

Fig. S1

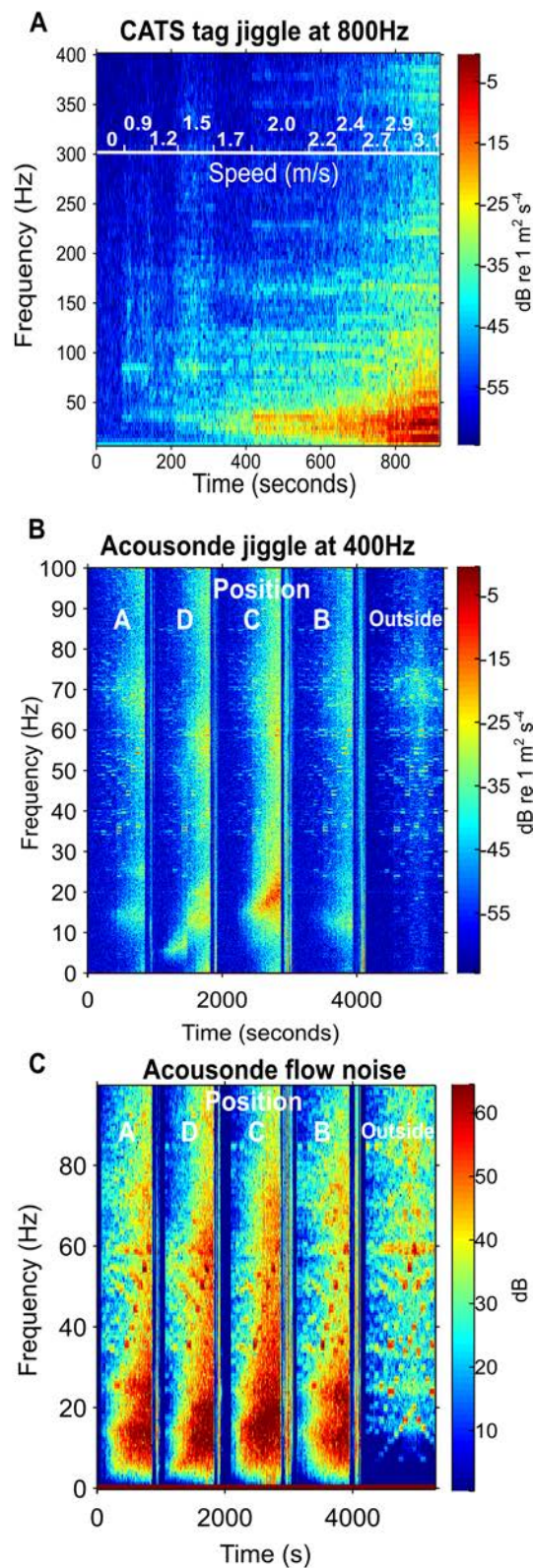


Fig. S1- Jiggle amplitude (A&B) and flow noise amplitude (C) for tags in a flow tank as functions of time and frequency as flow speed increases. Data in panels B & C were collected simultaneously. Position A-D refer to Figure 4. Spectrograms produced and spectral levels calculated using *Triton*; dB values are self-referenced in the acoustic spectrograms since the appropriate calibration transfer functions were unknown.

