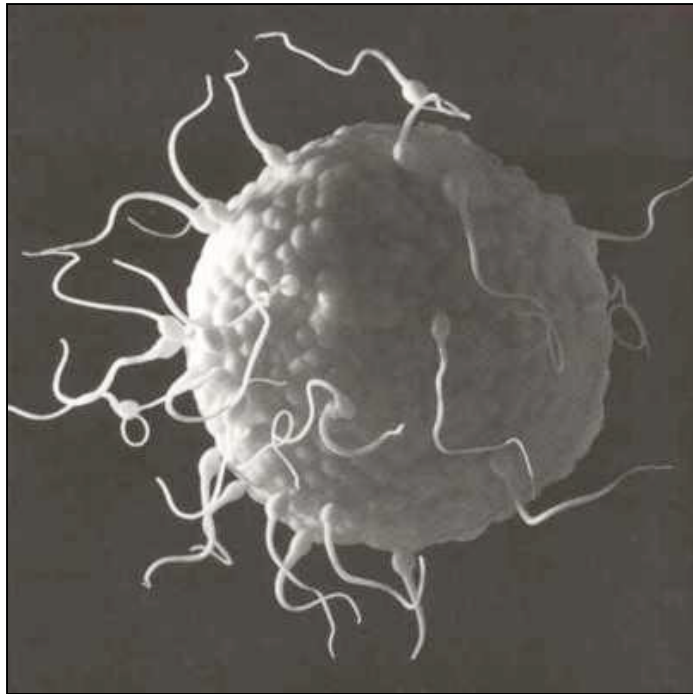


Recent advances in the study of ejaculate evolution



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Sperm competition



Behaviour

Sperm competition



Behaviour



Morphology

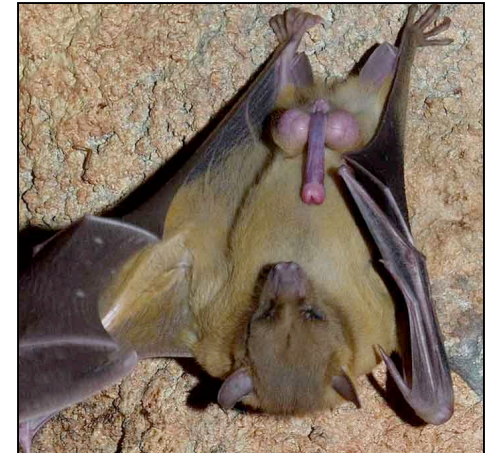
Sperm competition



Behaviour

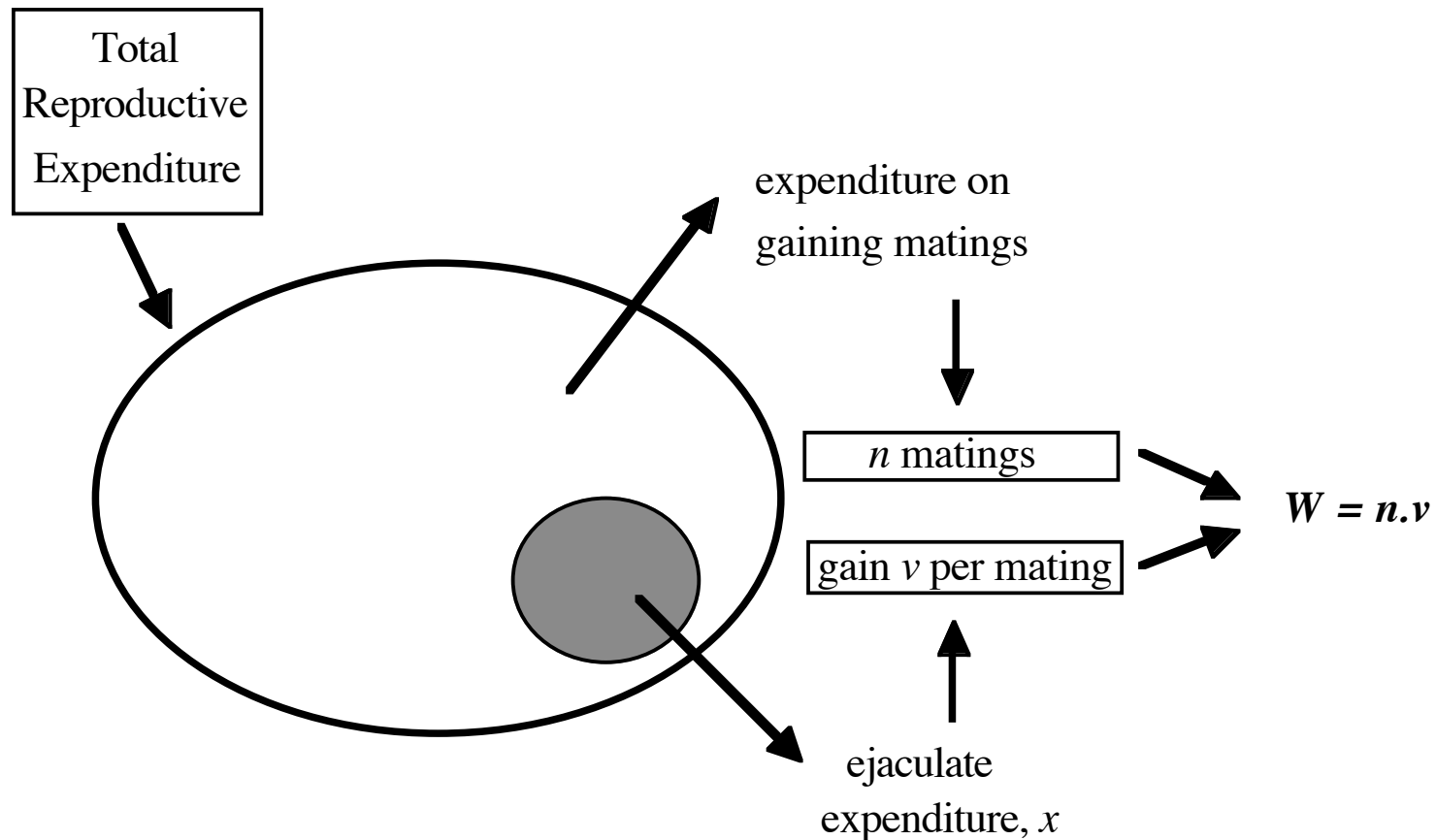


Morphology



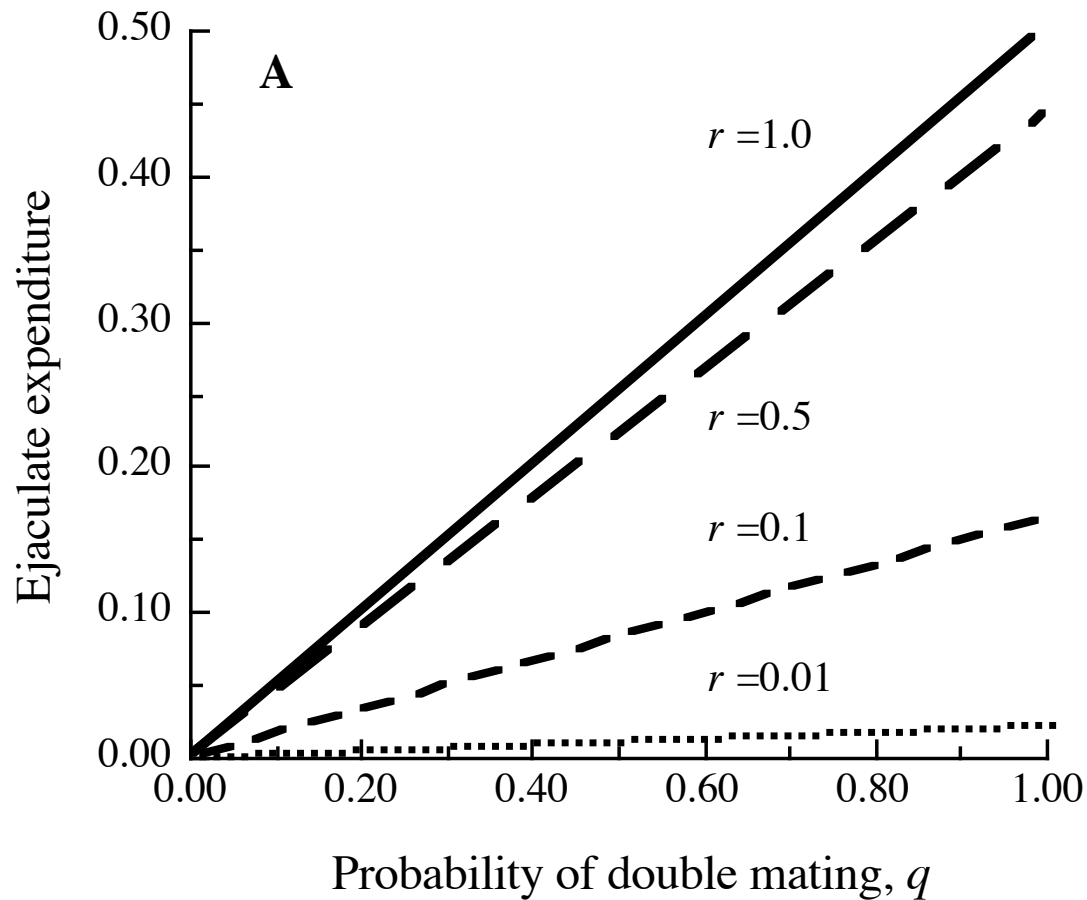
Physiology

Sperm Competition Games: Modelling the ESS ejaculate expenditure



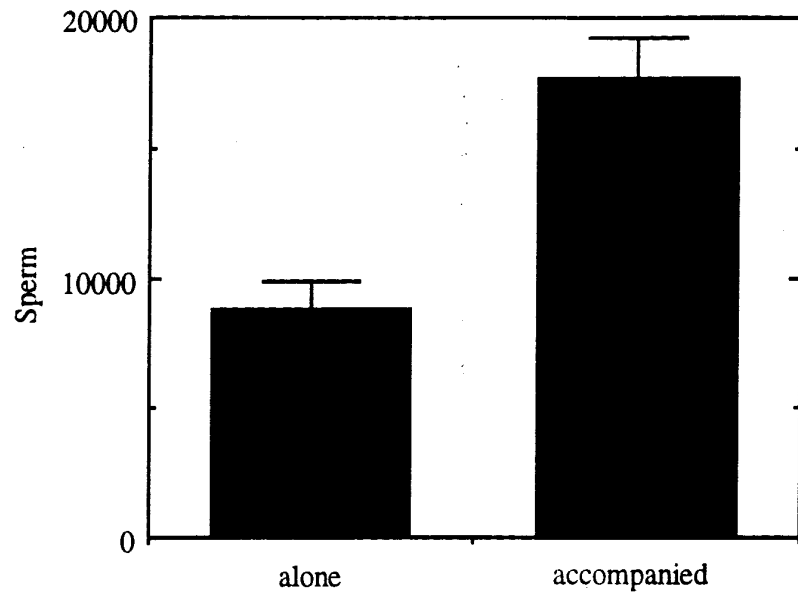
from Parker 1998

Sperm Competition Games: Modelling the ESS ejaculate expenditure

