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INTERNATIONAL PREVENTION AND MANAGEMENT OF INVASIVE SPECIES: THE NEVER-ENDING CHALLENGE

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Introduction

Invasive alien species (IAS)[1] are a local, state, and national problem, but in all cases, their first introduction to the lands and waters of the United States—whether intentional or not—can be traced back to an international vector. In turn, some of the worst invasive species problems afflicting the environment and economies of other countries have arisen from species native to our lands. The international community, recognizing that annual global environmental and economic costs created by IAS reaches into the trillions of dollars, has taken progressively more aggressive and cooperative actions in attempt to stem the flow of unwanted alien species among countries. This paper provides a brief overview of these international actions that are ongoing to prevent and manage IAS, and summarizes how the U.S. Department of State (State) is working within the international arena to assist in dealing with the global problem.

Multilateral agreements and treaties are particularly useful at addressing problems caused by invasive species when the impacts from them can be viewed as potentially affecting resources shared by the international community. Some of the multi-lateral activities addressing invasive species include the Convention on Biological Diversity (CBD), the International Plant Protection Convention (IPPC), the Ramsar Convention on Wetlands, the International Maritime Organization (IMO), the World Organization for Animal Health (OIE), the Food and Agriculture Organization (FAO), the World Health Organization (WHO), and the *Codex Alimentarius* Commission created in 1963 by the FAO and WHO to develop food standards and guidelines to protect human health and ensure fair trade. Agreements in trade bodies such as the World Trade Organization (WTO) and in environmental consultative mechanisms of free trade agreements are also proving effective at raising awareness of the IAS problem and developing cooperative solutions (Fisher 2005). Limited time does not permit discussion of each of these organizations, so I will focus on just a few international venues where cooperative actions are ongoing.

[1] Invasive alien species (IAS) are any species non-native to an ecosystem whose introduction causes or is likely to cause economic or environmental harm, or harm to human health. Under this broad definition, the socioeconomic and ecological damage to the global environment has been conservatively estimated to exceed $US 1.4 trillion annually, or roughly five percent of the global economy (*see* Pimental D. editor. 2002. Biological invasions: economic and environmental costs of alien plant, animal and plan microbe species. Boca Raton/London/New York/Washington DC; CRC Press, 369 pp.).

Convention on Biological Diversity

Article 8(h) of the Convention on Biological Diversity (CBD) commits Parties to the Convention to, "prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species." The CBD engenders efforts to sustain biodiversity, and the recognition of IAS by the Convention as a primary reason for the loss of biodiversity was a critical step in generating international momentum to address the link between IAS and sustainable biodiversity. The CBD has made several key decisions since its inception in 1993. At the fourth Conference of the Parties (i.e., COP IV) the CBD parties recognized that alien species were a cross-cutting issue impacting all seven thematic areas of the Convention: (1) marine and coastal biodiversity, (2) agricultural biodiversity, (3) forest biodiversity, (4) island biodiversity, (5) biodiversity of inland waters, (6) biodiversity of dry and sub-humid lands, and (7) mountain biodiversity. In the same decision, the COP recognized the particular importance and vulnerability of geographically and evolutionary isolated eco-systems such as small island states—a theme which I will return to later. The Subsidiary Body on Scientific Technical and Technological Advice of the CBD subsequently introduced common definitions for IAS and developed 15 guiding principles for implementing Article 8(h). At COP VI CBD parties adopted these guidelines identified a roster of experts, and promoted the Global Invasive Species Program (GISP) as the appropriate 'clearing-house' for scientific and technical matters related to invasive species under the Convention.

The CBD has also been a strong supporter of the Global Taxonomy Initiative (GTI). This initiative recognizes the need in every country—the U.S. notwithstanding—for building the capacity in systematics so that early detection and rapid response to new invaders can be more efficient. Finally, The CBD has designated substantial funds from mandatory and voluntary contributions to further the development of a global invasive species information network, or "GISIN" (http://www.gisinetwork.org). The GISIN is envisioned to provide a freely available portal to all existing invasive species databases once it is on-line (Sellers et al. 2004). Although it is no secret that the United States is not a party to the CBD, we consistently support international capacity building actions to address the IAS problem promoted by the Convention. For example, between 2001 and 2004, grants administered by the OES bureau of the State Department, along with supplemental funding from US AID, sponsored seven regional workshops convened by GISP, CABI and IUCN around the globe. These workshops were designed to build strategies for preventing and managing IAS in their respective regions (see www.gisp.org), and we were the principal sponsors of the first GISIN meeting (see www.nbii.org).

