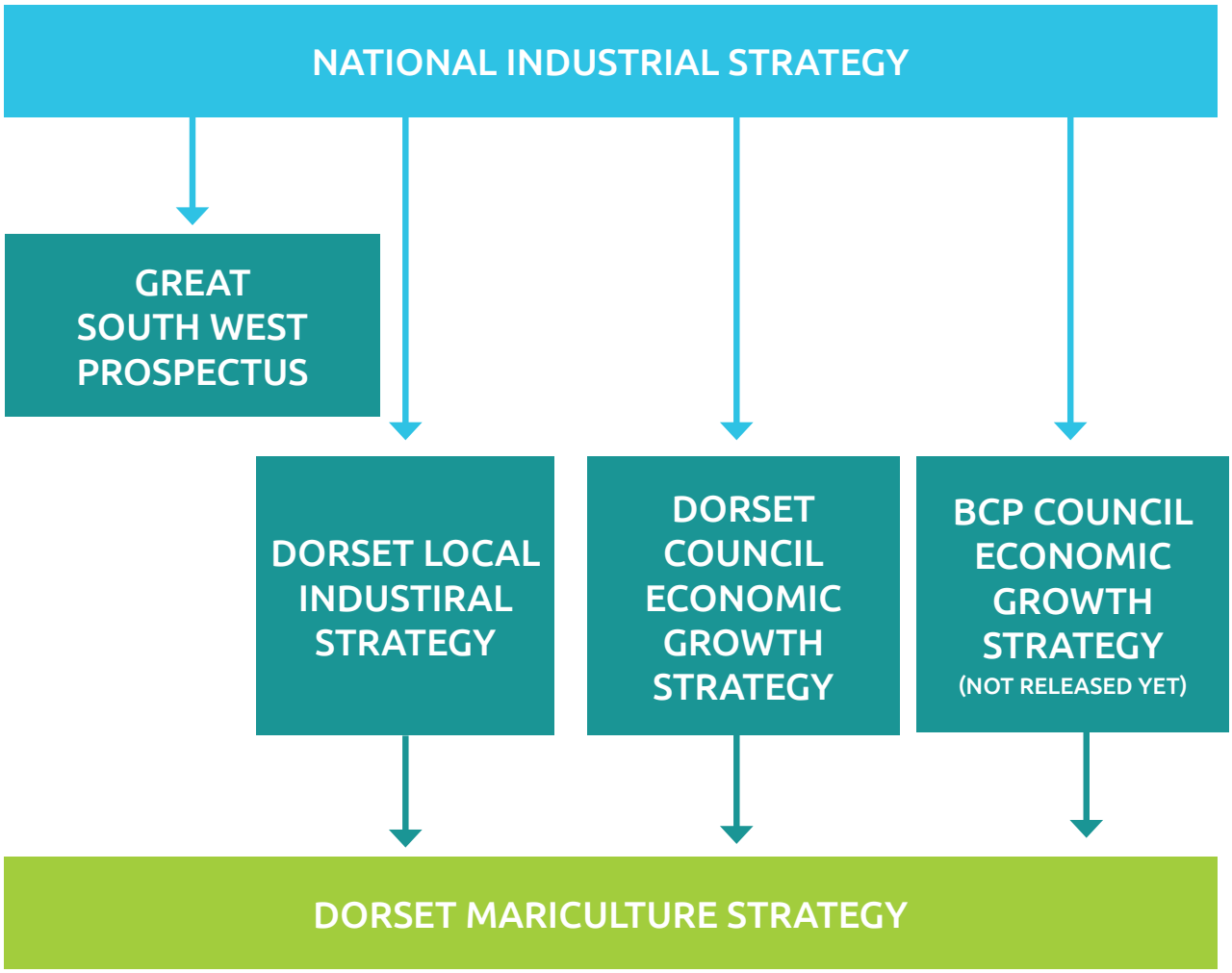
Although the freshwater aquaculture sector plays an important role within the Dorset economy, it should be noted that this strategy does not specifically cover the cultivation of freshwater species.

[1] Ref: Value of Scottish Aquaculture, 2017

[2] Ref: Future of the Sea: Trends in Aquaculture, 2017

[3] Ref: State of the World Fisheries and Aquaculture, 2018

Where the strategy sits in relation to other key economic strategies



Licensing, regulation and key organisations involved in aquaculture

There are many organisations involved in licensing and regulation of aquaculture. A list of these can be found in Appendix 1.

Sustainability

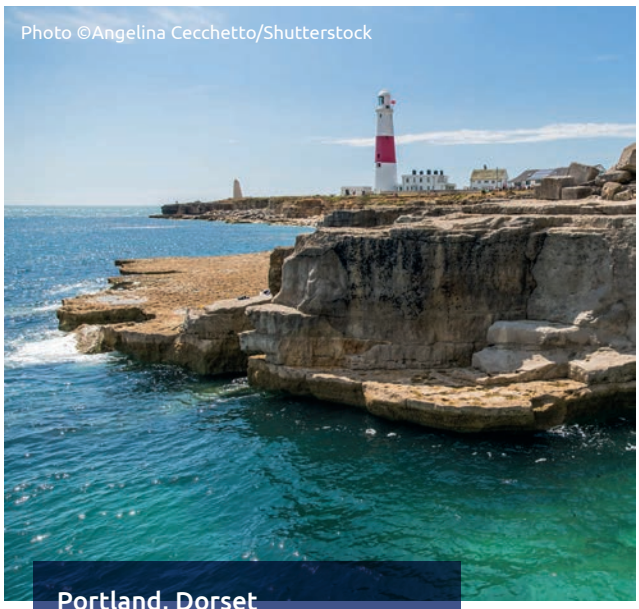
While the economic potential of the industry is recognised, a sustainable and responsible approach to development is paramount. The influences of aquaculture on the environment need to be considered and more work is needed to look at the potential effects of different farming methods on different habitats. However, with the correct approach to location, development, management and regulation, some types of aquaculture can provide environmental benefits. These include increasing biodiversity, reducing pressure on wild stocks, improving water quality, helping reduce greenhouse gas emissions by acting as a sink for CO2 and potentially acting as MPA. Onshore aquaculture can also be a way of minimising demands and pressures on marine space via the use of recirculation systems and cutting-edge technologies that ensure efficient use of resources, such as water, whilst containing and mitigating discharges and using relatively small areas of land to farm large amounts of food.