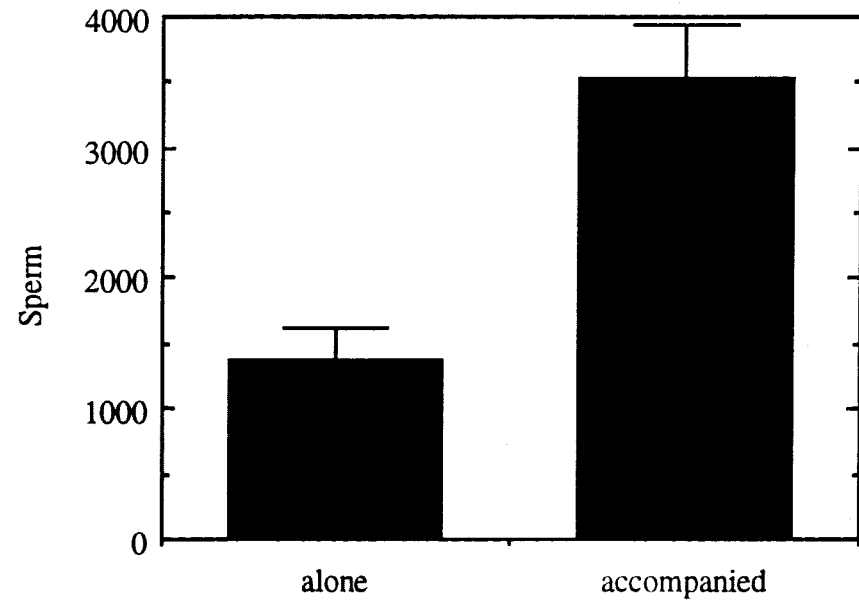


from Parker 1998

Strategic ejaculation in insects



Sperm ejaculated
by male *Tenebrio
molitor*



Sperm ejaculated
by male *Ceratitis
capitata*

from Gage 1991a, b

Ejaculate components:

- female sexual receptivity
- vitellogenesis
- oviposition

- sperm transport & storage
- capacitation
- motility & longevity

Sperm Competition and the Evolution of Ejaculate Composition

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Lots of Maths!

