

Robyn
Cleland/TGA/Health
24/05/2007 04:22 PM

To alex.mcnee@brs.gov.au, mary.bomford@brs.gov.au
cc Rebecca Newton/TGA/Health@Health_gov_au, Mark
Kinnear/TGA/Health@Health_gov_au
bcc

Subject Zebra danio - Glofish [SEC=UNCLASSIFIED]

UNCLASSIFIED

Hi Alex,

further to our phone conversation today about GM glofish (Danio rerio/zebra danio), meeting up on Thursday 31 May at 2pm would be really useful! Shall we come to you? It will be myself, Rebecca Newton and Mark Kinnear.

Mary, if you are available and could come too, that would be really useful! I think it would help to discuss risk assessment in the same context.

As I mentioned, OGTR has an application for the use of this GM fish in aquaria. Although intended for use in aquaria there is the possibility of release into the environment. We assess the risks posed by the GM organism against the background of the wild type and are struggling a little to find robust information in this area.

Some of the issues we are interested in are:

How long have wt zebra danio been available in Australia? (the blue book question)

Is there any concern with the wt regarding possible invasiveness/establishment in Australia?

Is there a risk assessment that underpins their listing as a permitted species under the EPBC Act?

Have the wt zebra danio ever been found in Australia?

Have people looked? any surveys? reporting? monitoring? State based or nationally?

With regard to the GM glofish:

Is the altered colouration likely to affect survival in any way?

Mating preference?

Predation?

Also any other contact people it might be worth having discussions with.

These are are few of the issues it might be useful to cover. Rebecca and Mark will certainly have some more questions that we hope you can help us with. There is some more info available on the OGTR website if you are interested.

<http://www.ogtr.gov.au/ir/dir072.htm>

look forward to meeting you on Thursday.

best regards

Robyn Cleland PhD

Manager, Contained Dealings
Office of the Gene Technology Regulator
MDP 4

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WODEN ACT 2600

phone: 02 6271 4216

fax: 02 6271 4202

email: robyn.cleland@health.gov.au

<http://www.ogtr.gov.au>

UNCLASSIFIED



"Bomford, Mary -
BRS"
<Mary.Bomford@brs.gov.au>

01/06/2007 09:01 AM

To Rebecca.Newton@health.gov.au

cc "McNee, Alex - BRS" <Alex.McNee@brs.gov.au>

bcc

Subject Danio rerio risk assessment. [SEC=UNCLASSIFIED]

History: This message has been replied to and forwarded

UNCLASSIFIED

Hi Rebecca

Attached please find the CLIMATE match map for *Danio rerio* in Australia. This is a high match to northern Australia - the species would have a high likelihood of establishing there if it was released in sufficient numbers.

The overall Establishment Risk Score for *Danio rerio* in Australia is 19.

An exotic finfish species' Establishment Risk Score is converted to an Establishment Risk Rank (Low, Moderate, Serious or Extreme) using the following cut-off thresholds:

<u>Establishment Risk Rank</u>	<u>Establishment Risk Score</u>
Extreme	= 20
Serious	15-19
Moderate	8-14
Low	= 7

So *Danio rerio* is right at the top of the Serious range and two thirds (10/15 species) of freshwater fish released in Australia with a 'Serious' Establishment Risk Rank have established exotic populations.

Regards



Mary Australia_ALL_070601_0742 Danio rerio.bmp mg_info.txt

UNCLASSIFIED



"Moore, Anthony -
BRS"
<Anthony.Moore@brs.
gov.au>

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

Anthony (Andy) Moore
Scientist
Fisheries and Marine Sciences
Bureau of Rural Sciences
Department of Agriculture, Fisheries and Forestry

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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
02) 6272 5861
02) 6272 3882 fax
alex.mcnee@brs.gov.au
web site: <http://www.brs.gov.au>
"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

Robyn Cleland PhD

Manager, Contained Dealings
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UNCLASSIFIED



"Bomford, Mary -
BRS"
<Mary.Bomford@brs.gov.au>

19/06/2007 10:41 AM

To Rebecca.Newton@health.gov.au

cc

bcc

Subject RE: Danio rerio risk assessment.
[SEC=UNCLASSIFIED]

History:

This message has been forwarded.

