

APFIC Regional workshop on

Low value and “trash fish” in the Asia-Pacific region



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FOREWORD

This Workshop report is a contribution to the new role of the Asia-Pacific Fishery Commission (APFIC) as a regional consultative forum. This forum provides its Members a neutral platform to examine issues affecting the sustainable development of fisheries and aquaculture across Member Nations. One of the major changes in modus operandi was to involve its partners and non-governmental organizations much more in the consultation and discussion processes on issues facing fisheries in the region. The Workshop was attended by 70 participants, brought together from both APFIC member countries as well as regional organizations that have a competence in fisheries, namely the Australian Centre for International Agriculture Research (ACIAR), the Mekong River Commission (MRC), the Network of Aquaculture Centres in Asia-Pacific (NACA), the Southeast Asian Fisheries Development Center (SEAFDEC), the WorldFish Center (WFC), and the Reversing Environmental Degradation in the South China Sea (UNEP/SCS).

The Workshop focused on the emerging issue of increasing demand for trash fish in the region. Based on the regional review of the current status and trends of “low value/trash fish” production and utilization, the Workshop discussed strategies to address the identified issues and design action-oriented outputs to implement the strategies at national, subregional and regional levels.

This Workshop is a clear example of how regional organizations and FAO member countries can join their resources to deal with issues of common interest. The elaboration of the action plan from this meeting is also a strong indication of the will to move forward on tackling some of the issues facing fisheries in the region. This report is the record of the Workshop and is further supported by presentations from the participants which cover in detail national and regional issues relating to low value/trash fish in the Asia-Pacific region. This is the first time the issue has been dealt with so comprehensively in the region and the outputs of this Workshop will provide a benchmark for the future.



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WORKSHOP CONCLUSIONS AND ACTION PLAN

An understanding of the issues

The Workshop concluded that the term “trash fish” was an inadequate term to describe the range of issues and different relative importance of the fish species caught that are collectively termed trash fish. It also noted that the term trash fish was used differently in different countries – in some it only referred to fish that was used for livestock/fish food, while in others it covered both livestock/fish food and human food. The Workshop also noted that inland small/low economic value fish share the same issues as coastal small/low economic value fish but recognised their importance as human food, particularly for the rural and coastal poor. Some participants felt that the term trash fish should only refer to the small/low economic value fish caught by larger scale trawlers operating further offshore, whilst others felt that the term should be replaced by some other term, such as “lowest value fish”.

This broad range of opinion meant that the Workshop could not agree on a common generic term and noted the difficulties that could occur in some countries, such as China, if the term trash fish was dropped for general use (for statistical purposes, China uses the term trash fish for fish that are utilized for animal feed and “low value fish” for those fish destined for human use). Taking this into account, the workshop recommended the use of an overarching term “low value/trash fish” in order to discuss the important issues and not become trapped in extended discussions over terminology. The Workshop recognized that these fish are generally of relatively low economic value and typically small-sized and can be used for either human consumption or as animal feeds (both for fish and livestock). They may be used directly in both aquaculture to feed other fish or processed into fish meal/oil for incorporation into formulated diets. The same is true for human food, where the fish may be consumed directly, or further processed, often using traditional methods of processing small fish. The use or disposal of these fish is strongly market-driven and linked to both direct human food demands, as well as wider livestock/aquaculture production sectors.

Within the Asian region, the umbrella term low value/trash fish covers discarded fish, direct feeding of low value/trash fish for aquaculture, low value/trash fish for human use, low value/trash fish for fish meal/oil etc. It was agreed that it was more important to focus on the issues and types of use for these fish, rather than insisting on a regionally accepted generic term. However, it is important to use the same term for the different categories of fish within the region that are included in the umbrella term – low value/trash fish.

Based on this understanding, the Workshop developed a list of issues relating to low value/trash fish that covered the following:

- increasing demand as direct feed for aquaculture and fish meal/oil
- food for livelihood or animal feed
- sustainability of harvesting
- ecosystem impact
- incentives for improved post-harvest
- growth overfishing/small juveniles
- discarding
- environmental impact of direct feeding to aquaculture
- social concerns as a major source of animal protein for poor people.

Action plan to address the issues

The Workshop developed an action plan to address these issues. This was based on a diagrammatic understanding of the supply and demand cycle for low value/trash fish and possible points for intervention (Figure 1). The identified points for intervention are shown in the boxes and include fishery interventions, improved utilization and improved feeds for aquaculture. It was also recognised that there is clear need for consistent policy between aquaculture development and fishery management, based on a common understanding and information base for decision-making.

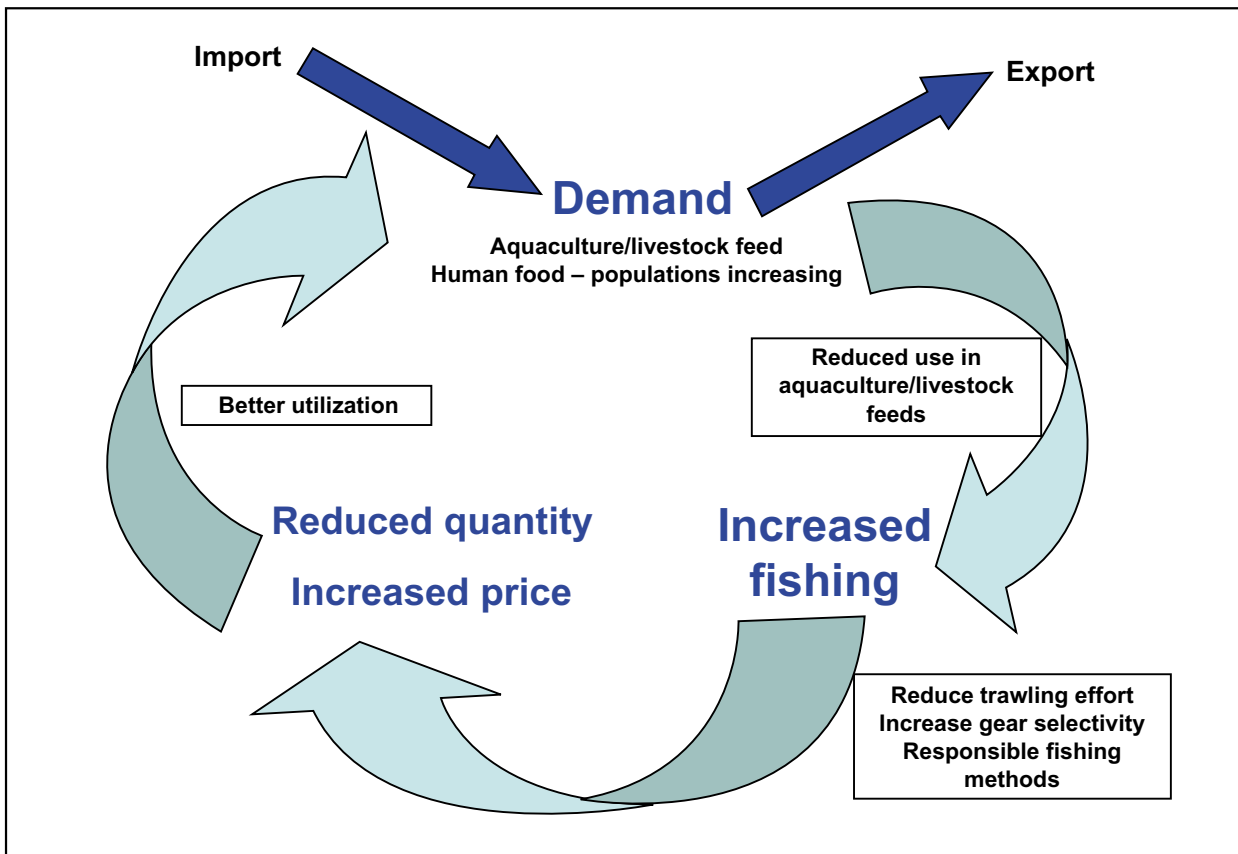


Figure 1: Demand and supply cycle for low value/trash fish and intervention points (in boxes)

Information and communication

The Workshop agreed that many of the serious issues associated with the increased catch of low value/trash fish would be addressed by adopting the following actions:

1. Adopt the following categories for data collection
 - i. discards
 - ii. direct aquaculture feed
 - iii. indirect aquaculture/livestock feed (meal and oil)
 - iv. human food (including processed products); and
 - v. others (non-food use e.g. fertilizers)
2. Provide a better understanding of the status, trends and utilization of low value/trash fish for planning and management;

3. Communicate the low value/trash fish issues to all stakeholders;
4. Improve awareness of the potential of pellet feeds for aquaculture;
5. Improve awareness of the suitability for human consumption; and
6. Recognize the importance of small fish in rural and coastal livelihoods.

