BLUE ECONOMY
COOPERATIVE RESEARCH CENTRE

SeaFisher – Novel Offshore Fish Pen Design

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Australian Government
Department of Industry, Science and Resources
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Moving Fish Farms to Offshore Sites

Offshore fish farming offers more sea space, better water quality, better waste dilution and dispersion, reduced risk of fish disease and parasites. However, offshore fish pens have to withstand very energetic sea environments during storms, and are expensive to build and maintain. Existing offshore fish pens - Ocean Farm 1 and Havfarm 1 cost more than USD 100 million.

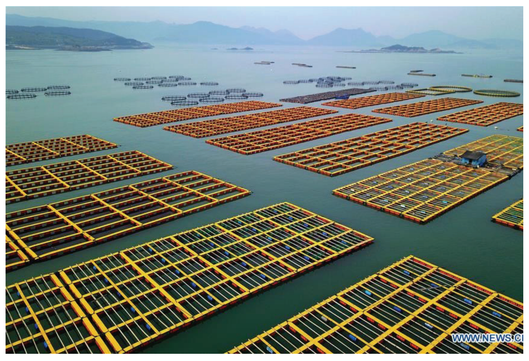

Figure 1. Crowded nearshore fish farms

Figure 2. Offshore fish pen – Havfarm 1

Our SeaFisher Design

Modularity: Frame structure is formed from assembling cubic pens of 20m length furnishing a 2xn array of pens. This modular design allows for different cultured water volumes for fish production. The frame members are constructed from bundling four lightweight High-Density Polyethylene (HDPE) pipes. The HDPE pipes are held together by pipe bundling brackets and joined together using connector pods. The HDPE material provides flexibility to dissipate wave and current energies and is very durable against sea environment and UV light. As HDPE is lighter than seawater, the pipes are filled with seawater and the bottom pipes filled with sand to keep the SeaFisher in the water.

Stiffening and Stability: Diagrid Glass Fibre Reinforced Polymer (GFRP) rods are used to stiffen and provide stability to the pen frame panel. Kikkonet is adopted for the pen net as it has relatively high stiffness and good anti-biofouling properties.

Bow Shield: The SeaFisher is protected from floating debris and strong surface waves by a bow shield comprising HDPE mats supported by HDPE truss members.

Submersible: The SeaFisher fish pen can be submerged to a depth of 20-30m below the water surface to avoid strong surface waves (design wave: H_S = 8m and T_P = 12s) and protect the fish during storms. Vertical aluminum ballast tanks and depth control buoys allow the fish pen to be lowered to the desired water depth or raised to the surface in an even keel manner. The buoys are spaced 40m apart and are connected to the SeaFisher by extensible cords with weights at the bottom ends. They are also connected to one another by a longitudinal inextensible cord to keep them in place.