IPPC

Approximately half of the 50,000 non-indigenous species in the U.S. are invasive weeds, and these yield the majority of the estimated $120 billion/year economic and environmental costs to the U.S. from invasive species (Pimental 2004). The International Plant Protection Convention (IPPC) is the international treaty whose purpose is to secure actions to prevent the introduction and spread of such problem plants, as well as pests of

beneficial plants and native flora. The provisions of the Convention extend to cover conveyances, containers, storage places, soil and other objects or material capable of harboring plant pests. In all, the IPPC has produced 19 international standards for phytosanitary measures (ISPM), which examine, in a variety of contexts, invasive issues. For example, ISPM 11 provides guidelines for conducting pest risk analyses, including genetically modified organisms. ISPM 15 contains information on the requirements for treating wood packaging material to prevent its potential as a vector for harboring plant pests. The IPPC has also recently produced a phytosanitary capacity evaluation (PCE) tool, whose function of is to aid NPPO diagnoses at gauging the capacity gap between the current situation and what is needed to meet the requirements of international standards.

ICAO

Microorganisms in aircraft food, insects in packing material, passenger goods containing plants and weeds, animals "hitchhiking" in the aircraft structure, all of these vectors for IAS introduction are possible through civil aviation pathways. The international civil aviation organization (ICAO) has recently begun to recognize the potential for invasive species spread via air travel, and adopted resolution A33-18 on "Preventing the introduction of invasive alien species," at their 33rd annual assembly in 2000. This resolution urged States to 'collectively support and cooperate' on efforts to prevent the spread of IAS via international civil aviation. The introduction of the brown tree snake in Guam, responsible for the extinction of numerous bird species there, and the source of a massive prevention effort in the State of Hawaii, is a classic example of an introduction via this vector (Enbring and Fritts 1988). Thirty-eight of 49 States that responded to an ICAO survey indicated they had IAS problems in their countries, and provided examples of IAS invasions via aircraft, air cargo, or passengers. ICAO has been particularly active in addressing aircraft disinsection measures required for preventing the spread of contagious disease pathogens—some of which may also be invasive, such as the SARS virus. The United States recently proposed a working paper in ICAO to consider non-pesticidal means for disinsection, such as air curtains, that is now being evaluated by member States of the organization.

International Maritime Organization

Roughly 10 billion tons of ballast water are discharged globally each year (IMO 2003), and carried along with this ballast are potentially invasive species that cause millions of dollars of environmental harm. Classic examples of invasive species introduced by ballast water include the zebra mussel, green crab, and comb jellyfish, amongst many others (Carlton 1999). In recognition of this problematic vector, the International Convention for the Control of Ships' Ballast Water and Sediments was adopted by diplomatic conference in February 2004, and was open for signature beginning this past June. The Convention will enter into force 12 months after ratification by 30 States, representing 35 percent of world merchant shipping tonnage (see Article 18, *Entry into force*). The UNEP/GEF funded GloBallast program serves to support the implementation of these IMO standards in developing countries.

The objective of the Ballast Water Convention is to minimize and ultimately eliminate the transfer of aquatic IAS through ships' ballast water and sediments. Signatories to the Convention will be required to implement a ballast water management plan that ensures that ballast water management practices and discharges meet the prescribed ballast discharge standard of no more than 10 viable organisms per cubic meter of ballast water that are greater than or equal to 50 micrometers in size, and fewer than 10 viable organisms per milliliter of ballast water that are between 10 and 50 micrometers in size. The question of whether we will ratify the Convention will await the final development and approval of the technical guidance documents that are under development by member countries. Notwithstanding, the Convention is a hallmark for international cooperation, as it represents the first time international shipping standards for aquatic invasive species have been developed. I would like to emphasize that the Convention does not preclude countries from applying more stringent measures, and our neighbors to the north have expressed the desire to begin discussions with us for considering such actions—which we hope to embark upon within the next several months. Certainly, both countries recognize that stringent standards often help to drive technology improvements.

