

**pregnancies (UPg).** Corresponding values for all sex and reproductive classes of SRKWs, including significant differences between classes, are presented in [Table 3](#). Note: T3 Concentrations are multiplied by 4 in Fig B to scale its concentrations to those of GC in order to present a double Y graph for 3 related metrics, each with different value ranges. Bars with the same letter are significantly different from each other.

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However, the initial T3 decline was longer in duration than that observed for the overall population, lasting until day 190. T3 concentrations in the pregnant females then increased until day 250 ([Fig 4A](#)), which was near the time when the FRC run reached it back ([Fig 1A](#)). While the pattern was the same in High T successful and unsuccessful pregnancies, T3 in High T UPg samples remained significantly lower than that in High T successful pregnant females ( $p = 0.004$ ), consistent with relatively higher nutritional stress in the High T UPg females ([Fig 4A](#)). Change in GC concentrations among pregnancy females were the exact opposite of T3, showing a steep rise until day 190 followed by a decline until day 250, and significantly higher in High T UPg compared to High T successfully pregnant females ( $p < 0.002$ ) throughout this period ([Fig 4B](#)). Change in the T3/GC ratio followed the same pattern as T3, also remaining significantly higher in High T successful pregnancies ( $p < 0.003$ ) ([Fig 4C](#)).

#### 4. Discussion

Reproductive failure in response to conditions that jeopardize offspring survival has been described as an adaptive response if conditions are likely to improve in the foreseeable future. This environmentally-mediated loss most commonly occurs early in reproduction (conception and early pregnancy) when the cost of suppression (e.g., lost time and energy; impacts on maternal health) is relatively low [[43,44](#)]. However, failure at later stages of reproduction is expected when cues indicating poor fetal or neonatal conditions present themselves late in the reproductive event. The longer the span between conception and birth the more likely later suppression is to occur. Premature birth is a relatively low risk way to suppress reproduction because the reproductive failure occurs post-partum with reduced chance of infection. However, its occurrence should still depend on when harsh conditions present themselves. If fetal demise occurs or environmental conditions become especially harsh (e.g., risk of sepsis from starvation induced ketoacidosis during pregnancy; [[45](#)]), spontaneous abortion is expected. Thus, spontaneous abortion, premature birth, still birth, and perinatal and neonatal mortality are all part of a continuum of reproductive suppression that present with harsh conditions, on balance with risk of reproductive loss at that stage of reproduction [[44,46](#)].

SRKWs have an 18 month gestation period and their nutritional health depends on the relative timing of multiple, seasonal fish runs (e.g., spring CRC and summer FRC), as well as food availability in between those periods, each of which vary markedly between years ([S1 Fig](#)). The increasingly common occurrence of SRKW births outside the typical winter calving period may well be an indication of the increased unpredictability of diminishing fish runs along with the corresponding high rate of late reproductive loss in SRKWs, including more costly late spontaneous abortions. The SRKWs had a 69% pregnancy failure rate during our study and an unprecedented half of those occurred at later stages of reproduction when the energetic cost of failure and physiological risk to the mother was relatively high. Temporal patterns in T3 and GC hormone profiles suggest that the SRKWs are experiencing periodic nutritional stress, partly caused by variation in the relative timing and strength of seasonal FRC and CRC runs ([Fig 1](#)). This nutritional stress is significantly associated with unsuccessful pregnancies in SRKWs ([Figs 3 and 4](#)), impairing the potential for population recovery through low recruitment as well as risk to the health and survival of the limited number of reproductive-age females.