$$\left. \frac{\partial W_m}{\partial s_1} \right|_{\substack{s_1 = \hat{s}_1; b_1 = \hat{b}_1 \\ s_2 = \hat{s}_2; b_2 = \hat{b}_2}} \propto \frac{r\hat{s}_2 F(\hat{b}_1 + \hat{b}_2)}{2(\hat{s}_1 + r\hat{s}_2)^2} + 2 \frac{N_f^{(1)}}{N_m^{(1)}} \frac{Q\beta'(\hat{b}_1 + \hat{s}_1)}{\bar{\beta}},$$

(7a)

$$\left. \frac{\partial W_m}{\partial s_2} \right|_{\substack{s_1 = \hat{s}_1; b_1 = \hat{b}_1 \\ s_2 = \hat{s}_2; b_2 = \hat{b}_2}} \propto \frac{r\hat{s}_1 F(\hat{b}_1 + \hat{b}_2)}{2(\hat{s}_1 + r\hat{s}_2)^2} + 2 \frac{N_f^{(1)}}{N_m^{(1)}} \frac{Q\beta'(\hat{b}_2 + \hat{s}_2)}{\bar{\beta}}$$

(7b)

$$\left. \frac{\partial W_m}{\partial b_1} \right|_{\substack{s_1 = \hat{s}_1; b_1 = \hat{b}_1 \\ s_2 = \hat{s}_2; b_2 = \hat{b}_2}} \propto \frac{\hat{s}_1 F'(\hat{b}_1 + \hat{b}_2)}{\hat{s}_1 + r\hat{s}_2} + 2 \frac{N_f^{(1)}}{N_m^{(1)}} \frac{QK\beta'(\hat{b}_1 + \hat{s}_1)}{\bar{\beta}},$$

(8a)

$$\left. \frac{\partial W_m}{\partial b_2} \right|_{\substack{s_1 = \hat{s}_1; b_1 = \hat{b}_1 \\ s_2 = \hat{s}_2; b_2 = \hat{b}_2}} \propto \frac{r\hat{s}_2 F'(\hat{b}_1 + \hat{b}_2)}{\hat{s}_1 + r\hat{s}_2} + 2 \frac{N_f^{(1)}}{N_m^{(1)}} \frac{QK\beta'(\hat{b}_2 + \hat{s}_2)}{\bar{\beta}}$$

