

WHAT A FISH KNOWS

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Humans have vastly underestimated fishes. Emerging scientific discoveries are revealing capacities and complexities that rival those of any other vertebrate group.

DIVERSITY

- There are over 33,000 described fish species, with dozens being added yearly
- The Age of Mammals is gone; we're in an Age of Fishes (within the Anthropocene)

PERCEPTIONS and SENTIENCE

- Fishes have more color vision receptors than us, and probably see more vibrantly
- Ambon damselfishes use covert facial signatures visible only in UV light
- Fishes fall for the same optical illusions that we do
- Fishes have the same suite of pain receptors as mammals
- Zebrafishes will pay a cost (swimming in a barren chamber) to use painkillers

THINKING and PLANNING

- Some fishes use tools: water as a projectile, coral/rock as an anvil to smash open clams
- Frillfin gobies use mental mapping to leap accurately between tide pools
- Archerfishes learn by watching experienced colleagues squirt water at flying insects
- Cleanerfishes outscored monkeys and apes (and a 4-yo girl) on a plate-removal test
- Tigerfishes use planning and athleticism to ambush flying swallows from behind

SOCIETY

- The cleaner-client mutualism involves Machiavellian social dynamics that rivals apes
- African elephantfishes use electric pulses to convey sex, size, age, distance, and libido
- Herrings communicate at night by farting
- Groupers use gestures to invite moray eels to go hunting with them

EMOTION

- Stressed fishes rebound on anti-anxiety Valium or anti-depressant Prozac
- Stressed surgeonfishes sought caresses, which calmed them down
- Wild fishes and pet fishes will approach trusted divers/guardians to get petted
- A study of three male cichlids described behavior that meets formal criteria for play
- Might mobula rays be feeling joy when they perform high leaps and slaps?

SEX

- "Parasitic" male anglerfishes bite females and stay there for the rest of their lives; they meld into her flesh, eventually sharing her bloodstream and inseminating intravenously
- Fishes invented the "fun" kind of sex (internal fertilization)
- Size matters to a female mosquitofish
- Mollies mate with males but lay unfertilized eggs, an immaculate deception
- A Japanese pufferfish creates and maintains an exquisite 6-foot-wide courtship arena

- Some fishes' placental structure is as complex as mammals; live births are common

SUPERLATIVES

- Fishes have the longest puberty: spiny dogfishes are sexually mature at 35+ years
- Frilled sharks have the longest known pregnancy: more than 3 years
- The reef triggerfish of Hawaii is known to locals as the humuhumunukunukuapua'a
- The least flattering animal name may be the hairy-jawed sack-mouth
- The most preposterous name: sarcastic fringe-head
- And the crudest: *Halichoeres bivittatus* (aka the slippery dick)

VIRTUE

- Rabbitfishes feed on reef algae, which makes them vulnerable to lurking predators; they forage in pairs, with one playing look-out; then they switch off so both get fed safely
- Mouth-brooding dads starve for weeks while protecting eggs or fry in their mouths
- Some fishes forego breeding while helping their parents raise young, as some birds do

FISH OUT OF WATER

- Humans catch and kill between 200 billion and 2 trillion fishes every year
- Leading causes of death are suffocation, crushing, decompression, exsanguination
- We have lost about half of all marine life in the past fifty years
- When we eat a tuna, we are eating a wild apex predator; the ocean equivalent of a tiger
- Aquaculture (factory farming of fishes) has been the fastest growing food sector
- Aquaculture includes crowding, rampant parasites, ocean contamination with toxic chemicals and bacterial diseases, genetic contamination, starvation of escapees
- A paradox: fish populations are declining, yet people are eating more fish
- Explanation: the advance of technology to find and catch fishes, and fish farming
- Bycatch (unwanted catch, usually tossed back dead or dying): about 200m tons/day
- We lose or discard some 640,000 tons of fishing gear in the water each year

ECOLOGY

- Oceanic blue-green algae produce more than half Earth's oxygen supply
- Only 3% of the Earth's mass is water, and only 1% is available fresh water
- Climate change is causing rising water temperatures and sea levels
- Ocean acidification is contributing (alongside rising temps) to coral bleaching
- Everything flows downstream: heavy metals, pesticides, prescription drugs

FOOD CHOICES

- 98% of the animals humans kill are killed to be eaten
- Whenever we purchase a product, we tell the producer: "Do it again"
- Optimal sources of omega-3 fatty acids are in plants: flax, walnuts, spinach, etc.
- Companies like Gardein, New Wave Foods, and Finless Foods, are producing or developing plant-based or lab-grown alternatives to fish and other seafood products

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