GH-transgenic Nile tilapia case study

About the fish

- This line expresses a single copy of an opAFPcsGH (ocean pout antifreeze polypeptide promoter - Chinook salmon growth hormone) transgene (Rahman et al. 2001).
- In a growth trial, the transgenic tilapia showed a 2.5-fold increase in growth compared with non-transgenic siblings.



- Food conversion efficiency was >20% greater in the transgenic fish.
- A digestibility trial suggested that transgenic tilapia were more efficient utilizers of protein, dry matter and energy.
- A company has purchased the license to market this line, and now wants to market it to commercial producers in your country.
- Would you approve? If so, with any restrictions?
- Rahman et al. 2001. Growth and nutritional trials on transgenic Nile tilapia containing an exogenous fish growth hormone gene. Journal of Fish Biology 59:62-78.

Simplified risk assessment – risk management framework

Define conceptual model(s) of the system Define assessment endpoints (harms) Identify and prioritize risk pathways Agree on assessment methods, models Estimate risk: Assess exposure. Assess likelihood of harm being

realized. $R = P(E) \times P(H|E)$.

Is risk acceptable?

No – identify and evaluate other risk management options.

No. Reevaluate. Perhaps stop the activity.

Yes – approve. Communicate risk.

Monitor outcome indicators.

Is outcome acceptable?

Yes.

Risk assessment

Pathway for assessing genetic harm If fish are farmed in an open system, esp. Disease/ if that species lives there, an option is to Predation parasites assume that escape will occur New vector If transgenic fish can escape into a system where that species lives, an option is to **assume** that survival will occur Reproduction Exploitative If transgenic fish can escape into a system competition for where same species lives, an option is to **assume** that encounters will occur Mates Space Mates transgenic and wild fish

Assess probability of transgenic fish escaping from aquaculture facility

Assess probability of survival to maturity in wild

Assess probability of encounter of mature

Assess probability of successful mating

Assess probability of offspring survival to reproduction

Assess probability of survival and reproduction in subsequent generations





Mechanical barriers (screens, filters)



Biological barriers (\rightarrow survival or reproduction of GM fish)

Operations management (fish handling procedures, limited access, maintenance)