Strategy Development

The Dorset and East Devon Fisheries Local Action Group (FLAG), a group of key stakeholders within the fisheries and aquaculture sector, recognised aquaculture as priority to ensure the continued sustainable development of the local sector. The Dorset Coast Forum (DCF), host of the FLAG, started the development of the Dorset Mariculture Strategy in January 2018 where priorities and opportunities were discussed at a key stakeholder's workshop. This identified key projects that could benefit the sector. A second workshop was held in November 2019 to develop this work and establish key priorities and action points. It also identified the role that existing growers could play in expanding the aquaculture sector in Dorset. Throughout the process there has been ongoing engagement, site visits and interviews with a range of different people.

The Dorset Sustainable Mariculture Strategy is intended to cover cultivation of marine species onshore, intertidally, inshore and offshore will be reviewed every 5 years.

A SWOT analysis of the Dorset Mariculture sector was undertaken during numerous workshops throughout 2018/19. This can be found in Appendix 2.



Portland, Dorset

Dorset Mariculture Priorities

There are four main priorities that could enable the sector to reach its full potential:

Infrastructure

For the sector to develop there needs to be the right infrastructure and facilities in place in suitable areas. There are potential sites and buildings available, but work needs to be done to ensure that these buildings are suitable for mariculture operations. This would need investment from operators, funders, investors or landowners.

Research and Innovation

The sector is constantly evolving and growing and with this comes the need for research to support technical development, economic viability and environmental sustainability. Data to support the impacts and benefits of mariculture will help to increase sustainability, capitalise on any ecosystem service benefits and ensure development is responsible. There is opportunity for mariculture to work in harmony with marine protected areas if done correctly.

Market and supply chain studies could open potential markets for new and existing species. Further research into sustainable cultivation techniques could refine existing techniques and support new species cultivation. Limited space on land and at sea requires innovation (e.g. adoption of co-location) and if Dorset is to succeed in its desire to boost the sector it will need to learn from other countries.

Good water quality is important for the cultivation of shellfish therefore work to improve collaboration, research and innovation will be vital.

Industry Support

Supporting the industry is key to ensuring success. The provision of advice on project development, funding and navigating licences will help drive the sector forward. The promotion of the sector on a local, regional and national scale will help to raise the profile of Dorset aquaculture and its products. Political support is also important to ensure the industry receives investment. Community support will strengthen the sector and improve understanding.

Training and skills

Having the right skills in place is important and it is felt necessary for those skills to be developed within Dorset whilst learning from the world-wide aquaculture community. Dorset is perfectly placed to offer unique training for the industry as it has an Agri-tech college, university and other colleges as well as many operators in the area requiring employees with specific training. Increasing diversity and inclusivity in the sector could be achieved through mentoring and apprenticeships.

Aquaculture careers and training

Dorset's Mariculture Overview

Currently most operations are SME's who collectively have considerable experience, knowledge, entrepreneurship and a desire to see the industry supported at a local and national level.

There is:

- Onshore cultivation of Lumpfish which are used as a biological control method to tackle the issue of lice infestations in the Scottish salmon industry. This operation is based in Portland Port and currently produces 850,000 fish per year.
- An intertidal operator focusses on the Pacific oyster in the Fleet Lagoon and this is coupled with an onsite depuration facility and restaurant.
- Species cultivated inshore at Portland Port including seaweed, scallops, oysters and mussels. There are currently two operators using the area.

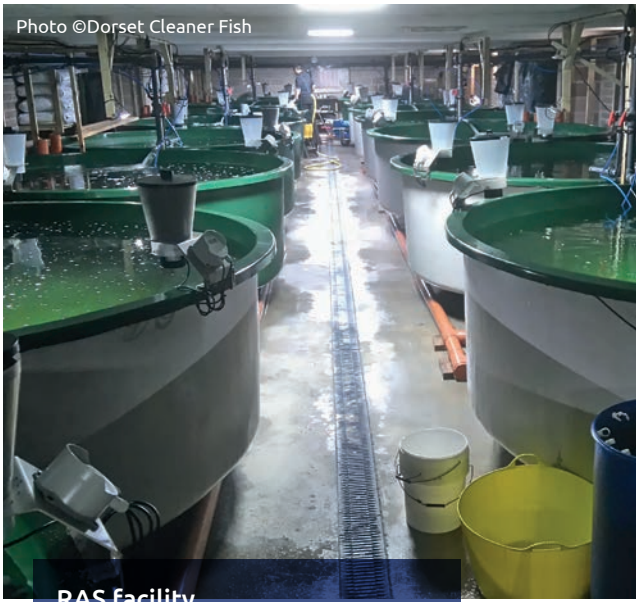


Photo ©Dorset Cleaner Fish

RAS facility

- The Poole Harbour Fishery Order 2015[4] ('The Order') is the largest Several Order in England. The Order allows Southern Inshore Fisheries Conservation Authority (IFCA) to lease grounds within a defined area of Poole Harbour for the purposes of aquaculture. The total extent of the Order covers an area of 837.8 hectares, with 199.76 hectares of this currently being used for the purposes of aquaculture (or 23.84% of the total footprint). This allows for the potential future expansion of aquaculture and cultivation activity within the Harbour. Under this Order, granted for a period of 20 years, Southern IFCA can continue to develop and support the potential for aquaculture in the Harbour. Under the current Management Plan 2020-2025[5] 12 lease beds are sub leased to seven separate lease holders comprising both companies and individuals. Current activity involves both farming and relaying of shellfish with Pacific oysters and mussels being the main species farmed. Today Poole Harbour is the largest production area in England for Pacific oysters, with production in Poole ranging between 300 and 400 tonnes per year.
- An offshore operator in the adjacent Devon waters that is the largest offshore rope cultured mussel farm in the UK and is likely to be able to produce up to 10,000 tonnes per year once its expansion is complete. Although not strictly in Dorset waters, there could potentially be ties to the local industry.

