Economics in Fisheries Management

LPWM2005 Fisheries Management

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Lecture 1. The bioeconomic model (PowerPoint)

The University of Queensland, 16 August, 2011

Accessing Notes to slides in pdf

1. Go to left hand bar, click on the ‘Layers’ icon (third from top);
2. Activate the ‘Presentation notes’ box;
3. To read Note, put cursor over ‘speech’ icon when it appears in top left corner of the slide.

Biological growth curve

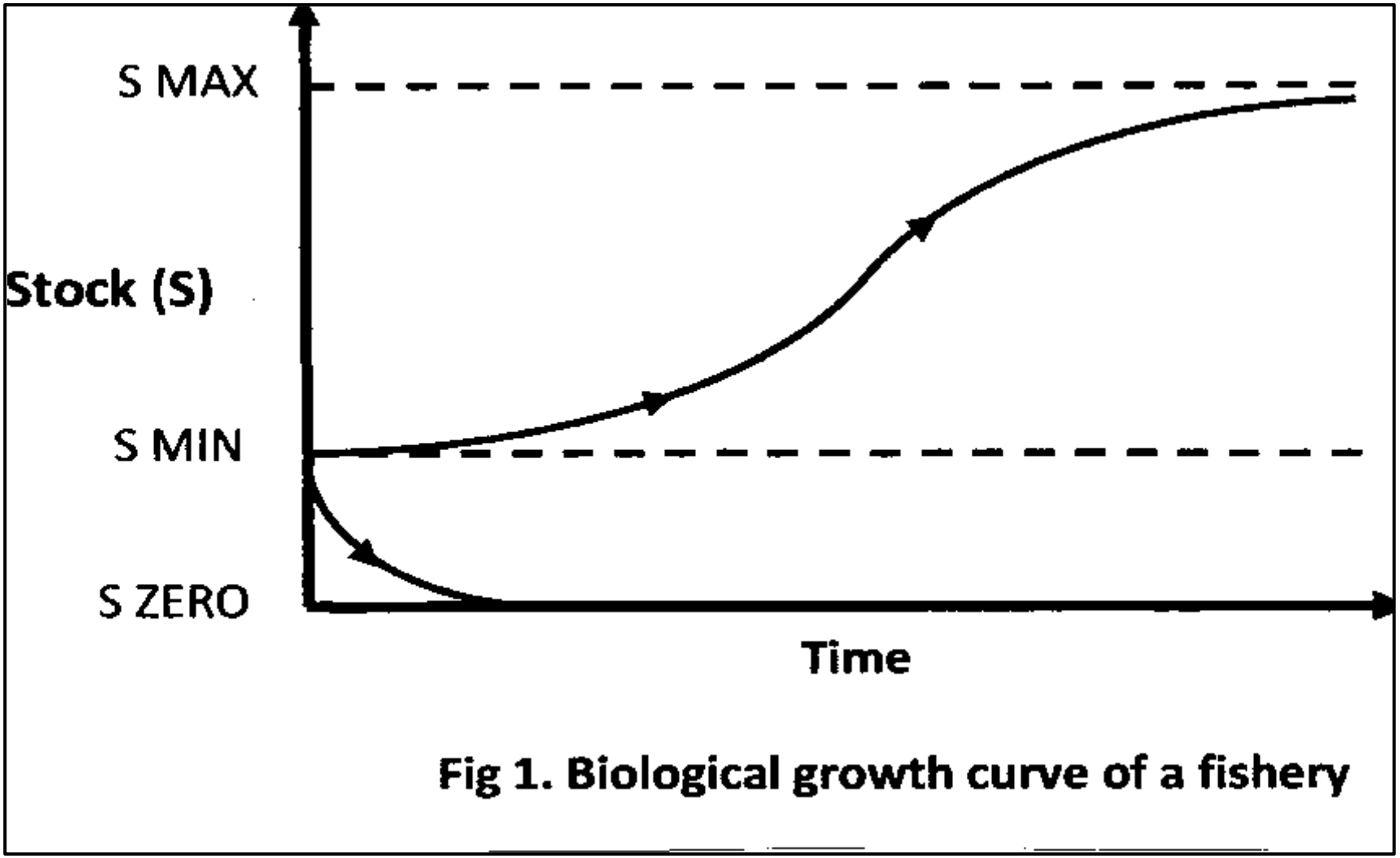


Fig 1. Biological growth curve of a fishery

Growth function and MSY

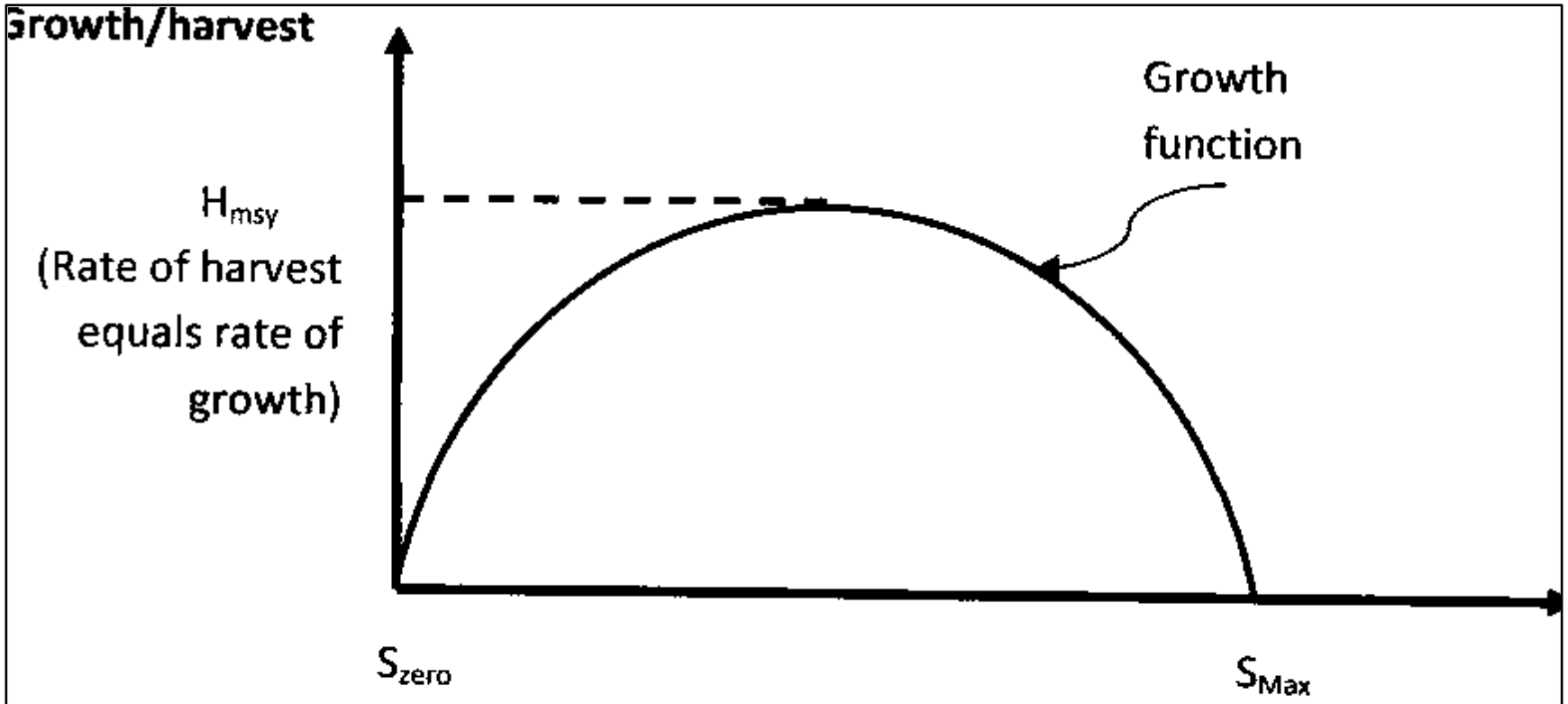


Fig 2. Growth in a fish stock

Overfishing

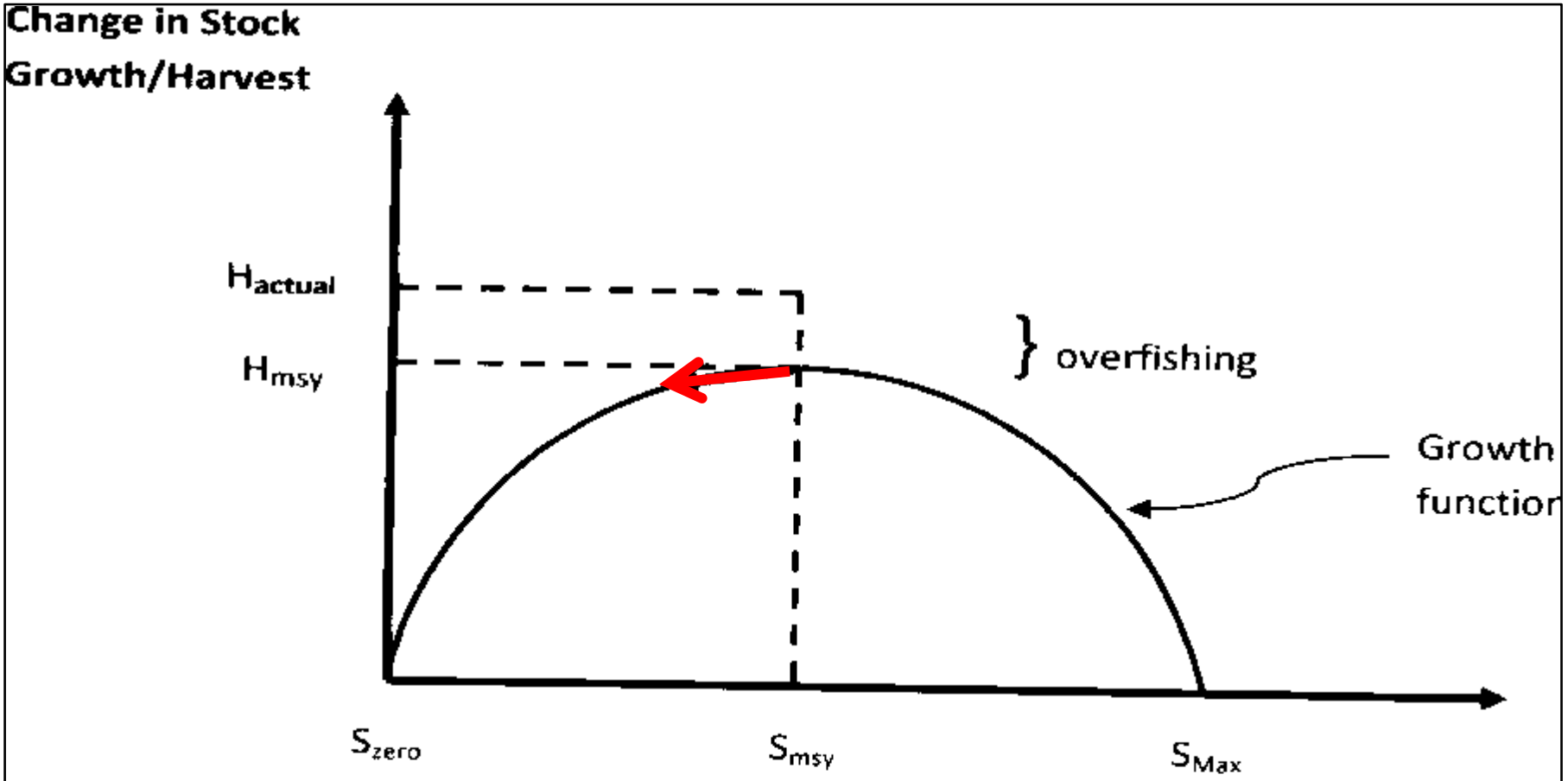


Fig 3. Overfishing and growth function

Overfishing

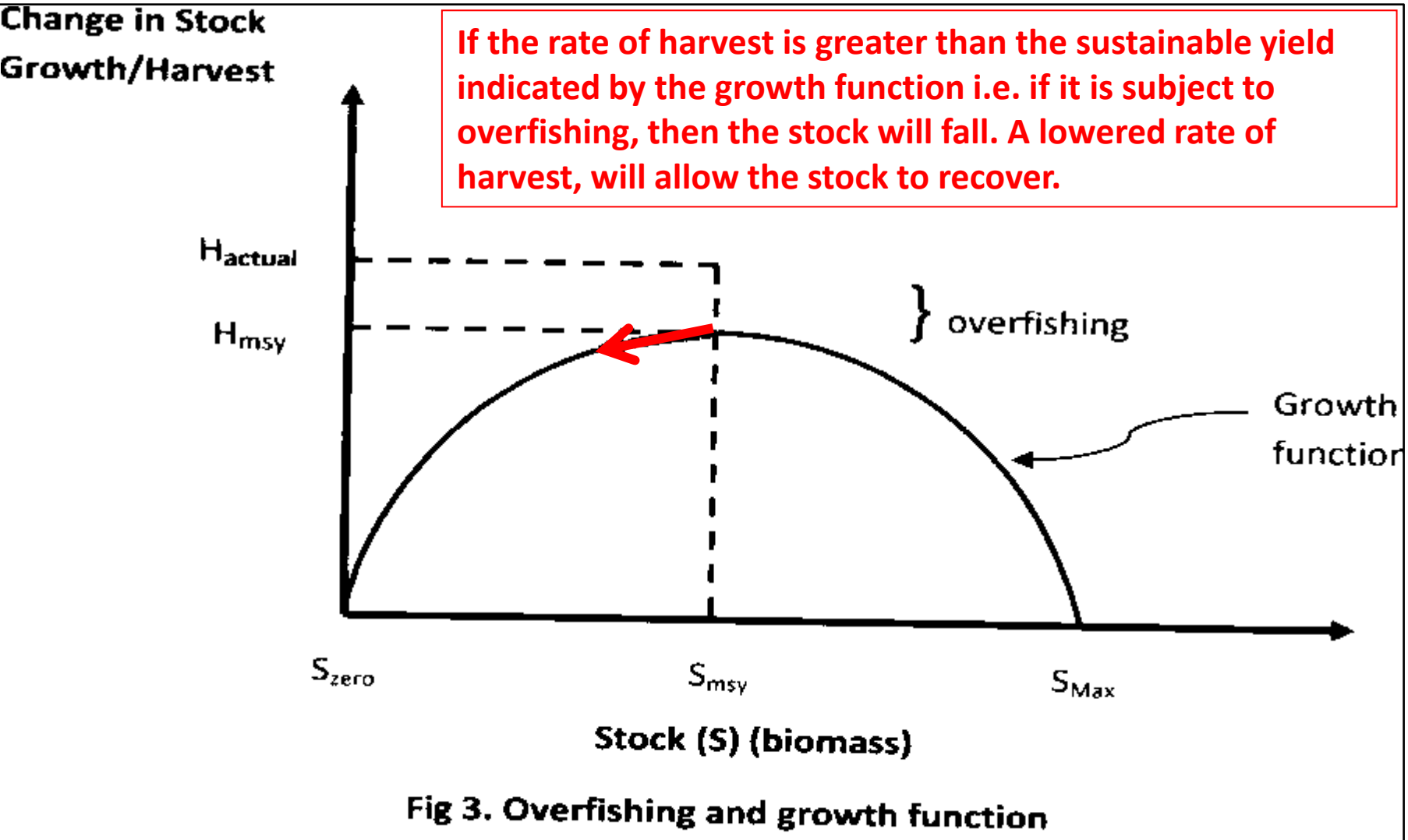


