

**Comments on TLSB's response re: parameter definition, as requested by NRW-PS  
in Shelley Vince email 19/2/18**

**Scope:** As previously, in my Comments for PASAS (Comments for PASAS\_GM 6Sept17.pdf), and at the meeting on parameters in December, these further comments are focussed on migratory salmonids, primarily salmon.

**3.2 Avoidance:** NRW PS proposed that the model should be run using Cefas' approach for avoidance, which TLSB has disputed. Do you have any additional advice with regards to the suitability of either approach, or are you able to provide an alternative with associated reasoning?

I do not agree with Cefas' approach that it is reasonable to assume that all fish species, of a given size, will respond similarly to the turbines. Clearly, they do not, as apparent from the behaviour of adult salmonids in their spawning migration at the Archimedes screw on the River Wear:

<https://www.youtube.com/watch?v=W9G3yjieZVE>

TLSB doesn't know how adult salmon will respond to tidal lagoon turbines in coastal waters when seeking their natal rivers. They may show some avoidance or not, or possibly even attraction. As discussed in 2.5 and 2.6 of my Comments for PASAS, the evidence from studies in Scotland and off Cardiff is that salmon, in coastal migration mode, like to go with the tidal flow which will tend to direct them through the turbines.

Adopting, as proposed by TLSB, the lowest possible avoidance rate of 22.58% is unreliably high, as noted previously in 2.20 of my Comments for PASAS. As indicated by NRW-PS, it makes sense to rerun the model with no avoidance.

**o We understand that the structure may also attract certain fish species to the development. We understand from previous advice that this cannot be numerically represented within the model. Can you please confirm that this is the case, if so, would your subsequent advice on the potential impact to fish populations take account of this?** No additional comment.

**4.1 Adults swim speed:** Is TLSB's proposed approach acceptable? If not, can you please explain why or indicate that this submission has not changed your previous advice.

No, in my view, TLSB's proposed approach is not acceptable. It is welcome that TLSB have now considered the speeds recorded by Smith et al (1981). However, their proposed revisions to swim speeds may be too high. As shown in my original comments, which included Fig.3 from Smith et al, swimming speed for adult salmon in coastal migration was generally around 0.5 bl/s, half that now proposed by TLSB as the mean swimming speed (i.e.  $\mu=1$  bl/s). Also, one sixth (17%) of Smith et al's observations were  $\leq 0.25$  bl/s, in contrast to TLSB's proposed new lower 99.7% CL (i.e. that means only 0.3% would be  $< 0.25$  bl/s).

There is clearly much uncertainty over both the range of this parameter, which affects others. Also its distribution, now assumed by TLSB to be normal, is unknown. Sensitivity analysis, now required

by NRW-PS will be needed to understand how the both range and distribution affect the MCA results.

**4.3 Salmon duration of presence: NRW PS has proposed that the full range of available data should be utilised, including tracking data from the Tawe barrage which is considered to be lacking from this analysis. TLSB do not feel it is appropriate to change the approach taken. Could you please advise me what additional data should be included and why it is relevant for this application.**

As noted in my Comments for PASAS (2.7 to 2.17), the selection by TLSB is heavily biased towards those fish which have been tracked rapidly into freshwater with low duration of presence. This careful selection gives a highly improbable mode and distribution for duration of presence. Consequently the analysis will understate, probably substantially, the likely impact of the lagoon.

As I am not employed by TLSB or NRW in relation to this work, it would be inappropriate for me to provide a suitable selection of tracking data. I suggest that, if needed, this selection be made by those NRW-TE staff, who have perhaps the best knowledge of local unpublished tracking data, especially in relation to the Tawe and Cardiff Bay barrages. At the meeting, it seemed to me that Ted Potter (Cefas), notwithstanding his wider expertise, was not familiar with several of the studies used, or not, by TLSB and perhaps had not appreciated the level of bias in the TLSB selection.

I recommend in seeking suitable tracking data, they should:

- only be for tracks started during the period covered by the model (i.e. May to September, but especially July and August);
- reflect typical pattern of river flows during this period, when they are often very low;
- recognise the obstructive impact of a barrage, as exists at Swansea, in retaining salmon in coastal waters, not just the estuary mouth; and
- specify the likely methodological biases inherent in each track used.

If, as suggested, TLSB does not want to change their approach or obtain valid field data then, as discussed, the risks of using such a distorted set of values for this parameter in the MCA should be made clear through a proper sensitivity analysis.

Guy Mawle

16 March 2018