[4] www.legislation.gov.uk/uksi/2015/1346/contents/made

[5] https://secure.toolkitfiles.co.uk/clients/25364/sitedata/files/PH-SO-2015-Management-Plan-2020-.pdf

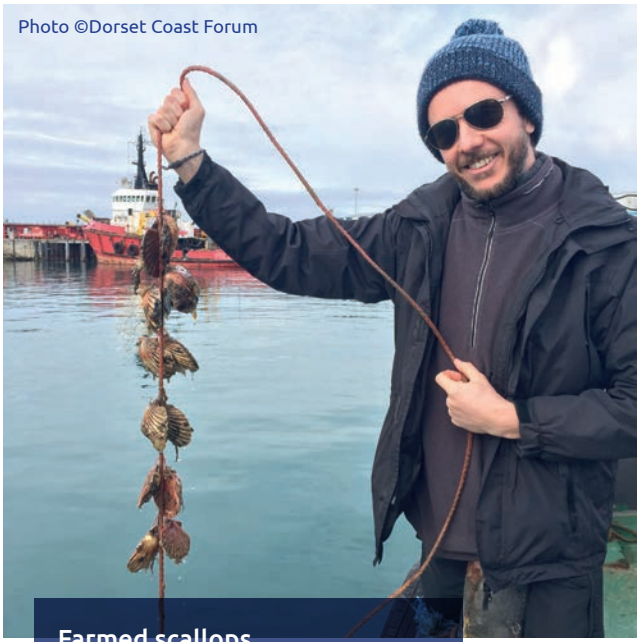
Development Opportunities

There are currently several development opportunities across Dorset that, with the right development, management and regulation could be successful.

These opportunities have been discussed with various stakeholders; however, the strategy is not an endorsement of any particular development opportunity but is there to highlight potential opportunities. It is important to note that:

- The opportunities have not had full feasibility studies carried out and each opportunity may require different permissions and licensing, infrastructure and stakeholder engagement.
- The environmental, social and economic impacts of each opportunity need further investigation. This includes the investigation of provision of ecosystems services of different farming techniques and ensuring that resource use is sustainable, negative impacts on the marine environment are minimised and mitigation is in place where needed.
- These opportunities are subject to several changing considerations, which include climate and coastal change, national policy, changes to licenses and permission, changes to marine and coastal habitats, new technology and research and changes its economic feasibility.
- The South Marine Plan highlights the number of activities present along the South Coast. The area contains one of the busiest shipping channels in the UK, significant fishing activity, as well as important tourism and recreation activities. Impacts on other marine users and resources must be considered in any potential opportunity.

Photo ©Dorset Coast Forum



Farmed scallops

General Development Opportunities

TYPE OF DEVELOPMENT	DETAIL	OPPORTUNITY FOR DORSET
Branding scheme and marketing campaign	Dorset is renowned for production of high-quality local produce.	In order to capitalise on the strong Dorset name a branding scheme could enhance the value of locally cultivated seafood and link with campaigns in partnership with Public Health Dorset to promote the health benefits of seafood. Links to the Aquaculture Stewardship Council[6] accreditation scheme and Best Aquaculture Practices[7] programme could add further strength to the Dorset brand.
Increased production of existing species	Upscaling production and expansion of existing or trial sites could see an increase in production levels.	There is scope for doing this in several areas with existing operators and species.
Multi species hatchery development	There is currently no commercial hatchery production in Dorset.	The development of a commercial hatchery locally could enable expansion of the Dorset's seaweed cultivation sector and would unlock the potential for a variety of species to be cultured. A multi species hatchery could provide a more stable business model for investors. There are several suitable onshore sites across the county with access to good quality seawater.
Integrated Multitrophic Aquaculture (IMTA)	IMTA is cultivation of complementary species at differing trophic (food web) levels in close proximity. The concept is that each species helps to reduce waste products or environmental impacts at one trophic level whilst obtaining some form of benefit, generally nutritional, at the same time. Further research on the economic and environmental value is needed. Greenwave[8] is a US example where success has been achieved.	In theory, IMTA could be carried out onshore, within sheltered inshore waters or in fully offshore conditions. While this approach offers obvious benefits, to date, there have been few examples of commercial IMTA projects in the marine cultivation sector but there is potential, with some small-scale trails already underway in Dorset. Commercial upscaling is the next step.
Managed Several Orders	The Poole Harbour Several Order 2015, provides a model for aquaculture development where growers can develop businesses under sub-leases, but where one organisation takes responsibility for management and establishes a system of overall control. The benefit of a development led process, as opposed to a plan led process is that planning for wider environmental considerations can be taken in to account at a strategic level.	The Poole model demonstrates how aquaculture can grow and develop within marine protected areas without compromising the objectives of that area. Given that the Dorset coast has a high proportion of marine designations, replication of similar several orders controlled by Southern IFCA or other agencies could see expansion of production.
Landing and Processing Facilities	Any expansion of offshore mariculture whether it is for finfish, shellfish or seaweed will require the use of large specialised vessels. It will be important that these vessels can quickly access offshore sites for feeding, maintenance and harvesting etc. As such, local dockside facilities for the vessels and landing facilities for harvested product will be required.	The availability of these types of facilities will help to attract new entrants and investment. Dorset has ports that could accommodate such work vessels. With the expansion in production of other species, regardless of cultivation techniques it is likely that an associated expansion of processing facilities will be needed too. This could include depuration facilities or algal processing plants for example.

