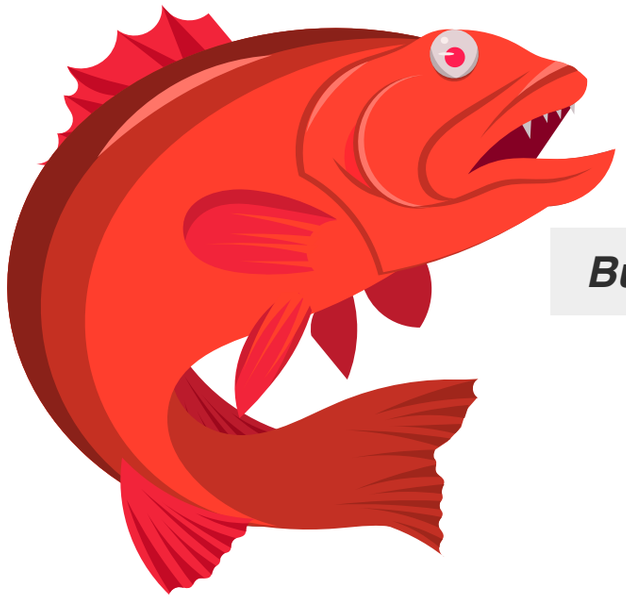
COGS 144 PRESENTS:

Referential Gestures in Fish Collaborative Hunting

Alexander L. Vail, Andrea Manica & Redouan Bshary

NICOLE TRAPPE

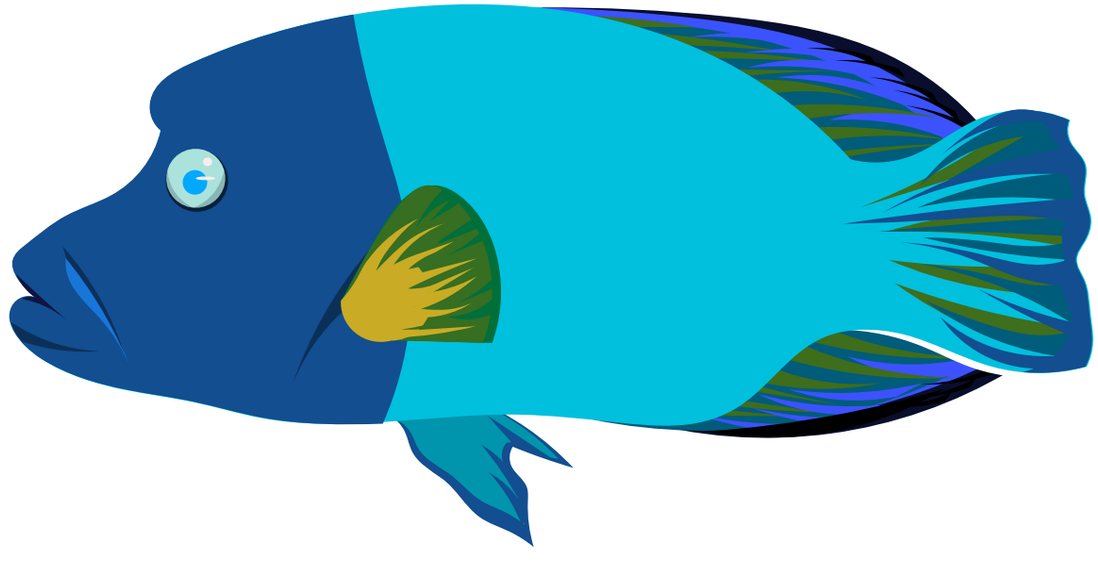


Burst speed

ROVING CORAL GROUPER

Plectropomus pessuliferus marisrubri

Powerful suction



NAPOLEON WRASSE

Cheilinus undulatu

Sneak through cracks

GIANT MORAY EEL

Gymnothorax javanicus

NICOLE TRAPPE

DEFINTION

Gesture

/ˈjesCHər/

Hobaiter and Byrne

1. Discrete and mechanically ineffective movement of the body targeted at the recipient
2. Used to elicit a specific behavior in recipient
3. Used intentionally towards a goal

