Global Environment Facility

GEF/C.28/Inf.7
May 9, 2006

GEF Council
June 6-9, 2006

REPORT ON THE STAP TRANSGENIC FISH BIOSAFETY BOOK-WRITING WORKSHOP

(Prepared by the Scientific and Technical Advisory Panel)

United Nations Environment Programme
برنامج الأمم المتحدة للبيئة • 联合国环境规划署
PROGRAMME DES NATIONS UNIES POUR L'ENVIRONNEMENT • PROGRAMA DE LAS NACIONES UNIDAS PARA EL MEDIO AMBIENTE
ПРОГРАММА ОРГАНИЗАЦИИ ОБЪЕДИНЕННЫХ НАЦИЙ ПО ОКРУЖАЮЩЕЙ СРЕДЕ
UNEP

Report on the STAP Transgenic Fish Biosafety Book-Writing Workshop

October 17-21, 2006

Convened at
Headquarters of the WorldFish Center of the CGIAR
Penang, Malaysia

Workshop attendees: 40 scientists and policy specialists from 19 countries, STAP Secretariat staff, workshop facilitator, and WorldFish support staff

Dr. Low (UNEP/GEF Biosafety Unit) speaking at workshop plenary as Dr. Schei (STAP and workshop chair) listens

Dr. Li (book editor) and Dr.Mair (chapter lead) admire a traditionally bred GIFT tilapia during the workshop field trip

Table of Contents

Preface

The introduction of genetically modified organisms (GMOs) offer new opportunities for meeting food, agriculture, and aquaculture needs in developing countries. However, the introduction of GMOs can also affect biodiversity and natural ecosystems. It is, therefore, important to take into account the environmental risks and benefits when decisions need to be made on GMOs.

The Cartagena Protocol on Biosafety of the Convention on Biological Diversity has identified scientific advice and capacity building as a priority need for developing countries. In response to this priority need, the Scientific and Technical Advisory Panel (STAP) of the Global Environment Facility (GEF) has collaborated with a number of international scientific networks to produce a series of book on scientific and technical aspects of environmental risk assessments of GMOs. The first book, a case study of *Bt* maize in Kenya was published in 2004, and a second book on methodologies for assessing *Bt* cotton in Brazil was published in 2006. The third and last volume in the series will focus on the methodologies for risk assessment and management of transgenic fish, and it will be published later this year.

STAP convened a book-writing workshop to develop the third volume on transgenic fish on 17-21 October, at the WorldFish Center in Penang, Malaysia. The objective of the workshop was to develop chapter outlines, and make progress on the book-writing with a focus on the latest methodologies for risk assessment of transgenic aquaculture in developing countries. The workshop also sought to broaden a global network of scientific and technical experts, and strengthened their ability in assessing and managing environmental biosafety of aquatic biotechnology in developing country contexts.

The book will provide methods and relevant scientific information for risk assessments on transgenic fish. The relevant organizations in each country will lead their own scientific risk assessments in order to inform their own biosafety decisions on transgenic fish.

The book-writing workshop brought together 40 scientists and policy specialists on transgenic fish from developed and developing countries. The workshop was led by STAP members Anne Kapuscinski and Peter Schei.

I hope very much this workshop report and book outline will help the GEF in their work and approaches to biosafety risk assessments on transgenic fish.

Yolanda Kakabadse
STAP Chair

May 5 2006
Washington, DC

Acknowledgements

Primary funding for planning and convening the workshop came from the STAP. Staff from the STAP Secretariat in Washington D.C. and Nairobi provided essential logistical support. The WorldFish Center provided in-kind support for planning and convening the workshop at its outstanding meeting facilities. Special thanks go to Dr. Alphis Ponniah of the WorldFish Center for extraordinary help with planning and convening the workshop including identifying participants from developing countries. Additional help to identify participants and design the workshop came from members of the STAP and GEF family organizations; professional staff of the Biosafety Unit of the CBD Secretariat, the UNEP/GEF Biosafety Frameworks Project, and the FAO Fisheries Department; leaders of book chapters; and CABI Publishing via anonymous reviewers of the book proposal. Funding for a workshop facilitator, Brian Stenquist of Meeting Challenges Inc., and for a workshop and book-writing assistant, Genya Dana, came from a Pew Fellowship in Marine Conservation to A.R. Kapuscinski. Brian Stenquist provided text for the workshop report section and conducted and summarized the workshop evaluation. The China Center of the University of Minnesota and the CSIRO Marine Lab in Hobart, Australia supported a meeting of book editors after the workshop.