Fig. S2-

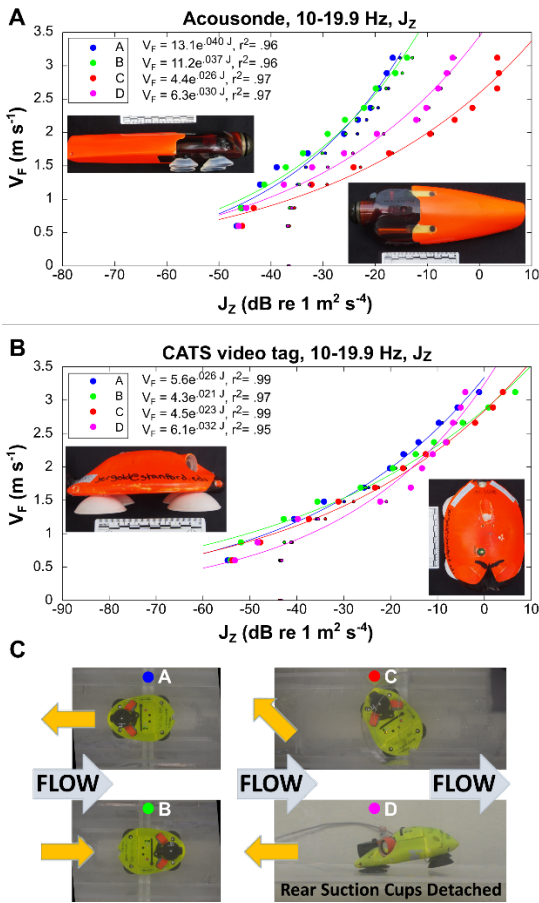


Fig. S2- Exponential regressions of accelerometer jiggle amplitude versus median flow speed in a recirculating flow tank for two tags in four different tag orientations. The Acousonde had larger variation in model coefficients for different tag orientations whereas the CATS tag, with a more symmetrical profile was more resilient to tag orientation differences. The tags are pictured with a 10 cm ruler for scale. A) Acousonde z-axis accelerometer jiggle. B) CATS tag (type m, see Cade *et al.* 2016) z-axis accelerometer jiggle. C) CATS tag (type p2) pictured in the four tested orientations, yellow arrows indicate the direction of the front of the tag. All plots show the jiggle calculated in the 10-19.9 Hz bandwidth. Small dots are calculated jiggle amplitudes while big dots (on which the regression was run) result from subtracting the jiggle amplitude associated with tank vibrations.