Regional and Bilateral Initiatives and Agreements

Regional collaborative programs to exclude invasive species provide some of the most tangible measures for implementing actions that address IAS. A good example has been the very high degree of cooperation in developing and testing biological control methods, as Dr. Delfosse will describe. Below I highlight just a few of the more relevant regional actions.

Invasive Species Risks from Development Aid

Development assistance projects have contributed to the introduction of IAS, as well as being adversely impacted by them. Development agencies have begun addressing this specific issue and are working to educate regional governments on the prevention and management IAS. In 2002, the US Agency for International Development (USAID) commissioned GISP to conduct an assessment on the linkages between development assistance and invasive alien species (IAS) in freshwater systems in Southeast Asia (Gutierrez and Reaser 2004). From this study aquaculture projects were found the most significant pathway of both the intentional and unintentional introduction of aquatic IAS—a result of the promotion of non-native species for aquaculture, such as tilapia (*Oreochromis spp.*). However, IAS can also adversely impact development assistance projects. The Golden apple snail (*Pomacea canaliculata*), for example, was introduced into Southeast Asia in the early 1980s for culture as a high-protein food source for domestic consumption, as well as for export. Local and foreign consumers failed to acquire a taste for GAS and the snails were quickly discarded into irrigation ditches and public waterways (Halwart 1994). The species soon made its way to rice fields, where the animals voraciously consumed young rice plants. Naylor (1996) estimated that by 1990 the costs of snail invasion in the Philippines alone were between US$425-1,200 million, excluding non-market damages to human health and ecosystems.

Recently, the NISC has embarked on a cooperative program with the Peace Corps to inform this program's efforts on aquaculture development, promoting native species in lieu of former practices where non-native fishes were often used.

Great Lakes Fishery Commission

The Great Lakes Fishery Commission (GLFC) was established by the Convention on Great Lakes Fisheries between Canada and the United States in 1955. The GLFC is perhaps the best example of how regional or bilateral cooperative actions can be successful. The Commission has been fighting for more than 50 years to prevent and manage invasive species that enter the Great Lakes through ballast water, trade of live organisms and aquaculture. The Commission receives federal funding of approximately $12 million a year from both the U.S. Department of State and Canada for this task. One of the responsibilities of the Commission is to coordinate the implementation of the invasive sea lamprey control program for the Great Lakes, by the Canadian Department of Fisheries and Oceans, the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers.

This control program uses several techniques to attack sea lamprey such as sea lamprey assessment, lampricide control, barriers, traps and sterile male release techniques, and it has been tremendously successful. Ongoing efforts by the Commission have resulted in a 90% reduction of sea lamprey populations in most areas of the Great Lakes. The Great Lakes Fishery Commission is also involved in a project to restore the existing electrical barrier and provide for the building of a second barrier to be placed in the Chicago Shipping and Sanitary Canal, preventing the movement of the Asian Carp from the Mississippi River into the Great Lakes Basin.

Managing Invasive Marine Pests in APEC Economies

APEC has assumed a leading role in the international arena recognizing and addressing the socioeconomic and environmental threats created by and posed to trade from IAS. Indeed, amongst the Agricultural Technical Working Group, Marine Resource Conservation Working Group, Fisheries Working Group and Transportation Working Group, APEC has sponsored 13 separate workshops to address topics related to invasive species since 2000 alone. For example, the APEC Fisheries Working Group, in cooperation with NACA, FAO, WHO and the OIE has also recently published a manual on "Risk Analysis for the Safe Movement of Aquatic Animals". The manual arose from the initial workshop, "Capacity and Awareness Building on Import Risk Analysis (IRA) for Aquatic Animals," (APEC Project FWG/01/2002), and provides a simplified overview of the risk analysis process to assist responsible individuals to formulate national policies and develop approaches to conducting risk analyses for pathogens.

At SOM III in August of 2003, APEC's Senior Officials endorsed a U.S. proposal for a meeting (workshop) to develop an overall strategy to address IAS prevention, eradication

and control among member economies. The People's Republic of China has offered to host the strategy meeting in Beijing and I am pleased to announce that as a formal date has (finally!) been set for September 18-22, 2005. Initial funding for the cross-sectoral meeting has been secured from the U.S. National Science Foundation, and State has received offers of additional support from several APEC working groups, the U.S. Department of Agriculture, and the Global Invasive Species Program, and we are continuing to look for additional sponsorship for this meeting from other domestic agencies and international partners. A U.S. proposal to use the ECOTECH subcommittee of APEC to better coordinate APEC's actions on IAS—particularly after the September strategy meeting—will be deliberated next week in Korea at the first APEC Senior Official's meeting of 2005.

