



# Advocating HRD in Aquatic Tagging: A Demonstration for Economically Important Small Pelagic Fishes

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Aquatic resources have been valuable sources of protein for most people in the Southeast Asian region. High fishing pressure and environmental impacts due to fast growing human population have however put much stress on the region's aquatic resources. In order to assure sustainability of these resources, responsible fisheries management has been actively promoted in the region. Recognizing that responsible fisheries management requires knowledge on fish behavior and habitat use as well as other biological information such as growth and reproductive ecology, SEAFDEC has been conducting studies aimed at collecting data and information on commercially important pelagic fishes of the region with a view of promoting sustainable fisheries management and conservation.

As early as 1998, SEAFDEC has implemented the regionalization of the global Code of Conduct for Responsible Fisheries (CCRF) and came up with regional guidelines on responsible fishing operations, responsible aquaculture, responsible fisheries management, and post-harvest practices and trade. The preparation of the Regional Guidelines for Responsible Fisheries Management, which covers industrial as well as coastal fisheries, was coordinated by the SEAFDEC Marine Fisheries Resources Development and Management Department (MFRDMD) and Training Department (TD).

## Information Collection for Fisheries Management

Keeping abreast with the provisions in the Regional Guidelines for Responsible Fisheries Management, MFRDMD and TD conducted a study on „Information Collection for Sustainable Pelagic Fisheries in the South China Sea% from 2002 to 2006 (Phase I of Japanese Trust Fund Project). Focusing on two groups of commercially important pelagic fishes, namely, the Indian mackerels and roundscads, the study was aimed at collecting information on fishery status and fishing gear operation as well as catch and biological data for pelagic fishery management purposes. Two basic methods were used in assessing the subpopulation of the targeted pelagic fishes, i.e., mtDNA and morphometry, the results however, were not very conclusive.

The movement behavior and migration routes of small pelagic fishes are useful information in determining their subpopulation. Since tagging is an effective method to determine such movements, a five-year regional tagging project for small pelagic fishes (Phase II) was initiated by SEAFDEC in 2007 which mainly aims to complement the results of the subpopulation study under Phase I and covers the Andaman Sea as well as the South China Sea targeting

on the small pelagic fishes and small tunas. The outcome from this tagging project is expected contribute to the region's efforts in improving the management of the targeted pelagic fish resources.

### Tagging of Economically Important Small Pelagic Fishes

Many research institutions and organizations have been promoting the use of telemetry to study the characteristics of fishes with a view to increase benefits while maintaining a balance between exploitation and conservation. As an important technology for measuring biological variables including information on biology and behavior of aquatic species, telemetry is therefore considered one of the most important tools in fisheries management. However, there are no available transmitters of telemetry and data loggers suitable for the targeted small pelagic fishes with about 20 cm in body length. Thus, a traditional tagging method using simple tags is being adopted in Phase II of the project in order to obtain information on fish behavior and migration patterns of small pelagic fishes.

Since many pelagic fishes seems to consist of a mixture of individuals originating from different populations and fishes of different genetic background are likely to be found in the same waters, studies on the behavior of fish from mixed and shared stocks require information on genetic



Tagging practice using fresh fish (left); and actual tagging of live fish (right)

background of individual fishes. Thus, genetic analysis combined with tagging could be useful tools in studying the migration pattern of fishes.

### Tagging Experiences

SEAFDEC and some countries in the region have had experiences in tagging of fishes (**Box 1** and **Box 2**). Specifically, Thailand has long history of tagging activities for small pelagic fish dating as far back as the 50s. Indonesia also conducted tagging activities for three species of tuna in the North Sulawesi waters from 1996 to 2000. MFRDMD conducted tagging of small tuna in the South China Sea

#### Box 1: National Experiences in Fish Tagging

##### THAILAND

**Fish tagged:** Indo-Pacific Mackerel collected from bamboo stake traps

**Releasing Area:** Gulf of Thailand (1962-1975) and Andaman Sea (1981-1984)

**Activity Duration:** 1960s to 1980s

**Objectives:**

1. To establish the migratory route of the fish and the speed of migration
2. To establish mortality rate of the fish
3. To establish other biological parameters
4. To stabilize the maximum sustainable yield of mackerel resources exploited in the Gulf of Thailand

**Tag used:** Red Dart Tags

**Results:**

1. From 1960 to 1965, total of fish tagged and released was 26,864 with 4,191 recaptured (15.6%)
2. From 1970 to 1975, total of 12,971 fishes were tagged and released in the Gulf of Thailand, only 6.57% was recovered
3. In the Gulf of Thailand, the longest recovery period was after 240 days while the maximum distance traveled by the tagged fish was 300 nautical miles at the rate of 1.2 nmiles/day

##### INDONESIA

**Fish tagged:** skipjack, yellowfin and big-eye tuna

**Releasing Area:** North Sulawesi waters

(Eastern part of Indonesia)

**Activity Duration:** 1996-2000

**Objectives:**

1. To establish the migration route and behavior of the three tuna species
2. To establish biological parameters

**Tag used:** Tip pointed dart tags

**Results:**

1. From a total of 16,217 tunas tagged and released, 833 were recovered (5.74%)
2. Many of the tagged fishes were recovered near the FAD areas, therefore small pelagic fishes should be tagged in FAD areas but released outside FAD areas in order to maximize gathering of information as regards fish movements and migration patterns
3. Distance of movement (yellowfin tuna): <10 miles - 68.27% with maximum distance of 1784 nautical miles (caught in the Pacific Ocean)
4. Distance of movement (skipjack tuna): <10 miles - 46.36%, 10-30 miles - 19.10%
5. Duration of capture (yellowfin tuna): <30 days - 78.23%
6. Duration of capture (skipjack tuna): <30 days - 94.24%