Fig 3. Overfishing and growth function

Overfished

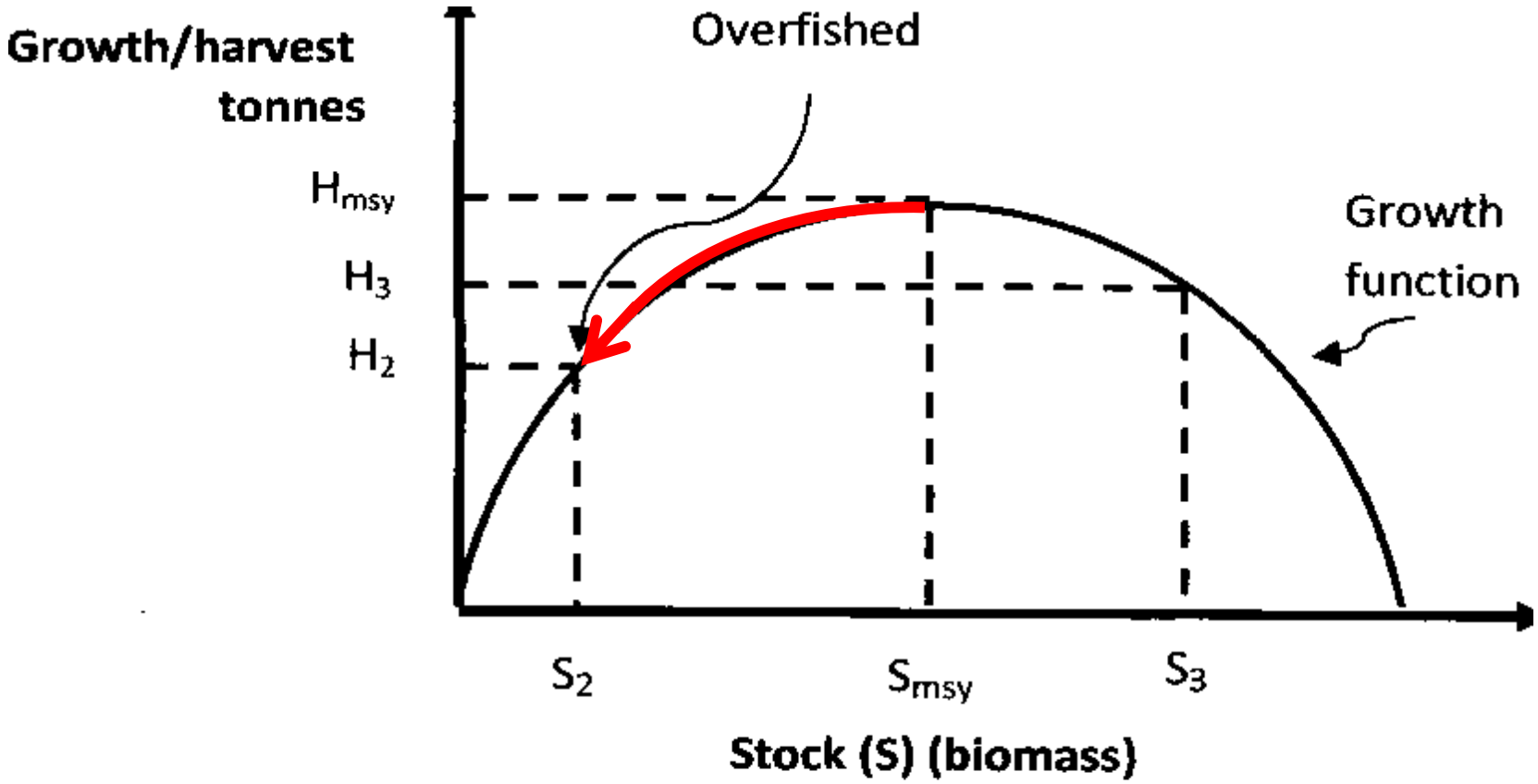


Fig 4. Yield curve for a fishery: harvest and growth rate of stock

Overfished

Continual overfishing has resulted in a reduced stock level, S_2, i.e. it is overfished; while fishing harvest is sustainable at constant H_2, it is at a much lower level than possible at H_{msy}. To achieve MSY, the stock would need to recover to S_{msy}.