[6] www.asc-aqua.org/about-us
[7] www.bapcertification.org/WhatWeDo
[8] ww.greenwave.org/our-model

Onshore Mariculture

TYPE OF DEVELOPMENT	DETAIL	OPPORTUNITY FOR DORSET
Recirculation Aquaculture Systems (RAS)	Recirculation Aquaculture Systems (RAS) represent an emerging area of aquaculture. They utilise recent advances in technology to enable the growth of a variety of species in controlled environments. Typically, RAS rear the chosen species at high densities, indoors in tanks, where life support systems provide waste removal and temperature control. These systems significantly reduce water consumption by filtering and recirculating water which means the placement of such operations is flexible.	Land infrastructure and fully trained staff are required to operate these systems, but many species can be cultivated through RAS. The potential of finfish cultivation through the technology has already been researched and there is precedent for a potential land facility at Portland Port, depending on the operation.
Potential Onshore Sites	The planning and licensing requirements of establishing aquaculture operations at different sites is required. Within Portland Port there is an extensive shore-based area available with buildings that may be suitable for aquaculture.	The port currently houses one onshore aquaculture operation producing lumpfish and there is potential for more operators. The Port could provide an excellent location as it offers 24/7 security, is close to the sea for water extraction and benefits from berths and anchorages with Portland Harbour. There may also be development space available in Weymouth. County farm infrastructure could be repurposed for RAS usage.
Hybrid Facilities	The National Lobster Hatchery in Padstow Cornwall[9] is an example with fisheries enhancement as its main objective, although it also supports mariculture research with public exhibition and education/conference facilities – all on a small footprint. These types of hybrid schemes ensure economies of scale and provide more of an economically viable option when compared to a singular activity.	Key opportunities are: • An innovation hub where facilities, science, industry, education and tourism all intersect could be developed • A dual use facility (e.g. public aquarium exhibition and shellfish depuration) • Dual use facilities for the wild capture sector like cold storage or ice machines.

[9] www.nationallobsterhatchery.co.uk

Intertidal Mariculture

TYPE OF DEVELOPMENT	DETAIL	OPPORTUNITY FOR DORSET
Manila and Native Clam	Both these clam species can be grown intertidally, normally under mesh, and there have been previous trials in the south west e.g. Exe Estuary. However, as the Manila clam is a non-native species, it is unlikely that permission would be obtained for intertidal cultivation in areas of Dorset where it has not already naturalised.	The Manila clam *(Ruditapes philippinarum)*, whilst a non-native species, is the subject of a controlled fishery within Poole Harbour. The Native clam *(Ruditapes decussatus)* is not currently cultivated within Dorset waters.
Native Oyster *(Ostrea edulis)*	There is a market for the Native oyster and generally a price premium compared to the Pacific oyster although the grow-out time is considerably longer.	Successful cultivation of the Native Oyster in RAS while maintaining growth rates would be a key breakthrough for the species. However, consideration of disease control and economic return versus Pacific oyster cultivation is needed.

Inshore Mariculture

TYPE OF DEVELOPMENT	DETAIL	OPPORTUNITY FOR DORSET
Scallop Cultivation	The technology exists to cultivate scallops within inshore waters. Ear hanging on longlines has been suggested as one possible approach to help avoid the biofouling associated with lantern nets.	The economics of production of scallops would require careful consideration especially given the relatively high cost and scarcity of supply of seed at present. A combination of cultivation in lantern nets and then ranching on the seabed has been trialled previously in Scotland. Such an approach would require both a licensed aquaculture site and a Several Order.
Mussel Production	The technology is proven for rope cultivation of mussels although seed supply is sporadic. Mitigation for Harmful Algal Blooms (HABs) could be realised if a business had multiple sites for production around the South West.	Mussel production inshore could further be developed either by a new entrant to the sector or by existing stakeholders looking to expand production. Some small-scale trials have already been undertaken and have proved promising.
Barnacle Cultivation	Sites for harvesting or cultivation could be intertidal, inshore or offshore depending on the species of barnacle used. Intertidal sites could be existing fixed structures or settlement surfaces specifically set out to collect settling barnacles. Inshore or offshore, the equipment utilised is like that used for rope mussel cultivation.	There has been a recent interest in Dorset for new sites to cultivate barnacles for use as feed in larval finfish. Co-development of this species could be complimentary to rope grown bi-valves in an IMTA system.

