Notes from meeting with Ned Norton and Don Jellyman (27/9/17)

Discussions on the effects of low flows at the 14 September Committee meeting raised questions about various factors that can stress tuna populations and their responses to those stressors. In particular, the Committee recalled that one of the potential responses to stress is having disproportionate numbers of males in the tuna population.

Dr Don Jellyman is a principle scientist with NIWA and has a long experience in research of tuna, including involvement in studies in Porirua Harbour catchments. This note outlines some of the key points from a meeting between Ned and Don and is background for Don's attendance at the upcoming Committee meeting.

Tuna response to density stress and minimum flows.

Large numbers of tuna in a restricted area of habitat can cause a density stress response in tuna, which results in a disproportionate number of males in a population. This is a relevant consideration when deciding minimum flows and allocation block sizes because these limits at least partly influence the area of habitat available during times of low summer flows.

Setting minimum flows that maintain habitat at or about the levels naturally available at MALF are unlikely to cause significant additional stress on the tuna populations in the Whaitua catchments. If the modelled habitat reductions associated with certain flows are correct, minimum flow restrictions for takes set at or around 90-110% of MALF would be likely to avoid such stress.

The relatively small percentage reductions in habitat predicted by the model with modest reductions below MALF are consistent with what one might expect from the type of streams in the Porirua Whaitua (i.e., channelised stream forms rather than wide braided forms). In that respect, the habitat change modelling results seem to make sense.

The levels of habitat reduction that might be expected to cause density stress for tuna are expected to be in the order of minimum flows around 50% of MALF which the model predicts would cause around 30-50% of habitat reduction.

It is also important to ensure that water abstraction does not force the stream flow down to near the set minimum for periods unreasonably longer than occurs naturally.

Management of other stressors on tuna

In addition to managing stream flows and habitat, there are a range of other stressors that affect tuna populations in different ways, some of which fall within the range of matters the Whaitua Committee can influence. These include:

- Flow variability – some variability is good but very flashy flows from largely impervious urban catchments can be bad for habitat erosion.
- Instream habitat not related to flow; e.g., instream cover, undercut banks, debris clusters etc (specifically not uniform concrete beds or edges)

- Habitat variety - riffles being the main food producing areas (and invertebrates are essential food for small tuna), and pools provide cover (and sometimes refuge from increased water temperature, especially if there's some addition of groundwater to pools)
- Riparian condition; e.g. shading to manage temperature and cover from predators etc
- Water quality; e.g., sediment, metals, nutrient effects on periphyton and dissolved oxygen
- Migration passage; e.g., avoiding restrictive structures like unnegotiable culverts and pipes
- Disturbance of historic toxins (DDT) in the soil in parts of the catchment
- Conditions in the harbour and at sea where tuna migrate to breed
- Human commercial and customary harvest
- National decreases in recruitment to national population