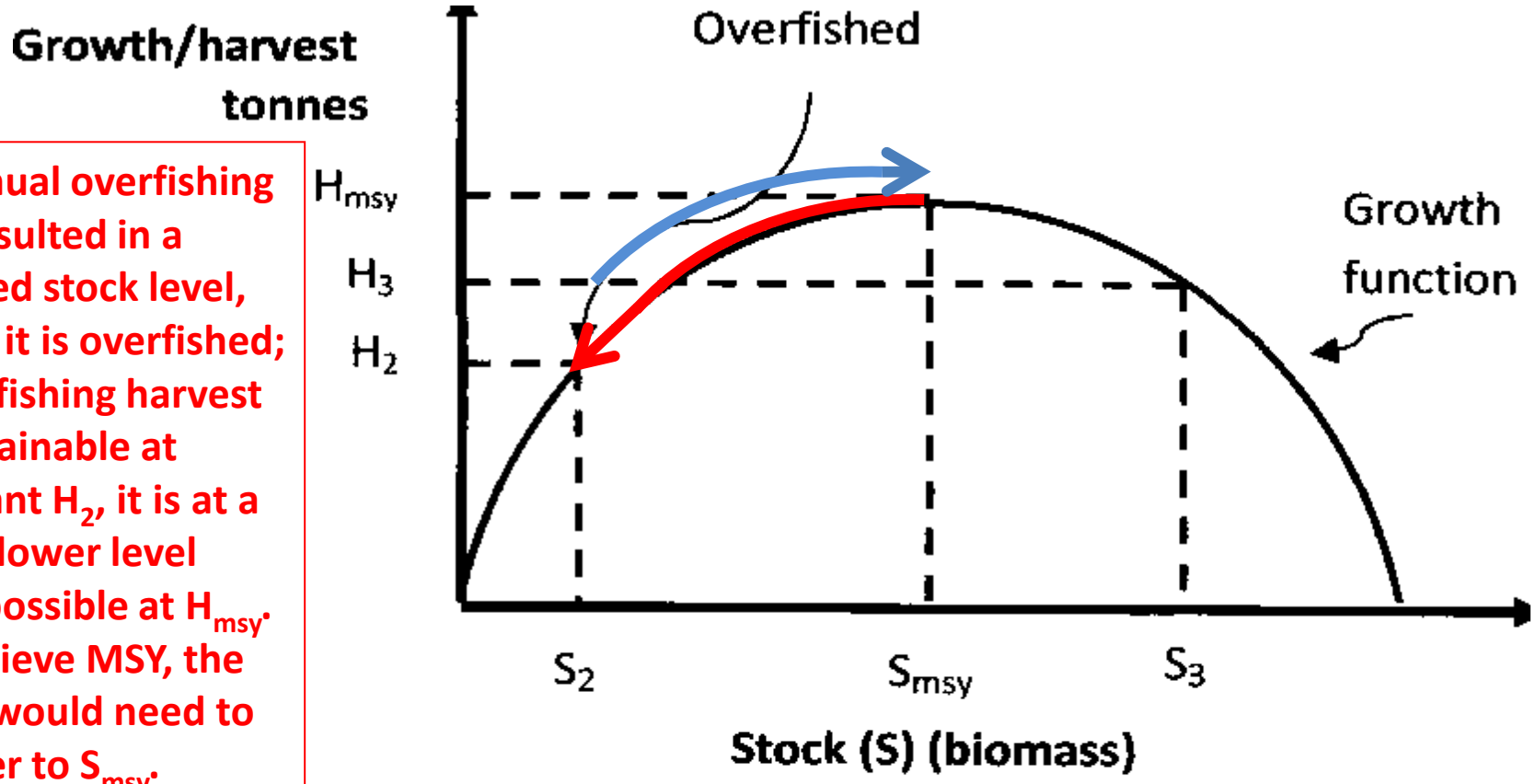


Fig 4. Yield curve for a fishery: harvest and growth rate of stock

Resource rent and Open access

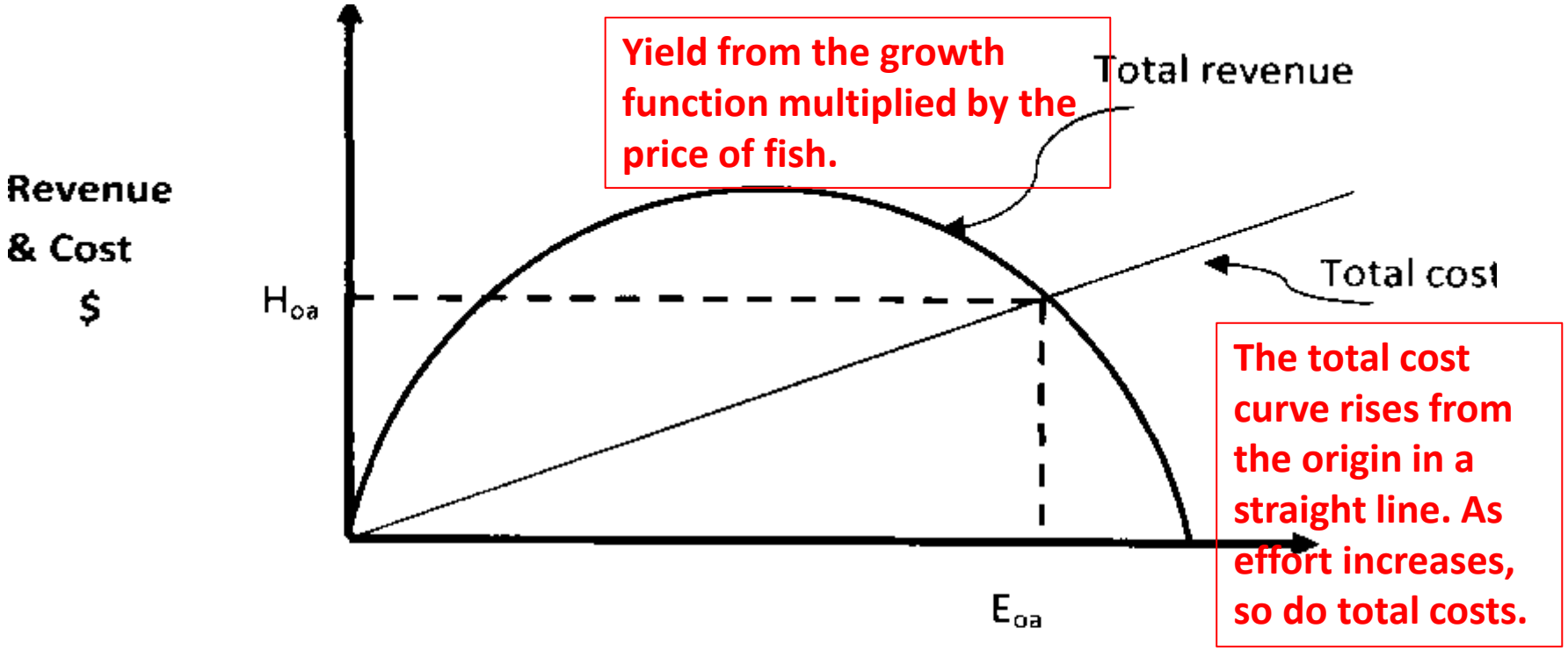


Fig. 4a: Open access fishery

Resource rent and Open access

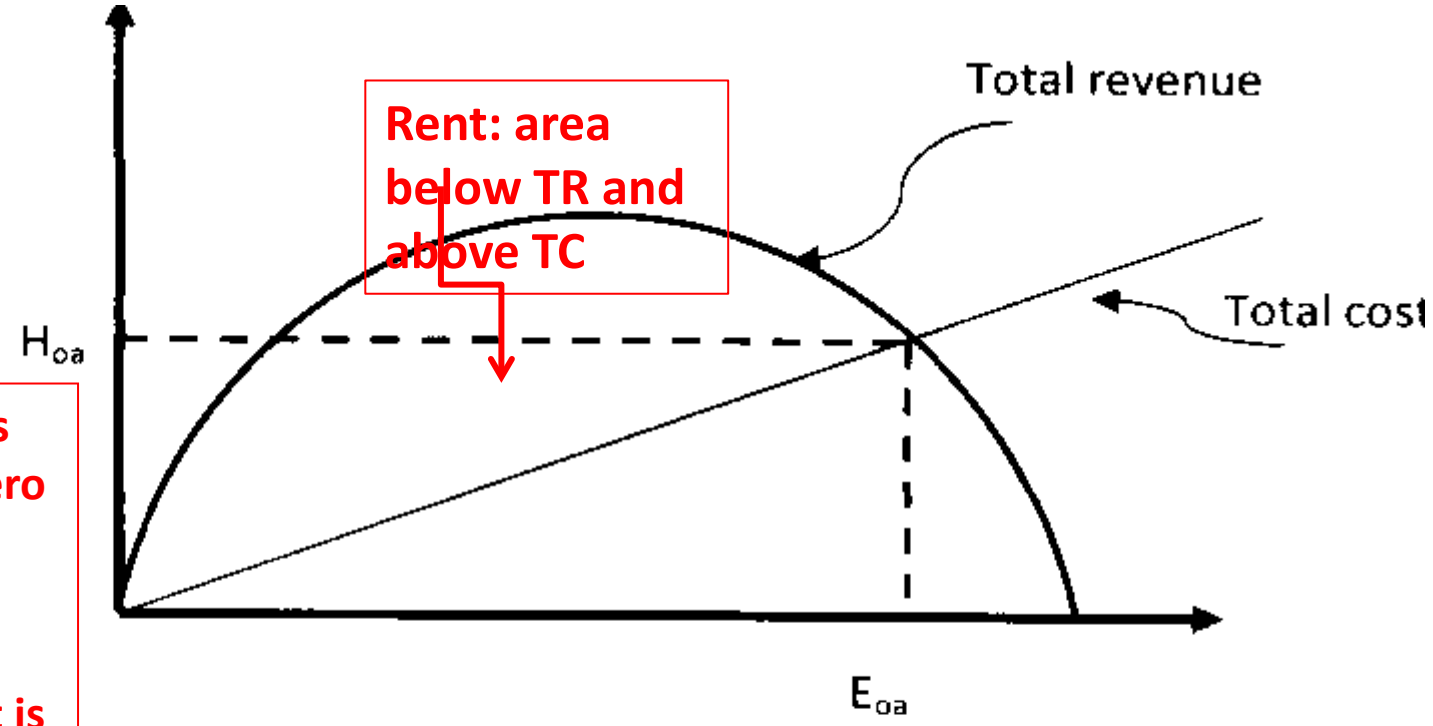


Fig. 4a: Open access fishery

Under open access rent is driven to zero as more and more fishing effort is applied seeking rents, until all rent is exhausted at $E_{oa,}$ and only "normal" profits are made ("normal" profit being wages plus interest on capital).

