Exercise walk-through

# 4.3
# Aquatic food production systems

International Baccalaureate · IB Diploma · Environmental Systems and Societies · HL

# Aquatic food webs and demand

## Producers to consumers

Phytoplankton, aquatic plants and algae support food webs.

People eat lotus rhizomes, kelp, carp, shellfish and marine fish.

## Pressure pathways

Demand reflects population, culture, income and trade.

Bottom trawling, ghost nets, **bycatch**, poisons and explosives affect different organisms.

# Compare farmed-food systems

## Possible gains

More controllable food production and employment.

Potential to reduce pressure on some wild stocks.

## System costs and limits

Feed substitution can move impacts onto land.

Seaweed uses dissolved nutrients; filter-feeders remove particles; capacity is finite.

# AHL: Model replacement cautiously

1. **Invented logistic stock.** K=1000 tonnes, r=0.4 per year, N=500 tonnes.
2. **Net production.** $rN(1-N/K)=0.4\times500\times0.5=100$ tonnes/year.
3. **Precaution.** Survey uncertainty, changing recruitment and unreported catch make an exact maximum risky.

## Decision

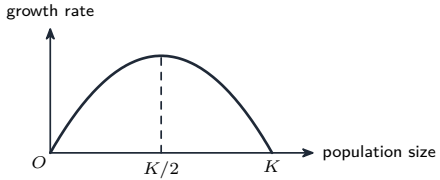
Catch per effort can be distorted by technology or aggregation; combine independent evidence.

# Exercises 2.1·2.2

**2.1** Explain why the open ocean fishery is called a “commons”. [2]




**2.2** Use the MSY graph. (i) State the population size at which MSY is taken. (ii) Explain why catching more than the MSY each year causes the catch to fall later. [3]



# Exercises 2.1·2.2

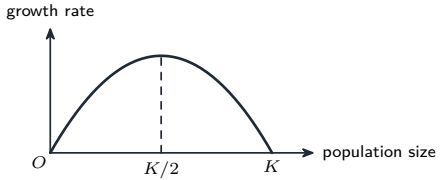
**2.1** Explain why the open ocean fishery is called a “commons”. [2]




**2.1**

it is shared and owned by no one, so access is open to all; each fisher gains by catching more, while the loss of stock is shared, so overfishing results

**2.2** Use the MSY graph. (i) State the population size at which MSY is taken. (ii) Explain why catching more than the MSY each year causes the catch to fall later. [3]



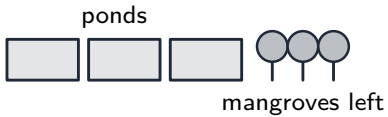

**2.2**

(i) about half the carrying capacity, $K/2$; (ii) catch above MSY is larger than the yearly growth, so the stock falls; a smaller stock produces fewer young, so the growth and the possible catch fall further

exercises.lol exercises.com.cn

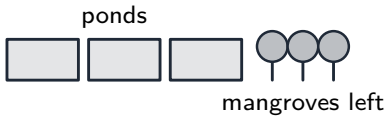
# Exercise 2.3

**2.3** Explain **three** environmental impacts of farming shrimp in coastal ponds. [3]



# Exercise 2.3

**2.3** Explain **three** environmental impacts of farming shrimp in coastal ponds. [3]



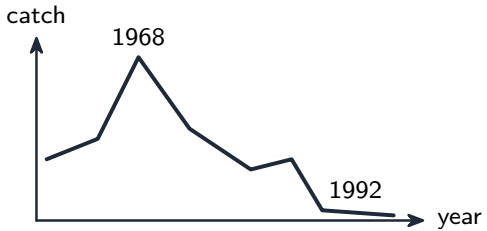

**2.3**

mangroves are cleared, removing nursery habitat and coastal protection; waste, food and chemicals flow out and cause eutrophication; disease and antibiotics spread to wild populations / feed uses wild-caught fish

# Exercise 3.1 (a)

**3.1** The graph shows the cod catch off Newfoundland, Canada.

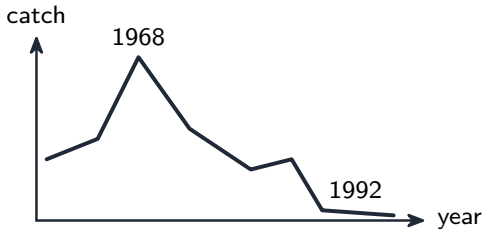
(a) Describe the trend in the catch. [2]



# Exercise 3.1 (a)

**3.1** The graph shows the cod catch off Newfoundland, Canada.

(a) Describe the trend in the catch. [2]




(a) catches rose to a peak in the late 1960s, fell, then collapsed to almost zero by the early 1990s

# Exercise 3.1 (b)

**3.1** The graph shows the cod catch off Newfoundland, Canada.

(b) Explain why the stock has recovered only slowly since fishing stopped in 1992. [2]

# Exercise 3.1 (b)

**3.1** The graph shows the cod catch off Newfoundland, Canada.

(b) Explain why the stock has recovered only slowly since fishing stopped in 1992. [2]

(b) the remaining population was very small, with few large breeding adults; the ecosystem changed: other species and predators took cod's place, and bycatch and cold water also slowed recovery

# Exercise 3.2 (a)

**3.2** A government wants to protect a declining fishery.

(a) Explain how **two** management methods would help the stock recover. [4]



# Exercise 3.2 (a)

**3.2** A government wants to protect a declining fishery.

(a) Explain how **two** management methods would help the stock recover. [4]




(a) any two, each explained: quotas keep the catch below the yearly growth; a larger mesh size lets young fish escape and breed; a closed season or area protects spawning fish

# Exercise 3.2 (b)

**3.2** A government wants to protect a declining fishery.

(b) Suggest **one** reason why fishers may not follow the rules. [1]

# Exercise 3.2 (b)

**3.2** A government wants to protect a declining fishery.

(b) Suggest **one** reason why fishers may not follow the rules. [1]

(b) loss of income or jobs / weak enforcement at sea / other countries keep fishing

# Exercise 3.3

**3.3** Some environmental groups say “eat farmed fish to save the oceans”.

Evaluate this advice. [4]



# Exercise 3.3

**3.3** Some environmental groups say “eat farmed fish to save the oceans”.

Evaluate this advice. [4]




**3.3**

award up to [4]: for: farming adds supply without catching wild stocks; herbivorous species such as carp or tilapia need little fish feed; against: carnivorous farmed fish (salmon) are fed fishmeal from wild fish; pollution, disease and escapes harm wild populations, and coastal habitats may be lost; conclusion: true for some species and well-run farms, not for all