## Example 7: Hermaphroditic fish

Members of some species of hermaphroditic fish choose, in each mating encounter, whether to play the role of a male or a female. Each fish has a preferred role (uses up fewer resources, hence allows more future mating). A fish obtains a payoff of H if it mates in preferred role and L if it mates in other role ($H > L$). Consider an encounter b/w 2 fish whose preferred roles are same. Each fish has 2 possible actions: mate in either role, and insist on its preferred role. If both fish offer to mate in either role, the roles are assigned randomly, and each fish's payoff is $\frac{1}{2}(H+L)$. If each fish insists on its preferred role, the fish do not mate; each goes off in search of another partner, and

obtains the payoff $s$. The higher the chance of meeting another partner, the larger is $s$.
Determine the range of values of $s$.

((Game differs from Prisoner's Dilemma only in the name of the actions.))

| F1 \ F2 | Either role | Preferred role |
|---|---|---|
| Either role | $\frac{1}{2}(H+L), \frac{1}{2}(H+L)$ | L, H |
| Preferred role | H, L | S, S |

Each player's preferences over the 4 outcomes are the same as they are in the Prisoner's Dilemma.

Thus, $\boxed{L < S < \frac{1}{2}(H+L)}$