Maximum economic yield

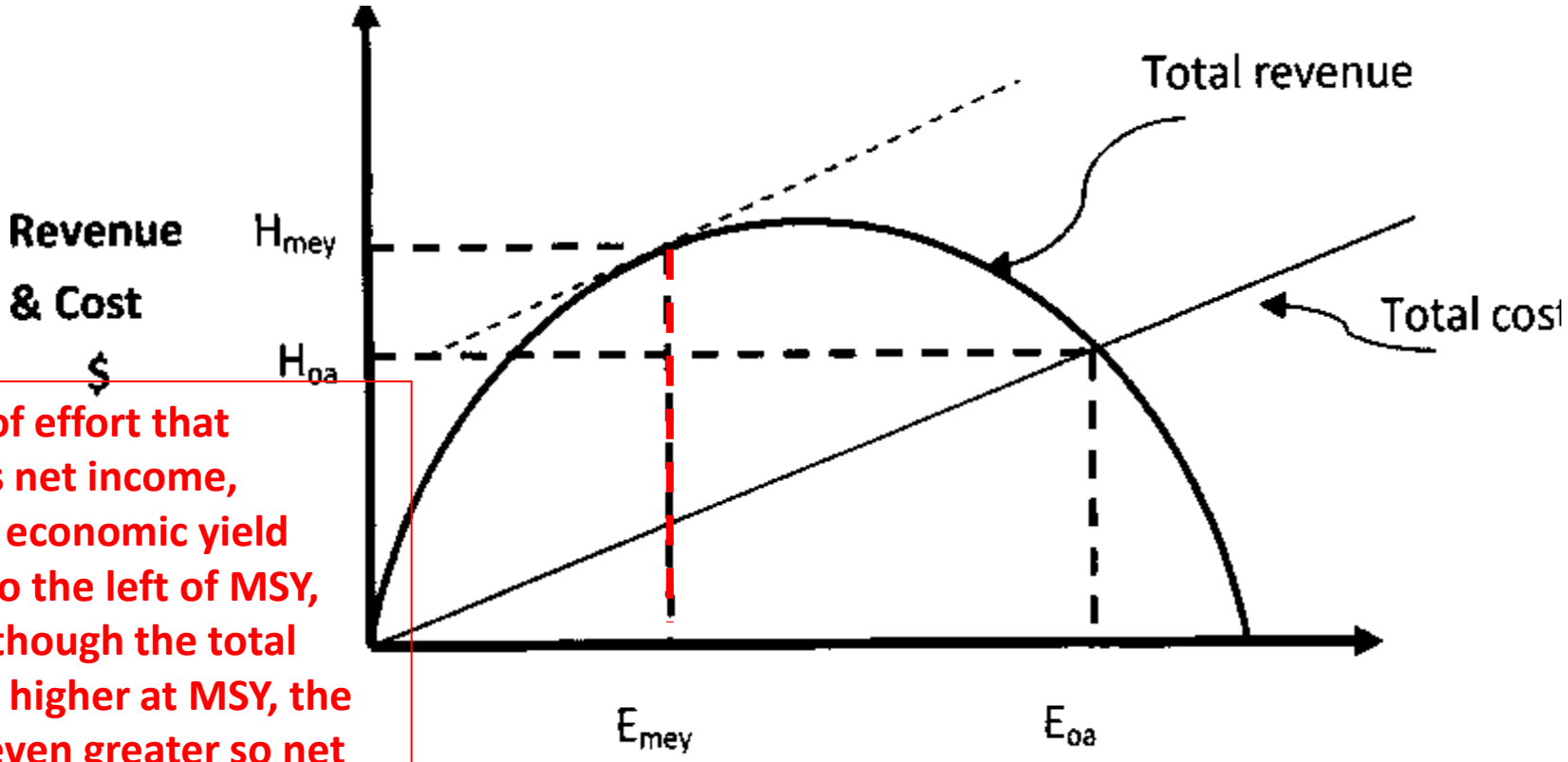


Fig. 5: Efficient harvest in a fishery

The level of effort that maximises net income, maximum economic yield (MEY), is to the left of MSY, at E_{mey}. Although the total revenue is higher at MSY, the costs are even greater so net revenue is lower at MSY than at MEY and the stock larger. The net revenue is also referred to as the "resource rent" generated by the fishery.

Profit max (MC=MR)