Fishery interventions

1. Reduce trawling and push net effort (and clearly monitor the effect of capacity reduction);
2. Introduce improved selectivity of fishing gears/fishing practices;
3. Facilitate reduction in “race for fish” through rights based fisheries and co-management;
4. Protect juvenile nursery areas (refugia/closed areas, seasonal closures); and
5. Provide alternative social support measures (including employment).

Improved utilization

1. Improve post-harvest fish handling; and
2. Develop new fish products through processing.

Improve feeds for aquaculture

1. Change over from direct feeding to pellet feeding;
2. Reduce fish meal content by substitution of suitable ingredients in pellets;
3. Invest in feed research for inland/marine species; and
4. Promote adoption and change over to pellet feeds.

GOAL AND OBJECTIVES OF THE WORKSHOP

The goal of the Workshop was to develop a clearer regional understanding of the status of low value/trash fish and the issues relating to these fish in the Asia-Pacific region. This included quantifying, to the extent possible, the current trends and status of trash fish. Based on the regional review of the current status and trends of low value/trash fish production and utilization, the Workshop discussed strategies to address the identified issues and design action-oriented outputs to implement the strategies at national, subregional and regional levels.

Recognizing that one of the significant uses of low/value trash fish in the region is for animal feeds and in particular its increasing demand for use as aquaculture feeds, the Workshop paid special attention to the implications for aquaculture and its development in the region.

MECHANISM OF THE WORKSHOP AND FORMAT OF THE REPORT

Editorial note: In the abstracts of the technical presentations, the use of the term trash fish has been left as it was provided by the author to recognize the different uses of the term prior to the Workshop. In order to reflect the agreement to revise the term, all reports on the discussions of the presentations and the deliberations of the Workshop, the “agreed” term low value/trash fish has been used.

All the background papers that were submitted for the Workshop are available on the APFIC Website (<http://www.apfic.org/modules/xfsection/article.php?articleid=1>).

The Workshop was composed of technical presentations and working group discussions.¹ The technical presentations covered the issues and findings of a range of related studies that have been conducted in the region as well as an analysis of trends in some selected fisheries. The Working Group sessions aimed at elaborating responses to a number of key issues:

- i. The current trends and status of trash fish (particularly the drivers of the trash fisheries and the potential/observed impact/distribution of benefits).
- ii. Implications for aquaculture (future availability of resource; diversification of feeds; competition with livestock industry).
- iii. Clearer indication of what can be changed (through development, research & management) and those issues that are more likely to follow market forces etc.
- iv. Strategies to address the identified issues and design a “Plan of Action” to implement the strategies, at national, subregional and regional levels.

The Working Groups were tasked with answering a number of key questions. In the first instance, two groups were asked identical questions relating to fishery issues while the other two groups were asked identical questions relating to aquaculture issues. The results of the two fishery groups and the two aquaculture groups were combined and presented to the plenary. These reports were then summarized and used to develop the Workshop conclusions and actions. The conclusions and actions are reported at the beginning of this report, followed by the presentations and discussions and, finally, the combined findings of the Working Groups.

OPENING OF THE WORKSHOP

Mr Vu Van Trieu, Director of the Department of International Cooperation, Ministry of Fisheries Viet Nam opened the Workshop by addressing the participants.² In his opening address, Mr Trieu expressed gratitude to all the partner organizations, namely the Asia-Pacific Fishery Commission (APFIC), the Food and Agriculture Organization of the United Nations (FAO), the Southeast Asian Fisheries Development Center (SEAFDEC), the WorldFish Center (WFC), the Network of Aquaculture Centres in Asia-Pacific (NACA), the Mekong River Commission (MRC), the Australian Centre for International Agriculture Research (ACIAR) and Reversing Environmental Degradation in the South China Sea (UNEP/SCS) to support the organization of the Workshop. He stressed that it was timely and appropriate to address the issue of trash fish that has significant implications for the resource management, food security and livelihoods of coastal communities in the Asia-Pacific region (opening address is in Annex II).

Mr Derek Staples, Secretary of the Asia-Pacific Fishery Commission (APFIC) introduced APFIC as one of the oldest Fishery Commissions in the world and explained that the Workshop was being held on the recommendation of the APFIC 28th Session held in Chiang Mai in 2004. APFIC recognised that there were many questions raised over the sustainability of both fisheries and aquaculture in the region in relation to the supply and demand of trash fish for both human and animal feed. This Workshop was convened to discuss the major issues connected with the changing nature of Asian fisheries from exclusively “fisheries for human food” towards a more diverse “fisheries for human food and feeds” and to develop an action plan to address these issues. Mr Staples also expressed his gratitude to the Ministry of Fisheries of Viet Nam for co-hosting the Workshop (welcome address is in Annex III).

¹ The Workshop timetable and agenda can be found in Annex I.

² The participants list can be found in Annex IV.

SUMMARY OF TECHNICAL PRESENTATIONS

Production and use of trash fish from marine fisheries in the Asia-Pacific region

The Asia-Pacific region dominates many aspects of world fisheries in terms of production, value and employment. Throughout the Asian region, captured and cultured marine fisheries continue to play an important role in the food security, poverty alleviation and in the economies of many countries. Within the Asian region, marine fisheries resources have been heavily exploited and as a result, development of coastal aquaculture has been encouraged to provide the protein, income, and employment and export earnings for some countries. This pressure on aquaculture development further contributed to fisheries overexploitation and ecosystem degradation. In 2003, 24 percent (or 32 million tonnes) of world fishery production was reduced to fish meal or other non-food uses. There is a general lack of accurate information of how much trash fish is presently used in the Asia-Pacific region, but a conservative estimate of 25 percent for livestock and aquaculture feed was given by the authors. The uses of trash fish are diverse and include: (i) local consumption (e.g. fresh, dried), (ii) direct feed (e.g. livestock, high value species aquaculture), (iii) fish meal production (e.g. for poultry, aquaculture) and (iv) value-added products (e.g. fish sauce, surimi, protein concentrates).

The issues relating to the different types of trash fish are inter-related. One major issue in the region is the increasing demand for trash fish for both aquaculture and animal feeds. Recognizing the effects of declining marine capture fisheries, many governments have turned to aquaculture as a means to increase fish supply, provide employment and generate foreign income. On one hand, aquaculture development can be seen as a viable option to utilize trash fish yet, on the other hand, it is increasing fishing pressure on the already overexploited fish stocks in the region. Over the last decade, the price of trash fish has risen considerably, and it is predicted to increase over the next few years due to increased demand for fish meal and fish oil to meet market demands for aquaculture of carnivorous fish (and well as a source of affordable food). Declining stocks of many trash fish species such as Japanese anchovy, chub mackerel and filefish will aggravate the situation. Given that aquaculture is predicted to grow while that of capture fisheries remains stable, it will be difficult to meet the demand for trash fish.