Offshore Mariculture

TYPE OF DEVELOPMENT	DETAIL	OPPORTUNITY FOR DORSET
Seaweed Cultivation	The most commonly farmed seaweed species in the UK are *Saccharina latissima* (Sugar Kelp), *Laminaria digitata* (Oarweed), *Alaria esculenta* (Winged Kelp), *Palmaria palmata* (Dulse), *Laminaria hyperborea* (Tangle or Cuvie). Farming of seaweeds with a potential higher value and demand, such *Porphyra* (Laver) and *Osmundea pinnatifida* (Pepper Dulse), is still at the Research and Development stage.	There is potential for commercial cultivation in Dorset and small-scale trials have been successful. A recent review of suitable species and cultivation techniques specific to Dorset has been undertaken by Cefas. Market analysis for seaweed products from Dorset and how to grow these markets along with consumer familiarisation with seaweed products would help drive sales and industry growth.
Rope Mussel Production	Offshore rope cultivation of mussels has been proven in the South West of England and further expansion of production is possible.	Offshore farming can prove capital intensive and sites should be considered carefully in respect of location to suitable ports for service vessels. Dorset has many ports suitable for such vessels. A reliable supply of seed would help development.
Urchin Cultivation	Sea urchins are a regular by-catch from the rope mussel lines offshore in Devon. If mussel ropes are left in the water beyond two years then the urchins are market ready when the mussels are harvested.	Supply and quality are unpredictable, so, there could be potential to keep urchins as and when they come off the lines and then hold them in stock, perhaps using onshore tanks or baskets at sea. This could provide reliable supply to end users.
Diversification for Fishermen	Any expansion of offshore mariculture would require the availability of suitable vessels for routine husbandry, maintenance and harvesting. Whilst these vessels are likely to be of a specialist design there may still be a role for local fishing vessels to play in supporting these operations.	There is currently an active inshore fishing fleet operating within Dorset waters. It is possible that some of these fishermen may be willing to consider diversification into aquaculture. An example is the GreenWave IMTA approach from the eastern seaboard of the US which was designed with current and ex-commercial fishermen in mind and could be a type of model that could be considered for south west fishermen i.e. training in mariculture operations, supply of seeded seaweed ropes and shellfish seed and a for-profit co-operative purchasing, processing and distribution facility. In addition to a local fishing sector there are also a wide range of other skills that might be employed within an expansion of mariculture including boat builders, charter boats etc. This diversification and expansion of businesses could help increase job security and address the issues of high unemployment rates and a seasonal workforce in coastal communities.
Marine Finfish Farming	Large scale expansion of marine finfish farming in English waters will require large offshore developments which will need significant investment, high and stable prices of products, long-term security of tenure and a greater variety of species in order to make them a more viable option.	There could be scope for offshore finfish farming in English waters but to date offshore mariculture around the UK has been focussed more on shellfish cultivation.

Proposed Governance Structure for the Strategy

Good governance is essential to oversee the implementation of the strategy and ensure that sustainable growth and development are considered when exploring the different developments.

A Dorest Mariculture Delivery Group will be will be established and be made up of key organisations within aquaculture. An agreed Terms of Reference will be written to provide guidance on each representative's role in supporting and advising on strategy implementation.

Representatives on The Group include:

- industry representatives
- Research and science representatives
- Skills and training representatives
- Governance and management representatives
- Food and supply chain representatives
- Economic and strategic representatives

Photo ©Seafish

Strategy Action Points

The tables show a range of actions to explore aquaculture development in Dorset. These action points are meant to be explored in partnership by stakeholders of the aquaculture sector and related organisations.

Infrastructure Action Points

ACTION POINT	BRIEF EXPLANATION
Deliver an Aquaculture Innovation Centre in Dorset	An Aquaculture Innovation Centre would provide coordinated industry access to: • Technical and scientific solutions to technology development • Skilled workforce development • Appropriate land and sea development space • Supported problem solving • Commercial sustainable aquaculture expertise • Policy and planning expertise • The latest research information and a range of specific aquaculture testing facilities • Aquaculture Industry and academic showcases • The national and international aquaculture arena • An area of collaborative working for industry across the South West It should also be noted that the draft English Aquaculture Plan (Ref: 2012) recommended the establishment of both an English Institute of Aquaculture and a National Aquaculture Technology Training Centre and a local or regional hub could feed into these recommendations.
Identify and deliver Digital Infrastructure	With the roll out of 5G mobile networks, the increased availability of technology and its reducing costs, there is the opportunity to develop Smart technology to help improve efficiency, reliability and help with monitoring and evaluation of techniques. It could also help improve water quality sampling processes; for example, a remote sensing network could be used to monitor water quality at existing farm sites and more generally across the coast. The Internet of Things (IoT) could also be used to the advantage of the industry with introduction of "smart" equipment. The use of Smart technology in aquaculture is in its infancy but there is an opportunity for Dorset to be at the forefront of this roll out although network signal around the coast needs to improve to provide reliability.
Investigate the **potential** for the development of communal depuration, processing and hygiene testing facilities at sites in Dorset.	Although initial ideas have been suggested for communal facilities, further exploration of the requirements, costs, how it could operate and the level of industry support for communal facilities is required. The provision of dockside and landing facilities for offshore mariculture have been raised. There also exists the potential to consider communal facilities for depuration of shellfish, processing of aquaculture produce and hygiene testing. New accredited technology for hygiene testing, such as impedance, would make this type of positive release possible and would be of great benefit for any moves towards a risk-based management approach to shellfish Classification, harvesting and dispatch. In practice communal facilities might be difficult to implement in a competitive market and there would need to be further investigation as to whether it would be economically viable or if any additional frameworks would need to be set up such as Community Interest Companies.

Research and Innovation Action Points

ACTION POINT	BRIEF EXPLANATION
Explore new markets and increase demand through supply chain studies, promotion of the sector and exploring the seed supply chain and hatcheries.	Three key aspects to achieving this are: • Collaboration between research, marketing and industry to fully investigate and realise the potential of new markets and species. This links to new technologies and investment. • Investigate the seed supply chain and hatcheries to strengthen the supply chain • Increase demand throughout the supply chain which will require education and knowledge within the seafood industry but ultimately within the general public and schools through education and promotion.
Support new technologies for the sector through research and investment	Research and innovation require investment if new technologies are to be trailed and tested. This links to the industry support work, the innovation hub and the rollout of Digital Infrastructure. Working with universities and science and research organisations would be one way of linking the industry with the necessary counterparts to develop new technologies and trail them.
Increase technology, innovation and collaboration around water quality	Water quality is a key factor in the success of the industry and so working together across organisations could be one way of enabling the development of preventative and mitigation measures and more accurate testing. The development of novel tests and new technologies to monitor water quality could provide the sector with confidence to expand production with reduced risks of shellfish bed closures due to poor water quality.
Establish branding for Dorset or SW aquaculture	Developing a brand for products that are cultivated in Dorset or the wider South West would require industry support and recognition throughout the supply chain. There are existing certifications and initiatives for seafood that the branding would not seek to replicate but additional roll out of complementary branding could help strengthen the supply chain. Branding specifically for aquaculture products rather than all Dorset fisheries products would be easier to provide provenance for as IVMS is not yet mandatory on fishing vessels but public perception of the distinction between wild capture and farmed products may influence whether a holistic brand would be more beneficial.
Undertake baseline studies and monitoring	With the emphasis on sustainable aquaculture, there will need to be baseline studies available in which to monitor the impacts of any developments along the coast both economically, socially and environmentally. The positive and negative impacts of different farming methods are variable and therefore in order to get a better understanding a collective effort would be needed to gather baseline data and continue to monitor the impacts. Environmental licensing may be required for certain practices and methods which might account for some impacts however a report into the likely impacts and how these can be monitored for different species/methods could be collated.