ASEAN Actions

In July of 2004 the Network of Aquaculture Centres of the Asia-Pacific (NACA) and FAO convened a State/OES-funded workshop of the Association of SE Asian Nations (ASEAN) region to build capacity in the region to prevent and manage the unregulated transboundary movement of aquatic animals for aquaculture, and the aquatic pathogens coincident to this practice. Partners to this effort included the FAO, the Mekong River Commission, and the OIE. Aquatic IAS are of increasing concern in ASEAN because of the social and economic importance of the fishery and aquaculture sectors. Aquatic animal diseases in particular have caused significant damage in recent years, and are now recognized as a major risk and primary constraint to the growth of the ASEAN aquaculture sector. The aquaculture industries alone provide several billion dollars of export earnings to ASEAN economies, so the economic and social risks are substantial. Participants agreed that the best way forward is to minimize the risks and costs associated with negative impacts of aquatic IAS and aquatic animal pathogens whilst capturing the social and economic benefits possible through the responsible aquaculture of alien species. Proceedings of this workshop will be freely available within the next month on the NACA web site (www.enaca.org).

Free Trade

Environmental consultative mechanisms (ECMs) associated with free trade agreements (FTA's) are a relatively new tool that is being applied at the regional level to address collaborative invasive species prevention and management. The North American Free Trade Agreement established the Commission on Environmental Cooperation (CEC), under which the U.S., Canada and Mexico are undertaking cooperative actions addressing invasive species. Actions are ongoing now in the CEC by each of the parties to evaluate a method of risk analysis developed by the U.S. Aquatic Nuisance Species Task Force for addressing the probable risks of aquatic species proposed for intentional introduction.

Invasive species are also being addressed in the U.S./Chile FTA, and language to address invasive species has been accepted in the ECM of the Central American Free Trade Agreement. One advantage to raising the issue in these venues is that the audience

differs, allowing the message to be conveyed to different ministries than might otherwise be aware.

NGO Activities

The non-governmental organization (NGO) community often represents the front-line of defense in addressing the ecological risks from invasive species and for implementing prevention and control actions. Indeed, most of the capacity building activities on the issue by the Department of State and US Aid would not be possible without the assistance of NGOs such as CAB-International, TNC, the National Fish and Wildlife Association and others. Major initiative areas are discussed below. There is a noteworthy emphasis on SIDS, where IAS are the leading cause of species extinction. SIDS generally contain the most vulnerable ecological communities to the impacts of invasive alien species (IAS) because of their unique species endemism, their lack of natural control mechanisms to new invaders, and their limited abilities to withstand economic impacts if IAS become established.

The Nature Conservancy & The Pacific Islands Invasives Learning Network

The Pacific Islands Invasives Learning Network (PIILN), a project recently initiated by the TNC with start-up funds from the OES bureau of the U.S. State Department, focuses on bringing peers from different locations in the Pacific to the table to share their experiences in combating IAS problems in SIDS. Consultations to establish the network have now occurred in approximately 20 Micronesia SIDS. State is working to assist TNC in expanding this learning network model throughout Melanesia, Polynesia, and eventually the Caribbean. The model recognizes that successful conservation requires complementary action by a variety of actors from all sectors—action based on a shared understanding of how natural systems function and a common vision of their improvement for today and future generations. Multi-disciplinary project teams will work together on strategies with critical input from other teams and experts, resulting in the creation of a common vision and plan for effective action on-the-ground. Partners to this effort include South Pacific Regional Environment Program (SPREP), the IUCN Invasive Species Specialist Group (ISSG), the Palau Office of Environmental Response and Coordination (OERC), and the USDA/USFS.

CAB-International Compendium Programs & The Global Invasive Species Program

A 2001-02 feasibility study for the development of an invasive species compendium initiated by the USDA-Agricultural Research Service, a Consortium member of the Crop Protection Compendium, recommended the National Invasive Species Council (USA) take the lead in developing this compendium. The USDA is moving forward aggressively in identifying funding for this effort within the USG at present, and I am cautiously optimistic for State's support in this endeavor. CABI has also been active in organizing capacity building efforts for addressing IAS—most recently in Ghana for the West Africa Region. Proceedings from this meeting are now available on the GISP website (www.gisp.org), as are the proceedings from the other regional IAS workshops

previously discussed. State is currently working with CAB-International in attempt to implement an ASEAN-Net data hub for the GISIN, finalize a Caribbean Basin Invasive Species Strategy for adoption by the CARICOM nations, and implement a Caribbean islands invasives learning network.

