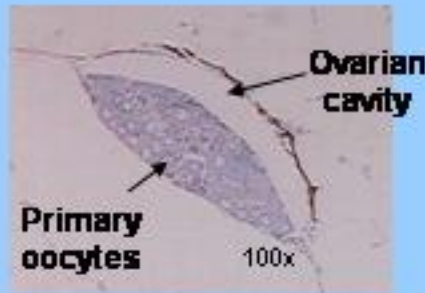


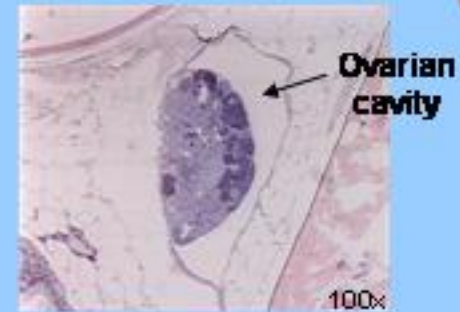
Effects of Oestrogens on Sexual Development in Roach are permanent and/or persistent.



Normal Ovary with ovarian cavity



Normal Testis



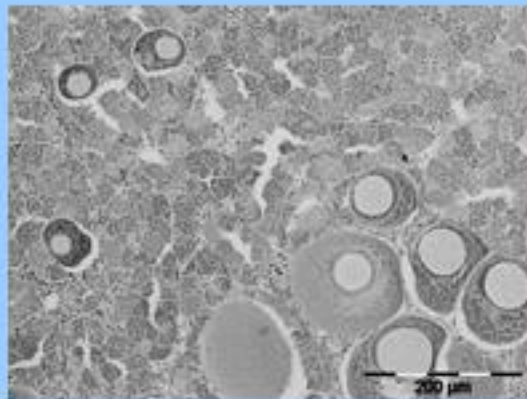
Testis with ovarian cavity

Exposure to oestrogenic to effluent during early life (to 50dpf) results in feminised reproductive ducts in 1 year old fish.

Exposure to ethinyloestradiol during early life (to 120dpf) results in feminised reproductive ducts in 2 year-old fish.

Liney, K.E., Jobling, S., Shears, J., Simpson, P., Tyler, C.R. (2005) Environmental Health Perspectives. 113 (10): 1299-1307