## Box 2: Regional Experiences in Fish Tagging

### SEAFDEC/MFRDMD

**Fish tagged:** small tuna species  
(*Euthynnus affinis* and *Thunnus tonggol*)

**Releasing Area:** South China Sea

**Activity Duration:** 1990-1998

**Objectives:**

1. To understand the migration patterns of the neritic tuna species in the South China Sea
2. To estimate the biological parameters of the small tuna species

**Tag used:** Tip pointed dart tags

**Results:**

1. About 74.9% of *E. affinis* tagged and released were recaptured, and 56.0% of *T. tonggol* tagged and released were recaptured
2. 25.1% *E. affinis* were tagged as free swimming school while *T. tonggol* was 44.0%
3. 1,044 tags were returned (4.39%)
4. Recoveries from offshore area was 94.06%
5. A total of 882 (86.1%) tagged *E. affinis* were recaptured within the first month after release
6. About 3.2% were recaptured on the same day the fishes were released
7. About 1.3% was recovered after one year of time at liberty
8. *E. affinis* migrates towards the north from November to May, and also towards north from January to March opposite the water surface current direction
9. *T. tonggol* migrates towards the Gulf of Thailand during the end of the year
10. Distance traveled for *E. affinis* in nautical miles: <250 g -  $12.1 \pm 0.6$ ; 250-300 g -  $14.9 \pm 0.8$ ; >300 g -  $59.3 \pm 3.5$
11. Distance traveled for *T. tonggol* in nautical miles: ave  $48.5 \pm 11.3$



### SEAFDEC/TD

**Fish tagged:** tuna

**Releasing Area:** Eastern Indian Ocean

**Activity Duration:** 22 October 2003-  
8 January 2004

**Objectives:**

1. To assist IOTC in their Tuna Tagging Program
2. To assist IOTC in recapturing the tagged tuna
3. To provide tagging data to the IOTC Database System

**Tag used:** IOTC Standard Dart Tags

**Results:**

1. Distance traveled: 390.6 nautical miles

from 1990 to 1998, while TD conducted tagging of tuna from 2003 to 2004 in the Eastern Indian Ocean as part of SEAFDEC's commitment to assist in the Tuna Tagging Program of the Indian Ocean Tuna Commission (IOTC).



*Tuna tagging by Indonesian researcher*

## Tagging Demonstration

As the first component of the five-year regional tagging project, tagging demonstration for the Indo-Pacific mackerel was conducted by SEAFDEC on 1 May 2007 at Samut Songkram Province, Thailand. A tagging technique was introduced in order to develop the capability of the member countries in improving fisheries management as well as in evaluating shared stock population and determining strategies for managing such population. Coordinated by MFRDMD and TD, the tagging demonstration was participated in by representatives from the member countries, namely, Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, the Philippines, Thailand, and Vietnam. In addition to human resource development, the said Tagging Demonstration also served as prerequisite for the implementation of the Regional Tagging Project (Phase II) in the SEAFDEC Member Countries for the period 2008-2011 which receives funding support from the Government of Japan's Trust Fund Program (JTF).



Proper handling of fish for tagging: in fishing boat (inset) and in acclimation tanks (above) emphasized during the May 2007 Tagging Demonstration

With the guidance of the tagging experts from Thailand and also from MFRDMD and TD who had considerable experience in fish tagging, providing useful information during the May 2007 Tagging Demonstration, the representatives from the other member countries were able to conduct actual tagging of fishes ensuring that the tagged fishes that were released are alive. After the tagging demonstration, the country representatives became confident in initiating tagging activities of important small pelagic fish species in their respective countries.



Tagging procedure advocated by Dr. Yoshinobu Konishi (extreme left) is tried by participants onboard a fishing vessel

Thailand's experience in fish tagging also includes valuable developed techniques on handling and transport of fishes used in tagging activities. Considering that proper handling and transport of fish ensures the success of tagging activities, the Department of Fisheries of Thailand also promotes the guidelines that it has developed for the collection and handling of small pelagic fishes used in tagging (**Box 3**). Introduced during the May 2007 Tagging Demonstration, the guidelines also include effective transport of fish from the collection area to land-based holding facilities.

## Way Forward

The May 2007 Tagging Demonstration served as an introductory activity for the Regional Tagging Project for Small Pelagic Fishes in the South China Sea and Andaman Sea to be carried out from 2008 to 2011 under the JTF Program. The participating member countries submitted their respective National Tagging Activity proposals under the five-year project. Considering financial availability, four pelagic species will be used in the tagging activities: two species of mackerel (*Rastrelliger kanagurta* and *R. brachysoma*) and two species of scads (*Decapterus macrosoma* and *D. maruadsi*).

The expected outcomes of the regional tagging project include: information on migratory patterns and migration routes; and information on short-term growth patterns for the targeted small pelagic fishes in the South China Sea and Andaman Sea. The project is also expected to provide recommendations and suggestions on management plan for purse seine fisheries in the South China Sea with reference to the information and outcomes obtained from Phase I of the JTF project.

### About The Authors

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