IUCN-ISSG

The World Conservation Union (IUCN, *www.IUCN.org*) Invasive Species Specialist Group (ISSG) shares many of the goals of the TNC and CAB-International in addressing the problems created by invasive species, and in building capacity amongst local communities to combat them. The ISSG developed the Global Invasive Species Database (GISD, www.issg.org/database) as part of the global initiative led by GISP, publishes the Aliens newsletter, and is responsible for assembling the list of the '100 worst invasive species'. In 2002, the ISSG launched the Cooperative Initiative on Invasive Species on Islands (CII) (a.saunders@auckland.ac.nz). The initiative focuses on building cooperative efforts to address impacts to island biodiversity principally, and is not focused on impacts to agriculture. Thus, the PIILN efforts are highly complementary to this initiative.

Conclusion

The brief summary I have outlined represents a small fraction of the global activities that are ongoing to address the IAS problem and the capacity building needs for improved cooperation worldwide. Other noteworthy projects such as the Pacific Islands Ecosystems at Risk Project (PIER), and projects conducted by the South Pacific Commission, Aus-AID, SEAFDEC, the Nordic/Baltic Regions efforts, and the World Wildlife Fund's efforts in the biocontrol of aquatic invasive plants that have been highly effective at raising local awareness on IAS prevention and control also deserve substantial credit. There will continue to be debate over the negative and positive consequences of introduced species, and open dialogue and minds will be needed from both sides of the spectrum to consider new control methods, including market development for uses of established IAS species for which eradication is simply no longer possible—to mitigate control costs if nothing else. The degree to which nations can implement appropriate prevention and management strategies will continue to be hampered by lack of resources, and helped by cooperative actions that take advantage of economies of scale inherent to cooperative management approaches. No nation can do it alone. Trading blocks and parties such as ASEAN, APEC have the opportunity, through their economies of scale, to address the IAS problem together, one industry at a time that single nations simply cannot support.

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International Prevention and Management of Invasive Species: The Never-Ending Challenge

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Invasive Alien Species Issues Are Cross-Sectoral with Multiple Linkages

- Sustainable biodiversity,
- Global warming,
- T&E Species preservation,
- Living modified organisms,
- Global plant, animal and human health
- Invasive species issues are addressed in all of these policy discussions--this talk represents just a few of the fora where actions addressing IAS are ongoing

International Activities on a Multi-Lateral Scale

- Multilateral agreements and treaties are useful when IAS impacts affect resources shared by the international community.

- Examples: CBD, IPPC, Ramsar Convention on Wetlands, International Maritime Organization (IMO), the World Organization for Animal Health (OIE), Food and Agriculture Organization (FAO) and World Health Organization (WHO).

Convention on Biological Diversity

- Article 8(h) commits Parties to the Convention to: *"prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species."*

- The recognition of IAS by the Convention as a primary reason for loss of biodiversity was a critical step in generating international recognition of the link between managing IAS and sustaining biodiversity.

- 3 Decisions: IV/I; V/8; VI/23*

CBD--SBSTTA

- The Subsidiary Body on Scientific Technical and Technological Advice Developed 15 Guiding Principles to address biodiversity impacts from IAS:
  - precaution; 3-stage hierarchy; ecosystem approach;
  - research, education and public awareness
  - prevention: border control; info exchange; cooperation
  - Introductions: intentional; unintentional;
  - Mitigation: impacts; eradication; containment; control
- Promoted Global Invasive Species Programme (GISP) as clearing-house for disseminating technical IAS information among Parties, proposed the development of the Global Taxonomy Initiative (GTI)--V/9

The International Plant Protection Convention

- Half of the 50,000 non-indigenous species in the U.S. are invasive weeds, and these yield the majority of the estimated $137 billion/year economic and environmental costs to the U.S. from invasive species.

- IPPC : Intent to prevent the introduction and spread of problem plants, as well as pests of beneficial plants and native flora.