There is a general concern that the rapid expansion of aquaculture may ultimately be constrained by the dependence on trash fish and fish meal, popularly referred to as the "fish meal trap". The Asia-Pacific countries may need to increase imports of fish meal from the global market for the aquaculture industry, or replace these with other feed materials. The replacement of fish meal in aquaculture diets is hence a major international research priority. There is also an increasing conflict between the use of trash fish for feed or for human consumption. This means there are trade offs between direct food benefit and the indirect employment and income generation opportunities afforded by feeding to aquaculture and livestock. Poor handling and post-harvest in small-scale fisheries continues to play a role in the supply of trash fish. The benefits of improved post-harvest handling are probably outweighed by the costs of capital investments.

Direct use of trash fish occurs for some cultured species (such as grouper and mud crabs) and are also used as supplemental feeds of other species such as tilapia, prawns and milkfish. Trash fish are also being increasingly used as the raw ingredient in local production of fish meal and fish oil in the Asia-Pacific region. The feed mill industry is a major sector in the region with a large number of factories spread across many States. They produce large quantities of aquaculture, poultry and livestock feeds. Many governments have encouraged aquaculture development as a means to provide food and income to local communities to offset the overexploited marine fishery resources. Such policies often create high demand for low value fish as they are raw materials for fishmeal

production. All countries reported that low value fish are directly consumed by poor people as they are cheap and provide good source of protein.

Another issue related to fish landed by larger industrial vessels. These fish are typically landed at a single point (port) and typically in a poor state of preservation or severely damaged from the capture method used. Utilization of this fish is either through conversion into fish meal or direct use for livestock or aquaculture in the general vicinity of the landing site. The question is whether better post-harvest handling and processing would yield a better return for this limited resource.

Another distinctly different, but related issue, is the capture of juvenile fish of potentially important commercial species (so-called “growth over-fishing”). Trash fish currently constitute about 60 percent of the total trawl catch from the Gulf of Thailand and between 18 to 32 percent of trash fish are juveniles of commercially important fish species. Given a chance to grow to a larger size, these species would provide much more benefits in terms of production, but more importantly, in terms of value.

Utilization of low value fish for fishmeal production is likely to continue, particularly in China and Thailand where several fishmeal plants are in operation and products from aquaculture earn high export income. Appropriate estimation and recording of low value fish landings is needed to determine the extent of fishing. A starting point for this is clear identification/characterization of these low value fish into juveniles of different fish species or family. This is needed to reduce the statistical reporting of ‘mixed fish’, ‘miscellaneous fish’ and trash fish from national catch statistical systems. It is recommended that social impact assessment (SIA) could be conducted to determine the total benefits and losses of catching low value fish for aquaculture production or allowing them to grow to marketable sizes. Indexes derived from SIA could be used as an indicator to suggest policy directions for sustainable fisheries management.

For the purpose of the Workshop, trash fish was defined as:

“Fish that have a low commercial value by virtue of their low quality, small size or low consumer preference – they are either used for human consumption (often processed or preserved) or used for livestock/fish, either directly or through reduction to fish meal/oil”.

One obvious but important conclusion from the presentation was the strong inter-dependency between capture fisheries and aquaculture, which will require more coordinated management in the future.

Production and utilization of trash fish in selected Chinese ports

The utilization of fish for food and non-food is not routinely monitored in China. In order to test sample survey methodologies as a possible means for monitoring catches and fish utilization, pilot sample surveys were undertaken at three Chinese fishing ports. The surveys revealed that very large quantities of trash fish (for non-food use) and low value fish (for human consumption) are taken by trawl and sail stow net gears. The proportion of trash fish is highest in trawl catches for December to May when it constituted over 50 percent of the catch. Between 25 percent and 70 percent of low value fish are small-sized species of commercially important fish species and between 32 percent and 50 percent of trash fish are juveniles of commercially important fish species.

Increased fishing pressure for low value fish and trash fish is almost certainly resulting in overexploitation of commercial fish stocks in the East China Sea, with a consequent negative impact on sustainable development of marine capture fisheries in China. Even if fishing for trash fish and low value fish can be justified on economic grounds (which is far from clear), there are serious concerns about impacts on the ecosystem and biodiversity. Issues relating to the increasing fishing

effort for low value fish and trash fish require urgent attention from national fisheries authorities and regional fisheries organizations such as APFIC to determine whether such fisheries are justifiable on economic, social and ecological grounds.

A survey of marine trash fish and fish meal as aquaculture feed ingredients in Viet Nam

There was a concern that, in the future, the rapid expansion of aquaculture may be constrained by increasing dependence on low-value marine trash fish and fish meal. From a reported aquaculture production of 0.65 million tonnes in 1999, the Vietnamese government is planning to double their production to 1.15 million tonnes by 2006 and triple to 2 million tonnes by 2010. It is thus timely to describe the production, uses (including alternatives) and trends of trash fish, fish meal and fish oil to assess if the availability of trash fish will restrict future expansion of their aquaculture. The presentation was based on information from field visits and interviews carried out in Hai Phong, Khanh Hoa, Baria-Vung Tau, An Giang and Kien Giang provinces as well as in Hanoi and Ho Chi Minh City from 9 to 26 February 2003.

There are conflicting data on the volume of trash fish landed. The inshore fishery in Viet Nam is heavily over-fished but the total fish catch, as well as the proportion of biomass of trash in the total catch, continue to rise. There has been a dramatic rise in the use of trash fish in aquaculture with probable doubling its price, indicating a finite supply. It is unlikely that aquaculture based on traditional use of trash fish as a direct feed can expand considerably.

There are two types of fish meal in Viet Nam: "fish powder" produced in a traditional artisanal way by sun-drying and grinding; and fish meal product from industrial process in which raw materials are cooked before drying. Fish powder is mainly used to feed livestock. Feed mills in Viet Nam only use domestically produced fish meal for livestock and some freshwater fish for grow-out feed as it is generally of poor quality.

Fish meal for high quality feed for fish fingerlings and crustaceans is imported and represents about 90 percent of the total fish meal used. Fish oil for aquafeed manufacture is also imported. Future demand for fish meal is expected to increase dramatically as aquaculture production increases and some species, such as catfish, are increasingly fed pelleted diets containing fish meal. While high market value species such as grouper, lobster and shrimp may be able to compete for fish meal on the local market, catfish and tilapia will need to be fed increasing amounts of plant-based proteins.

Use of inland trash fish for aquaculture development in the Mekong Basin

The use of inland (freshwater) trash fish for aquaculture is rare in north eastern Thailand and Lao PDR, because selling of preserved small freshwater fish as food is more profitable than using these to feed carnivorous fish. Fish preservation is primarily by fermentation, drying or salting. Preserved fish products are generally more valuable than fresh fish.

The composition of feed for carnivorous or omnivorous fish varies across northeast Thailand and Lao PDR. In pond culture of striped snakehead, by-products of Indo-Pacific mackerel and chicken intestines from processing plants are used. In cage cultivation of *Pangasius bocourti*, waste from *Cirrhinus mrigala* and *Labeo rohita* processing are used as feed. In small-scale cage cultivation of sand goby (*Oxeoletis marmoratus*), inland trash fish is used as feed. The use of inland trash fish as feed for giant snakehead and snakehead cage culture is practised at Ban Xai Oudom, Nam Ngum Reservoir (in Lao PDR). This cage culture relies mainly on small fish, Pla Keo and Pla Kao, as feed. Seasonal shortage of inland trash fish, and the availability of alternatives limit the potential of inland trash fish as feed material. In comparison with downstream countries (Cambodia and Viet Nam), it

seems that current usage of inland fish as trash fish is minimal or negligible in the Mekong Basin, in Thailand and Lao PDR. Marine fish (Indo-Pacific mackerel) caught in the Gulf of Thailand is transported inland to processing factories and the wastes are fed to inland water aquaculture in the northeast of Thailand.