Referential Gesture

Pika and Bugnyar

1. Directed towards a referent
2. Mechanically ineffective
3. Directed towards a recipient
4. Receive a voluntary response [from the recipient]
5. Demonstrate the hallmarks of intentional production

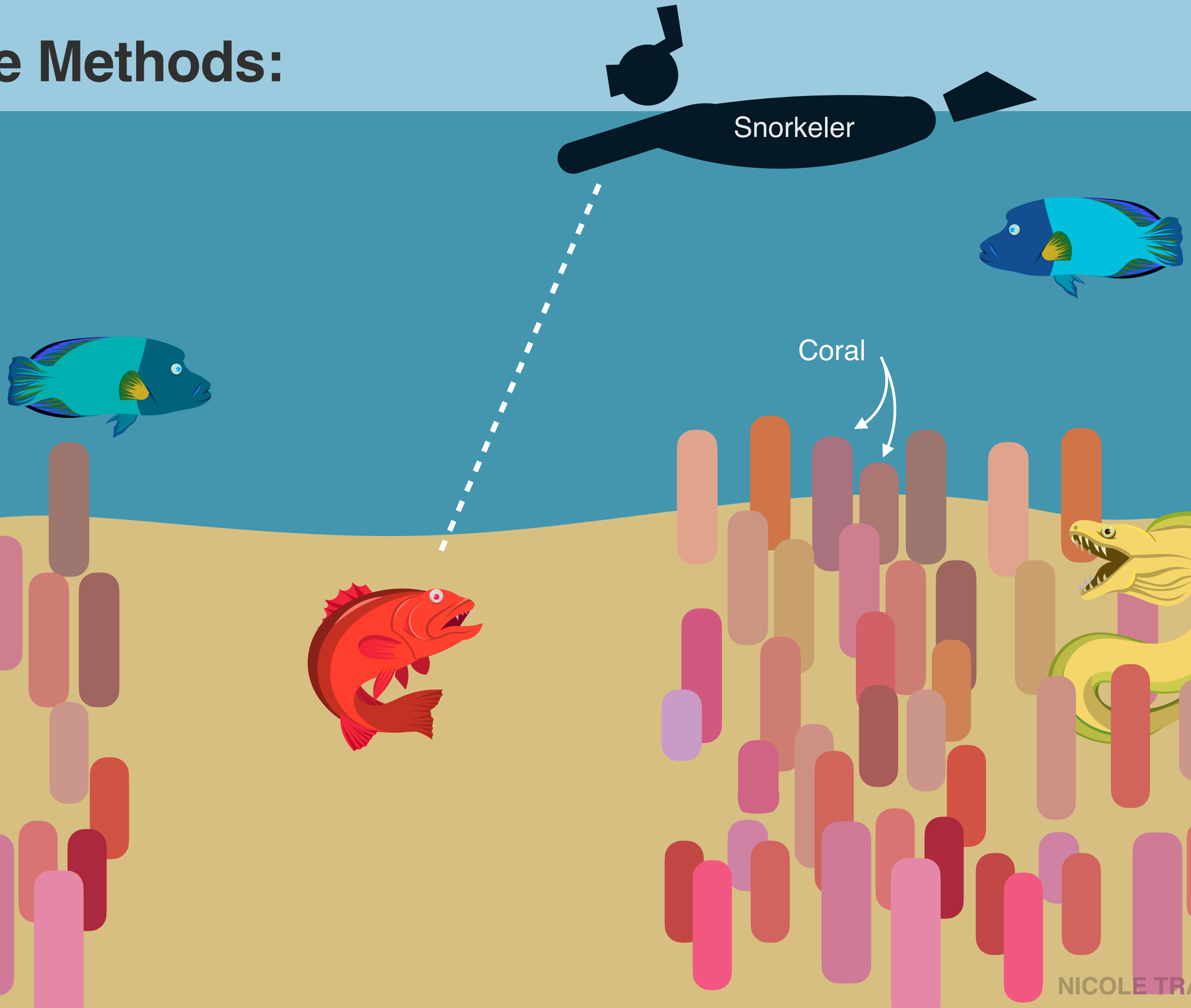
Research Question:

Do **groupers** show evidence of referential gestures?
Specifically, does the **grouper** *headstand* count as a referential gesture?

