

How do we know?: lesson 2 of 3

Weighing the evidence

Not all evidence is equal



MCP survey divers collecting data. Photo: MCP



Sort the evidence

With your group, arrange the eight cards from weakest to strongest evidence. Be ready to explain your order.

Card

A friend's story

My cousin saw a reef die from sunscreen.

Card

A viral post

A shared graphic with no source.

Card

A company press release

Written by a company selling a product.

Card

A news article quoting a scientist

Useful, but check what the scientist actually said.

Card

One laboratory experiment

Controlled, but conditions may not match the real ocean.

Card

One field study

Measured on real reefs, but only in one place and time.

Card

Several studies that agree

Different teams, places and methods reaching the same answer.

Card

A major review

Experts weigh all the evidence together, like the IPCC.



A rough guide, not a rule

Evidence usually gets stronger as you go from stories, to single studies, to many studies that agree, to careful reviews of all the evidence.

But a single well-designed study can beat a sloppy review. Always ask: how was this measured, how big was the sample, and who checked it?



Four case files

Each group investigates one case and reports back on what went wrong, and how it was found out.

Case 1

The rays and the scallops

Correlation is not causation

Case 2

The sunscreen and the corals

Lab conditions are not the real world

Case 3

The fish that ate plastic

Peer review is not a guarantee

Case 4

The shrimp with super-eyes

A true fact can lead to a false conclusion



How science corrects itself

Replication

other teams repeat the study

Re-analysis

others re-examine the data

Retraction

journals withdraw papers that don't stand up

Science isn't a pile of facts. It is a way of checking that keeps catching its own mistakes, sometimes slowly.



Talk about it

Which case would be hardest for a non-scientist to spot?

Is a retracted study a failure of science, or science working?

What questions will you ask the next time you read 'a new study shows'?

Next time: make a claim you can defend



Photos and sources

Photos: survey divers by MCP. All illustrations drawn for this lesson by Marine Conservation Philippines.

Sources:

- Myers, R. and others (2007). Science.
- Grubbs, R.D. and others (2016). Scientific Reports.
- National Academies (2022). Review of fate and effects of sunscreen UV filters.
- Smithsonian Ocean. Sunscreen and coral reefs.
- Retraction Watch (2017). Science fish-microplastics paper.
- Thoen, H.H. and others (2014). Science.

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/