Overview - STAP books on environmental biosafety methods for international scientific capacity building

The STAP has developed environmental biosafety books in response to a priority need for scientific advice and capacity building expressed by the parties to the Cartagena Protocol on Biosafety, under the Convention on Biological Diversity (CBD). The second meeting of the Conference of the Parties to the Protocol established an Ad Hoc Technical Expert Group on Risk Assessment (decision BS-II/9, paragraph 4), charged to evaluate existing approaches to and guidance materials on risk assessment. The expert group met in November 2005, and its report cites the STAP biosafety books as important resources. The meeting's rapporteur, who also co-edited a STAP biosafety book, stressed the capacity-building that resulted from scientists participating in producing these books.

The workshop reported herein was a major step in developing volume 3 of the series, *Environmental Risk Assessment of Genetically Modified Organisms*. The series provides scientifically peer-reviewed tools that can help developing countries strengthen their own scientific and technical capacity in biosafety of GMOs. The STAP has partnered with international scientific groups and CABI Publishing to produce these books.

The book-writing workshop for volume 3 on methodologies for transgenic fish brought together 40 scientists and policy specialists from 19 countries in Penang, Malaysia on October 17-21, 2005. This gathering demonstrated global scientific and technical cooperation to develop timely and broadly applicable capacity-building tools. The workshop showed how the STAP can leverage its scientific networks to address needs of the GEF family and international conventions. For instance, the STAP collaborated with the WorldFish Center of the CGIAR, a global leader in the area of sustainable use and conservation of aquatic biodiversity. Participants from different scientific, policy and cultural backgrounds, from pre-doctorate to senior scientists, and with a good gender balance, worked closely together for one intense week. The STAP has thus put in place a north-south and south-south network of scientists prepared to assess and manage the environmental biosafety of transgenic fish for many years into the future.

This workshop greatly increased the visibility of the STAP among influential aquatic biodiversity scientists from the developing world. A co-founder of the Third World Academy of Science participated in the workshop and will be a book co-author. At the ending plenary session, his congratulatory comments included a significant note that *this activity was his first encounter with the STAP, even though he has had many interactions with related international organizations*. He stressed that many more leading scientists in the developing world should know about the STAP's role and activities in providing scientific and technical advice for developing world contexts. All workshop participants filled out evaluations at the final plenary session, and they were uniformly extremely positive.

Workshop Report

The workshop had two main purposes. One major objective was to make substantial progress in writing a multi-authored book that brings together the latest methodologies for risk assessment of transgenic aquaculture in developing countries. Another purpose was to jump-start scientific and technical capacity building in assessing and managing the environmental biosafety of aquatic biotechnology in developing country contexts. The workshop broadened a global network of scientific and technical experts and strengthened their ability to provide scientific and technical advice to international, regional, and national bodies and to train the next generation of advisors in this area.

The design and execution of a process to support such a workshop required a variety of actions before, during and after the weeklong event. Evidence from formal and informal feedback offered by participants during the workshop and progress made after the workshop indicates that the process used was effective and successful. Below is a brief overview of the workshop process, important actions taken before, during, and after the event and some illustrative comments by participants.

The Workshop Process

The essence of the design for this workshop was to support opportunities for individual, small group and whole group work. Writing this type of book is both an individual and collective process, and the workshop provided time for individuals to work alone as well as in small chapter teams. It was essential for the whole group to feel a part of the entire enterprise; several plenary events were convened throughout the week. This nesting of individual, chapter team and whole group work allowed small intellectual pieces (sections and chapters) to be integrated into a larger whole (the book) and for small social experiences (team work) be blended into a group *esprit de corps* (the workshop).