Fig. S3

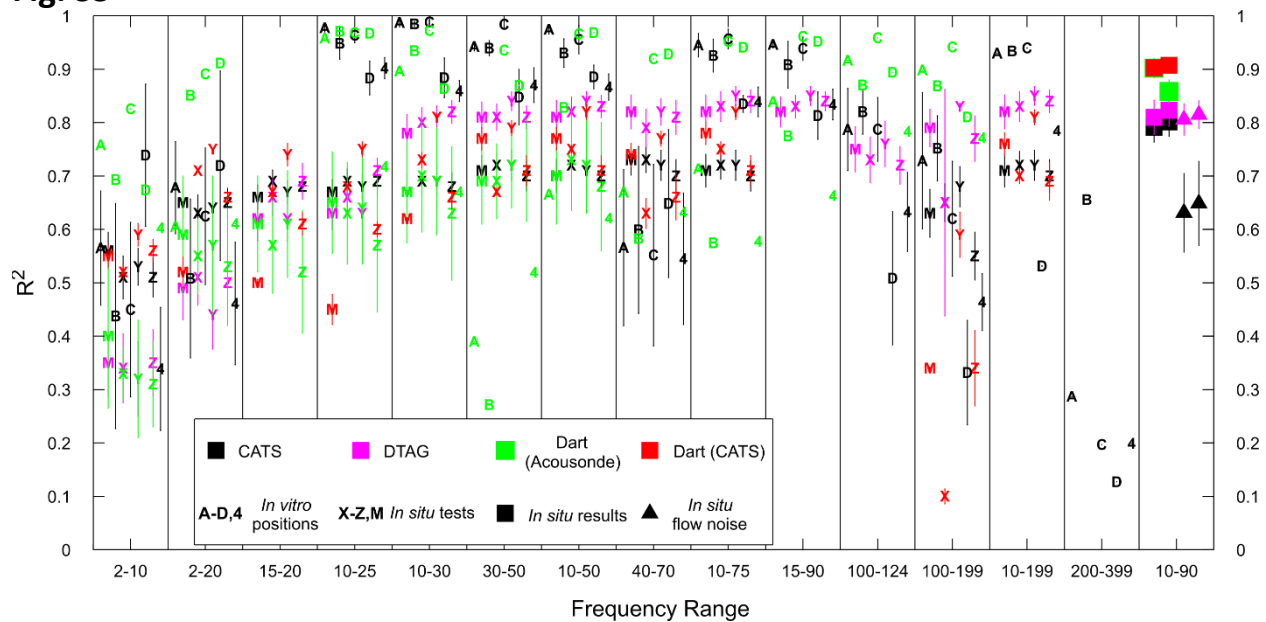
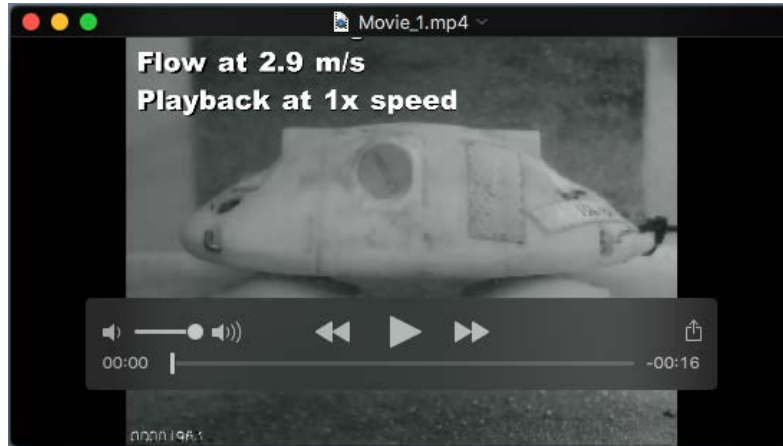
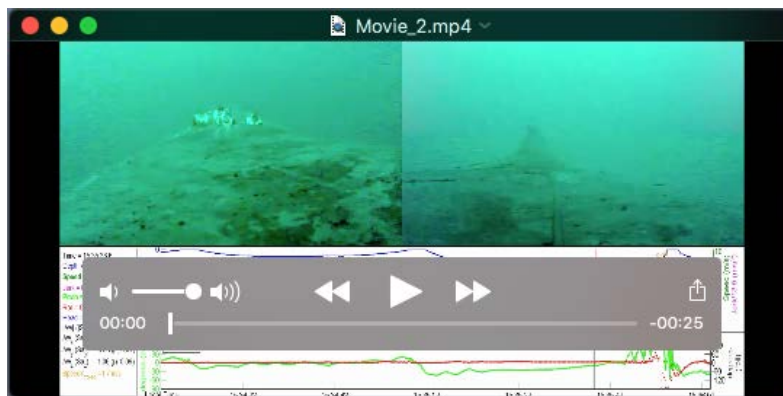


Fig. S3- Coefficients of determination (R^2) for calibration curves resulting from *in vitro* and *in situ* tests and the final results for 25 deployments (last column). A-D refer to different tag positions (Figure 3), 4 refers to a single calibration curve for all 4 positions. *In vitro* data shown is for curves regressing the magnitude of all three axes versus the median flow speed over a one minute period. X-Z are calibration curves from the jiggle in each axis separately, and M is the calibration curve for the magnitude of all three axes. Tag type are arranged by color. *In situ* results are only for baleen whale species.

Movies



Movie 1- A CATS video tag in the experimental flow tank. Z-axis motion is apparent.



Movie 2- Multi-axis jiggling is apparent from camera motion during this deployment on a humpback whale (deployment mn161117-10) when the animal moves at high speed preceding a breach. Clipping of the accelerometer signal is apparent in the 10-90 Hz speed signal (green line), but if the jiggle signal is filtered at a higher frequency, the effect of clipping can be mitigated though not eliminated.