(8b)

1. When seminal fluids increase female fecundity

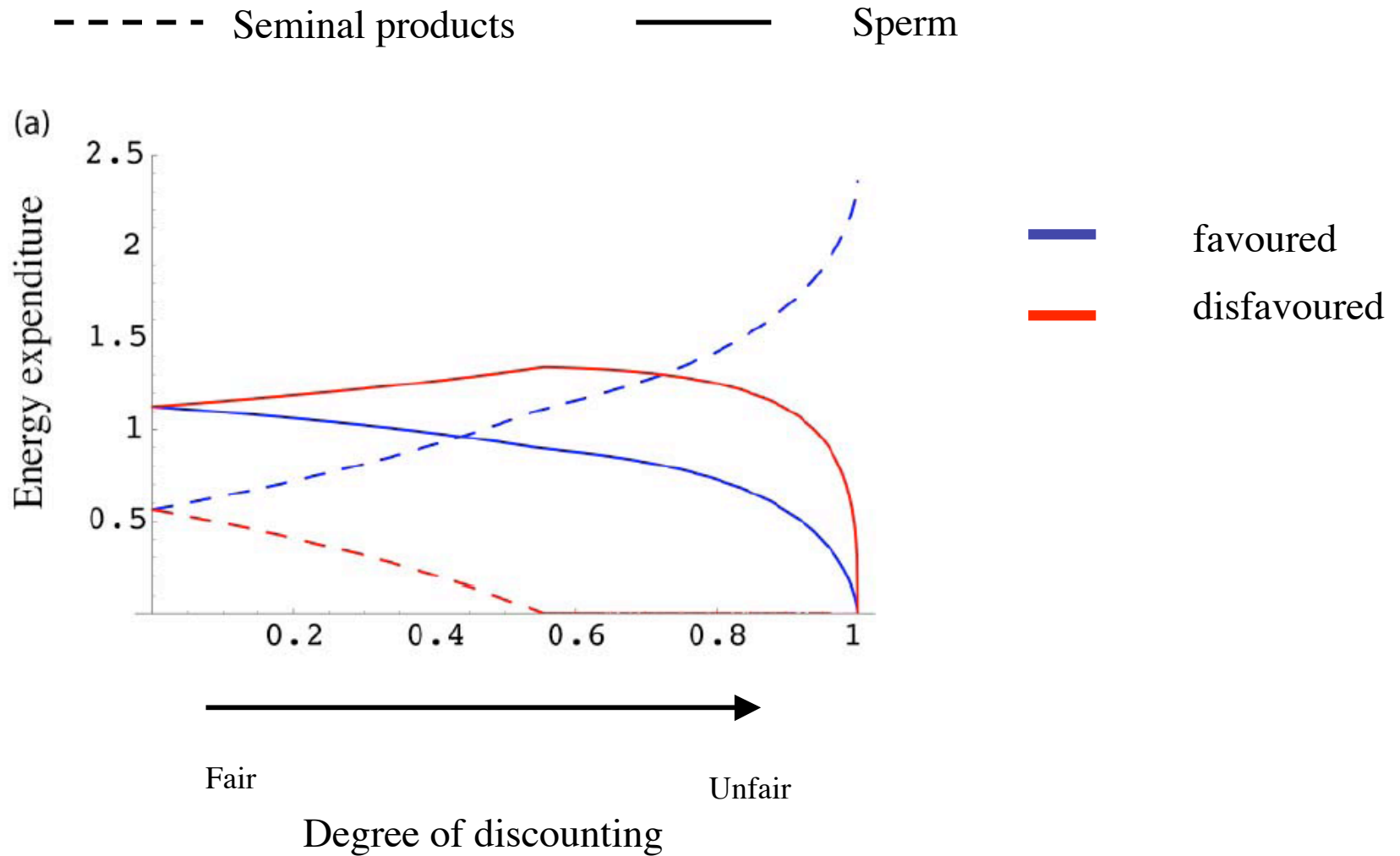


Figure 1a: from Cameron et al. 2007

1. When seminal fluids increase female fecundity