Some comments offered by participants in response to the question "what worked well during the workshop" illustrate the satisfaction participants had with the overall design:
"Good balance between plenary and break-out groups"
"Opportunity to work together in small focused groups …plenaries were very useful"
"Mix of plenary and breakout sessions"
"Well organized – writing time was available"
"Discussions with my own chapter mates as well as other participants"

Designing the Workshop

Before the Workshop – Preparation

Having decided to embark on this ambitious project, the first step that the STAP and its collaborators took was to imagine the outline and chapter organization of the book. The book took shape through STAP meetings, phone calls and emails.

The next challenge was to decide whom within the international science community should work on the book and which chapter (or chapters) they would be invited to help create. Conference calls and emails were used to develop a list of participants and their possible assignments.

The final planning step was to design a workshop agenda that would move a diverse set of scientists through the process of orientation to the work, introduction to each other and execution of the tasks. It was also necessary to figure out how to use the WorldFish Center facilities in an effective way. The workshop agenda and facility-use plan was crafted and refined via email, conference calls, and several small design team discussions.

Comments offered by participants illustrate the satisfaction they had with workshop preparation:

"Chapter outline was worked out very well"
"The procedure for writing the book is clear and makes the participant work easy, especially the discussion within small groups"
"Workshop was well organized, kudos to the organizing committee – all the necessary support / logistics have been provided"
"Thanks to Anne, Peter, Guadalupe, Genya and others for their huge amount of work prior to the meeting to make this all happen"

During the Workshop – Adaptive management

Once the workshop began, the essential tasks were to implement the design, follow the agenda and modify where necessary to support the participants' efforts. No major modifications were necessary to the agenda and schedule. However, many smaller adjustments to room arrangements, support facilities, and time schedules helped participants remain focused and successful.

Chapter leaders (lead authors) did a marvelous job of creating effective small team discussions. Each team also had recorders who maintained a record of team decisions on laptops and used projectors to display team progress on meeting room walls.

Technology played a vital role in the success of the workshop. All participants had access to laptop computers so they could work individually on the chapters. Participants were able to share their individual work by transferring rough drafts between laptops using "jump

drives." Projectors allowed groups to view and discuss collective progress. Access to the internet, provided by the WorldFish Center, allowed participants to retrieve relevant research papers for use during the workshop.

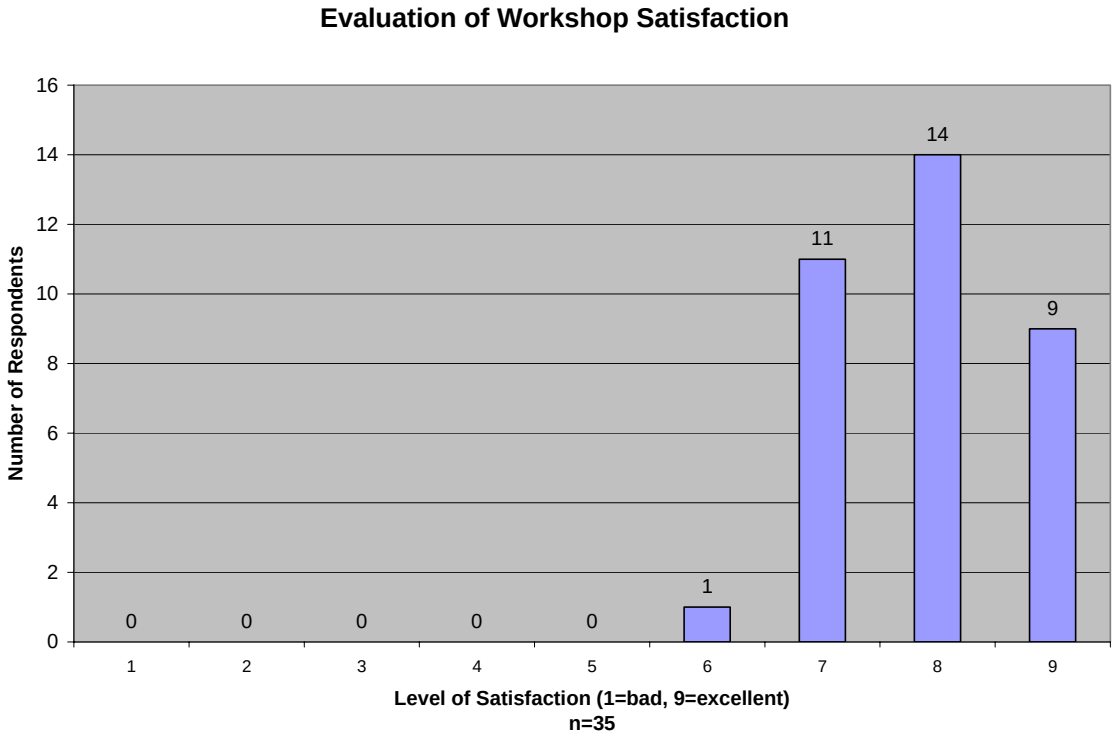
It was essential to keep participants energized, inspired and well fed during the workshop. Support staff often had to cajole the small groups from their discussions or rouse individuals from their private writing in order to provide them with a morning or afternoon snack. The range of tasty Malaysian treats, energetic small talk of workshop colleagues, and the warm sunshine and occasional Penang rains kept participants refreshed and ready to work.

