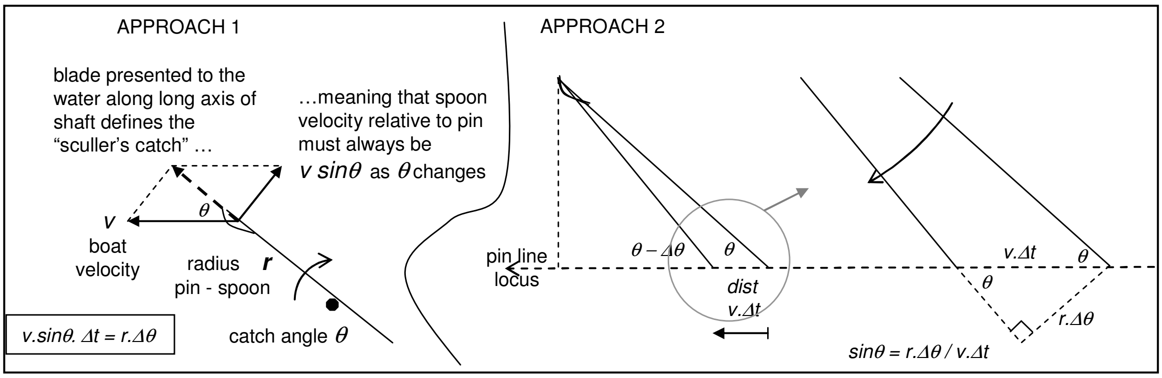
Appendix: Catch "Spear-Entry" Method and Calculations

“Neat catch” described by modelling blade being presented to the water entirely along its shaft axis throughout. Simplifying Assumption: constant shell velocity through this phase.



For net spoon velocity to lie parallel to blade shaft, assuming zero blade cant angle and constant boat velocity during entry, the tangential velocity of the spoon must be $v\sin\theta$. (see diagram). “$v\sin\theta$ ” effectively defines the splashless catch.

From the two approaches illustrated above we can write, for small $\Delta\theta$ in Δt:

left $v.\sin\theta.\Delta t \approx r.\Delta\theta$ right $\Delta t \approx \frac{r}{v}\cdot\frac{\Delta\theta}{\sin\theta}$

Which at the limit becomes…

$$t = \frac{r}{v}\int_{\theta_0}^{\theta}\frac{d\theta}{\sin\theta}$$

…integrating to a rather nasty-looking

$$t = \frac{r}{v}\left(\ln\tan\frac{\theta}{2} - \ln\tan\frac{\theta_0}{2}\right) \quad \text{or} \quad \theta = 2.\tan^{-1}\left(\exp\left(\frac{v.t}{r} + \ln\tan\frac{\theta_0}{2}\right)\right)$$

where

t	time elapsed since initial catch position
v	boat velocity
r	outboard radius to notional centre of spoon
θ	catch angle (at time t)
θ_0	initial catch angle (at time $t = 0$)

Handle travel during this phase is then given by inboard x.($\theta - \theta_0$)

So, for example, a “minimal disturbance catch” in a 1x, if time taken to fully bury is $t = 0.2$s, outboard radius (pin to approx centre of spoon) r is 1.88m, initial catch angle θ_0 is 35 degrees and boat velocity at catch is 4 m/s, the handle tip travels a mighty 26cm arc before becoming properly buried.

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