Previously:

In 2006, **Redouan Bshary** from the University of Neuchatel in Switzerland discovered evidence of a grouper rousing a **moray** and later **wrasses**[1]. On further investigation of the video footage, he realized a gesture was being used. This gesture was later called a *shimmy*. Other articles, like Bshary et al. , have shown evidence of **morays** and **wrasses** responding to a new gesture—*the headstand*—though there was not enough evidence to prove it a referential gesture.

The Methods:



GESTURE 1

“Let’s go hunt”

Grouper moves horizontally and in front of a **moray** hiding in coral

High frequency shimmy

After a shimmy, the **moray** will either join the **grouper** on a hunt or ignore it. If the **moray** ignores the gesture, the grouper will resignal until the **moray** moves.

Is it a gesture?

- ✓ Shimmy is inefficient
- ✓ To elicit joint activity
- ✓ Used intentionally with persistence for joint activity

Is it a referential gesture?

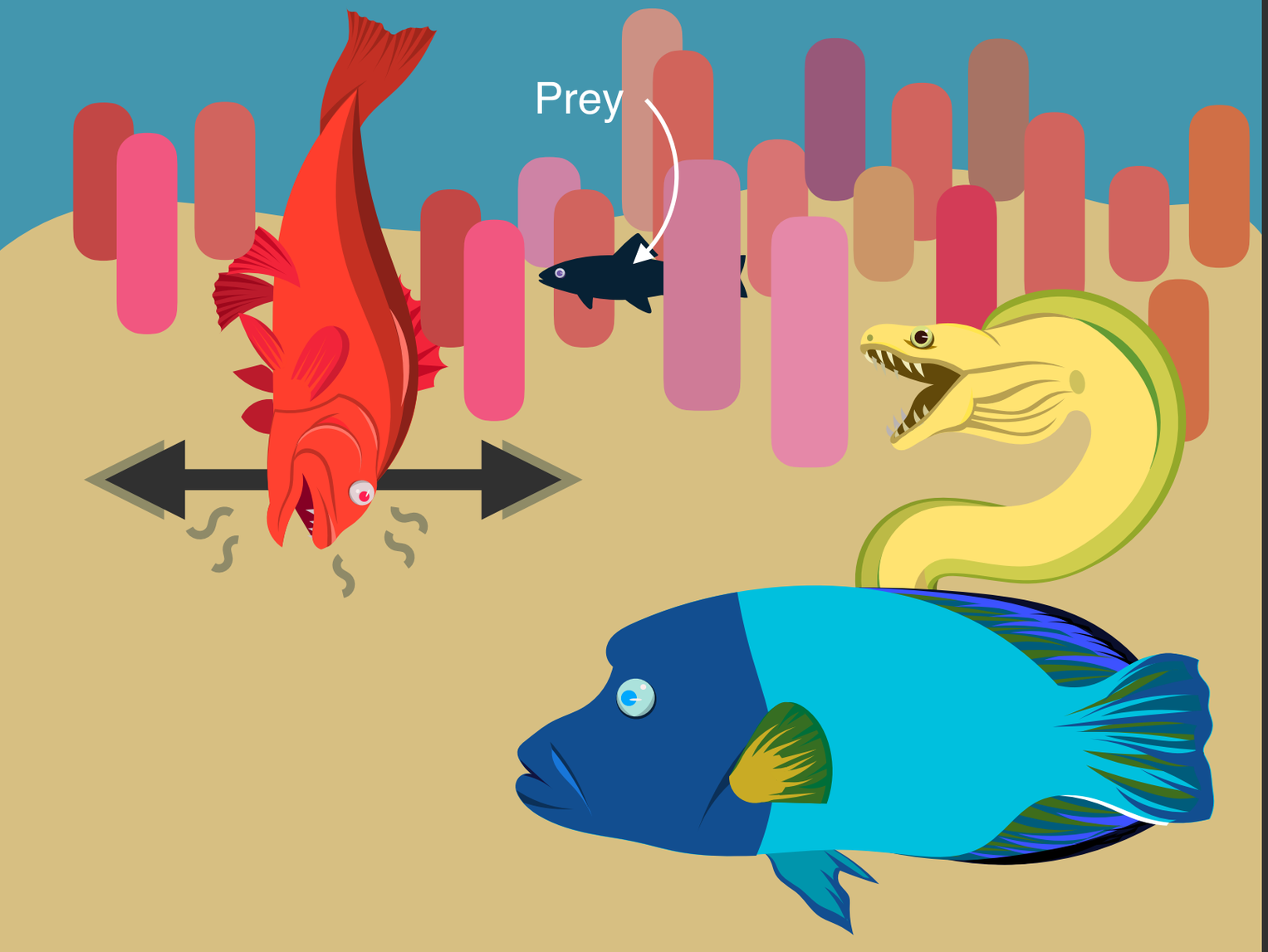
- ✗ Does not direct attention to an external entity

