

THE ROLE OF F-SERIES PROSTAGLANDINS IN PHEROMONAL MEDIATED REPRODUCTION IN BROWN TROUT

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Introduction

Both the urine and ovarian fluid from ovulated female brown trout (*Salmo trutta* L.) contain reproductive priming pheromones that significantly increase the plasma concentrations of sex steroids in male trout prior to spawning. In a closely related sympatric species, the Atlantic salmon (*Salmo salar* L.), the reproductive priming pheromones released by the females have been identified as F-series prostaglandins. These pheromones elevate the levels of expressible milt, 17,20 β -dihydroxy-4-pregnen-3-one, testosterone and 11-ketotestosterone in male fish. The aim of this study was to determine whether F-series prostaglandins are also involved in pheromonal mediated reproduction in brown trout.

Materials and methods

Electro-olfactogram (EOG) recordings were made from the olfactory epithelium of mature male brown trout (mean length 189 \pm 2.1 mm; n=10) in response to the following:

1. PGF_{1 α}
2. PGF_{2 α}
3. 15-ketoPGF_{2 α}
4. 13,14,-dihydro-15-ketoPGF_{2 α}
5. ovulated female trout urine
6. trout ovarian fluid

Mature male brown trout were also exposed to the F-series prostaglandins, female trout urine and ovarian fluid for 5 hours and the following measured:

1. plasma 17,20 β -dihydroxy-4-pregnen-3-one (17,20 β P)
2. plasma testosterone
3. plasma 11-ketotestosterone
4. expressible milt

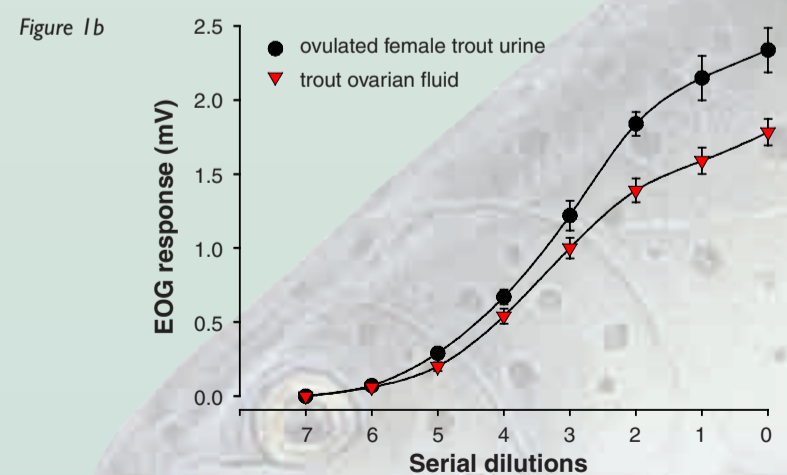
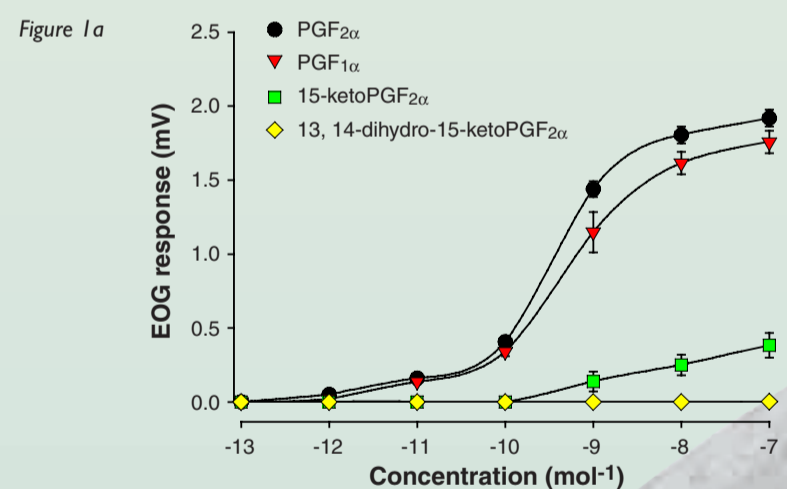


Figure 1. Olfactory recordings (EOG) from male trout (n=10) exposed to a) F-series prostaglandins b) ovulated female trout urine and ovarian fluid. Vertical bars represent S.E.M.