In Viet Nam, at least 11 species of freshwater trash fish and 15 species of marine trash fish were identified in the trash fish fed to common cultured species. Price of trash fish and feed ingredients has tripled since 2001. Almost all the trash fish are small with low market value while captured fish are of low quality due to bad preservation method. Both freshwater and marine trash fish are used as feed for fish cultured in An Giang and Dong Thap provinces. Farm made feed for carnivorous species the proportion of freshwater trash fish is only 13.6 percent while marine trash fish is around 86.4 percent. For omnivorous species, freshwater trash fish consist only 0.3 percent whereas marine trash fish consists 36.3 percent.

In Cambodia, aquaculture of carnivorous and omnivorous fish species and crocodile is highly dependent on inland fisheries of low value, the so-called trash fish for sourcing key dietary nutrient inputs. Thousands of tonnes of low value fish are also used for producing fish feed and other animal meal and for human consumption. This study provides clear understanding of the status of low value fish. In order to achieve this goal, five objectives were developed: (1) to identify and characterise these low value fish into different species, genus or family; (2) to determine approximate quantities or proportions, to the extent possible, of trash fish; (3) to identify issues relating to the utilization of trash fish in Cambodia; (4) to examine research needs or strategies to address the identified issues; and (5) to look at the implications for aquaculture development and sustainable fisheries management in Cambodia's Mekong Basin.

It was reported that marine fish caught in the Gulf of Thailand are transported to northeast Thailand for processing. Marine trash fish (i.e. "processing waste" of Indo-Pacific mackerel in particular) are utilized in feeding freshwater aquaculture in the northeast of Thailand which represent a by-product of this processing and so their use is economically sustainable.

The status of trash fish resources in coastal fisheries of Thailand and Malaysia – regional synthesis on the analysis of TrawlBase data for trash fish species and their utilization

The composition of trash fish is highly diverse, over 97 families within Southeast Asia and China. This is due to the numerous types of fisheries that contribute to trash fish and the fact that most comes from trawl fisheries, which are relatively unselective. Most of the trash fish families have another commercial value and yet can comprise a substantial proportion of the trash fish. The market pathways for trash fish vary at different locations within countries, depending on the local markets and demand. They also appear to change rapidly through time. There is also movement of trash fish between states/provinces. The main source of trash fish within Malaysia, Thailand and the Philippines are the trawl fisheries. In Thailand, trash fish and low value fish production have been reasonably constant over recent times, but a greater proportion is coming from outside the Thai Exclusive Economic Zone. In Malaysia, trash fish production is increasing and most comes from the fisheries on the west coast of Peninsular Malaysia.

Aquaculture demand for trash fish for both direct feeding and via pellet feeds has increased with rising fish production. The trash fish for direct feeding is likely to be mainly met by local trash fish production. Within Southeast Asia and China, China has the greatest estimated demand for trash fish, Viet Nam and the Philippines are the most dependent on it, with an estimate of over 94 percent of their production reliant on trash fish. The natural fish stocks that contribute to trash fish show trends that should be of concern. In Thailand and Malaysia, most of the dominant families in

trash fish examined show a decline in their relative abundance. This stock assessment results should be treated with caution given the data limitations, but they do suggest that several families are being exploited at levels greater than estimated maximum sustainable yields. This is more apparent in those families that have other commercial value aside from trash fish.

The future projections for increased aquaculture growth will result in increased demand for trash fish unless feeding practices change. If this increased demand is met within the region by increased fishing pressure on trash fish families, this is unlikely to be sustainable. For families that contribute to fisheries outside of trash fish, increased take by trash fish fisheries will be detrimental to these fisheries. Given the fisheries do not appear to be able to contribute more sustainably, the increased demand may result in shifts of families from other market pathways to aquaculture. However, the social and economic implications of this are not clear, e.g. they may move away from direct human consumption. The management of trash fish in capture fisheries is a significant challenge, even in comparison to the challenge of managing other types of fisheries in the region. Trash fish generally comes from non-target fisheries, using relatively unselective gear. The landings are particularly difficult to monitor as they are often away from major landing sites. There is a strong demand for trash fish that is also changing rapidly as markets evolve. These market drivers are also occurring at a very local scale, which is difficult to monitor or influence. Developing management strategies that will be effective given the combination of these factors should be the focus of future discussion.

Trends in coastal aquaculture and effect on feed demand in the Asian region

Aquaculture production will increase due to the growing demand for aquatic animal products to meet global food demand. Because much of this demand will be for species that require feeding, the demand for aquatic animal feed (aquafeed) will also increase. Several factors will influence feed demand and use, including regional and global trade issues, economics, increasing intensification of aquaculture systems and the species farmed. Coastal aquaculture will see growth in marine fish and shrimp farming, and a proportional increase in aquafeed demand. Improving hatchery technologies are likely to further stimulate growth of marine finfish production in the Asian region due to greater availability of seed stock.

Aquafeeds and aquaculture development in the region rely heavily on wild capture fisheries. The use of wild capture fisheries for aquaculture feed is diverse, including direct use of so-called low value/trash fish, the ingredients in moist diets, and the conversion to fishmeal and fish oils for incorporation into formulated diets. Globally, fish meal and fish oil used for aquaculture has been estimated at 17.7 million tonnes in 2001. Including the direct use of trash fish largely used in the Asian region, possibly about 20-25 million tonnes of capture fishery products are being used for aquaculture production. Further research is required to improve the database.

Aquaculture growth based on direct feeding of trash fish is unlikely to be sustainable in the long term. The challenge for aquaculture is clearly to seek alternatives to direct feeding of trash fish and to make better use of existing resources. The challenges will be technical, environmental, social, economic and political concerns. There are also transboundary issues – stocks and trade – requiring collaboration among countries. The change will have social implications. The stakeholders involved include feed companies, small and large-scale fishers, employees on and off shore, aquaculture farmers and employees, traders, governments and others. The collection and use of trash fish for aquaculture, directly or indirectly, involves many poor people and change will have significant implications for the people involved. There will inevitably be conflicts that will need to be managed effectively. Incentives and support are needed for the change. Collaboration and networking will be useful to address the challenges. NACA and the marine finfish network look forward to the outcome of the Workshop recommendations for collaborative follow up actions.

The future of feeds and feeding of marine finfish in ASEAN

Trash fish remains the traditional method of feeding marine carnivorous fish throughout the Asia-Pacific region and is likely to remain so for some time yet. However, marine seacage aquaculture expansion continues in the region. The socio-economic and environmental consequences of its reliance on trash fish will be increasingly felt to the detriment of all. The paper outlined some of these consequences in terms of the impact of trash fish feeding on near-shore fishery stocks, the damage to the coastal environment and its potential to introduce disease in the cultured fish. Also described was the results of the regional collaborative grouper aquaculture research project to develop compounded grow-out feeds as alternatives to feeding trash fish. The processes carried out by the project team to disseminate these finding through organization of regional industry workshops and the dissemination of the information through electronic and hardcopy publications are also described. Building on the success of the original project, a follow-on project has commenced to promote the use of compounded feeds as replacements for trash fish and also to address concerns which deter fish farmers in the region from using compounded feeds.