NICOLE TRAPPE

GESTURE 2

“Yo there’s a fish”

Grouper orients itself vertically with its head down and shakes head to indicate location of prey to **moray** and **wrasse**



Has only been observed over location of escaped prey after an unsuccessful chase. Indicates to the collaborators where the prey is hiding.

Is it a gesture?

- ✓ Headstand is inefficient
- ✓ To elicit joint activity
- ✓ Used intentionally with persistence for joint activity

Is it a referential gesture?

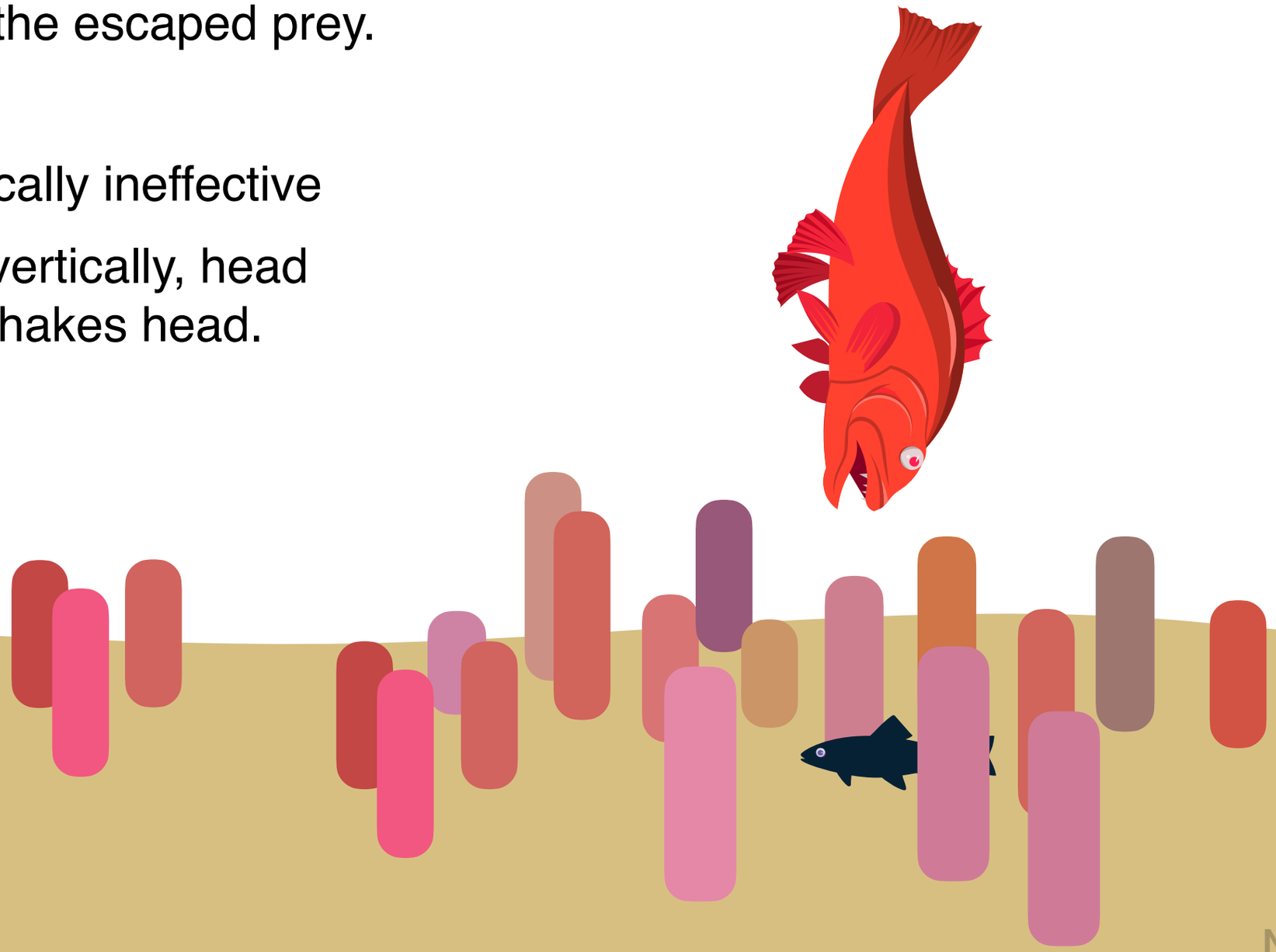
Is the *headstand* a referential gesture?