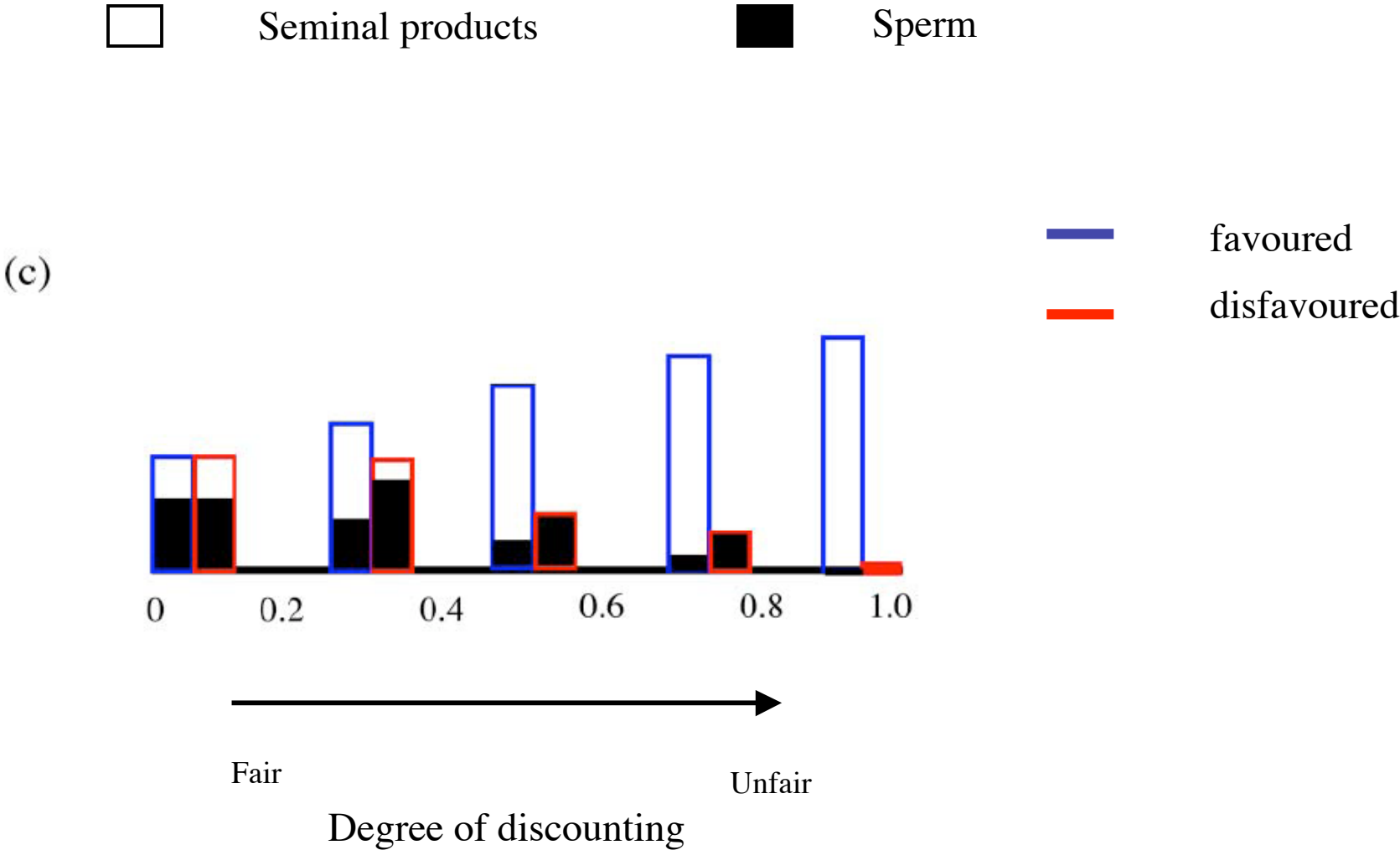


Figure 1c: from Cameron et al. 2007

2. When seminal fluids increase competitive ability of sperm