In addition, a field trip to a WorldFish hatchery gave participants a chance to see first-hand the development of a famous line of traditionally bred tilapia, the GIFT tilapia. Participants walked around the fishponds in small groups, discussing aquaculture and aquatic biodiversity conservation, the intricacies of traditional breeding and genetic engineering, various risk assessment techniques, the beauty of surrounding landscapes and the generosity of our Malaysian hosts. Laughter, stories and personal reflections sprinkled the lightly raining morning with sunshine and camaraderie.

Here are a few relevant comments offered by workshop participants on their evaluations:

"Excellent facilities at the WorldFish Center"
"Well organized, good facilitators and good deliverable"
"Very cooperative co-authors – very competent chapter leader"
"Our team leader is a very good facilitator of ideas"
"The field trip was an interesting and relaxing break"
"Interesting field trip – nice accommodations for hotel and workshop"
"The organizers did a wonderful job of keeping participants active and addressing most of their concerns"

Participants' Ratings and Suggestions for Improvement
As part of the workshop evaluation, participants were asked to rate the workshop on a scale of 9 to 1, with 9 being "excellent" and 1 being "bad."



Participants were also asked about what did not work well for them during the workshop and how future workshops might be improved. Many participant responses reflected design challenges that had been recognized by the organizing group before the workshop began, but they were not able to address them in advance. All of the suggestions should be viewed in the context of the very positive ratings participants gave the workshop and should not overly skew the sense of success felt by workshop organizers. Here are some responses that illustrate participant insights:

"Sorry, couldn't think of anything"
"The studies on ecosafety are still limited"
"The time. It's too little time to do such great job. A previous exchange of ideas by email would help to save time and to be more efficient in the meeting. Or planning more time for the meeting."
"Did folks have enough opportunity to switch to different groups, if needed?"
"Not enough time to actually write"
"There were times when thinking and writing was not possible due to agitated discussions (loud!!) during work within the other group using the same room."
"I am responsible for two chapters, so it made me too busy. But I had fun with both."
"Overlapping issues between chapters."
"Too much overlap between certain chapters. Too many people developing outlines. Two groups in the same room not the best. But a consensus document was achieved."

After the Workshop – Follow-through
By the end of the workshop, each Chapter team had a refined outline and some very good rough draft writing. Each lead author committed to following up with their team and to post the results

of ongoing team writing on a website. The book editors, with support from book writing assistant Ms. Dana, committed to supporting the lead authors and chapter teams in shaping their work into final book form. Since the workshop, co-authors have produced two versions of each chapter that were reviewed by the editors. In February 2006, book editors met in person and by video conference to thoroughly review each chapter and provide detailed suggestions for revisions of each chapter. Following these revisions and editing, the chapters will be submitted to Series Editors for anonymous peer review. After this peer review, the entire book manuscript will be revised and edited once more and the final book manuscript submitted to the publisher.

