Changing forms of fish farming

Crab farming in Bangladesh

In south-west Bangladesh, large areas of farmland are regularly submerged in salty water; many farmers have taken up crab farming after struggling to grow rice. The financial returns are so good that some farmers are contemplating carrying on with crab farming even if their land becomes suitable for growing rice and other crops one day.

Land is regularly flooded in the monsoon season and by the tropical cyclones that blight the area, such as Cyclone Aila in May 2009. At less than a metre above sea level, south-west Bangladesh is vulnerable to tidal surges and Aila broke the embankments that protected the land from the influx of sea water. A year-and-a-half later, water still seeps in during high tide and floods acres of farmland. Regular inundation with saltwater makes the land unsuitable for growing crops.

The non-governmental organization BRAC has been helping with relief and rehabilitation work in the area. Crab farming has enabled many farmers to provide new homes for their families. Rather than providing aid, BRAC gave farmers money to buy small crabs, fatten them up and sell them back for export to countries such as Taiwan, Malaysia, and Singapore. To grow on a crab to saleable size takes just 15–20 days. Some crabs can grow as heavy as 4 kg and fetch up to $5 each.

Most of the Bangladeshi farmers are Muslims, whereas crab farming is traditionally a Hindu occupation because most crab consumption is by Hindus. However, although many Muslims do not eat crab, it is not a banned meat in Islam.

This shows that when land becomes unsuitable to grow crops, it can be used in other ways. For south-west Bangladesh, crab farming has had a clear economic benefit. Moreover, the environmental impact of crab farming is limited. Crabs feed on small fish, they consume very little, and no other chemicals are added. Each crab is allowed a maximum of 10g of fish daily, otherwise it will overeat.

Fishing down the food chain

A study by Villy Christensen from the University of British Columbia’s Fisheries Centre has shown that populations of predator fish at the top of the food chain, such as cod, tuna, and groupers, have suffered huge declines, shrinking by around two-thirds in the past 100 years. Over half of this decline has occurred in the past 40 years.

There are always far fewer top predators than the prey they forage on because only about 10 per cent of the energy entering any trophic level is available to the next trophic level. The other 90 per cent of the energy is either used up in life processes or lost as heat. The first and second laws of thermodynamics explain this in more detail.

Christensen has shown that the total stock of ‘forage fish’, such as sardines and anchovy, has more than doubled over the past century. These are fish that are normally eaten by the top predators. As commercial fishing of these predators has increased and removed large numbers of the big, predatory species from the ocean, small forage fish have been left to thrive.

He calls for consumers to shift their attention down the marine food chain from predators like tuna and cod to eat more of the burgeoning population of forage fish such as coley, mackerel, dab, pouting, herring, and sardines in order to rebalance the world’s fish species.

The vast majority of forage fish that are being caught are used inefficiently in fish farms, to feed salmon, for example. Forage fish are also turned into fishmeal and fish oil and used in the aquaculture industry, which is in turn becoming increasingly reliant on this feed source.

The rise in wild forage fish populations has knock-on effects on marine ecosystems. These fish eat more of the zooplankton in the oceans, which means that the next stage down the food chain – the plant plankton normally consumed by the zooplankton – increases rapidly (blooms). This can produce anaerobic conditions (low oxygen levels) and thus a decline in biodiversity. There are clear examples of this in the Black Sea.

Questions

**1** What is the problem with the land in south-west Bangladesh? *[1 mark]*

**2** How long does it take to get an economic return from crabs? *[1 mark]*

**3** How much can a crab sell for? *[1 mark]*

**4** Which religious group is associated with the consumption of crab? *[1 mark]*

**5** Can Muslims eat crab? *[1 mark]*

**6** Why are there fewer predatory fish than forage fish? *[2 marks]*

**7** Suggest why too many foragers may pose a problem. *[2 marks]*

**8** What are forage fish mainly used for? *[3 marks]*