Social Learning in fishes
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Bad Press

Goldfish have a 3 second memory
Fish are smart!

Animal behaviour: Inside the cunning, caring and greedy minds of fish

By revealing that fish cooperate, cheat and punish, Redouan Bshary has challenged ideas about brain evolution.

Alison Abbott
26 May 2015
Learning and memory

Social environment: Fish School
Living in complex social groups

A. Bhat & A. Magurran 2006 J. Fish. Biol


5 weeks
Group size matters

• Benefits of familiarity

• Fish learn faster in larger groups
• Fish learn faster in larger groups... or not
Leaders, followers and personality

- Boldness
- Sociality
- Activity
Dispersal
• Variation in group dispersal behaviour did not correlate with the groups’ average personality score

• This is not about group conformity and consensus building

• Positive and negative social feedback defines group movement
Fish can pool their knowledge

Means and 95% CI

Proportion of naive fish

Social learning

Predators

Mates

Prey
Social learning during foraging

C. Brown & K. Laland 2002 J. Fish. Biol
Social learning enhanced in familiar groups

W. Swaney et al. 2001 Anim. Behav.
- Divided attention
Who follows who?

• Small fish follow other small fish
• Fish prefer to follow a large group than a small group
• Fish follow familiar rather than unfamiliar demonstrators
• Fish tend to follow demonstrators that have directed behaviour (high motivation)
• Poorly trained demonstrators are more effective than well trained demonstrators
• Males will follow females, but females won’t follow males
• Personality partially defines each role (leader, follower, lager)
Public v private info


J. Kendal et al 2008 Behav. Ecol.
Personality affects trade-offs between private and social information
Personality test 1
Training (3x/d 15d)
Preference test
Info use test
Personality test 2

Info use test

- Treatment 1) public and private info coincide
- Treatment 2) public and private info conflict
- Treatment 3) social stimulus control
Proportion of time spent in rich zone

Private and public info coincide

Private and public info conflict

Social networks
Social networks in Port Jackson sharks
Collecting social contact data for social networks

Social data must be collected at a small scale

Proximity receiver 2012
- No assortment by sex (r=-0.02±0.08)
- No assortment by size (r=-0.01±0.06)
- No assortment by genetic relatedness

MiniSUR receivers 2012
- Assortment by sex (r=0.13±0.07)
- Assortment by size (r=0.11±0.06)
- No assortment by genetic relatedness

MiniSUR receivers 2013
- Similar associations to 2012
  - Assortment by sex (r=0.35±0.08)
  - Assortment by size (r=0.14±0.08)
  - No assortment by genetic relatedness
• Social aggregations act as information centres
Social networks and social learning

At least 3 interactions

Social networks and information diffusion

Low complexity aquarium

Structurally complex aquarium

3-spined sticklebacks

Rewarded foraging patch

Control patch (no reward)

Social learning and fishy culture

Within a generation

Between generations
Transmission chains

Proportion of shoal swimming through green door

French grunt daily migrations

Imitation?

Learning to produce particular body movements through observation of others

Brown Surgeonfish

Freshwater stingray


Implications: social learning and culture

• Fisheries enhancements
• Fisheries conservation and management
Hatchery production for restocking
Benthic Foraging

Latency to forage on benthos (sec)

Surface vs. Benthic

Fisheries management

Herring movements in the North Sea

1 = 1952-1956
2 = 1965
3 = 1973-1986
4 = 1988 -1994
5 = 1995-2001
6 = 2002 -2005

Conclusions

• Fish are much smarter than most people think
• Fish rely on both social and private information
• Social learning causes information to rapidly spread through a group
• Social relationships predict how information disperses
• Vertical transmission of information can lead to stable culture
• Understanding social learning processes has practical applications in fisheries management
Suggested reading