Final Thoughts from Participants

Overall the workshop was a great success. Significant progress was made in organizing and writing the book. Workshop participants left inspired and energetic. Here are a few of the closing remarks they offered:

"Amazing collaboration, cooperation, and team work! Quite remarkable for such a diverse group of people. The 'community of science' and 'fish/aquaculture' world helped bring us together. But the will to work together came from each person – what a blessing"
"The great level of the friendship developed between us, people of different countries and continents"
"Excellent group of collaborators with diverse experience and expertise. Remember how fun it can be to work hard on a problem"
"It is a brilliant idea to bring together a diverse group of scientists and bio-safety people. Splendid diversity of participants. It is a privilege to work with experts in the field."
"What a great meeting! Congratulations to Anne K. for her great capacity to choose a great group"

Book Outline

Title: *Environmental Risk Assessment of Genetically Modified Organisms, Volume 3: Methodologies for Transgenic Fish*. CABI Publishers

Editors of Vol 3: Anne R. Kapuscinski (STAP), Sifa Li (China) and Keith Hayes (Australia)

Series Editors: Peter Schei (STAP) and Eric Hallerman (USA, guest editor replacing Kapuscinski for this volume). Schei and Hallerman will conduct an independent, international, and anonymous scientific peer-review of the book manuscript.

Chapter Authors: lead listed below as **. Alignment of co-authors may change based on actual contributions to the final version sent to the publisher.

Notes on Design of Chapters:
• **Introduction** – each chapter starts with an easy to grasp introduction
• **Summary for policy specialists** – each chapter ends with a brief, non-technical summary
• **Book cohesion** – editing of chapters will assure that they cross-reference each other and are part of a well-integrated, overall tool.

Series Foreword
Yolanda Kakabadze (STAP Chair), Peter Schei and Anne Kapuscinski (STAP members)

Preface *Anne Kapuscinski, Sifa Li, Keith Hayes*

Chapter 1: Introduction ***Anne Kapuscinski (STAP), Keith Hayes (Australia), Sifa Li (China), Robert Devlin (Canada), and others*
Book focuses on: methodologies from appropriate areas of *science* for assessing and managing environmental biosafety of transgenic fish; and transgenic fish that might be produced and used in developing countries; examples include potential aquaculture of transgenic carp in China and transgenic tilapia in Cuba and Thailand. Book does not: address food and human health safety of transgenic fish, except to note that unintended environmental entry of certain transgenic fish could raise food or human health safety questions; nor give guidance on drafting or evaluating biosafety policy. Purpose is to strengthen the science needed to *inform* biosafety policy and regulation in developing countries. The book is based on an analytic-deliberative process for risk assessment and management, and this chapter will present a comprehensive framework showing the systematic steps involved in such a process. Environmental risk assessment identifies the kinds of ecological effects and estimates the probability of such effects that might result from accidental escape or intentional introduction of transgenic fish into aquatic ecosystems. Risk assessment can utilize qualitative and quantitative information to assess a chain of events from environmental entry of the transgenic fish to potential ecological change. Scientific analysis is needed to conduct a risk assessment (described in greater detail in Chapters 4-6) and multi-stakeholder deliberation allows for determination of socially acceptable and unacceptable ecological changes (discussed in Chapter 2). Risk management also depends on scientific analysis and involves risk reduction planning and implementation and post-approval monitoring (discussed in Chapters 8 and 9). Uncertainty analysis (discussed in Chapter 7) is

an essential component of risk assessment and management. Some information in book may also be helpful for environmental risk assessment of selectively bred fish.

Chapter 2: Problem formulation and options assessment: multi-stakeholder-driven deliberation in risk assessment of transgenic fish ***Kristen C. Nelson (USA), Zubaida Basiao (Philippines), Anne Cooper (USA), Madan Dey (WorldFish Center), Miguel Lorenzo Hernandez (Cuba), Sathin Kunawasen (Thailand), Sifa Li (China), Domingo Fonticiella (Cuba), Blake Ratner (WorldFish Center), Maria-Isabel Toledo (Chile),Wattana Leelapatra (Thailand)*

This chapter will discuss methodology of the PFOA, building on similar chapters in Volumes 1 and 2 of CABI book series. This chapter will explain how this process is science-driven, transparent, involves multiple stakeholders and why this is important for environmental risk assessment. The approach of this chapter will be to present methodologies that others can use for the PFOA process by using four case studies of China, Chile, Cuba, and Thailand. These case studies will provide comparisons across specific countries about how the PFOA could be applied in each regulatory policy context. This chapter will not draw conclusions for any specific case, but will illustrate issues that commonly need to be addressed based on these four cases. In addition, the chapter will identify capacity building needs in order to conduct a PFOA as part of the environmental risk assessment, with specifics on transgenic fish.

