Answers to Exercise 40

Mating Systems and Parental Care

1. A system in which both parents care has evolved, and is an ESS. That is, if we introduced a different strategy in Year 20, the results would still go back to a two parent caring system. We have called this "social monogamy" because the model does not assume that individuals that provide the care actually contribute sperm and eggs to offspring. Monogamy evolved because two parents are required for parental care, or $P_2 >> P_1$. Additionally, because the probability of re-mating for males that desert is not significantly greater than the probability of re-mating for males that care.

2. Single parent guarding is likely when $P_2 = P_1 >> P_0$. Male desertion is favored if $p > p'$ so that by deserting a male will likely obtain a second mate. Female desertion is favored when $V > v$ (females that provide care cannot allocate more energy towards egg production).

3. If P_0 is not greatly less than P_1, it is likely both parents will desert. Female desertion is favored when $V > v$ (females that provide care cannot allocate more energy towards egg production). Male desertion is favored when $p > p'$

4. You should see that the inequalities for both ESS 2 and 3 are met.

	A	B	C	D	E
17		**ESS 1**	**ESS 2**	**ESS 3**	**ESS 4**
18		Both care	Male cares	Female cares	Neither cares
19	**Female inequality**	FALSE	TRUE	TRUE	FALSE
20	**Male inequality**	FALSE	TRUE	TRUE	FALSE

The initial frequencies of r and s determine which parental care system is ultimately the most successful. For example, when $r = 0.9$ for females and 0.1 for males, females provide care but males desert. In contrast, when $r = 0.1$ for females and $r = 0.9$ for males, males provide care but females desert. If the starting conditions are that both sexes desert, male care is more likely to emerge, and if the starting conditions are that both parents care, female care is more likely to emerge. Male care is favored when a female who is preadapted to put all of her energy into eggs experiences a significant drop in clutch size when she has to devote energy to care (so $V>>v$). Female care is favored when she is preadapted to expend considerable energy on care, and thus doesn't even lay large clutches so that energy can be allocated towards care. In this case, v will not be much lower than V. Females therefore mainly lose the male's help and offspring survival is a little lower, and since males can re-mate they are favored to desert.