Research and Innovation Action Points

ACTION POINT	BRIEF EXPLANATION
Work with schools and Public Health Dorset to promote seafood as part of a healthy diet and lifestyle	A central weakness that has been highlighted for the seafood sector in the UK is low domestic demand. There are several national and local initiatives (e.g. Seafish and their Seafood Week campaign; Dorset Seafood Festival) to help promote seafood consumption. However, at present much of UK seafood is still exported to overseas markets such as Europe and, more recently, Asia. There is a need to try and increase the public's awareness of UK seafood, including the health and wellbeing benefits, ecosystem benefits as well as introducing younger consumers to seafood. Linking in with local and national efforts to help address may help address this is Dorset. For example, education and training programmes exist across Dorset but further rollout could be explored. Schemes such as procurement of local seafood for use in school meals could be developed alongside working with Dorset Public Health could promote the health benefits to a wider audience.
Develop the concept of Aquaculture Park areas in Dorset	Explore the concept of an 'Aquaculture Park'. This is where there might be a working arrangement where a main marine stakeholder is granted or has the licence/ ability to undertake a secondary co-location activity, such as mariculture, within the spatial footprint of their site. They would also have the right to sub-let the licensed areas for co-location activities to selected partner organisations, such as aquaculture producers. The Aquaculture Park concept envisages that the main stakeholder will supply services to those partner organisations to help maintain a degree of control over partner activities. Services might include supply of production equipment; hire facility for support vessels; co-operative onshore facilities through to central administration of licensing, permissions, Classifications etc. The advantage to industry of the Aquaculture Park concept is that start-up costs and times are greatly reduced, and overhead costs may also be reduced depending on the services provided. This may help to increase investor confidence that a commercial return can be made on investments into the aquaculture sector and could help Industry to more easily access finance.

Industry Support Action Points

ACTION POINT	BRIEF EXPLANATION	
Further develop local collaboration	Marine Plans are a statutory planning tool which the Marine Management Organisation have responsibility for. The South Plan should be used for all planning decisions and help ensure that the right activities happen in the right place within the marine environment. Nationally the MMO and CEFAS have identified areas of aquaculture potential in English waters based on environmental variables and constraints, but the plans did recommend that localised investigations needed to be done. CEFAS have mapped some local areas to look at potential for development which included stakeholder engagement with marine users however this work needs to be expanded to whole of Dorset and there is potential for this work to look more deeply and widely at the interactions and intersection. Such work might help to further increase understanding of the constraints and impacts around development. However, in creating a mariculture strategy, there has been concern from stakeholders of the wider marine environment about the competition for space in particular from the wild capture sector, tourism and recreation industry and conservation sector. The Southern IFCA have management plans such as the Poole Harbour Shellfish Management Plan and it has created fisheries management plans for specific MPAs. These plans work in partnership to engage stakeholders and secure the right balance between social, environmental and economic benefits to ensure healthy seas, sustainable fisheries and a viable industry. There are so many different variables depending upon the intended method of cultivation, species and site selection that a blanket proposal or document would be extremely difficult to produce. However, when developments are proposed or stakeholders raise questions, facilitation of the application to increase understanding of the requirements of the specific development across sectors may prove beneficial. Documents such as the Poole Harbour Management Plan and the Dorset Aquaculture Virtual Aquaculture Hub[10] demonstrate the requirements of applicants. A key contact liaising with Agencies and Authorities on behalf of applicants could smooth the whole application process for new developments.	
Provide support to industry with through the Aquaculture Development Officer role	This role will continue to: • Provide advice, information and support to the industry • Act a key point of contact • Work in partnership across the sector to provide links, connections and advice for project development • Promote the sector at a local, regional and national scale • Help write funding bids and increase investment into the sector • Identify opportunities • Develop and run working groups or issue specific groups for the industry and other stakeholders	• Work to signpost to relevant regulators and organisations • Build relationships between aquaculture and other sectors • Promote and update the Virtual Hub • Provide ongoing stakeholder engagement, collaboration and information dissemination across all marine users and sectors. • Support and promote the High Potential Opportunity. The Department of International Trade (DIT) High Potential Opportunity (HPO) for aquaculture in Dorset is intended to help attract Foreign Direct Investment (FDI). It is important that Dorset continues to actively market and promote its strengths to overseas investors.
Promote the Aquaculture Virtual Hub to industry	The Aquaculture Virtual Hub is a resource for the industry for signposting and facilitation for information, advice, investment and funding for the industry. It has been built around the aquaculture mapping that is being produced by Cefas as part of a FLAG funded project to highlight aquaculture opportunities within the Dorset and East Devon area. To be effective, the mapping output will require feedback and periodic updates. The Virtual Hub has a feedback option on the mapping output that will help to inform future updates and revisions of the maps.	