Chapter 3: Transgenic fish for developing countries: scientific background ***Yoon Kwon Nam (South Korea), Norman Maclean (UK), Cuizhang Fu (China), T. J. Pandian (India), Maria Rowena R. Romana-Eguia (Philippines)*

This chapter will introduce the history of approaches and technology for creating transgenic fish and review developments for future research. It will also summarize the status of development of transgenic fish focusing on species important for developing countries such as carp, tilapia and loach. Review target traits and species for future transgenic fish development. Briefly introduce ways to integrate environmental biosafety at the concept or early research stage, such as containment methods, design of safer DNA constructs, and early phase risk assessment.

Chapter 4: Gene construct and expression: information relevant for risk assessment and management *** Zhiyuan Gong (Singapore), Norman Maclean (UK), Rebeca Martinez (Cuba), and Ofelia Galman Omitogun (Nigeria), and Mario Pablo Estrada (Cuba)*
Detail the construction and expression of transgenic constructs in fish and why this knowledge is important for environmental risk assessment and management. Address expression for target trait and unanticipated effects on non-target traits; expression in different genetic backgrounds; and transgene stability, silencing and rearrangement. Explain how certain design approaches and subsequent expression can pose specific hazards, then identify criteria for designing constructs that reduce or prevent certain hazards. For example, the chapter will address viral and bacterial sequences, transposable elements, plasmid sequences, and antibiotic resistance markers.

Chapter 5: Approaches to assessing gene flow ***Anne Kapuscinski (USA), Robert Devlin (Canada), Ian Fleming (Canada), José Gallardo (Chile), Jeff Hard (USA), Wongpathom Kamonrat (Thailand), Wilson Mwanja (Uganda), Roberto Neira (Chile), Alphis Ponniah (WorldFish Center), Kelly Paulson (USA), Jiraporn Trisak (Thailand)*

Present methodologies for assessing gene flow from farmed fish to wild and feral relatives in aquatic ecosystems. Explain chapter's applicability to assessing gene flow from transgenic fish as well as from selectively bred fish. The chapter also introduces approaches for assessing possible changes in genetic and species diversity resulting from gene flow; refer reader to chapter 6 for discussion of other possible ecological effects that might cascade from gene flow. Present a generic invasion model (gene flow = probability of entry x probability of introgression) and discuss dividing each component of this model into sub-components that can be assessed by relevant types and combinations of experiments, collection of field data, existing biological/ecological data based, and mathematical modeling. Approaches for estimating the probability of introgression include a quantitative method, the net fitness methodology developed by Muir and Howard. Explain the central importance of genotype by environment interactions in any approach used to estimate introgression potential. Where possible, the chapter will give illustrative examples, such as estimating the entry potential of tilapia from cage culture operations in Thailand and of tilapia from farm ponds in Uganda. Discuss data needs, possible experiments to address data needs, confinement needs for such experiments, limitations and assumptions of approaches presented in the chapter, and needs for building scientific and technical capacity to assess gene flow.

Chapter 6: Assessing ecological effects on aquatic biodiversity prior to entry into natural environments ***Robert Devlin (Canada), Ian Fleming (Canada), Keith Hayes (Australia), Jorgen Johnsson (Sweden), Channa Bambaradeniya (Sri Lanka), Fredrik Sundström (Sweden), Mohd Zakaraia-Ismail (Malaysia), William Ojwang (Kenya)*

Present methodologies for assessing effects on population, species, and community levels of biodiversity, including relevant methods for laboratory, field, and simulation (modeling) experiments. Present ecological assessment from two starting points. First, define traits of transgenic fish that might escape and how expression of these traits in an aquatic ecosystem could lead to different ecosystem effects. Second, discuss characteristics of aquatic ecosystems and how interactions with organism traits could lead to significant ecosystem effects. This discussion will draw on ecological concepts of inter-specific and intra-specific interactions (e.g., predation, disease, toxicity, cannibalism) and of abiotic factors that influence biotic interactions. The chapter considers both situations in which transgenic fish are an introduced, non-native species (lack wild relatives) in potentially receiving environments and in which they have wild or feral relatives. Present different ecological risk assessment methods and their limitations, such as the challenge of accounting for genotype by environment interactions. Different methods presented include extrapolation of phenotypes derived from lab experiments, studies in semi-natural mesocosms, studies of surrogate models released into nature (e.g., fish with growth-implants), and retrospective and predictive methods (qualitative modeling, semi-quantitative modeling and quantitative ecosystem interaction models).