Juvenile and trash excluders – the experience from the fishery

The Training Department (TD) of SEAFDEC has completed a wide range of experimental fishing trials on the use of Juvenile and Trash Excluder Devices (JTEDs) over recent years. These trials investigated the effectiveness of the rigid sorting grid, rectangular window and semi-curved window JTEDs in releasing juveniles of commercially important fish species and trash fish from demersal fish trawling operations.

Experimentation began in the provinces of Chumpon and Prachuap Kirikhan of Thailand in 1998. This initial work led to the identification of the rigid sorting grid device as an effective tool in the exclusion of juvenile and trash fish from fish trawls. Further experimentation focusing on the effects of grid spacing on the performance of this JTED was completed in Brunei Darussalam and Viet Nam during 2000 and 2001.

In September 2001, fishing trials using the rigid sorting grid JTED were conducted in Malaysian waters. This work focused on the effects of grid spacing and day/night influences on JTED performance. Grid spacing of 1.2 cm is highly effective in reducing capture of juveniles and trash fish in fishing areas adjacent to the Malaysian Peninsular. JTED performance was also generally greater during day-time fishing trials.

In 2002, TD has completed trials in the Indonesian waters and in the Philippines. The results from the Arafura Sea region of Eastern Indonesia trials suggested that the rigid sorting grid device with the 4 cm spaced sorting grid achieved the highest releasing rates of juvenile and trash fish. In 2003, investigations completed in the Philippines highlighted that the rigid sorting grid device with a grid spacing greater than 1 cm was generally more effective in the exclusion of juvenile and trash fish than the rectangular and semi-curved window JTEDs.

During 2004, demonstrations and experiments on the use of JTEDs were completed in Myanmar and Cambodia to provide a complete coverage of relevant SEAFDEC member countries. Researchers are confident that the above mentioned activities have been effective in developing regional understanding of the use of JTEDs. All work have been completed in close collaboration with the fisheries departments of the Member countries involved in the project. This has been effective in capacity building for regional governments and fisheries personnel to be responsive to the needs of fishers as they move toward the development of more sustainable fish trawl practices.

Maximizing utilization of fish catch for human consumption

The research and developmental works of SEAFDEC/MFRD on utilization of underutilized and low value small demersal and pelagic fish catch are aimed at maximizing utilization. Through R&D, researchers have found that small demersal fish species are suitable raw materials for making frozen surimi and fish jelly products. The breakthrough coupled with transfer of technology has led to the dramatic growth of surimi industry in the region. MFRD has also developed a range of value added products such as, fish sausages, fish nuggets, fish tofu, sweet meat and fish floss from small pelagic fish species.

Economic aspects of capture fisheries for low value fish

Two theoretical model analyses of the interaction between aquaculture and wild capture fisheries were applied to the fishery of the Gulf of Thailand. The first model considered the interaction at the output level only and concludes that expanding fish supplies through aquaculture can reduce the harvesting pressure on wild stocks. However, when considering also the interaction at the input level, that is the use of fish as feed (or seed) an alternative model found that while in the short term aquaculture can increase fish supply, in the long run, aggregate fish supply from aquaculture and capture fisheries could be lowered by the expansion of aquaculture. This dire outcome would arise in situations where there exists open access to wild capture fisheries.

The open access condition in many Asian marine fisheries has caused overfishing, loss of biodiversity, large share of low value species or size categories in the catch, low product quality, preponderance of unselective gear types, primarily trawl and pushnet, and marginal profitability. In this situation, the revenues made through the bycatch or targeted catch of low value fish are often important for the vessels' financial viability. There is, therefore, an important link between the demand for low value fish as input into aquaculture and the development of the fishing fleets and fishing effort in the marine capture fisheries of the region.

In another study, it was found that fishmeal is not a unique product among protein meals and contributes only a small share to total global production. While no other industry than aquaculture has increased as rapidly its demand for fishmeal during the last two decades, there is little evidence that fishmeal cannot, or has not been, substituted by other protein meals, especially soybean meal. Whether demand for fishmeal becomes more inelastic as the rapid growth trend in aquaculture continues in future or not, this will depend on the technological progress in aquafeed and farm management. Greater reliance of future aquaculture growth in the region on formulated pellet feed would lessen its dependency on both low value fish caught domestically and on imported fish meal.

There does not, therefore, need to be a trade-off between future aquaculture growth and the recovery of marine fisheries in the region. Based on the example of the Thai demersal fisheries in the Gulf of Thailand, the paper noted that a recovery strategy of marine capture fisheries would generate significant income to the national economy and reduce the threats to the sustainability of marine ecosystems. Social and economic support measures to facilitate the reduction of fishing fleets, especially of push-netters and trawlers, would be needed but would yield high returns to the economy, the fishing industry and the marine environment.

SUMMARY OF WORKING GROUP DISCUSSIONS

There is a need for a common understanding of terminology

Considering the different context of use of, and composition in trash fish, the working groups suggested that the term should be better referred to as low value fish. The main perceived contributors to low value fish of the catch are those that have no preference (or may be unsuitable/unsafe) for direct human consumption or that have suffered from improper handling of catch. Since the term “value” is relative to the consumer it was also suggested that lowest value fish might be used. The range of definitions for trash fish or lowest value fish is variable across the region and this affects how the catches that would fall into this category are reported.

The difference in utilization of low value fish is perhaps most marked between inland fisheries producing areas and coastal areas. In inland fisheries the “low value” fish caught are almost entirely used for human consumption. They may be processed as a means of preservation during periods of seasonal abundance. The emergence of aquaculture in some of these inland fisheries areas is presenting an alternative channel for use. In coastal areas, low value fish may be caught by near-shore artisanal fishers and this catch is often used directly for human consumption or in local aquaculture operations.

Lack of reliable data and information

It was reported that data and information on trash fish production (species, size) and uses were patchy and often poor in quality in many countries in the region. In VietNam no data are available on the proportion of trash fish used for feed production/direct feed for aquaculture and livestock and for the production of fish sauce, although some recent estimates based on indirect methods are available.

The exact portion of fish meal going to aquaculture compared with that going to livestock feed is also unknown although it is known that the share for aquaculture is increasing. Chinese production of fishmeal is about 500000–600000 tonnes, requiring almost 2.5-3.0 million tonnes of wet fish. Three kinds of feeds are used in China for aquaculture: trash fish used for direct feeding; moist pellets and dried pellets.

It was questioned why science, as a basis for fisheries management, is so unreliable. Whereas trawl survey data for the Gulf of Thailand indicate that catch per unit effort and biomass estimates have declined to only 10 percent of what they were at the beginning of the time series, these data could under-estimate the decline, because there are now some commercial catches coming from areas outside the Gulf of Thailand, or from areas which are not covered by the trawl surveys. MSY estimates from the equilibrium methods may not be reliable and may be too high, as the time series used for the calculations are only from a period when the stocks have been already over-fished. MSY estimates from the Maximum Likelihood method are more conservative and have the advantage that they have associated error bounds. Unfortunately, there are large discrepancies between the methods making the provision of advice to decision-makers difficult.

Sustainability of the current harvesting regime

There is currently a lack of hard data available to indicate with certainty, whether the biomass increases caused by “fishing down the food chain” can be sustained at current levels or increased or it will collapse. This is an area which requires further significant analysis.

Policy/management dimensions

Fisheries management needs to be linked to poverty alleviation strategies. A goal may be to provide disincentives to the large-scale trawler operations and through the reduction of this effort bring benefit to the small-scale fishery sector. The artisanal level of the fishery is able to value to low value fish using traditional methods, thus further strengthening their income generation from the fishing livelihood.

The workshop noted that rather than blaming aquaculture for creating a demand for low value/trash fish which in turn leads to a deterioration in the state of fishery resources through over-fishing, it may be more realistic to view aquaculture as taking the opportunity of increasing supplies of low value/trash fish that result from the failure of fisheries management to prevent extensive “fishing down the food-webs”.

