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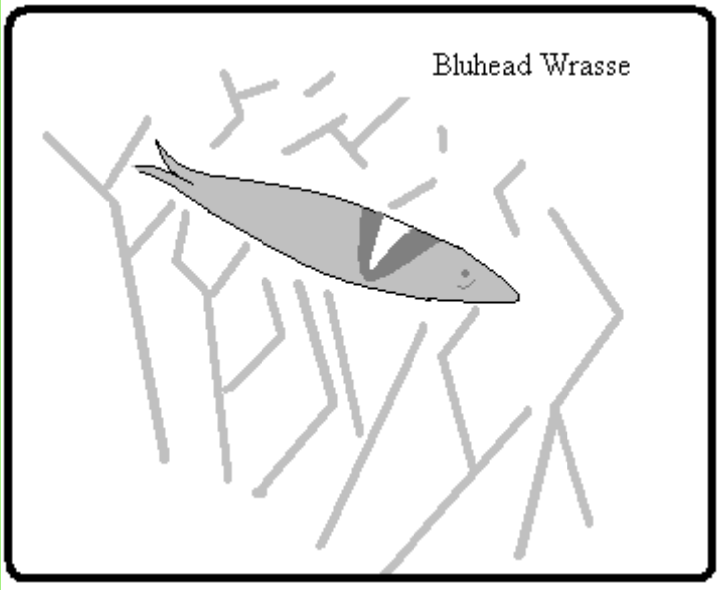
Cooperation and competition

Service providers work better in pairs than alone, says S.Ananthanarayanan

The cost and quality of service depend both on the provider-client relation as well as the relation between the providers. The relations are typically exercises of each participant finding a strategy to optimize her own gain. The journal, ***Nature*** recently reported a study of how pairs of a species of fish cooperate while cleaning a client fish species of parasites, in a way that is best for all the players.

Symbiotic cleaners

Wrasses are a family of bright coloured, smaller, marine fish that are marked by a jaw structure with separate jaw teeth that jut out. A group of them are the ***cleaner wrasses*** which provide a service to other fish by feeding on parasites and dead tissue in the clients' mouths and gill cavities. Client fish are known to seek places where wrasses congregate, to seek 'cleaner service' and predator fish leave wrasses alone because of the latters' value as cleaners. But the cleaners are not entirely benevolent, they also like to snatch a bit of healthy tissue and mucous, which is an extra charge the clients usually do not agree to pay!



When a client fish is being cleaned by wrasses, it patiently allows its parasites and scales to be cleaned, till the cleaner takes a nip at healthy tissue. The client discourages this behaviour usually by swimming away – so that the feeding session ends for the cleaner. How soon a cleaner is likely to chance a 'cheating bite' and whether a cleaner behaves differently when working with a partner can be matters of mathematical study.

Marginal Value Theorem

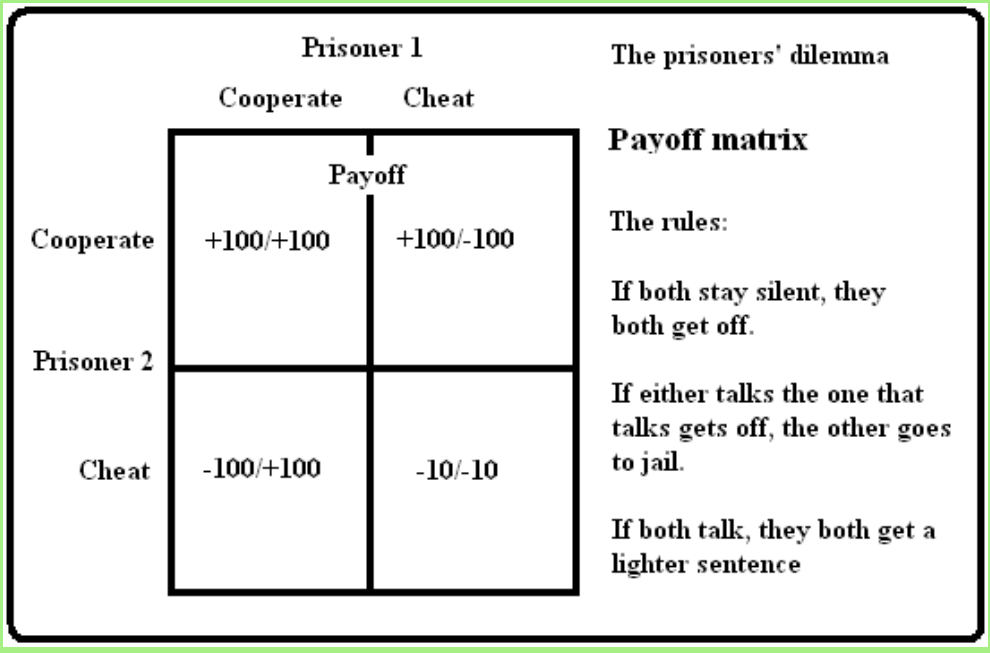
This has to do with the strategy while plucking apples in an orchard. One method would be to pick just two apples from each tree and go on to the next. But this would be wasteful because a lot of time would be spent walking between trees. Another method would be to pick all the apples from a tree before going on to the next. This would not be so bright either, because the speed of getting apples falls as the tree gets depleted – and the last apples would take a long time to find. The ideal is somewhere in between, in fact, somewhere near the moment when the time when time taken for picking an apple becomes equal to the time for walking to the next tree.

In the case of cleaner wrasses, the cleaners find plenty of dead tissue and client parasites at the start of the cleaning. But a nip at the client itself would send the food away. The cleaner hence defers the tempting bite till the stock of dead tissue has grown thinner. And then, it would be better to take that bite, than to keep cleaning the client.

The prisoners' dilemma

This classic game theory example is of two prisoners who are charged with a serious crime. But the police do not have enough evidence for conviction. So they put the prisoners in separate cells and make them an offer. If one of them confesses, while the other does not, the confessor goes free while the other gets twenty years. If both of them confess, they both get one year. But if neither confesses, they both go free.

Here the safest individual strategy is to confess. This eliminates the risk of twenty years and the worst can be one year. Hence, with rational, mathematically inclined prisoners, the police is likely to solve the crime. But if the prisoners belong to a ***cooperative*** and well indoctrinated community, they may both hold out and go free! Variations of this game form the basis of many management programmes, to promote cooperation and trust among employees, managers and enterprises.



Strategy also becomes relevant when cleaner fish are working in pairs. There is an advantage for fish to work in pairs, because clients are likely to seek them out for faster service. But while the pair efficiently reduces the supply of scales and parasites, only one of them can take a bite of living tissue, for the client will fly and the other cleaner will be left hungry. Being the first to bite every time will induce the partner to leave and pair with another cleaner fish Hence, out of cooperation, each cleaner delays taking the bite and the client reaps the benefit.

Field trials

Redouan Bshary and colleagues at Neuchatel, Switzerland checked this out in field observations at Ras Mohammed National Park, Egypt and aquarium experiments with the fish ***Labroidus dimidiatus*** and its client ***reef fish***. The results showed that the 'client jolt rate' (response to cheating bites) was significantly less in the case of cleaning in pairs than when cleaner fish act alone. Wrasses generally work in male-female pairs and it was found that the increased cooperative behaviour, or feeding contrary to preference, when working in pairs, was in the female, rather than the male. "Females caused significantly less jolts when inspecting in a pair than when inspecting alone, whereas there was only a trend in the same direction for males", say the researchers in their paper.