Chapter 7- Uncertainty Analysis ***Keith Hayes (Australia), Mark Burgman (Australia), and Helen Regan (USA)*

Provide a brief and non-daunting overview of the types of uncertainty, why uncertainty analysis is important, and the range of methods available to address them. Provide a brief discussion of the issues associated with the practical application of these methods for developing nations and transgenic fish. Introduce kinds of uncertainty commonly encountered in environmental risk assessment: vagueness, incertitude and variability. Illustrate kinds of uncertainty using points from prior chapters, such as

variability of a biological parameter used to estimate gene flow and incertitude regarding genotype by environment interactions. Introduce qualitative methods and quantitative methods for assessing each kind of uncertainty. Discuss data needs, caveats, and software available for practical applications of uncertainty analysis. References cited in this chapter will direct readers to additional sources for learning more details of how to conduct uncertainty analysis.

Chapter 8: Risk management: reducing risk through containment and confinement of transgenic fish ***Graham Mair (Australia), Yoon Kwon Nam (Korea), Igor Solar Arroyo (Chile)*

Introduce containment and confinement as representing different degrees of risk management. Review different methods of physical/geographical confinement (e.g. site selection, mechanical barriers) and biological confinement (sterilization by ploidy manipulations or transgenic approaches, sex control) and present one or more real examples. Discuss strengths and weaknesses of different methods, value of redundancy in containment or confinement strategies, and research needs to improve methods.

Chapter 9: Risk management: post-approval monitoring and remediation ***Wansuk Senanan (Thailand), Acacia Alcivar-Warren (USA), Miguel Lorenzo Hernandez (Cuba), Jiraporn Trisak (Thailand), Jeff Hard (USA), Mohd Zakaraia-Ismail (Malaysia)*

Discuss how to detect key population and ecological endpoints after transgenic fish have escaped or are deliberately introduced into aquatic ecosystems. (Refer readers to chapters 5 and 6 for discussion of importance of these parameters.) Monitoring can be designed to detect escapement, presence of transgenes (in first generation hybrids and introgressed individuals) and population establishment of non-native transgenic fish species. Review methodologies for detection of these different possible effects. Address baseline date needs, sampling design and statistical power; and strategies for "expecting the unexpected"— monitoring for unforeseen problems (see also chapter 7).

Chapter 10: Summary and synthesis ***A. Kapuscinski, Sifa Li, Keith Hayes, Genya Dana, Robert Devlin and others*

Synthesize prior chapters on the status of biosafety science and relevance for developing countries regarding:

- Summarize the main messages on risk assessment as presented in the book
- Identify areas where science is adequate for assessing environmental biosafety of transgenic fish
- Identify main gaps in scientific methods and understanding
- Call for further development of multi-stakeholder deliberation methods
- Discuss scientific and human capacity building needs: research and scientific knowledge in different natural sciences, social sciences and system safety; training of various parties in public and private sectors, collaborative opportunities across the North-South divide
- Discuss ways that development of transgenic fish could be made safer in the first place from the early stages of laboratory research through regulatory approval.

Glossary

Appendix A - Workshop evaluation form

Feedback on the Transgenic Fish Biosafety Writing Workshop
World FishCenter – 17-21 October, 2005

1. What worked well for you at the workshop?

2. What did not work well for you at the workshop? How would you improve future workshops?

3. What are some interesting ideas you heard at the workshop that you will share with others?

4. Please rate the workshop:

1	2	3	4	5	6	7	8	9
bad				okay				excellent

   Briefly, why did you give it this rating?

5. Do you have any ideas on next steps to complete the book?

6. What is one final thought you would like to share with others at the workshop?