UNCLASSIFIED

Hi Rebecca

Attached table has the scores for all exotic freshwater fish introduced to Australia - both successful and failed. I've added *Danio rerio* right at the end. I've also added the cutoff thresholds converting risk scores to risk ranks at the end. Finally I've put in a graph showing the numbers of successful and failed fish species in each risk rank.

Lots of fish score higher than *Danio rerio*. I'd have been really happy if my risk model had scored all the fish that have successfully established in Australia as Extreme.

Please phone me on 6272 4263 if you have any queries.

regards

Mary

From: Rebecca.Newton@health.gov.au [mailto:Rebecca.Newton@health.gov.au]
Sent: Tuesday, 19 June 2007 10:09 AM
To: Bomford, Mary - BRS
Cc: McNee, Alex - BRS; Robyn.Cleland@health.gov.au; Mark.Kinnear@health.gov.au
Subject: Re: Danio rerio risk assessment. [SEC=UNCLASSIFIED]

Hi Mary

Thank you for your rapid assessment of *Danio rerio*. We were a little surprised that this species has an establishment risk score of 19. I imagine only carp and goldfish would score higher.

Would you be able to provide some more details on the input data used to make the assessment?
Which factors assessed contributed greatest to this number?

How does this compare to other aquarium species you have assessed?

I look forward to hearing from you.

Regards
 Dr Rebecca Newton
 Contained Dealings Evaluation Section
 Office of the Gene Technology Regulator
 Phone 02 6271 4351
 Fax 02 6271 4202
 Email Rebecca.Newton@health.gov.au

"Bomford, Mary - BRS" <Mary.Bomford@brs.gov.au>

10/1/20



01/06/2007 09:01 AM

To Rebecca.Newton@health.gov.au
 CC "McNee, Alex - BRS" <Alex.McNee@brs.gov.au>
 Subject Danio rerio risk assessment. [SEC=UNCLASSIFIED]

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Regards

Mary

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DAFF ----- Establishment risk scores for exotic freshwater finfish species introduced to Australia.doc

UNCLASSIFIED

Establishment risk scores for exotic freshwater finfish species introduced to Australia using PC CLIMATE outputs for climate match scores

Appendix K Table K1. Establishment risk scores for exotic finfish species introduced to Australia with new climate match scores based on PC CLIMATE. A. Successful introductions.

B. Failed introductions (recorded but not known to be established).

The Climate Match Scores in Column A are based on PC CLIMATE Euclidian match ($\Sigma 60\%$ level) converted to Climate Match Scores using the cut-off thresholds presented in Figure 10. The values in Columns B-E are taken directly from Bomford and Glover (2004). The Total Establishment Risk Score (column F) is the sum of the scores in columns A-E. The Total Establishment Risk Score (column F) is sorted in ascending order.

A	B	C	D	E	F	G
Climate Match Score 1-8	Overseas Range Score 0-4	Establishment Score 0-3	Introduction Success Score 0-4	Taxa Risk Score 0-5	Total Establishment Risk Score 0-24	Establishment Risk Rank
Three-spot cichlid <i>Cichlasoma trimaculatum</i>	2	0	0	4	10	Moderate
Victoria Burton's haplochromine <i>Haplochromis burtoni</i>	0	1	2	3	10	Moderate
Goby <i>Acentrogobius pflaumi</i>	0	1	2	5	11	Moderate
Blue acara <i>Aequidens pulcher</i>	2	2	2	3	13	Moderate
Red devil/Midas cichlid <i>Amphilophus citrinellus</i>	2	2	4	3	14	Moderate
Convict cichlid <i>iatus</i> <i>Archocentrus nigrofasciatus</i>	0	2	4	4	14	Moderate
Niger cichlid <i>Tilapia mariae</i>	3	2	4	4	15	Serious
White-cloud mountain minnow <i>Tanichthys albomibes</i>	4	2	4	3	16	Serious
Yellowfin goby <i>Acanthogobius flavimanus</i>	1	2	4	5	16	Serious
Chameleon goby <i>Tridentiger trigonocephalus</i>	1	2	4	5	17	Serious
One-spot live bearer <i>Phalloceros caudimaculatus</i>	3	2	4	5	18	Serious
Jack Dempsey <i>Cichlasoma octofasciatum</i>	2	3	4	4	18	Serious
Weather loach <i>Misgurnus anguillicaudatus</i>	2	3	4	5	18	Serious
Brook trout <i>Salvelinus fontinalis</i>	4	3	3	4	18	Serious
Roach <i>Rutilus rutilus</i>	4	3	4	3	19	Serious
Jewel cichlid <i>Hemichromis bimaculatus</i>	3	2	4	5	19	Serious