Future trends of low value element of the fisheries

While noting that trends of low value/trash fish will be contextual depending on areas and scale of fisheries, the workshop considered that future trends of low value/trash fish will generally be:

- Where there is no proper management of fisheries in place, the proportion of low value/trash fish in the total catch may increase due to irresponsible fisheries leading to fishing down the food-web.
- This will mostly derive from trawlers and push netters that lack storage facility on-board or that have poor handling facilities; it will also derive from small pelagic fisheries (e.g., purse seine) and freshwater ‘Dai’ fisheries (in Cambodia).
- Discarding is not a prominent issue in the region, except in few isolated fisheries.
- The price of fishmeal and particularly fish oil will increase in the region and probably globally.
- There will be increasing prices of fish; including low value/trash fish due to:
 - reducing amount of low value/trash fish in the total catch, as a result of the improvement efforts of current management of fisheries;
 - decreasing total fish supply for human consumption, which will result in turning some part of low value/trash fish to higher value;
 - increasing demand of fish in response to growing human population in general and inaccessibility of high value fish among the poor;
 - increasing demand from aquaculture expansion even considering attempts to identify non-fish protein sources; and
 - there will be increasing demand for high value aquaculture species, both in local and international markets. This is linked generally to increased demand for healthy (EFA’s, etc.) functional foods.
- This demand for fish will also be linked increasingly to the need for traceability and certification (either for safety of the product or production method).
- Increasing urban populations will demand more standardised products and/or consistent supply
 - including the food safety element.

What are the drivers for aquaculture's use of low value/trash fish?

Some cultured species produced currently depend on direct feeding of low value/trash fish e.g. groupers and other carnivorous finfish, lobsters, *Babylonia* snail. The reasons for this use are:

- the feeding method has evolved this way out of practical considerations and is therefore now considered habitual/traditional;
- the convenient supply availability of the fish locally, particularly during certain seasons;
- low value/trash fish is still relatively cheap for aquaculture (this is also seasonally affected); and
- fisher/aqua-farmers are able to catch the feed by themselves (feed costs are offset as opportunity cost of the fishers time).

It was noted that targeted fisheries for trash fish for aquaculture are developing (e.g. for lobster & *Babylonia* snail in Khanh Hoa province) where pelleted feeds are not yet a viable/acceptable alternative.

In terms of both direct feeding and using low value/trash fish in fish meal/oil, the need for fresh fish was highlighted if it is to provide a good ingredient/feed for aquaculture (amino acids, EFA's, etc.). There are well known problems with low quality fresh fish as direct feed for aquaculture (thiaminase, transfer of diseases etc.) but there is still a widespread perception in the region that direct feeding of low value/trash fish is better because:

- it may be more acceptable than a pellet feed;
- there is often limited availability of pelleted feed;
- farmers lack experience of pellet feeding and therefore are uncertain of profit margins and the feeding methods;
- agricultural products inclusion (food/health safety issues); and
- there is a general difficulty of weaning some species onto pellets.

What will drive aquaculture away from the direct use of low value/trash fish?

The workshop identified a range of factors that would deter the direct use of low value/trash fish in aquaculture. These would be:

Factors that affect the profitability of operation

- increase of the price of low value/trash fish;
- increased competition for alternative uses (e.g. for direct human consumption);
- scaling up of production units – requires pellet feeds; and
- disease outbreaks.

Factors that affect the efficiency of operation

- general unavailability in some areas, or seasonal/uncertain decreases in supply (this limits larger operations but small scale operators may be able to overcome this);
- pelleted feed readily available at reasonable price;
- availability of fingerlings weaned onto formulated diets;
- information, knowledge, education and demonstration about value of pellet feeds;

- increasing knowledge about inefficiency of poor quality of trash fish (farm economics, water quality & wider environmental pollution);
- overcome taste issues using pellet fed fish; and
- increased availability of cost-efficient substitutes (e.g. plant proteins, terrestrial animal meals, catfish processing by-products, etc.).

Factors relating to the legality/compliance of operation

- legislation against polluting aquaculture practices;
- legislation/policy to prevent targeted catch;
- pressure from “consumers” for sustainably produced aquatic products (environment, social, economic); and
- need for feed ingredient traceability to allow export marketing (EU legislation).

Future availability of low value/trash fish for feeds?

The Working Groups concluded that overfishing will ultimately lead to a decline in overall supply. (it was acknowledged that there maybe short term increases but will decline in the longer term). The effects of this would be that:

- price of low value/trash fish will increase
- the use of trash fish for direct feeding will decrease
- there will be a drive towards improved post-capture technology and adoption of this technology. The result would be that more of the fish landed would be fit/acceptable for direct human consumption and more low value/trash fish would go to human food and less for aquaculture. For some high value aquaculture species, the quality of low value/trash fish for aquaculture might also improve.
- there will be a tendency for introduction of legislation for more targeted fisheries and exclusion devices to minimise catch of low value/trash fish species.
- demand from aquaculture of high value species can out compete traditional uses of low value fish e.g. fish sauce manufacture.

What will be the effect of competition between aquaculture and with livestock or other industries?

The Working Groups concluded that the aquaculture of high value species will probably out compete livestock industries for trash fish and fish meal as it had larger profit margins and the increasing price of fish. The increased competition for fish and fish meal tend to drive towards increased use of pelleted fish feeds. There would also be increased competition with the emerging Surimi industries and such like. It should be noted here that since this requires human food quality fish, the competition here may be less.

Diversification of aquaculture feeds

There will be an increasing availability of appropriate formulated feeds (farm made and commercial pellets) in the region. However, the formulated feeds for shrimp, fish fingerlings, marine finfish and lobsters still require high quality trash fish for fishmeal production.

If prices of fish meal rise substantially this will also be accompanied by and increasing substitution of fish meal, fish oil, low value/trash fish. This will be most quickly seen in feeds for less carnivorous species. There is still currently limited knowledge of the nutritional requirements for many culture species.

Direct feeding of trash fish to pellet feeding – time to change

Whereas growth in the use of trash fish is not sustainable, the growth in aquaculture production is because aquafeeds can be used. At present the conversion of low value/trash fish to pellets which are more efficient feeds is not an economic proposition, but this may well change in the future.

Feed development for shrimp is a good example of what the industry can achieve if there is sufficient demand. Feed formulations for tilapia and catfish feeds are relatively simple. The diversity of marine fish species requires different feed formulations (e.g. specific feed formulations for sea bass, various groupers and cobia) and this represents a constraint to the level of the demand for a specific feed.

Currently formula aquafeeds contain much fishmeal though dependence on fishmeal can be reduced in the future. Although for rearing species such as grouper, fishmeal will continue to be needed, dependence on low value/trash fish can be greatly reduced through the use of pelleted feeds. Such a change will be essential for aquaculture expansion to continue.

Fish oil supplies are likely to run out long before supplies of fishmeal. Alternatives to fish oil in aquafeeds need to be sought urgently. It was pointed out that, at present, VietNam does not produce fish oil except for *Pangasius* oil (low value). All fish oil is imported. Attention was drawn on the constraints in the availability of fish oil and on its importance as a primary source of nutritional element in particular of Omega III fats.

Trade-offs between poverty alleviation or economic efficiency

For those countries that have a large number of poor people dependent on low value/trash fish a decline in supply may have negative implication on food security. In general, the disposition of low value/trash fish is market driven and dependent upon local economic mechanisms. The flow of disposition will depend on the relative “buying power” of livestock and aquaculture production versus uses in direct human consumption (bearing in mind, that there is always part of this catch that is unsuitable for direct consumption and part that might be).