1. Directed towards a referent

All headstands were performed over the location where the grouper ended an unsuccessful hunt. The signal indicates either the location of the prey's escape **OR** the escaped prey.

2. Mechanically ineffective

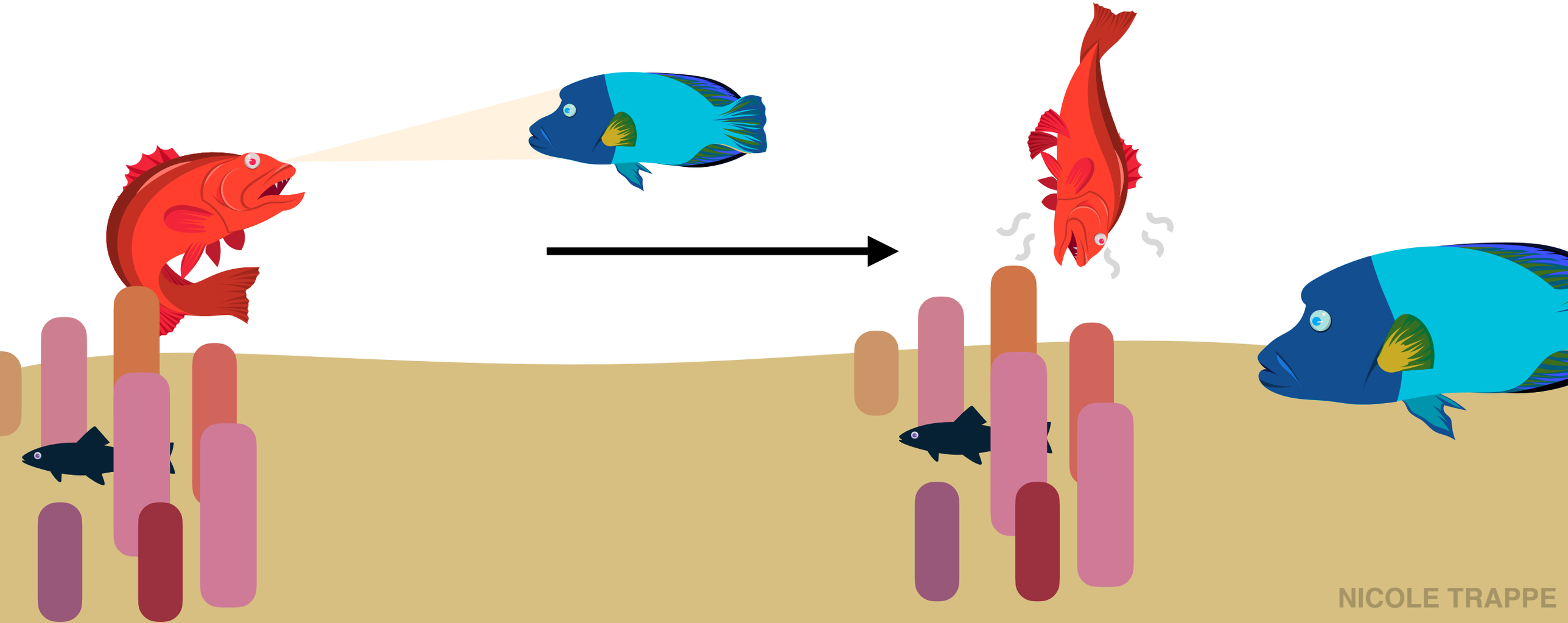
Holds itself vertically, head down, and shakes head.