International Plant Protection Convention

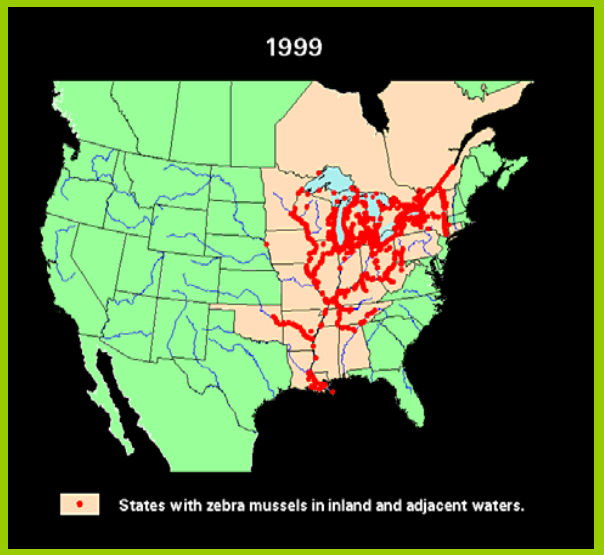
- Provisions of the Convention extend to cover conveyances, containers, storage places, soil and other objects or material capable of harboring pests.
- The IPPC has produced 19 international standards for phytosanitary measures (ISPM), which address, in part, the invasive issues.
- ISPM 11 addresses guidelines for conducting pest risk analyses, including genetically modified organisms.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

- Now addressing aviation vectors for IAS
- Recent publication of position paper
- Hitchhikers in food, packing material, wheel wells, etc.
- Need refined inspection guidelines

International Maritime Organization (IMO)

- Roughly 10 billion tons of ballast water are discharged globally each year, causing millions of dollars of environmental harm.



- Classic ballast introductions: zebra mussel, green crab, and comb jellyfish, amongst others.

- International Convention for the Control of Ships' Ballast Water and Sediments adopted by diplomatic conference in February 2004.

International Ballast Water Convention

- The Convention will enter into force 12 months after ratification by 30 States, representing 35 per cent of world merchant shipping tonnage
- The objective of IBWC to minimize and eliminate the transfer of aquatic IAS through ships' ballast water and sediments.
- First standards developed to replace first voluntary guidelines for ballast water exchange: 10 orgs/ml ballast (<50 um); 10 orgs/m^3 (>50 um)

Regional and Bilateral Initiatives and Agreements

- Regional collaborative programs are tangible measures for implementing IAS control
- E.G., biological control methods

Effective Invasive Species Prevention is Much More Than Border Control

Actions

- **screening for intentionally introduced species.**

- **Identification & addressing pathways for unintentional introduction**

- **Risk analysis and rapid response identification and control tools**

FTAs : Environmental Cooperation Agreements Can Be Frameworks to Promote Actions to Combat IAS

- Develop Standards for Environmental Protection & Human Health Based on Sound Science
- Implement Standards for Protection of Environmental & Human Health
- Conserve Natural Resources While Sustaining Development
- U.S. Chile, NAFTA, CAFTA

ADDRESSING INVASIVES IN THE CENTRAL AMERICAN/DOMINICAN REPUBLIC FTA

•Tariff Reductions Increase Trade by $772 mil in 2004, to $1.118 in bil by 2013

• ECA is Under Development and Invasives Are Being Considered as 1 of 9 work programs under the theme of harmonizing laws, codes, standards and regulations for the protection of human health based on sound science and international norms

• Plant Threats: *Miconia calvescens*, *Eichhornia*,

Solanum tampicense, *Spartina sp*

• Pet Trade Risks Ornamental fish--enter duty fre

2nd largest source of introduced fish in U.S.,

1/3 of most devastating from aquaria

U.S./Chile Program of Work From ECA

- 11 Action Items Approved by EAC

- wildlife protection
- sharing private sector expertise
- improving environmental enforcement
- Improving agricultural practices
- strengthening capacity of environmental enforcement officials
- **preventing the transmission of invasive species**

Great Lakes Fishery Commission

- Established 1955 By Convention on G. Lakes Fisheries
- Works to prevent and manage invasive species that enter the Great Lakes through ballast water, trade of live organisms and aquaculture.
- 90% reduction in invasive sea lamprey, at $12 million/year--good example of bilateral cooperation to address IAS.