have they been many
est. elsewhere
successful
(%)

A. Successfully introduced species1	A	B	C	D	E	F	G
	Climate Match Score 1-8	Overseas Range Score 0-4	Establishment Score 0-3	Introduction Success Score 0-4	Taxa Risk Score 0-5	Total Establishment Risk Score 0-24	Establishment Risk Rank
Sailfin molly <i>Poecilia latipinna</i>	6	2	3	4	5	20	Extreme
Platy <i>Xiphophorus maculatus</i>	6	2	3	4	5	20	Extreme
Green swordtail <i>Xiphophorus hellerii</i>	7	1	3	4	5	20	Extreme
Redbelly tilapia <i>Tilapia zillii</i>	6	4	3	3	4	20	Extreme
Redfin perch <i>Perca fluviatilis</i>	5	3	3	4	5	20	Extreme
Tench <i>Tinca tinca</i>	6	3	3	4	5	21	Extreme
Oscar <i>Astronotus ocellatus</i>	5	4	3	4	5	21	Extreme
Rainbow trout <i>Oncorhynchus mykiss</i>	7	4	3	4	3	21	Extreme
Brown trout <i>Salmo trutta</i>	6	4	3	4	4	21	Extreme
Three-spot gourami <i>Trichogaster trichopterus</i>	5	4	3	4	5	21	Extreme
Mosquitofish <i>Gambusia holbrooki</i> + <i>affinis</i>	6	4	3	4	5	22	Extreme
Guppy <i>Poecilia reticulata</i>	6	4	3	4	5	22	Extreme
Goldfish <i>Carassius auratus</i>	7	4	3	4	5	23	Extreme
Mozambique tilapia <i>Oreochromis mossambicus</i>	8	4	3	4	4	23	Extreme
European carp <i>Cyprinus carpio</i>	8	4	3	4	5	24	Extreme

↑
genus risk
family risk

good discrimination
between successes &
failures

10 introductions at least 1 will be successful.

propagate species - pet shops/aquarists
 correlation of # (species) / establishment risk
 kept in pet shops

propagate more important than climate match etc.

B. Unsuccessfully introduced species (recorded but not known to be established)	A	B	C	D	E	F	G
	Climate match score 1-8	Overseas range score 0-4	Establishment score 0-3	Introduction success score 0-4	Taxa risk score 0-5	Total Establishment Risk Score 0-24	Establishment Risk Rank
Sobayta seabream <i>Sparidentex hasita</i>	1	0	1	2	2	6	Low
Pearl cichlid <i>Geophagus brasiliensis</i>	3	1	0	0	3	7	Low
Redbanded perch <i>Hypoplectrodes humtii</i>	2	0	1	2	2	7	Low
Japanese seabass <i>Lateolabrax japonicus</i>	3	2	1	2	0	8	Moderate
Common triplefin <i>Forsterygion lapillum</i>	4	0	1	2	2	9	Moderate
Dominican gambusia <i>Gambusia dominicensis</i>	2	0	1	2	5	10	Moderate
Green terror <i>Aequidens rivulatus</i>	3	1	1	2	3	10	Moderate
Banded cichlid <i>Heros severus</i>	4	2	0	0	4	10	Moderate
American flagfish <i>Jordanella floridae</i>	2	0	1	2	5	10	Moderate
Sumatra barb <i>Puntius tetrazona</i>	1	0	3	3	5	12	Moderate
Plainfin frogfish <i>Porichthys notatus</i>	4	4	1	2	2	13	Moderate
Redhead <i>Vieta synspila</i>	3	4	1	2	4	14	Moderate
Chinook salmon <i>Oncorhynchus tshawytscha</i>	4	4	2	1	3	14	Moderate
Firemouth cichlid <i>Thorichthys meeki</i>	5	0	3	4	4	16	Serious
Atlantic salmon <i>Salmo salar</i>	5	4	3	1	4	17	Serious
Wami tilapia <i>Oreochromis urolepis</i>	7	1	3	4	4	19	Serious
Blue tilapia <i>Oreochromis aureus</i>	6	3	3	4	4	20	Extreme
Rosy barb <i>Puntius conchonus</i>	6	3	3	4	5	21	Extreme
Zebra danio <i>Danio rerio</i>	5	3	3	3	5	19	Serious