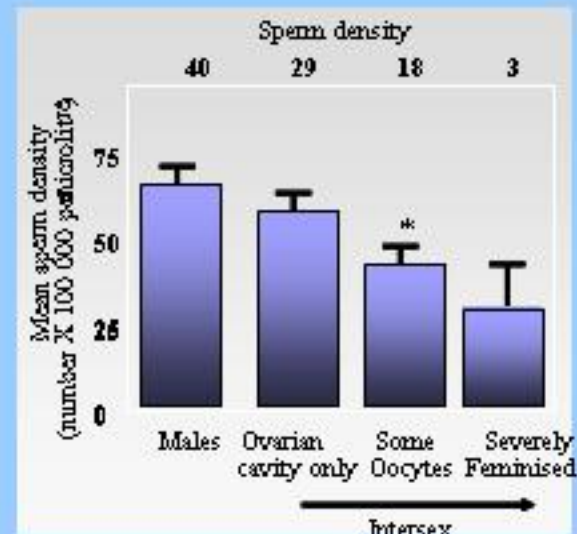
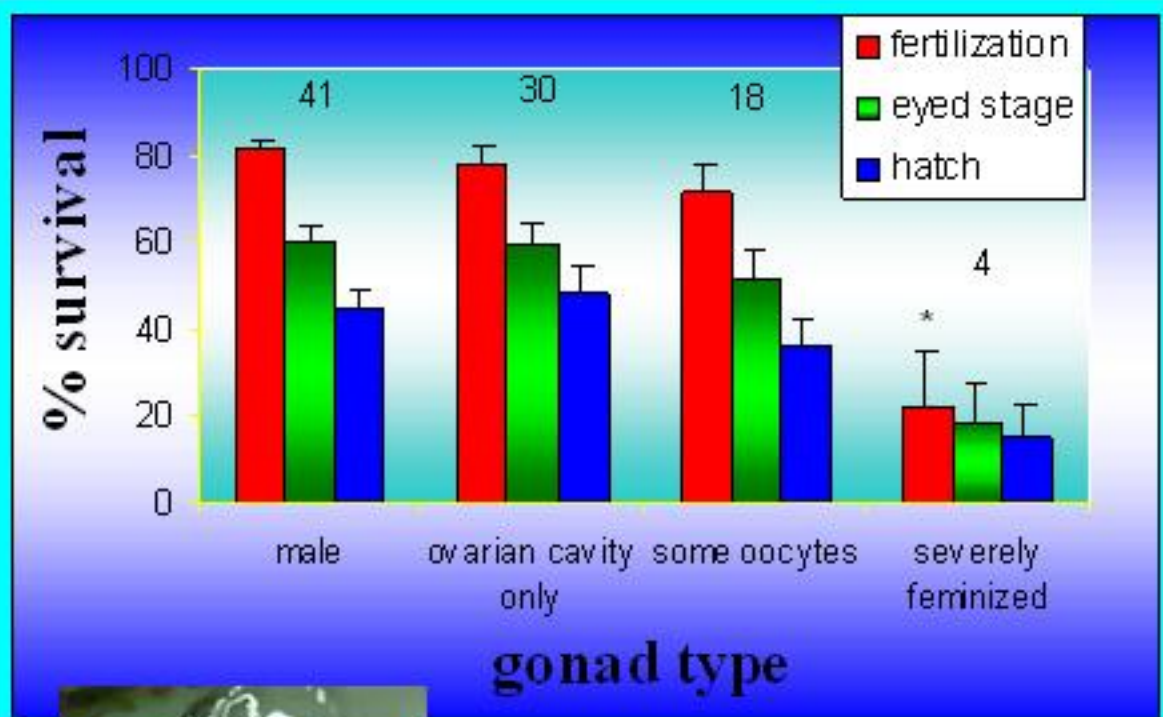
Lange, Paull, Katsu, Iguchi, Tyler, 2006 - Data in prep



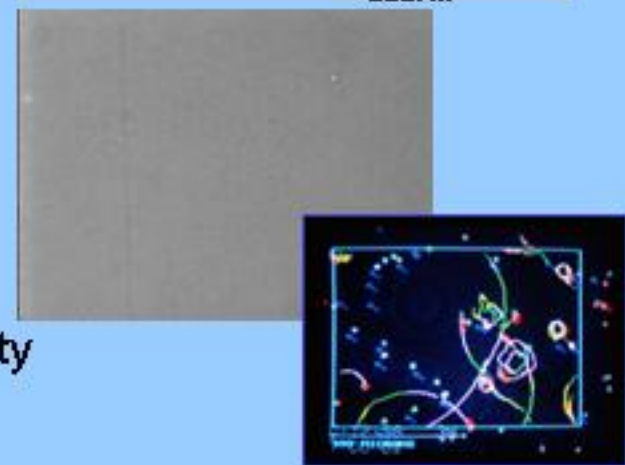
Exposure to ethinyloestradiol during early life (to 120dpf), results in intersex in 2 year-old fish.

Lange, Paull, Katsu, Iguchi, Tyler, 2006 - Data in prep

Intersex has Reproductive Consequences for Individual Roach.