Linkages Between Development Assistance and Invasive Alien Species in Southeast Asia Freshwater Systems--U.S. Aid Study

- Three Linkages
  - Development Assistance as a Pathway of Introduction
  - Development Assistance Projects Adversely Impacted by IAS
  - Development Assistance Projects Working to Address IAS

Assistance Projects Working to Address IAS

- Control Projects (e.g. *Mimosa pigra*)
- Education and Awareness
  - *State Dept.:Prevention & Management of IAS: Forging Cooperation in South and Southeast Asia* – August 2002
  - *International Workshop on the International Mechanisms for the Control and Responsible Use of Alien Species in Aquatic Ecosystems* – August 2003
- Assessments
  - *USAID – Linkages Between Development Assistance and Invasive Alien Species in Southeast Asia Freshwater Systems*
  - *SIDA – Exotic Species in Aquaculture: Problems & Projects*

Development Assistance Projects Adversely Impacted By IAS

- Best Documented Case: Golden Apple Snail (GAS) (*Pomacea canaliculata*)
- Suspected or Known to Impact Development Projects
  - Irrigation and Drainage: Water hyacinth (*Eichhornia crassipes*), *Salvinia molesta*, *Mimosa pigra*
  - Food Security Projects: GAS, rats, invasive fish (tilapia, walking catfish, pacu)

Managing Invasives in APEC Economies

- MRCWG IMP Workshops: Phase 1 (2001), Phase 2 (2004) --> Draft regional framework for controlling invasive marine pests
    - identified hull fouling as significant risk and mission for future operations in APEC
    - proposed regional fishery management organizations should address vessel contributions to IAS.
    - U.S/Chinese Sponsor APEC Strategy Meeting on IAS: September 18-22 2005

Addressing Risks From Transboundary Movement of Aquatic Animals in the ASEAN Region of SE Asia

- NACA/FAO/OIE
- State (OES) Sponsor
- Capacity Building
- Tsunami—now what??

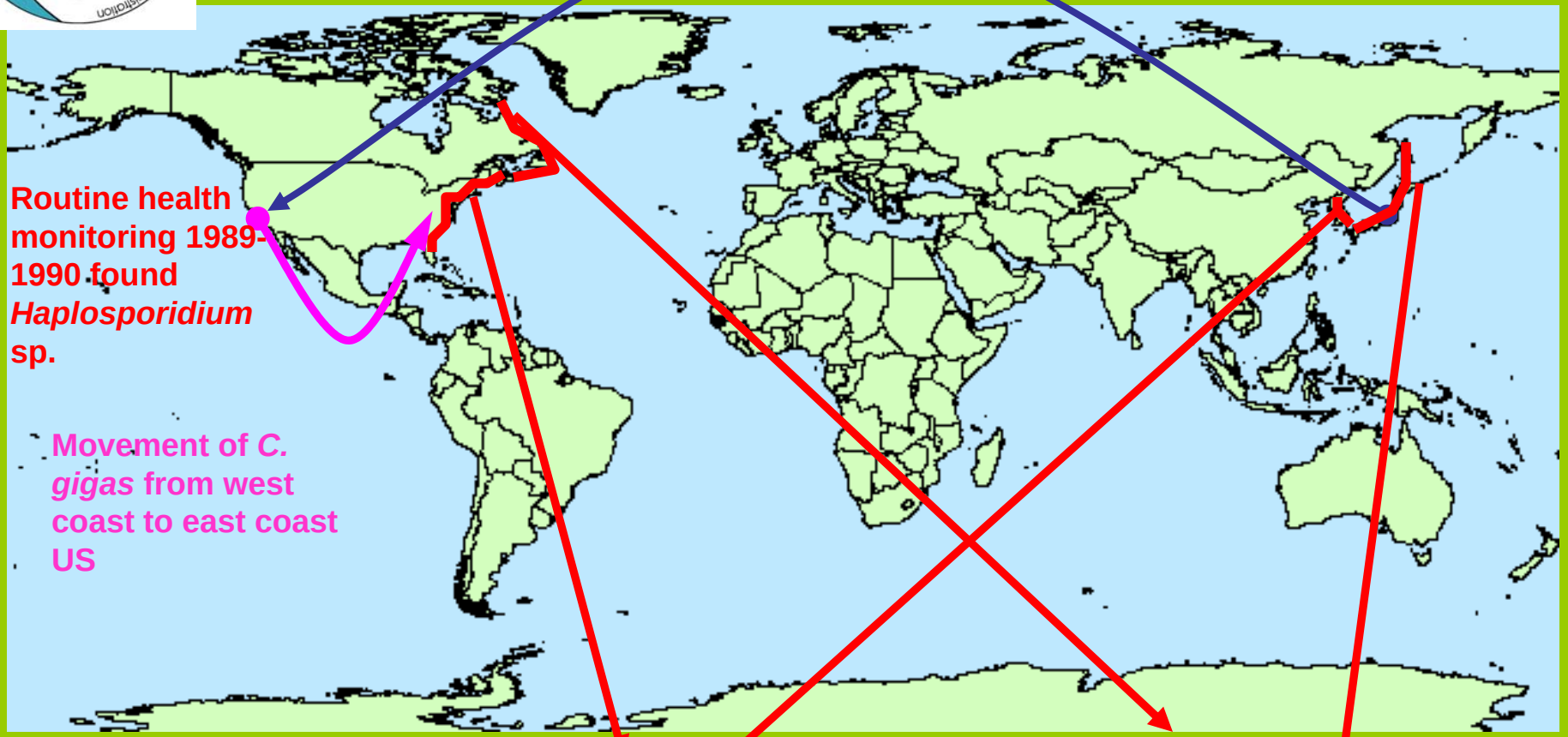
Aquaculture Facilities Lack Containment…