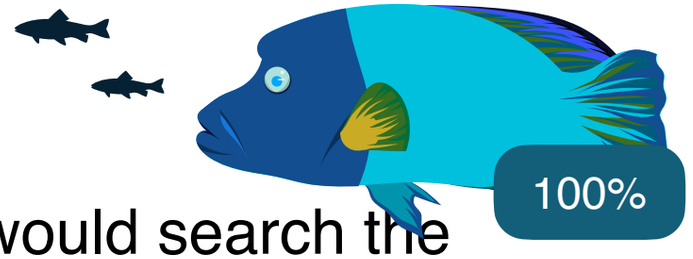
Is the *headstand* a referential gesture?

3. Directed towards a recipient

Grouper waits (up to **25m**) until there is a recipient. As soon as it spies one, it performs the headstand. As soon as the wrasse or moray inspected, the grouper would stop the signal. Coral trout only perform headstand if octopus nearby. Octopus will approach if gesture performed.



Is the *headstand* a referential gesture?



4. Receive a voluntary response [from the recipient]

The wrasses responded *immediately* (within **1m**) and would search the location. The morays were **58%** likely to also search after receiving the signal. Wrasses were significantly likely to approach a grouper if doing the headstand.

5. Demonstrate the hallmarks of intentional production

Intentionality is shown by persistence until goal is reached, elaboration of communication, and means-ends disassociation by using 2 signals for the same goal.

Persistence: groupers continue to perform headstand until a predator inspects.

Elaboration + means-ends: if a moray doesn't move in the direction a grouper wants and leaves, the grouper will swim over to it, perform the shimmy ("let's hunt") then swim back to the location of the prey/escape and perform the headstand ("here!").

KEY TAKEAWAY

“Referential gestures are not restricted to large-brained species and suggest they may have evolved in other taxa with an ecological need for them”.

This offers support for an **ecological approach** to cognition and that we may find more evidence of gestures—and referential gestures—if we first look for **cooperative interactions**. Referential gestures may not be as rare as we thought or require such cognitive feats. Instead, they’re likely a response to ecological needs and problems.

TAKEAWAYS

~~Fish are simple-minded *(dumb)*.~~

Groupers have been observed to wait up to **25m** before signaling *(good memory)*.

~~Only apes and corvids can use referential gestures.~~

Groupers and coral trouts use referential gestures + other fish species and invertebrates respond.

~~Referential gesturing requires advanced cognitive processes.~~

Referential gestures may actually be a result of cooperative interactions rather than the result of a large brain.

LIMITATIONS/FURTHER QUESTIONS

The researchers only focused on the actions of the **grouper**. We don't know if the **moray**/**wrasse** gesture back to accept or deny the hunt.

Because these predators swallow their prey whole, how do they decide who gets it?[2] There's no splitting the spoils so how do they communicate over the prize in a way that limits conflict?

Groupers rarely succeed in making **morays** reach the crevice with signal elaboration so why do they do it?

How do the groupers decide when to stop the shimmy or headstand?

How did 3 predators (different species) start to collaborate (or sense that it's not a threat)?

REFERENCES

1. https://api.nationalgeographic.com/distribution/public/amp/science/article/groupers-use-gestures-to-recruit-morays-for-hunting-team-ups
2. https://www.newscientist.com/article/dn10730-eels-and-groupers-hunt-better-together/amp/