Some of these effects are a function of poor sperm quality



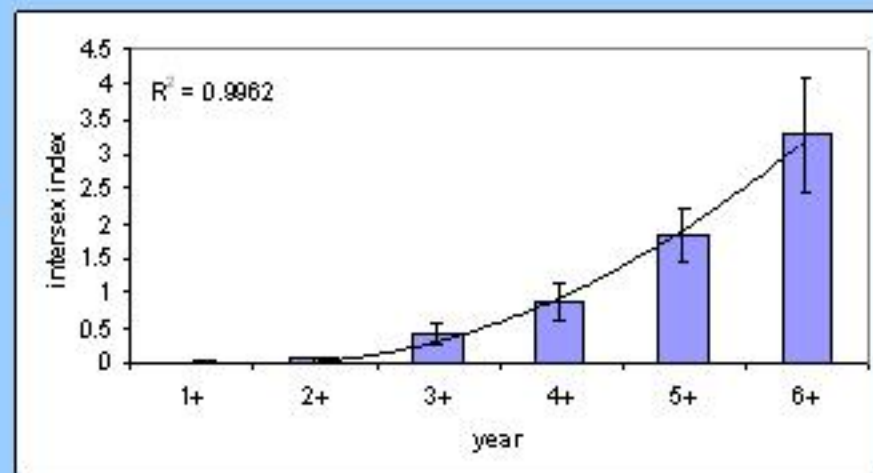
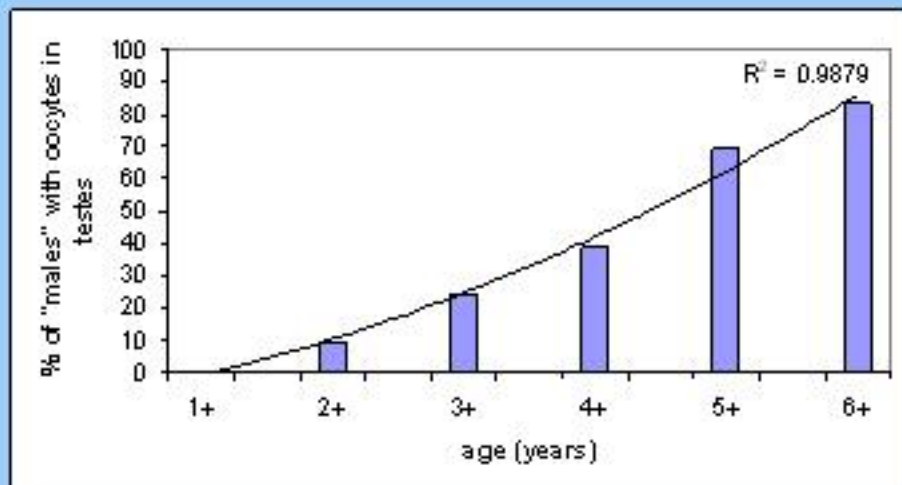
Poor sperm