leaf/long square with record

Arthington model

1 established in Columbia - successful.

1 out in New Mexico - unsuccessful.

000160

Simon Barry
 sample size taken into account when calculating family risk of success

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Establishment Risk Rank	Establishment Risk Score
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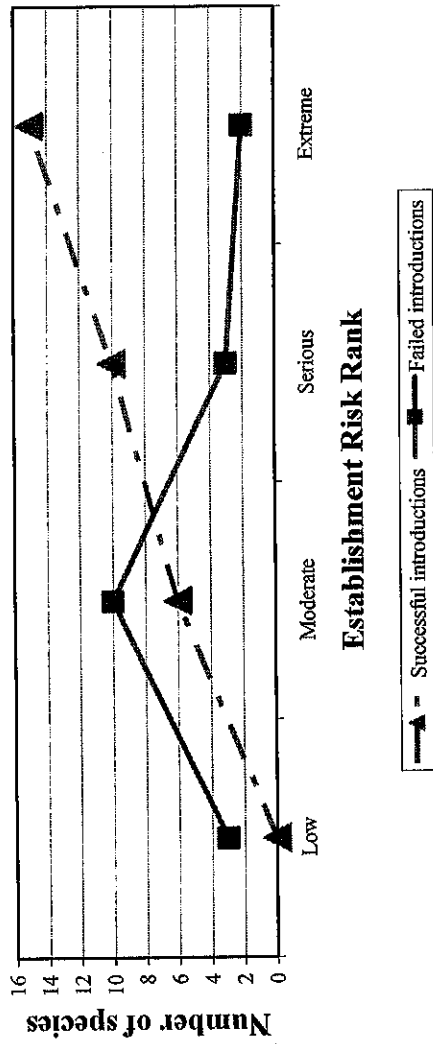


Figure 1. Number of species in each Establishment Risk Rank compared for successful and failed exotic freshwater finfish introduced to Australia with cut-off thresholds adjusted downwards.

Robyn
Cleland/TGA/Health
27/07/2007 01:27 PM

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

bcc

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

UNCLASSIFIED

Hi Andy,

many thanks for those very useful comments. It gives us a much better idea of some of the parameters we should be thinking about. We are trying to obtain some meaningful data in a comparison between the three GM lines, a naturally occurring golden line and the wt. The problem is that we don't know how different each GM line may be so guesstimating numbers is a bit tricky. Your comment about variance is directly relevant to this. We are primarily interested in captive populations. As far as we know there are no wild populations of Danio in Australia. We are primarily interested in life history traits and establishing how similar the GM lines are to the golden line and wt. I really appreciate your prompt response!

cheers
Robyn

Robyn Cleland PhD

Manager, Contained Dealings
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"Moore, Anthony - BRS" <Anthony.Moore@brs.gov.au>



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Robyn
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26/07/2007 03:55 PM

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cc Rebecca Newton/TGA/Health@Health.gov.au, Mark
Kinnear/TGA/Health@Health.gov.au
bcc

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[SEC=UNCLASSIFIED]

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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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