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27/07/2007 10:27 AM

To "McNee, Alex - BRS" <Alex.McNee@brs.gov.au>,
Robyn.Cleland@health.gov.au
cc Rebecca.Newton@health.gov.au,
Mark.Kinnear@health.gov.au

bcc

Subject RE: meaningful numbers for Danio biology
[SEC=UNCLASSIFIED]

UNCLASSIFIED

Hi Robyn and Alex

My comments are only really general and you probably already know this stuff. The number of individuals required to estimate any particular trait is likely to vary considerably and will be a function of the variability of that trait. The number will also depend on the amount of type 1 and type 2 error you are willing to accept, which will invariably be related to what the consequences are of being incorrect and the resources available. Much of fisheries science is plagued by using too few individuals and having no estimate of error. Often with the explanation that we used 20 fish because that is all we could get, which is fine, as long as you realise the limitations of the sample and don't go on to make a type 2 error by rejecting the null hypothesis when it is actually correct.

Therefore, the best approach would be to do a rough pilot where you measure the variance of each trait in a small sample and use those data to estimate the relative variance, which could then be used to calculate how many individuals you would need to estimate each trait. This also enables you to have a much better estimate of error. However, a critical point that should not be overlooked, is that the sample should be representative of the population and not just a family group as variance within a family unit will be much lower per trait than that across the population. Therefore, the sample should be sourced from several locations. Another critical point for this study, if you are trying to estimate variance of traits across the entire population, individuals should be sourced from both wild and captive populations. We know variance in the absence of selection is often very different to the wild type, and estimates based on captive populations and extrapolated across the population are likely to be misleading. It is also worth noting that the heritability of traits changes within captivity, another reason why using captive fish to extrapolate across the total population is likely to lead to errors.

So, what does all this mean for the question of how many? Which really comes back to what you are using these estimates for and what are the consequences of getting it wrong. If it is just to get an idea of these life history traits, then a small sample of probably 20-50 individuals might do. However, if you are hoping to get an accurate estimate of each of these variables, then as we can see from above it is much more difficult and not just a matter of picking a number out of the air. I would also suggest that the variance (range in this case) is as important as the mean.

Hope it helps. Happy to discuss further.

Cheers, Andy

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The Bureau of Rural Sciences (BRS) is the scientific bureau within the Australian Government Department of Agriculture, Fisheries and Forestry. BRS provides nationally focused scientific advice to support evidence-based policy development and decision making by government.

-----Original Message-----

From: McNee, Alex - BRS
Sent: Friday, 27 July 2007 8:51 AM
To: Moore, Anthony - BRS
Subject: FW: meaningful numbers for Danio biology [SEC=UNCLASSIFIED]

Andy,

See below - I had a brief chat with Robyn yesterday and put her on to Ron Thresher.

Any thoughts - this is more your area?

Alex McNee
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"A scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die and a new generation grows up that is familiar with it." Maxwell Planck

-----Original Message-----

From: Robyn.Cleland@health.gov.au [mailto:Robyn.Cleland@health.gov.au]
Sent: Thursday, 26 July 2007 3:55 PM
To: McNee, Alex - BRS
Cc: Rebecca.Newton@health.gov.au; Mark.Kinnear@health.gov.au
Subject: meaningful numbers for Danio biology [SEC=UNCLASSIFIED]

Hi Alex,

further to our phone conversation today, we are interested in your views about the approximate number of individual Danio's that would be required to give meaningful information (statistically significant) about a number of biological traits including:

size
lifespan
growth rate
time to sexual maturity
age at which egg production declines
number of eggs per spawning
time to hatch post-fertilisation
survival rate of embryo's
temperature requirement for embryo development

I think we would be most interested in an average for each trait. Information regarding the range for each trait would be useful but less critical.

hope you can help!

best regards
Robyn

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