- sperm heads
- immotile
- tracked sperm
- pretracked sperm

....and this is the best case scenario

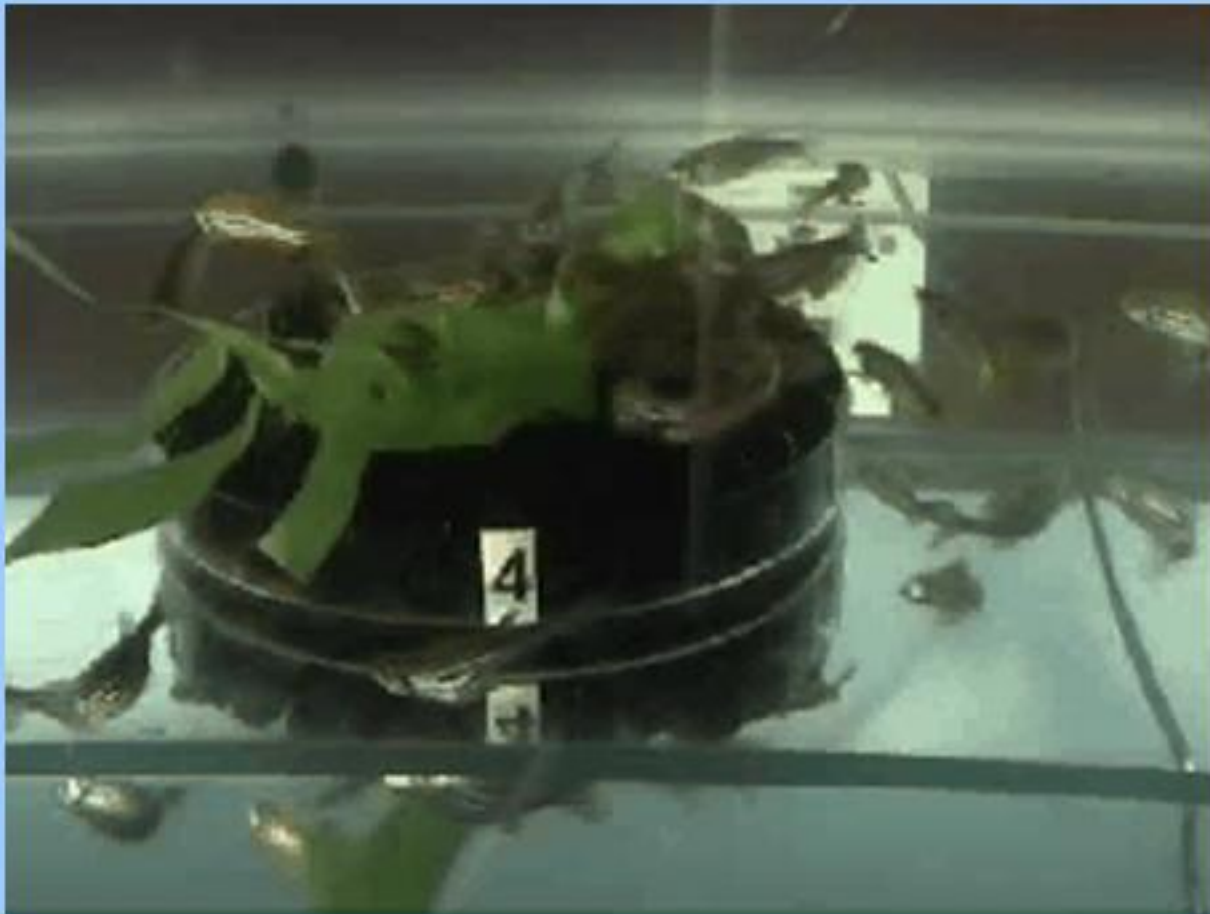
Jobling, S., Coey, S., Whitmore, J. Beresford, N., Nolan, M., Brighty, G., Sumpter, J.P. and Tyler, C.R. (2002) *Biology of Reproduction* 66(2):272-281.
 Jobling, S., Coey, S., Whitmore, J. Beresford, N., Nolan, M., Brighty, G., Tyler, C.R. and Sumpter, J.P. (2002). *Biology of Reproduction* 76 (2):515-524.

Intersex (incidence and severity) increases with age



If older fish are dominant in the breeding shoal, the impacts of intersex are could be severe

Oestrogens alter reproductive behaviour



Roach have a similar reproductive biology to the zebrafish

So...are roach populations impacted by sexual disruption in English Rivers?



A synopsis of what we know:

- ❖ Intersex and feminisation is widespread in roach populations in English Rivers and the incidence can be very high
- ❖ Feminising effects on the gonad in males are permanent/persistent
- ❖ Intersex fish can have a reduced reproductive capacity
- ❖ Older fish are the most affected (but we do not know if they are the dominant breeding fish)

Will intersex affect the sustainability of roach populations in English Rivers ?



- ❖ Anecdotal evidence for lack of recruitment in some roach populations (but evidence for sustained populations in others)
- ❖ There are not sufficient long-term (and detailed) monitoring programmes of roach populations to judge any decline, or otherwise
- ❖ Many roach populations in English Rivers are interconnected
- ❖ Fish may possibly acclimate/adapt to environmental oestrogens



Answer**WE DO NOT KNOW!**