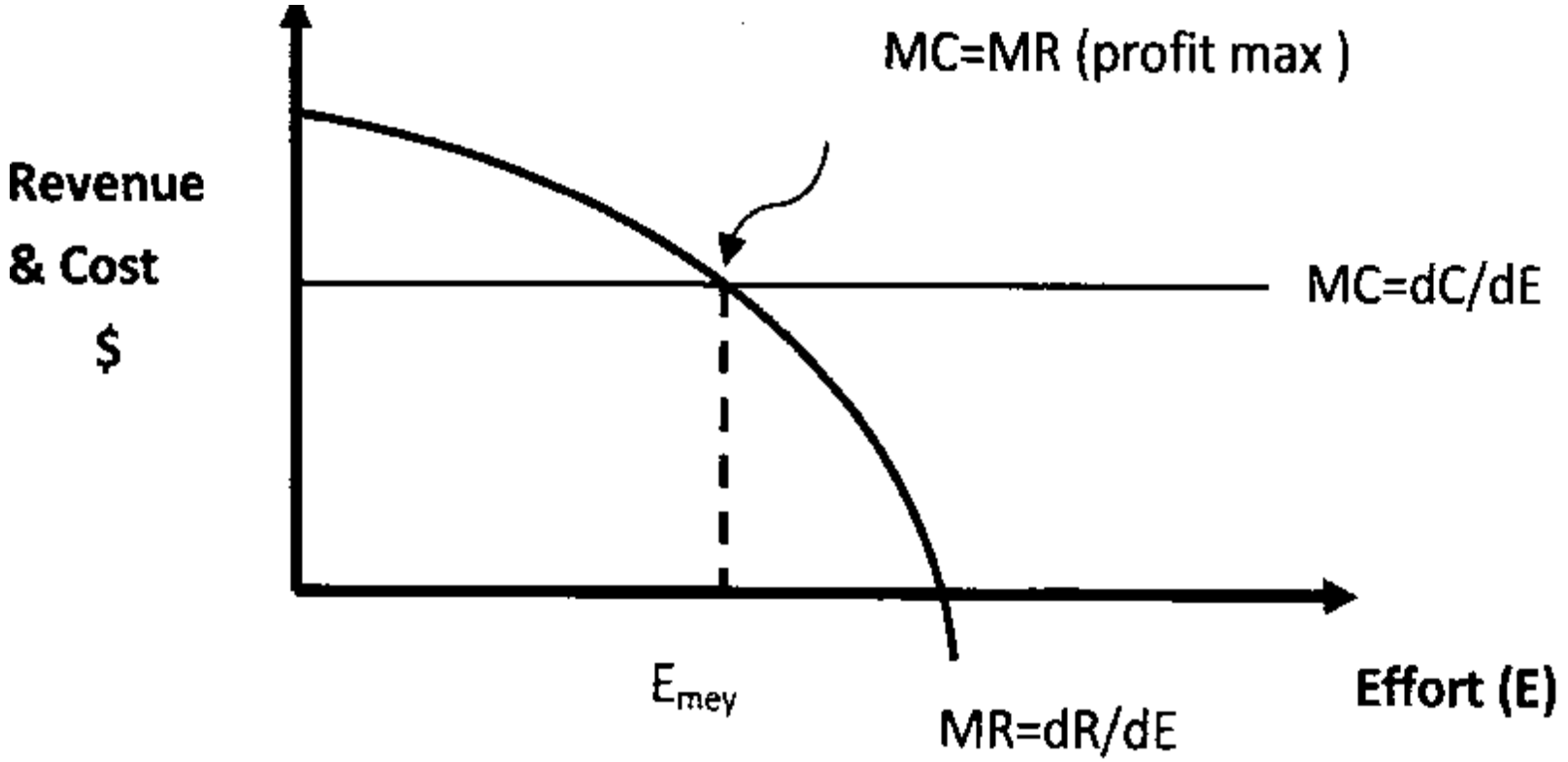


Fig 6: Marginal conditions and profit maximisation

Decision rules in managing a fishery

Increase catch

Value of increased catch > value of reduced future catches

Decrease catch

Value of decreased catch < value of increased future catches

Note, it is general practise to apply a discount to the stream of reduced or increased future catches converting them to a single present value.

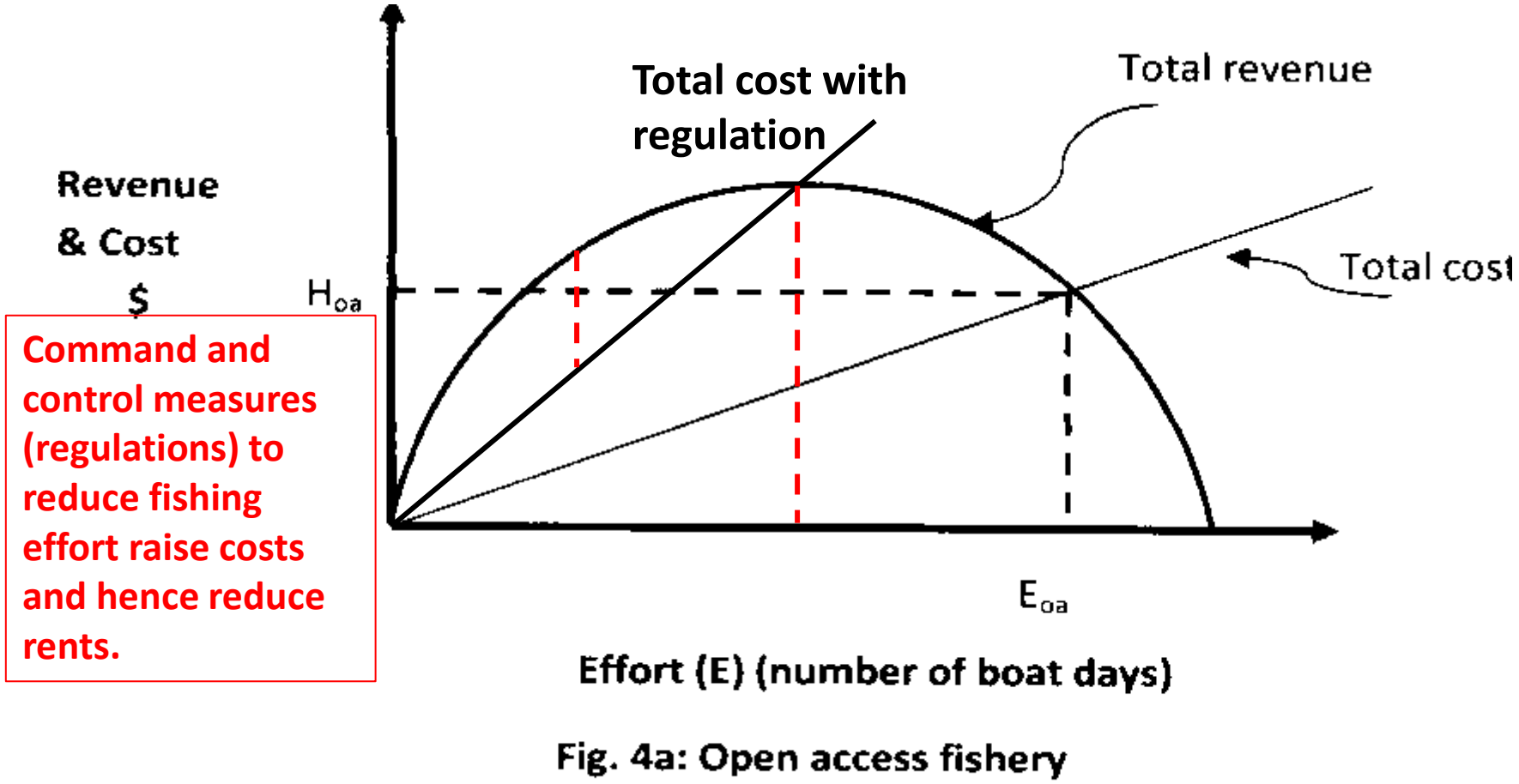
Applying the Precautionary Principle

Stock information poor

MSY uncertain

Examples Orange roughy
Southern bluefin tuna
New fisheries

Regulation and fishing costs



Command and control measures (regulations) to reduce fishing effort raise costs and hence reduce rents.

Fig. 4a: Open access fishery

Economic efficiency demands more than achieving optimal yields and stock.
It also requires that the yield is achieved at minimum use of scarce resources, i.e. cost.