[10] www.dorsetaquaculture.co.uk

Training and Skills Action Points

ACTION POINT	BRIEF EXPLANATION
Establish an aquaculture Apprenticeship Scheme and courses linked to the sector	A skilled workforce is essential if the sector is to develop further. Ensuring that Dorset has a pool of skilled employees would be a great benefit to the sector and for future investment. Many courses already exist through Seafish Training Centre and there are mobile industry trainers however new courses could be established or modules within existing courses be modified to suit the industry. A new Aquaculture course is being run by Kingston Maurward College in 2020 but this could also be expanded through the development of an aquaculture apprenticeship scheme and other practical training.
Establish an industry and education working group	Setting up a sub-group for the training and skills priority of the strategy would ensure that the correct key stakeholders from industry and the education sector are able to work together to ensure we have a skilled workforce.

Appendix 1

Licensing, Regulation and key organisations involved in aquaculture

Licensing and regulation of aquaculture operations can be tricky to understand as, depending on what the operation is, there could be many organisations involved in setting up and monitoring. Below is a list of organisations who are involved in regulation, provide an advisory function or grant licenses, rights and permits in relation to aquaculture. Who operators deal with will depend on the nature of their business.

Department for Environment Farming and Rural Affairs (Defra)

Defra is the UK government department responsible for policy and regulations on the environment, food and rural affairs. They provide government mechanisms (funding), regulations and initiatives (planning) which provide support to the industry. They have produced the 2015 Sustainable Aquaculture Multi Annual National Plan and the 2012 Planning for sustainable growth in the English Aquaculture Industry.

Marine Management Organisation (MMO)

The MMO license, regulate and plan marine activities in the seas around England so they're carried out in a sustainable way. This includes aquaculture development. They have produced the South Marine Plans which aim to balance the activities of marine users. The MMO is the licensing authority for England which includes any aquaculture activity that requires a license. The Marine Information System has been created for public authorities to industry applicants. Find out more about Marine Planning in England. The MMO, in partnership with Cefas and Crown Estate, have identified areas of aquaculture potential in English waters based on environmental variables and technical constraints. This could be used in conjunction with the marine planning process which would identify other activities and services existing in the area. One of the recommendations from the report is for more localised mapping of those potential areas to be done.

Centre for Environment Fisheries and Aquaculture Science (Cefas)

Cefas collects manages and interprets data on the aquatic environment, biodiversity and fisheries. They advise Defra and other public and private sector customers on issues connected to the aquatic environment. Cefas created the Aquaculture Regulatory Toolbox for England which provides guidance on regulatory issues for aquaculture businesses and regulators.

Fish Health Inspectorate

The FHI inspect fish and shellfish farms and investigate serious outbreaks of disease in both farms and the wild. They publish the application forms to apply to run a fish or a shellfish farm, move live fish, shellfish or salamanders, or hold non-native species.

Southern Inshore Fisheries and Conservation Authority (SIFCA)

Inshore Fisheries and Conservation Authorities (IFCAs) lead, champion and manage a sustainable marine environment and inshore fisheries, by successfully securing the right balance between social, environmental and economic benefits to ensure healthy seas, sustainable fisheries and a viable industry. Southern IFCA manages the coastal fisheries of Hampshire, Dorset and the Isle of Wight. IFCAs must manage the exploitation (whether commercial or otherwise) of sea fisheries resources in their districts and also have a statutory duty to ensure that the conservation objectives of Marine Protected Areas (MPAs) in their districts are furthered. If an IFCA assesses that a private or several fishery (including aquaculture) in its district is or will damage an MPA then it is the IFCA's responsibility to ensure that the site is managed to ensure compliance with the Habitats Directive. This can include making byelaws to manage restrict several or private fishery rights, if the right is being exercised in relation to an MPA. Further information can be found here: www.southern-ifca.gov.uk.

Appendix 1

Seafish

Seafish was set up to support the UK seafood industry. It supports the aquaculture industry through initiatives to expand the sector, providing guidance on interpreting and adhering to regulations and supporting access to farmed seafood products outside of the UK. Seafood 2040 is a collaborative project that includes a priority to grow a sustainable aquaculture sector by establishing an Industry- Government English Aquaculture Leadership Group.

Crown Estate

The Crown Estate manages half of the foreshore around England and lease and licence tidal land and seabeds. It also leases land for aquaculture and other coastal development projects.

Local Authorities

In Dorset, Dorset Council (DC) and Bournemouth Christchurch and Poole Council (BCP) are responsible for granting planning permission for land based fish farms and are a consultee for marine based aquaculture developments licensing and planning permissions. The Food, Safety and Port Health within each authority protects public health, primarily, by ensuring that food is safe to eat and therefore plays a role in local aquaculture. It has responsibilities in relation to classifying shellfish beds including applications, sampling, monitoring, inspection and traceability of products. The department also has regulation duties in relation to pollution events, food hygiene, enforcement and provide export certification for exports (subject to EU negotiations).

Environment Agency

The Environment Agency protect and improve the environment. In relation to aquaculture their responsibilities are to assess and issue licenses for waste and veterinary discharge, abstraction and discharges licenses. The Agency delivers water quality objectives for protected shellfish growing waters.

Food Standards Agency

The Food Standards Agency is responsible for food safety and food hygiene. The Agency is responsible for decisions in relation to classification and official control monitoring of shellfish. It can offer advice on closure and re-opening of shellfish production and relay areas.

Natural England

Natural England are an advisory body to the government for the natural environment and help to protect England's nature and landscapes for people to enjoy and for the services they provide - which includes MPAs. They advise on planning applications or licensing for aquaculture operations.

Appendix 2: SWOT analysis of the Dorset Marine Mariculture sector

This SWOT analysis of the Dorset Mariculture sector was undertaken during numerous workshops throughout 2018/19.