The meeting was informed that different grades of low value/trash fish are used for different purposes. For example in Thailand only high quality low value/trash fish (anchovies) are now utilized for fish sauce production. However, in Viet Nam low value/trash fish are still consumed by poor families for domestic consumption.

The channels for sale and disposal of low value/trash fish is not confined to larger trawlers and the spread of the economic linkages from the low value/trash fish landed extends into surrounding rural areas. It may also extend even further if the fish are processed into fish meal and thence into fish feeds.

Potential/observed impacts or consequences of the above-identified trends

- the increase in total fishing pressure is leading to loss of aquatic biodiversity and overfishing;
- incentive to identify/use non-fish protein sources for human consumption and aquaculture feeds (including more efficient feeding methods and farm management);

- lower food security from fish and negative impact on poverty, as fish will be less affordable, particularly for the poor for food consumption and as feeds for aquaculture as alternative livelihoods;
- possible expansion of fisheries particularly industrial/large-scale;
- small-scale/traditional fish processors may be edged out by larger processing operators;
- possible change in aquaculture types from carnivorous species to herbivorous species or poly culture; and
- there will be shifts in the rural/urban consumption patterns of fish.

DISCUSSION ON ACTIONS NEEDED TO ADDRESS THE ISSUES

The Workshop was informed that several countries in the region are currently instituting some actions aimed at addressing some of the issues of low value/trash fish. Considering that there will be increasing in demand of fish in response to the growing human population, overarching policy for sustainable utilization of fishery resources and development of aquaculture taking into consideration of balancing of social, economic and environmental implications.

In order to achieve this, efforts to put in place effective management framework for fisheries should be exerted in long-term so as to ensure that fisheries will continue to provide stable supply of fish as a main animal protein source for human consumption. Priority should be given to reducing capacity of destructive fisheries (trawl) and reducing volume of small-sized fish in the catch.

Fisheries related interventions

While noting that the above long-term goal can not be achieved over night, the following are identified as actions/strategies in short and medium terms:

1. Need to develop better understanding of status and utilization of low value/trash fish through statistics, data/information gathering and research so as to provide a solid foundation for tailoring planning and management of fisheries.
2. Addressing the issues of low value/trash fish should be made in the broader framework of fisheries management focusing primarily at management of fishing capacity. This includes application of co-management (including rights-based fisheries), participatory decision-making, roles of fisheries subsidies, etc. Management measures such as gear restriction (trawls and push nets), seasonal and areas closures (including refugia) should be implemented.
3. Development and promotion of fishing methods that could reduce amount of juveniles of commercially important species from the total catch. Fisheries management measures such as refugia and closed areas are most likely to be effective if they are targeted at the nursery areas of juveniles.
4. While continuing to develop and support better fish handling techniques, there is a need for incentives for better handling of catch. These incentives can be different for small and large scale fisheries.
5. Under the broad context of reducing low value/trash fish in total catch, there is a need to maximize utilization of low value/trash fish for human consumption through appropriate processing technology rather than to be used as source for fish meal.

6. As a cross-cutting action/strategy, regional cooperation on the above actions/strategies as well as awareness building on status and utilization of low value/trash fish in the context of sustainable fisheries should be promoted to major stakeholders including decision-makers (within and outside fisheries sectors), fishers and consumers.

Actions/Strategies to address the identified issues within the aquaculture context

Actions that could be taken at the national level were identified as:

7. Improved feeding practices at farm level
 - training for farmers on feed preparation, feed and feeding management and benefits of using artificial diets
 - promotion of 'organic' low intensive farming
 - promote farmer's club/associations (purchase of feed, sale of products)
8. Improved feed research and development
 - involve private sector (feed company) in collaborative development
 - improve capacity for nutrition research
 - development of farm made feeds (nursery)
9. Policy and legislative action to promote better practice
 - integrating and balancing the resource use for feed production, into national fish production targets
 - incentive policy for poor households to adopt pellet feeding of aquaculture
 - environmental standards for discharge from production units
 - planned development (promotion of aqua zone away from major fisheries landing areas)
 - incentive for more sustainable production systems

Role of international organizations and regional fisheries bodies

- information (and standardize terminology)
- reporting, monitoring (consistent among countries)
- policy directions (harmonization at the regional level)
- need to learn what management intervention that will work from available management "tools" (e.g., closed season, mesh size regulation)
- core research/development/extension:
- regional collaboration on diet development and development of weaning diets technologies
- awareness raising of advantages/disadvantages of pellets vs. low value/trash fish
- consumer taste testing/trials (Research on Consumer Preferences)
- regional collaboration to improve post-harvest handling to improve quality
- impact assessment of using low value/trash fish – environmental and aquatic animal health

TIMETABLE & AGENDA OF THE REGIONAL WORKSHOP ON LOW VALUE AND TRASH FISH IN THE ASIA-PACIFIC REGION

Hanoi, Viet Nam, 7-9 June 2005

Time	Activity
Day 1 – 7 June 2005	
08.30 – 09.00	Registration
09.00 – 09.30	Welcome remarks – Mr Pham Trong Yen MOFI-Viet Nam – Dr Vu Van Trieu APFIC/FAO – Dr Derek Staples
09.30 – 10.00	An APFIC/CDC review of Trash fisheries and utilization Simon Funge-Smith & Derek Staples (APFIC Secretariat)
10.00 – 10.30	Coffee/Tea
SESSION I – Regional trends of trash fish and implications for aquaculture	
10.30 – 10.50	Introduction to the Consultation – Rationale and Goals, election of chair Simon Funge-Smith
10.50 – 11.20	This paper summarizes the findings and conclusions of the Chinese fishery study and the landings of fish, its quality and the utilization Richard Grainger & China Team
11.20 – 12.00	This review highlights the overwhelming importance of trash fish in Viet Nam fisheries, and indicates the increased in catch of trash fish and the apparent association of this increase with a decline in predators due to overfishing. Geoff Allan & Peter Edwards (ACIAR)
12.00 – 12.30	Feeding freshwater aquaculture in the Lower Mekong – trends and demands. Suchart Ingthamjitr & MRC Fishery Programme
12.30 – 14.00	Lunch
14.00 – 14.30	An analysis of the Trawlbase data for Malaysia and Thailand, the likely future trends in the fishery, the possible impacts of current fishing pressure. Len Garces (Worldfish Trawlbase Team)
14.30 – 15.00	Trends in mariculture/brackishwater culture & effect on feed demand in the Asian region. Mike Phillips & NACA Team
15.00 – 15.30	The future of feeds and feeding of marine finfish in ASEAN. The need for strategies for development of alternative aquaculture feeds Mike Rimmer & ACIAR Team
15.30 – 16.00	Coffee/Tea
16.00 – 16.30	Plenary discussion
16.30 – 17.00	Wrap-up day 1
17.00 – 17.30	Short meeting of sub-group to work on ‘action items’ (e.g. research issues, policy recommendations, information/extension issues, etc.). Elect a chair and rapporteur.