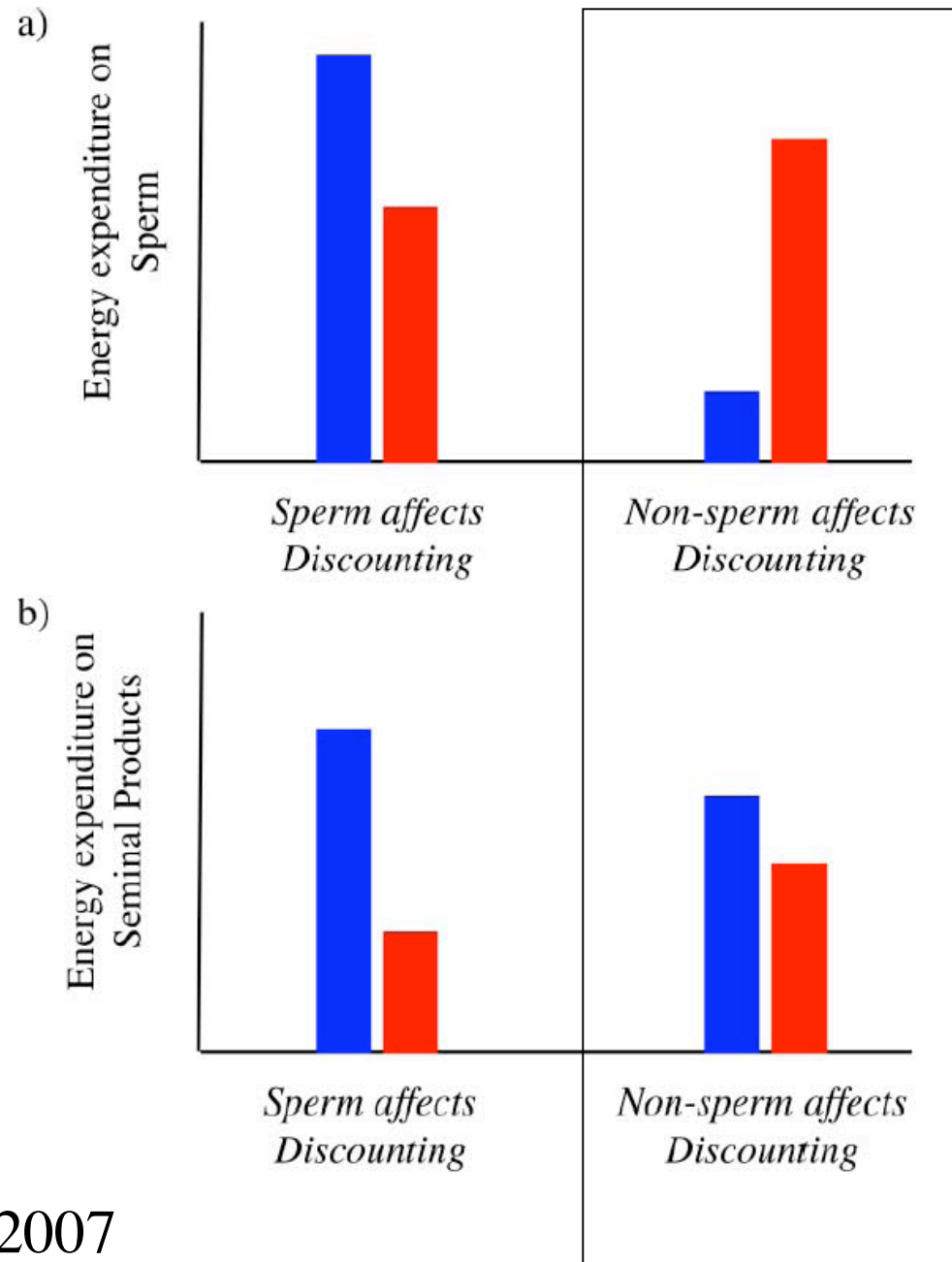
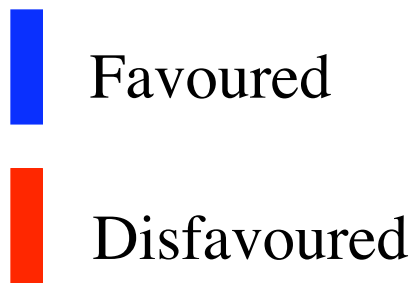
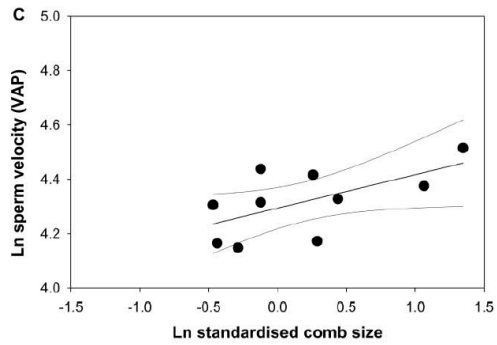
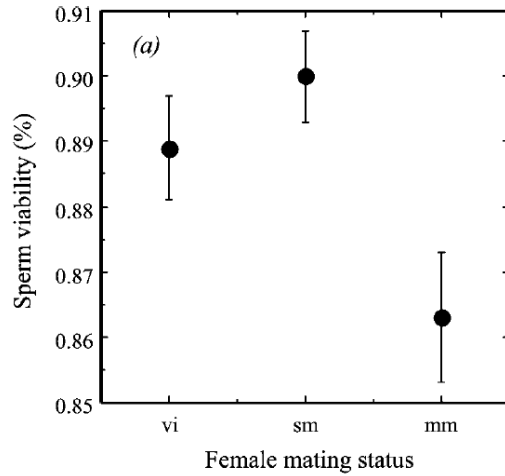