STRENGTHS

COMMON TO ALL MARICULTURE LOCATIONS

- Dorset can fulfil the environmental criteria demanded by international certification schemes
- Generally good seawater quality (RAS is controlled for this factor)
- Local markets for most products (excluding lumpfish)
- General momentum and political will amongst industry stakeholders to address challenges and explore opportunities

ONSHORE MARICULTURE

- Potential availability of agricultural buildings that could be switched to RAS use
- Availability of shoreside areas within Portland Port with associated buildings

INSHORE MARICULTURE

- Availability of aquaculture zones within Portland Harbour
- Existing mature aquaculture businesses
- Eco-harvesting techniques employed in Poole Harbour
- Large commercial scale production of Pacific oysters in Poole Harbour with overseas exports
- Pacific oyster seed is available from France at a lower cost for some areas where disease status is the same as France
- Poole Harbour Several Order, 2015
- Marine designations could be a strength in terms of biodiversity, product quality and marketing of products as seen in the Lyme Bay Reserve

OFFSHORE MARICULTURE

- Nearby sites have proved suitable for offshore shellfish cultivation
- Technology and expertise now exist for offshore aquaculture
- Shore-based docking and landing facilities for large vessels

WEAKNESSES

COMMON TO ALL MARICULTURE LOCATIONS

- Low demand on the home market for seafood
- Regulatory resource
- Complex licensing and permissions processes
- Planning environment
- Access to finance or capital – especially with offshore aquaculture where initial capital costs of setting up will be high
- Labour pool for processing can be limited

INTERTIDAL MARICULTURE

- Delay in release of a finalised Government policy regarding the status and treatment of Pacific oysters for aquaculture in England
- Competition for space in intertidal areas resulting in a lack of new sites for intertidal aquaculture Labour pool for processing can be limited

INSHORE MARICULTURE

- Regulations/permissions within ports and harbours can cause delays in obtaining licences
- Water quality
- Competition for space with other marine users
- Lack of space for expansion
- Commercial shipping can pose a risk to aquaculture infrastructure

OFFSHORE MARICULTURE

- Poorly understood economics of large-scale seaweed farming
- Lack of food hygiene information with respect to seaweeds
- Perception that MPAs will impose restrictions on aquaculture operations
- No long-term security of tenure for marine leases makes financing difficult
- Coincidence of important fishing areas with potential aquaculture production areas poorly understood

Appendix 2: SWOT analysis of the Dorset Marine Mariculture sector

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OPPORTUNITIES

COMMON TO ALL MARICULTURE LOCATIONS

- Brexit (e.g. new trade/market opportunities)
- Encourage consumption within Dorset e.g. through school meals
- New species
- Certification or accreditation of products
- Raise awareness of how aquaculture can develop sustainably whilst meeting conservation objectives in the marine environment
- Work to have a positive synergy between aquaculture and the marine environment by aiming to provide ecosystem services such as carbon sinks, habitat restoration, increased resilience and biodiversity and reducing pressure on wild stocks

ONSHORE MARICULTURE

- Facilitate planning for change of use of agricultural buildings to use with RAS
- Diversification for agriculture
- Possible use of 'waste' energy from agriculture to heat water
- Foreign Direct Investment (FDI) through mechanisms such as the HPO
- New investment sources such as fund-based investment

INTERTIDAL MARICULTURE

- Depuration for norovirus
- Move to a risk-based management system for Classification of shellfish
- Expansion of existing Pacific oyster production
- Aquaculture processes can improve water quality, development of certain farming methods can be used to offset effects of, for example nitrogen and phosphorus.

INSHORE MARICULTURE

- Move to a risk-based management system for Classification of shellfish
- Increased supply to overseas markets
- Co-location
- Multi-species aquaculture
- Development of commercial scale seaweed aquaculture
- Subtidal shellfish cultivation including mussels and oysters
- Cooperative processing facilities
- Creation of additional lease beds in Poole Harbour under Southern IFCA management
- Lease bed realignment in Poole
- Assessment of ecosystem service benefits of shellfish production to support catchment-based initiatives
- Systematic assessment of seed mussel resources

OFFSHORE MARICULTURE

- Move to a risk-based management system for Classification of shellfish
- Large-scale shellfish & seaweed production
- Co-location
- Potential to attract new FDI and fund-based investment, possibly based on environmental credentials of the sector e.g. Environment Finance
- Use of new remote sensing technology for water quality, HABs etc.
- Offshore relay areas
- Diversification for fishermen e.g. GreenWave project
- Potential to exploit natural mussel seed resources for relaying

THREATS

COMMON TO ALL MARICULTURE LOCATIONS

- Brexit (e.g. tariffs; restrictions on movements of goods)

INTERTIDAL MARICULTURE

- Norovirus in shellfish / lack of reliable test for viability / infectivity levels are unknown
- Climate change and warming waters could lead to new hygiene threats e.g. from *Vibrio* species bacteria.
- Oyster herpes virus in some Dorset sites (although this can result in lower seed costs with imported seed)
- Water quality effected by agricultural practice and adequacy of water treatment processes.

INSHORE MARICULTURE

- Norovirus in shellfish / lack of reliable test for viability / infectivity levels are unknown
- Delays in receiving export licences
- Climate change and warming waters could lead to new hygiene threats e.g. from *Vibrio* species bacteria
- Local periodic water quality issues associated with inadequate storm water storage e.g. Poole Harbour
- Lack of access to seed mussel resources

OFFSHORE MARICULTURE

- Occasional unexplained poor water quality results
- Competition for the marine space resource
- Damage to equipment caused by other marine users
- Security of stock
- Opposition to new sites by other marine stakeholders
- No legislative requirement to consider co-location in new offshore renewable energy developments before licences are issued

Dorset & East Devon

Aquaculture