TAC

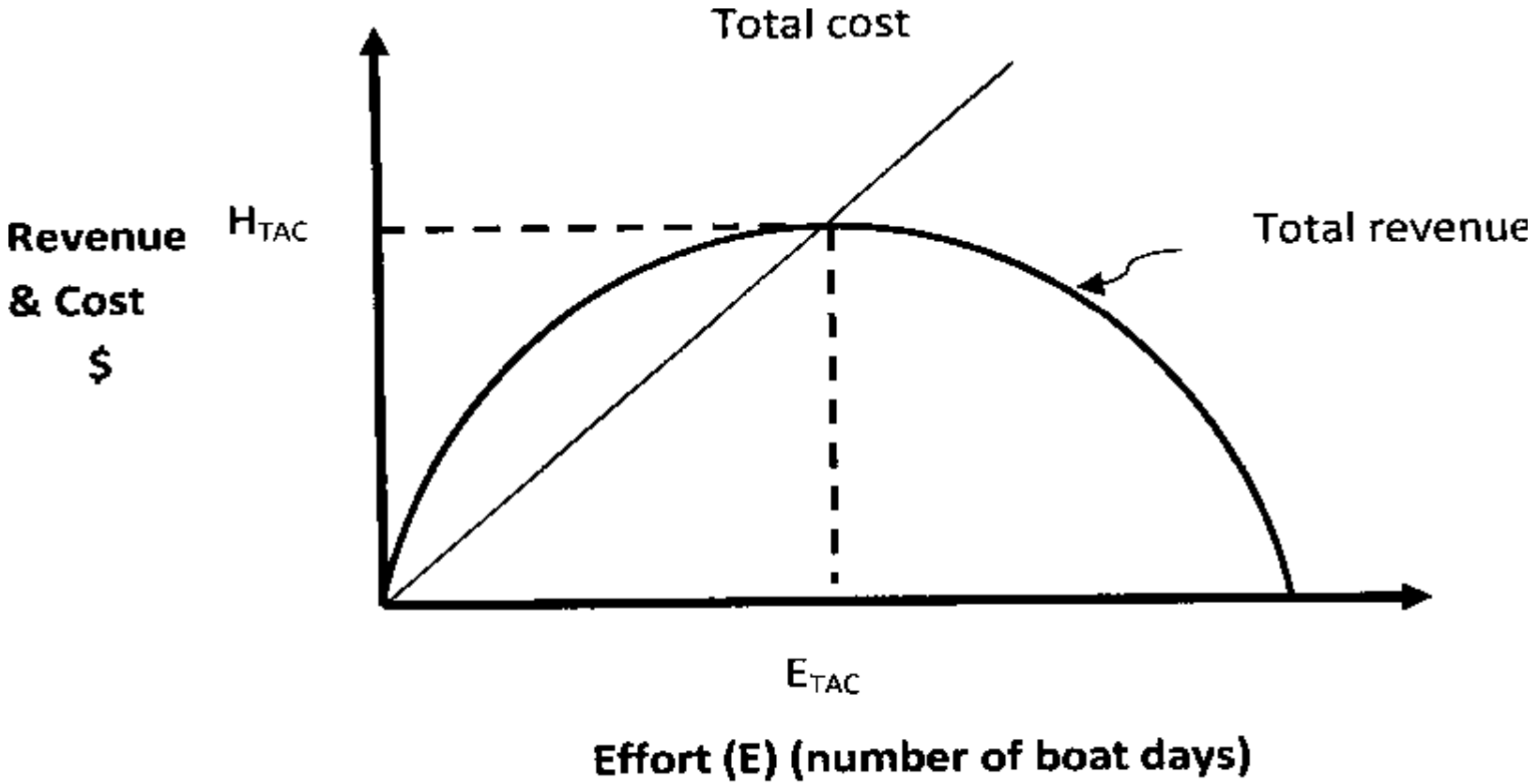


Fig. 6a: TAC

TACs can be ineffective in achieving efficiency by leading to overcapitalisation in the fishery and rent dissipation.

Individual transferable quotas (ITQs)

Benefits

Efficient in single species fishery

Limitations

May be ineffective in multi-species fishery

Preservation value - tax on fishing

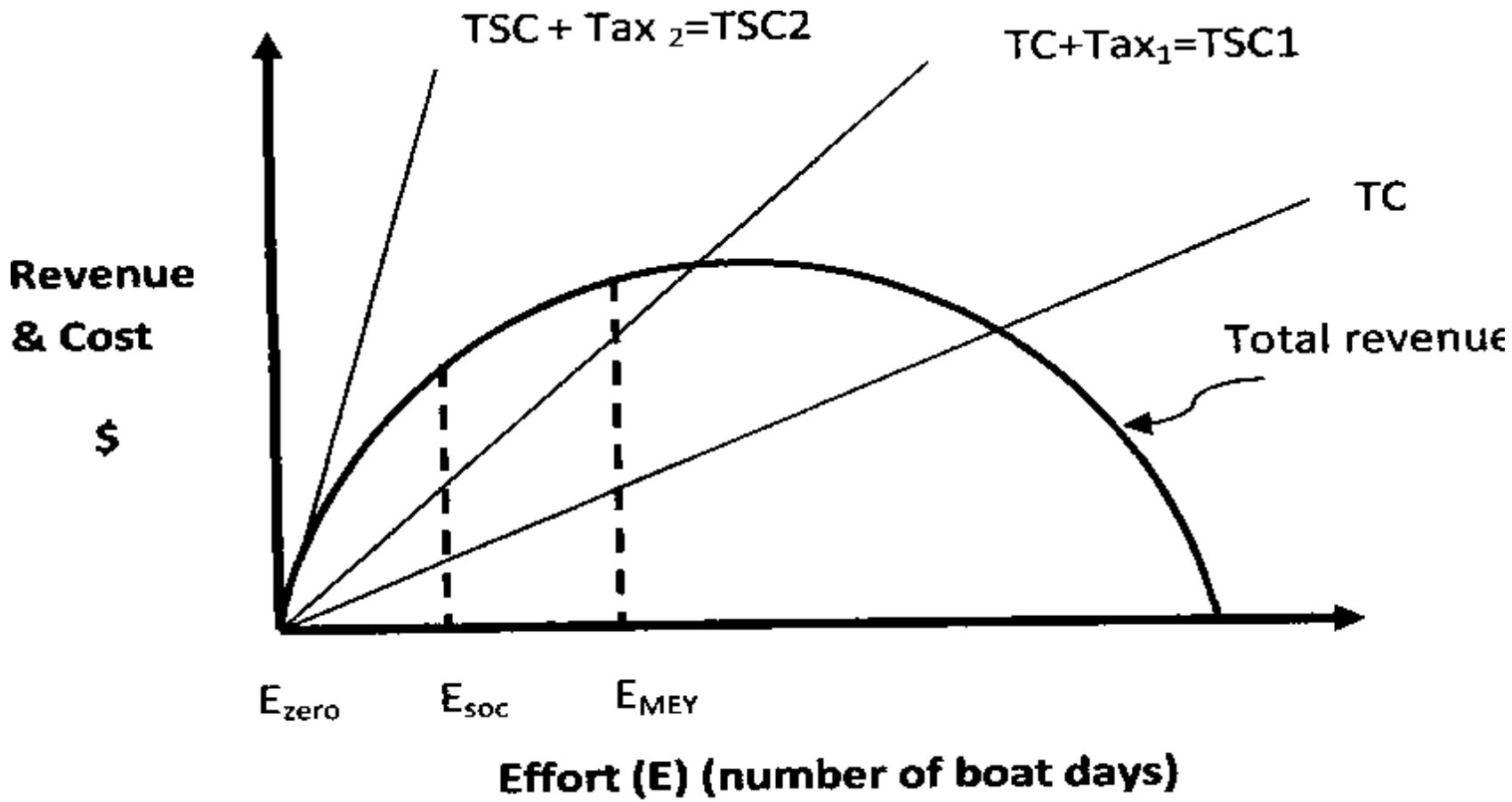


Fig. 8: Social optimum with preservation value

Bycatch

"Technical innovation may reduce the level of bycatch. However, unless there is a general awareness of the issue it is unlikely that bycatch issues will actually be rated important enough by authorities responsible for fisheries management to reduce or close a fishery."

