

Shark science and fisheries: lesson 1
of 3

Built to be slow

Why sharks can't keep up
with fishing



A bamboo shark in Negros Oriental. Photo: MCP



Life in the slow lane: the dusky shark

**about 20
years**

before a female can breed

**22 to 24
months**

of pregnancy

**3 to 16
pups**

every two or three years

US fisheries scientists expect dusky shark populations to need about 100 years to rebuild.

How we know: NOAA Fisheries. Ocean Conservancy.



Sharks and bony fish: two strategies



Many sharks

Grow slowly, mature late, have a few large, well-developed young.



Many bony fish

Grow fast, mature early, release thousands to millions of tiny eggs.



The key idea: growth rate

Every population has a maximum rate at which it can grow when numbers are low. Scientists call it r .

If fishing removes a bigger share each year than the population can replace, it shrinks, however many there are to start with.

Which will have the higher r : a shark or a sardine?



Model it

1. Each year: new population = population + growth – catch.
2. Growth = $r \times \text{population} \times (1 - \text{population} \div 1,000)$. Catch = fishing rate $\times$ population.
3. Model a shark ($r = 0.06$) and a fast-growing fish ($r = 0.6$), both starting at 1,000 and both fished at 10% a year.
4. Work out five years by hand, then compare with the full answers.

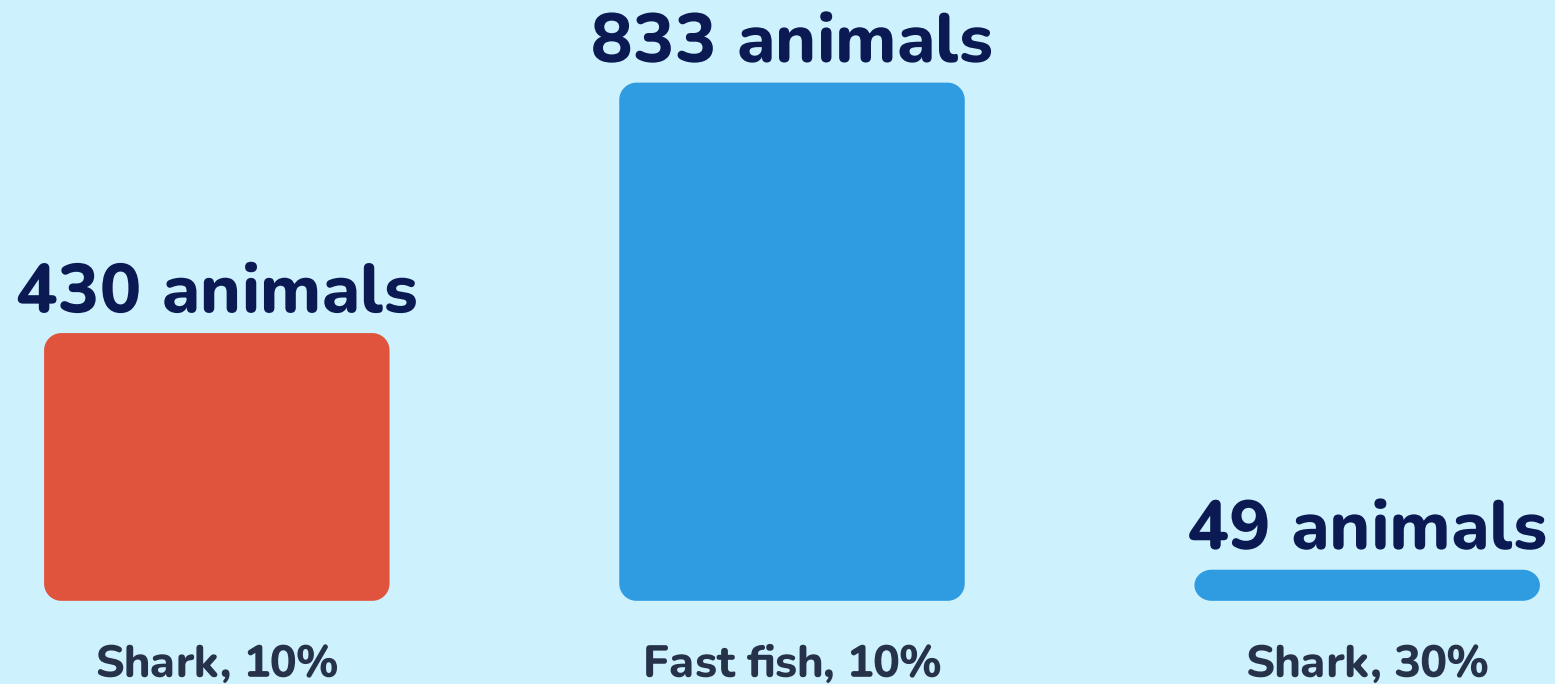
Example, year 1

Shark: $1,000 + 0.06 \times 1,000 \times 0 - 0.1 \times 1,000 = 900$



What the model shows

Population after 10 years of fishing, starting from 1,000.



Talk about it

Why does the fast fish level off while the shark keeps falling?

What is the highest fishing rate the shark population could survive in this model?

What does the model leave out?

Next time: counting the catch



Photos and sources

Photos: bamboo shark and fish market by MCP. All illustrations drawn for this lesson by Marine Conservation Philippines.

Sources:

- NOAA Fisheries. Eight surprising shark facts.
- Ocean Conservancy. Dusky shark fact sheet.

Full links are in the teacher reading. Free to use and share for education. Made by Marine Conservation Philippines. More free lessons: marineconservationphilippines.org/resources/teachers-resources/