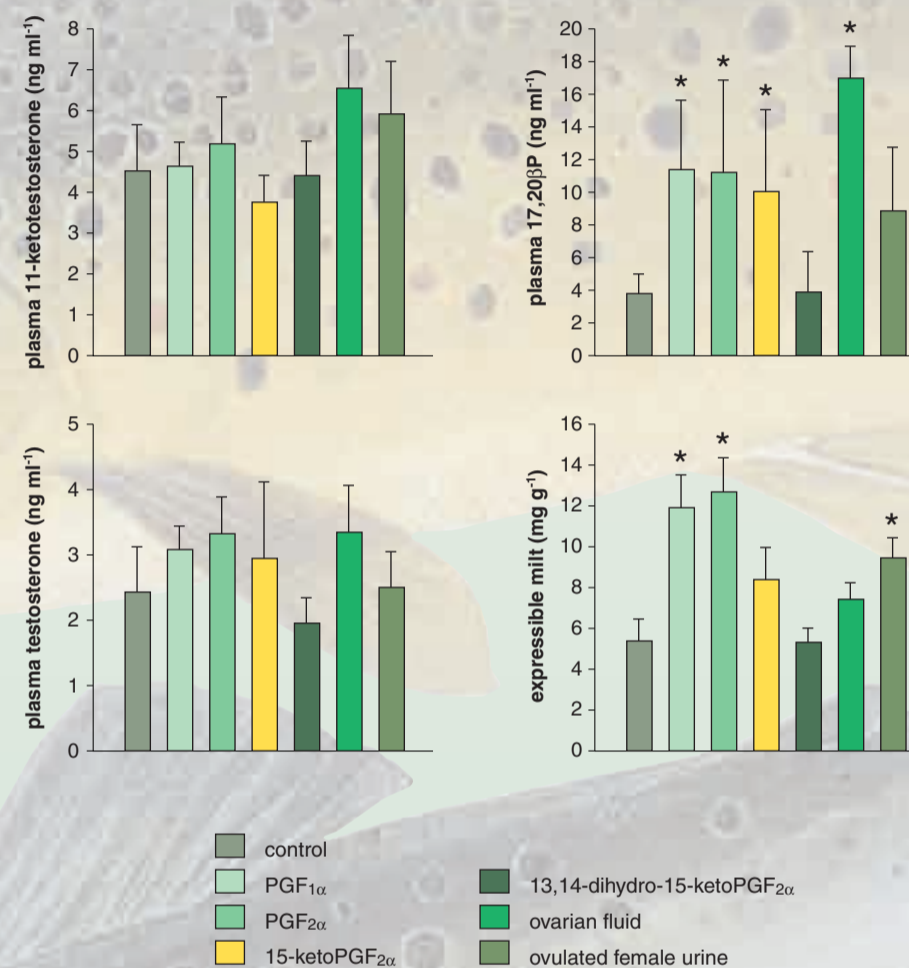


Figure 2. Mean levels \pm S.E.M. of expressible milt and plasma testosterone, 11-ketotestosterone and 17,20 β P in groups of male trout (n=12) exposed to F-series prostaglandins, ovulated female urine and ovarian fluid. *P<0.05 compared to control fish.

Results

- The olfactory epithelium of male trout was acutely sensitive to PGF_{1 α} and PGF_{2 α} (threshold 10⁻¹¹ M), 15-ketoPGF_{2 α} (threshold 10⁻⁸ M), but not 13,14,-dihydro-15-ketoPGF_{2 α} .
- The male trout olfactory epithelium was also sensitive to ovulated female trout urine and ovarian fluid.
- Exposure to PGF_{1 α} and PGF_{2 α} , elevated the levels of plasma 17,20 β P and expressible milt
- Exposure to 15-ketoPGF_{2 α} and ovarian fluid elevated the level of plasma 17,20 β P
- Exposure to ovulated female urine elevated the level of expressible milt
- There was no response to the controls or 13,14-dihydro-15-ketoPGF_{2 α} .

Discussion

1. The results suggest that PGFs function as reproductive priming pheromones in brown trout.
2. There is evidence that PGF_{2 α} occurs within both the ovarian fluid (181 \pm 11 ng ml⁻¹) and urine (3.5 \pm 1.9 ng ml⁻¹) of ovulated female trout.
3. In the UK spawning in brown trout and Atlantic salmon may occur in the same tributaries during the months of November and December. A similar pheromone mediated reproductive strategy may explain the basis of hybridisation between the two species.