Figure 2: from Cameron et al. 2007

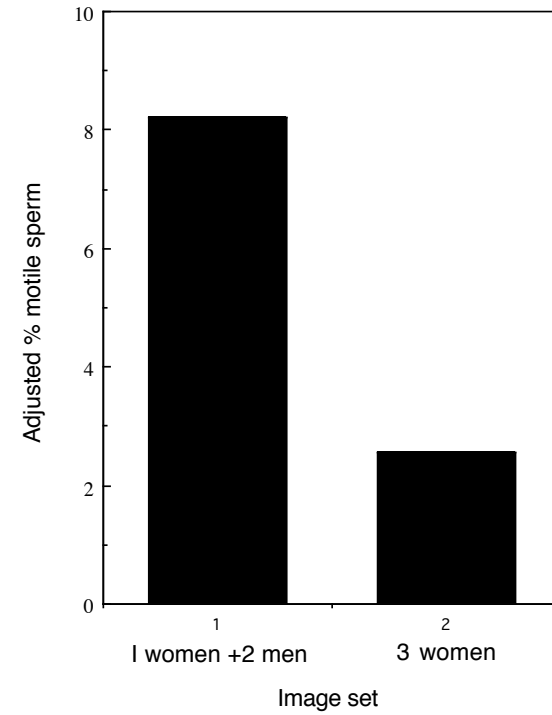
Strategic adjustments in sperm quality



Cornwallis et al. 2007



Thomas & Simmons 2007



Kilgallon & Simmons 2005

Analysing variation in seminal fluid quality

- biochemical profiles
- proteomics
- quantitative gene expression
-

Further Reading

Cameron, E., T. Day, and L. Rowe. 2007. Sperm competition and the evolution of ejaculate composition. *Am. Nat.* 169:E158-E172.

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