Marteilioedes parasites infect the cytoplasm of oocytes in C. Gigas

Origin of of *H. nelsoni* (MSX disease)

C.gigas importation from Japan to west coast of US since 1902 to 1980

In-situ hybridization of samples from Korea (1971), Japan (1993) and California samples gave positive reaction = *H. nelsoni*



H. nelsoni does not cause disease in *C. gigas*; *H. nelsoni* was introduced to the US through healthy *C. gigas* which was introduced to East Coast US, where *H. nelsoni* shifted virulence to a new host, *C. virginica* and caused mass mortality.

NGO ACTIVITIES TO COMBAT IAS

--Critical Partners for Implementation of Policy

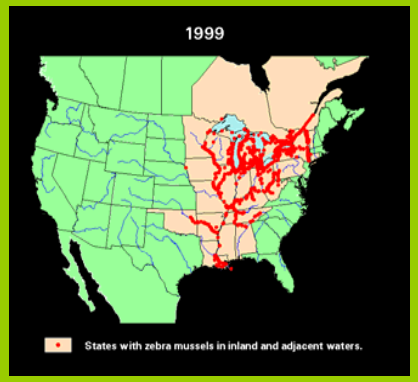
--Especially in Developing Region and SIDS

- **shortage of scientific info on basic biology of IAS**
- **lack of awareness of problem (esp. in marine)**
- **insufficient networking mechanisms for sharing info**
- **poor coordination in SIDS for IAS management**
- **insufficient cross-sectoral policies and legislation**
- **inadequate enforcement...**

NGO Community IAS Involvement Con.

- CAB-International
  - Caribbean Invasive Species Strategy
  - Invasive Species Compendium Project (NISC/USDA)
- GISP (with State Funding)
  - Regional IAS Workshops (2001-3)
  - GISIN (Baltimore 2004)
- IUCN/ISSG:
  - Global Invasive Species Database,
  - Cooperative Initiative on Invasive Species on Islands
- TNC
  - Pacific Islands Invasives Learning Network
  - Clean Trade Project
- Pacific Islands Ecosystems at Risk Project (PIER)
- SEAFDEC, WWF, AUS-AID, FAO, SPREP, NACA

Thoughts to Part With...



- IAS impact global environmental and economic health
- National control requires international intervention
- Think inside and outside the box:
  - aquatic weeds are hosts for pathogens, not just a habitat/water quality problem;
  - can we find some positive economic use for established IAS species?
- No control and/or eradication options are without risks, & no plan is perfect,

  (but holding out for perfection can be *extremely* costly)

Capacity Building Needs for Addressing the Problem Here and Abroad…

- Robust analyses of receiving environment for intentional introductions (quantitative!)
- More empirical research to refine risk assessments (*not reworking of the same data*)
- More local level involvement with surveillance and control
- Honest assessments of the risk of escape and intentional release
- Community education of economic and environmental risks
- Implementation of voluntary best practices by industry & trade sectors