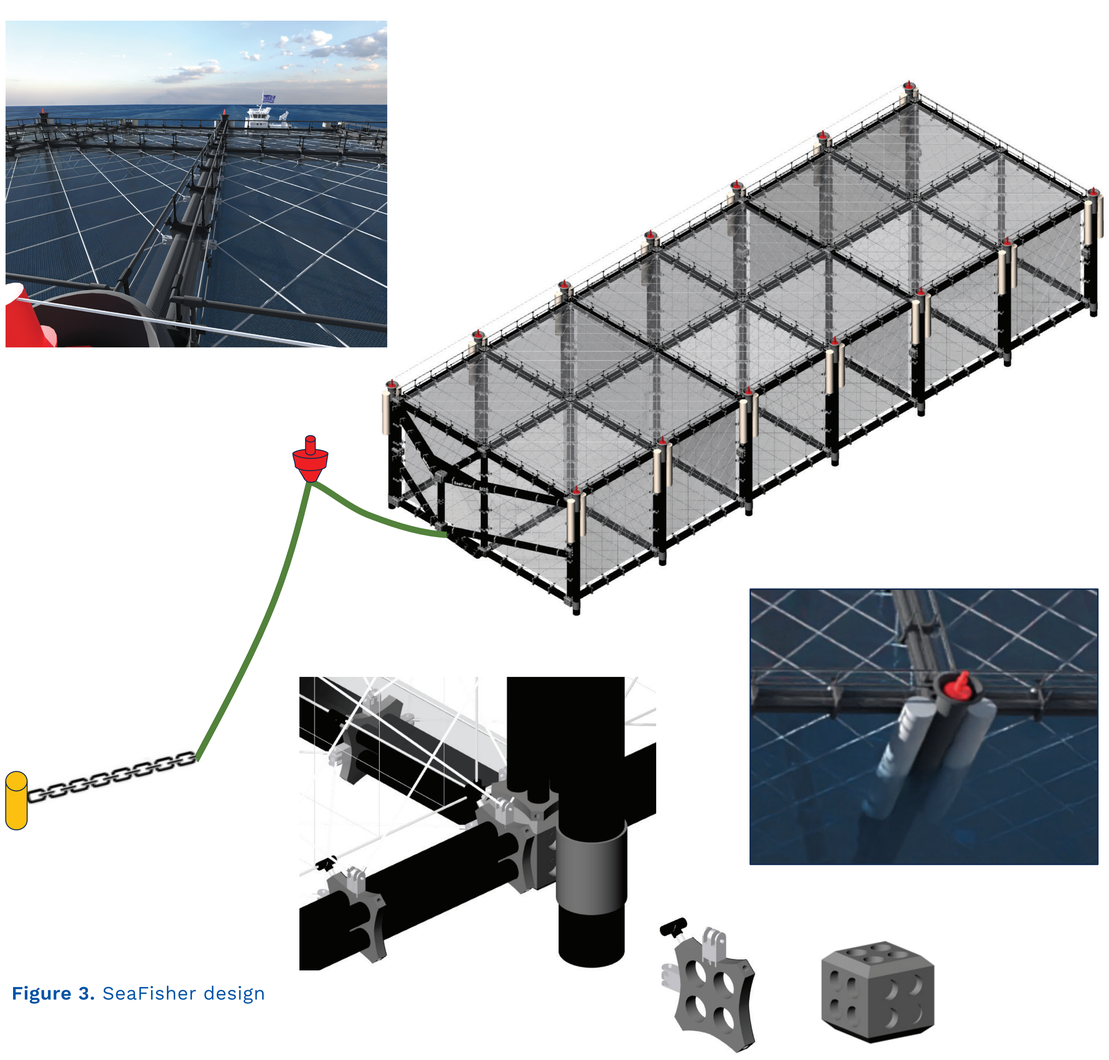

Figure 3. SeaFisher design

Single Point Mooring: A single point mooring system is adopted so that the SeaFisher can weathervane to reduce environmental loads on the structure and mooring lines. Additionally, it helps in waste dispersion and minimises the mooring benthic footprint. The mooring system comprises a hawser, a buoy, a studlink and a suction anchor.

Cost Effective: Capital costs for Ocean Farm 1 and Havfarm 1 are about A$130 million and A$180 million, respectively. The estimated capital cost for the SeaFisher design is about A$8 million, including main structure and the mooring system. Comparing the CAPEX divided by farming capacity, SeaFisher is 6.5 and 11 times cheaper than that of Ocean Farm 1 and Havfarm 1 respectively.

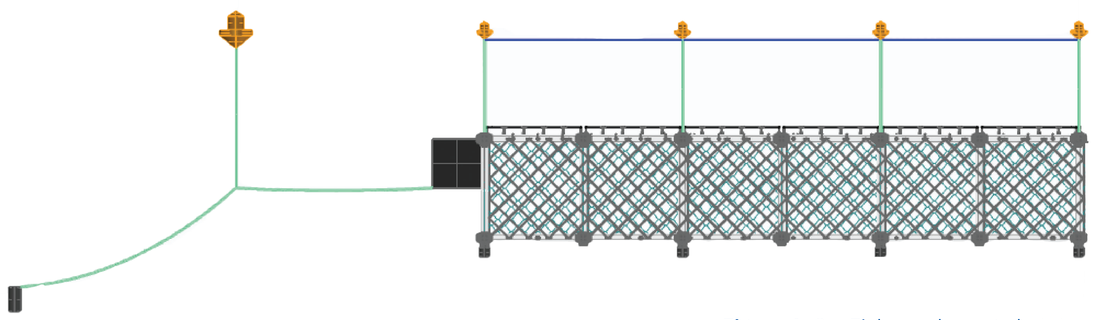

Figure 4. SeaFisher submerged state

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