Time	Activity
Day 2 – 8 June 2005	
09.00 – 09.30	Juvenile & trash excluders – the experience from the fishery. Value adding and utilization of low value species for direct human consumption. Mr Bundit Chokesanguan (SEAFDEC TD) & Goh Kian Heng (SEAFDEC MFRD)
09.30 – 10.00	Economic aspects of capture fisheries for low value fish. The economic potential of fisheries rehabilitation versus the economic value addition of aquaculture to low value fish will be considered. Rolf Willmann (FAO)
10.00 – 10.30	Plenary discussion
10.30 – 10.50	Coffee/Tea
SESSION II – Working Group discussions	
10.50 – 11.00	Short introduction to the Working Groups
11.00 – 12.30	Working Group 1a & 1b – Fisheries Future trends of the trash fish element of the fisheries of the Asia-Pacific region Working Group 2a & 2b – Aquaculture Future trends of the ‘trash fish/fish meal’ feed component in aquaculture in the Asia-Pacific region.
12.30 – 14.00	Lunch
14.00 – 15.30	Second session of Working Groups – development of summary conclusions
15.30 – 16.00	Coffee/Tea
16.00 – 17.00	Plenary session – Preliminary findings/presentations of the four Working Group findings
17.00 – 17.30	Short meeting of the sub-group on ‘action items’ (e.g. research issues, policy recommendations, information/extension issues, etc.)
Day 3 – 9 June 2005	
SESSION III – Plenary discussions	
09.00 – 09.30	Finalized Presentation of the Working Group 1
09.30 – 09.50	Discussion
09.50 – 10.10	Finalized Presentation of the Working Group 2
10.10 – 10.30	Discussion
10.30 – 11.00	Coffee/Tea
11.00 – 12.30	Conclusions and implications of changes in the supply and demand of trash fish in the region
12.30 – 14.00	Lunch
14.00 – 15.00	Report of the sub-group Overarching Policy recommendations for management, research & development Discussion and development of recommendations and actions
15.00 – 15.30	Rapporteur’s review
15.30 – 16.00	Coffee/Tea
16.00 – 16.30	Conclusions of the Workshop & final discussion
16.30 – 16.45	Workshop Closing

**OPENING STATEMENT OF MR VU VAN TRIEU, DIRECTOR OF
INTERNATIONAL COOPERATION DEPARTMENT, MOFI, VIET NAM**

First of all, on behalf of the Ministry of Fisheries of Viet Nam, I would like to express my warmest welcome to all the distinguished participants in the Workshop on Asia-Pacific Trash Fish. I would like to wish you all good health and happiness.

Distinguished participants,

Over the past years, the fast growth rate of the fisheries sector has led to the fact that this sector has become one of the spearhead economic sectors in Viet Nam. The fisheries production has been increasing year-by-year, having exceeded 3 million tonnes in 2004 (3 037 000 tonnes), of which the aquaculture production reached over 1.1 million tonnes. Total fisheries export volume rose to over 2.2 billion USD in 2003, and nearly 2.4 billion USD in 2004. At present, Viet Nam seafood is imported into 86 countries and territories worldwide.

Besides the above achievements, Viet Nam's fisheries sector is also facing several big challenges such as the declining coastal resources, the slow seafood catching growth rate compared to the increase in the number of fishing boats and fishing capacity. The portion of trash fish caught in the recent years has also been on a rise while the portion of caught fish with high economic value is decreasing.

Being fully aware of the consequences of the declining marine fisheries, and in order to conserve and utilise the marine resources appropriately to improve the living standards, create employment for the coastal communities as well as to retain a sustainable source of materials for seafood processing and export, the Government and the fisheries sector of Viet Nam have been putting a lot of efforts in promoting aquaculture, stabilising the marine catch production, focusing on increasing offshore fishing and reducing the inshore fishing capacity. Currently the aquaculture sub-sector is developing strongly and widely in all the provinces throughout the country. The demand for feed used in aquaculture has been rising steadily, while the major source for aquaculture feed and feed production is from marine fisheries, which are the trash fish that is normally not used for human consumption, and the damaged products caused by the poor post-harvest reservation process. Trash fish is also used widely in the feed production for cattle and poultry in agriculture.

In addition to that, as also happening in other developing countries in the region, trash fish in Viet Nam is still used for human consumption in some coastal communities and processed for food for inland communities. It is that high demand for trash fish that has been putting a great pressure on the coastal resources, which have already been overexploited. The exploitation of juveniles of high economic valued species is also affecting negatively on the reproduction and development of these species.

In that context, the Ministry of Fisheries of Viet Nam welcomes the initiative of the Asia-Pacific Fisheries Commission, FAO regarding the organisation of this Regional Workshop on Asia-Pacific Trash Fish. This is quite a large regional workshop dealing with this issue, which has been able to gather many leading experts in the area of trash fish exploitation and utilisation in the region. We do hope that the Workshop will come up with a clear picture of the current situation of trash fish exploitation and utilisation in each country and in the region in general, the influence of trash fish use on aquaculture, marine fisheries and livelihoods of coastal communities, and based on that we will set out orientations for the exploitation and utilisation of trash fish in order to conserve the marine resources in our waters and to utilise our common natural resources appropriately.

I would like to take this opportunity to thank the Asia-Pacific Fisheries Commission for the initiative and the organisation of this Workshop. My thanks also go to the Food and Agriculture Organization of the United Nations (FAO), the Southeast Asian Fisheries Development Center (SEAFDEC), the WorldFish Center (WFC), the Network of Aquaculture Centres in Asia-Pacific (NACA), the Mekong River Commission (MRC), Danish International Development Agency (DANIDA), Australian Centre for International Agriculture Research (ACIAR), as well as the governments of regional countries for sending participants to the Workshop. Thank you all for participating.

I would also like to thank the Asia-Pacific Fisheries Commission and Danish International Development Agency for their financial support in the organisation of this Workshop.

Once more, I would like to wish you all good health, success and happiness. I wish our Workshop will be a great success.

Thank you very much for your attention.

OPENING STATEMENT OF THE SECRETARY OF APFIC

As the Secretary of the Asia-Pacific Fisheries Commission (APFIC), I welcome you all to the APFIC “Regional Workshop on low value and trash fish in the Asia-Pacific region”. APFIC is the oldest Regional Fisheries Commission in the World, beginning its life as the Indo-Pacific Fishery Commission way back in 1948. Since that time it has served its members well, spinning off several smaller bodies such as INFOFISH and NACA. However, as more subregional fishery bodies such as SEAFDEC and BOBP-IGO have come into being, APFIC has had to modify its role and responsibilities. Following an extensive review over the past few years, the Commission decided at its 28th session last year that it could best serve its members by becoming a Regional Consultative Forum. This Forum was to provide its Members a neutral platform to examine issues affecting the sustainable development of fisheries and aquaculture across Member States. One of the major changes in *modus operandi* was to involve its partners and the non-governmental organizations much more in its business and it is encouraging to see many of our partners here today. We are running out of space to fit all the logos!

It was agreed at the last Commission meeting that APFIC should hold a major Consultative Forum Meeting every two years and organize a number of inter-sessional workshops on issues considered to be of major regional importance. The first of these is today’s trash fish workshop and there will be a second one on “Mainstreaming Fisheries Co-management” to be held in Siem Reap, Cambodia in August 2005. Recommendations coming from these two workshops will be further considered the APFIC biennial Consultative Forum Meeting and subsequent Commission session. APFIC is also planning to organize a workshop as part of the 2006 East China Congress, to provide a forum for fisheries to become a major player in the larger Integrated Coastal Zone Management and Large Marine Ecosystem arena.

During the workshop, you will be hearing and discussing several major issues connected with the evolution of Asian fisheries from “fisheries for humans” towards “fisheries for aquaculture”. There are many questions over the sustainability of supply and demand in these fisheries, as well as socio-economic and ethical concerns. The objective of the workshop is to tease out these issues and to come up with ways to address them. In preparing for this workshop, it became obvious that there are many gaps in our knowledge about what is happening in many Asian fisheries and I also believe that we should also come up with ways to address these knowledge gaps. Three days is not a long time to come up with solutions but I would like to see a fairly well formulated action plan emerge from the workshop. I know you will all contribute constructively to achieve this goal.

In moving onto the agenda of the workshop, I would just like to take this opportunity at the outset to thank everyone who has enthusiastically contributed to what, I am sure, will be a major success.

Thank you.

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