sharks

billfish

Annual catch of turtles by longline worldwide 50,000-200,000†

turtles

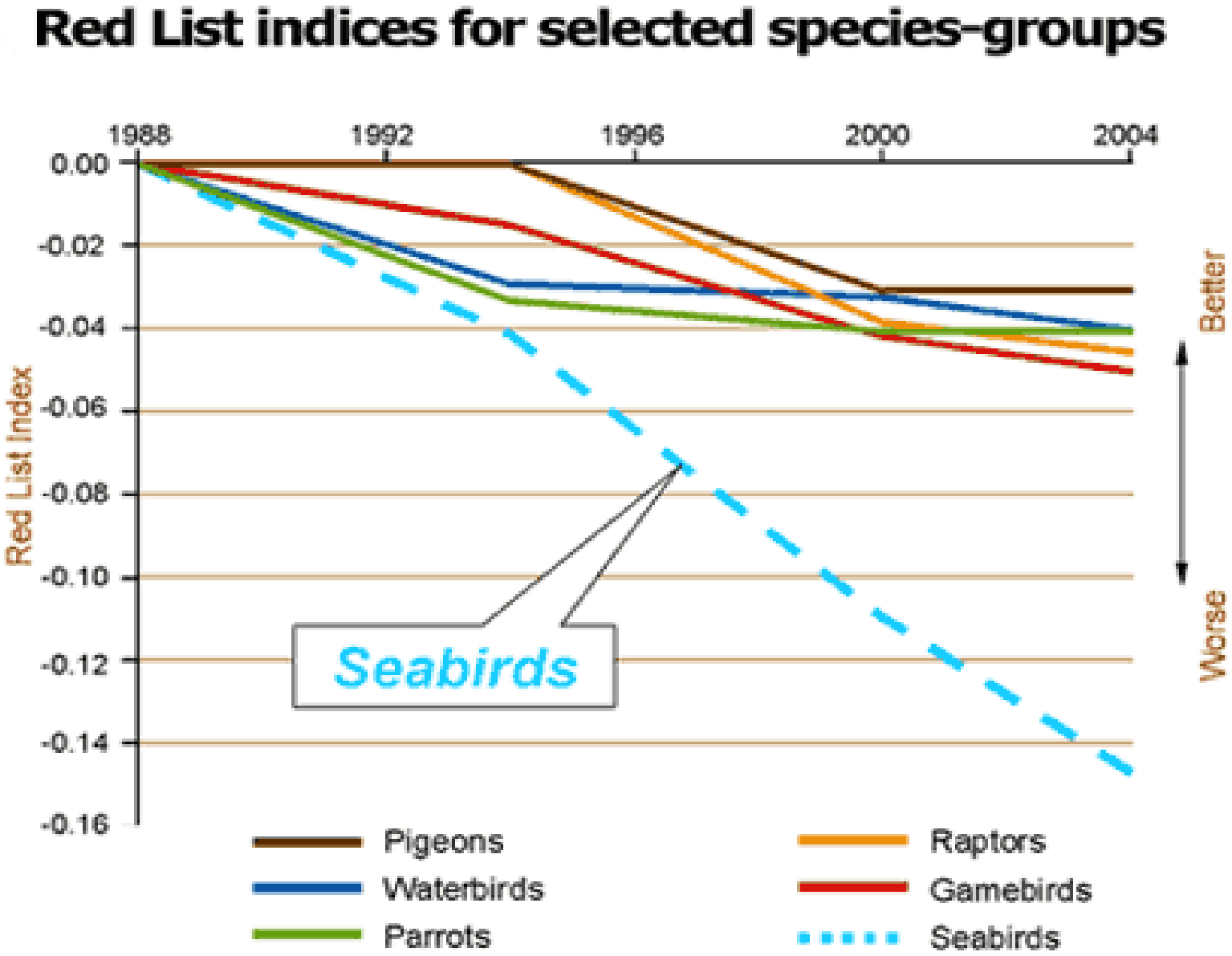
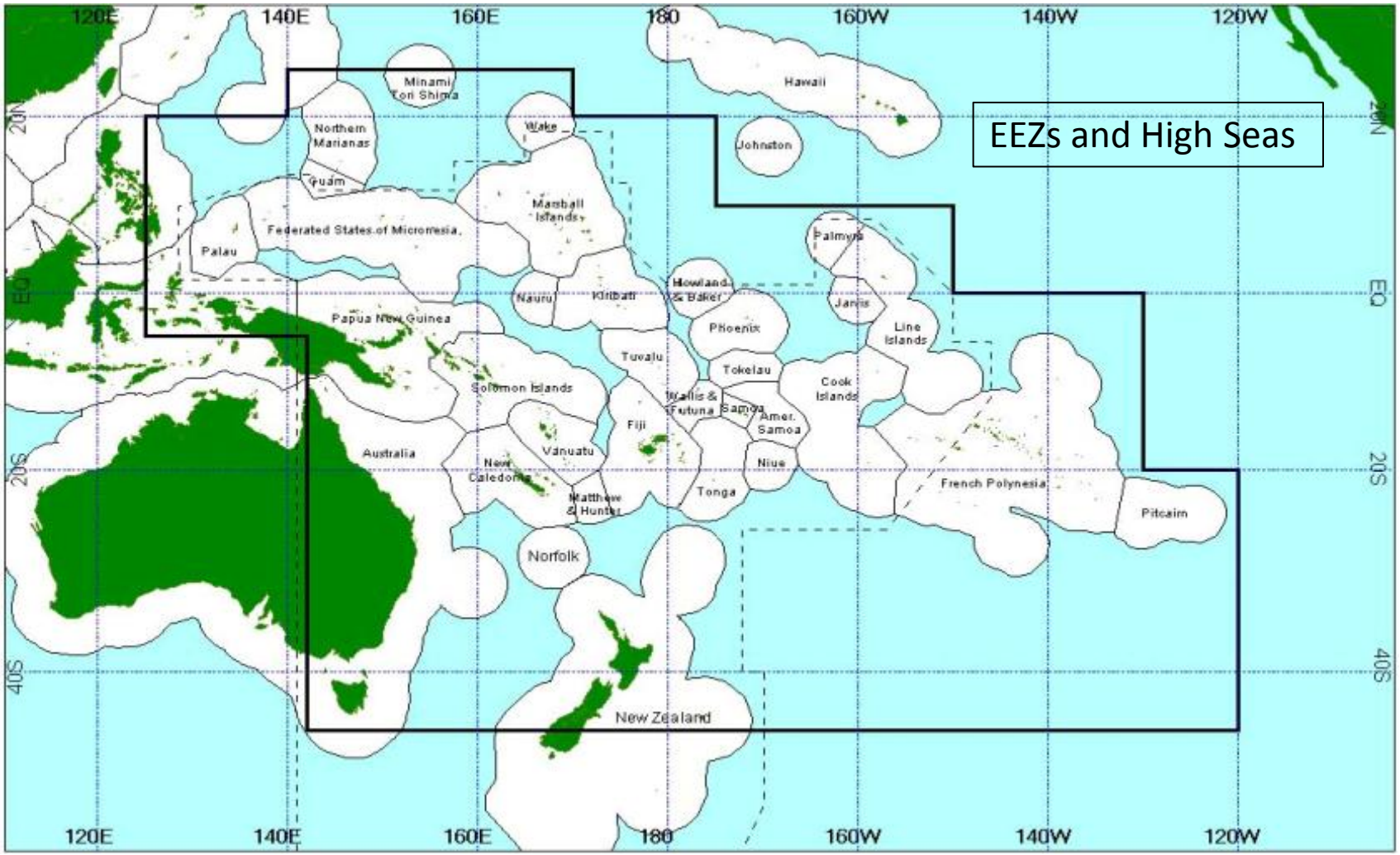


Figure 9: Seabird bycatch

Jurisdictions and management



Key message

Maximum Economic Yield (MEY) is always less than Maximum Sustainable Yield (MSY) in a fishery.

Self test

Show that MEY is always less than MSY with a labelled diagram.

Key Words

Bioeconomic model	EEZ
Maximum sustainable yield (MSY)	High seas
Resource rent	TAC
Open access/Rent dissipation	ITQs
Maximum economic yield (MEY)	Precautionary principle
Overfishing	Decision rules
Overfished	Bycatch