

ISBN 983-9114-53-9  
SEAFDEC/MFRDMD/SP/20  
SOP For Tagging Of Fish JTFII



# STANDARD OPERATING PROCEDURES (SOP)

For  
Tagging of Small Pelagic Species



"Tagging Program for Economically Important Pelagic Species in the South  
China Sea and Andaman Sea", 2008 - 2012

Conducted by  
SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER /  
MARINE FISHERY RESOURCES DEVELOPMENT AND MANAGEMENT DEPARTMENT

In collaboration with  
SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER -  
TRAINING DEPARTMENT

ISBN 978-983-9114-53-9



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Funded by:

Japanese Trust Fund Program (Trust Fund II)

Perpustakaan Negara Malaysia                      Cataloguing in Publication Data  
Standard operating procedures for tagging of small pelagic species /  
conducted by Southeast Asian Fisheries Development Center,  
Marine Fishery Resources Development and Management Department ;  
in collaboration with Southeast Asian Fisheries Development Center/  
Training Department.  
ISBN 978-983-9114-53-9  
1. Pelagic fishes--South China Sea. 2. Marine fishes--South China Sea.  
3. Pelagic fishes--Andaman Sea. 4. Marine fishes--Andaman Sea.  
I. Southeast Asian Fisheries Development Center.  
Marine Fishery Resources Development and Management Dept.  
II. Southeast Asian Fisheries Development Center/Training Department.  
639.320916472

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|    |  |  |
|----|--|--|
|    | practices for small pelagic fishes used in this area?                                      |  |
| 7. | What other action should be taken by Government to increase small pelagic fish stocks      | Please specify : _____<br>_____<br>_____ |
| 8. | Factor that respondent think contribute to the declining of small pelagic fish resources:- | _____<br>_____                           |
| 9. | Other:   |  |

|    |   |  |                   |
|----|---|--|-------------------|
| 4. | Higher composition of spawner / big size fish             | Month/s  | Average size (cm) |
|    | i. Local Name (Short Mackerel)                            |  |                   |
|    | ii. Local Name (Indian Mackerel)                          |  |                   |
|    | iii. Local Name (Shortfin Scad)                           |  |                   |
|    | iv. Local Name (Japanese Scad)                            |  |                   |
| 5. | What is the right month/s to fish for scad?               |  |                   |
|    | What is the right month/s to fish for mackerel?           |  |                   |
| 6. | Do you change your fishing ground? On what reason?        |  |                   |
|    | If change, describe your fishing area by season / month   |  |                   |
| 7. | Does the fish stock size changed since the past 10 years. |  |                   |
|    | i. Local Name (Short Mackerel)                            | Getting bigger / getting smaller / Remain the same |                   |
|    | ii. Local Name (Indian Mackerel)                          | Getting bigger / getting smaller / Remain the same |                   |
|    | iii. Local Name (Shortfin Scad)                           | Getting bigger / getting smaller / Remain the same |                   |
|    | iv. Local Name (Japanese Scad)                            | Getting bigger / getting smaller / Remain the same |                   |

**D. PERCEPTION**

| Choice of Answer: please refer the score below:<br>1- Very agree 2- Agree 3- Slightly agree 4- Not agree 5-Very not agree 6- Not Sure |                      |
|---|----------------------|
| Question  | Choice Answer        |
| 1. Small pelagic fish resource will be extinct if catch and fishing effort is not controlled  | 1 2 3 4 5 6          |
| 2. Small pelagic fish resource is declining   | 1 2 3 4 5 6          |
| 3. Measures taken by the government is enough to ensure small pelagic fish resources will not extinct                                 | 1 2 3 4 5 6          |
| 4. Responsibility to manage and conserve the fishery resources should be shared between the Government and fishers                    | 1 2 3 4 5 6          |
| 5. Close season during the spawning will increase fish resource   | 1 2 3 4 5 6          |
| 6. What is the destructive fishing gear/s or fishing  | a. _____<br>b. _____ |

**Tagging Program for Economically Important Pelagic Species in the South China Sea and Andaman Sea**

**1. Tagging area**

The tagging program on small pelagic fishes will be conducted in two ecosystems; South China Sea and Andaman Sea, involving eight ASEAN-SEAFDEC member countries. Seven ASEAN-SEAFDEC member countries bordering the South China Sea namely, Brunei Darussalam, Cambodia, Indonesia, Malaysia, The Philippines, Thailand and Vietnam are involved in this program. Indonesia, Malaysia and Thailand together with Myanmar conduct this program in the Andaman Sea.

The sites of the tagging operation are shown in the map in Figure 1. A total of 17 sites in the South China Sea (including two alternate sites) and seven sites in the Andaman Sea (including one alternate site) were selected as the best locations to conduct this tagging activity in the region.



**Figure 1:** Map showing the 17 sites selected in the South China Sea and seven sites in the Andaman Sea for the tagging program. The three alternative sites are located in Malaysia; Mukah is the alternate site to Kuching, Kudat is the alternate site to Kota Kinabalu and Pangkor Island is the alternate site to Kuala Perlis.

## 2. Selected species

Two species of Mackerels namely Short Mackerel (*Rastrelliger brachysoma*) and Indian Mackerel (*Rastrelliger kanagurta*) and two species Scads; Shortfin scad (*Decapterus macrosoma*) and Japanese scad (*Decapterus maruadsi*) were chosen for this program. The selection of species by countries and by tagging sites is provided in the Table 1.

**Table 1: Selection of the small pelagic fish species by country and by tagging site for the tagging program, 2008-2010**

| Country                 | Tagging Site         | Selected Species   |
|-------------------------|----------------------|--|
| <b>South China Sea:</b> |                      |  |
| 1. Brunei Darussalam    | 1. Muara             | <i>Rastrelliger kanagurta</i> , <i>D. maruadsi</i>                                       |
| 2. Cambodia             | 2. Tomnop Rolok      | <i>R. kanagurta</i> , <i>R. brachysoma</i>   |
| 3. Indonesia            | 3. Pemangkat         | <i>Decapterus macrosoma</i>  |
| 4. Malaysia             | 4. Tok Bali          | <i>R. kanagurta</i> , <i>R. brachysoma</i> ,<br><i>D. macrosoma</i> , <i>D. maruadsi</i> |
|                         | 5. Kuantan           | <i>R. kanagurta</i> , <i>D. macrosoma</i> , <i>D. maruadsi</i>                           |
|                         | 6. Kuching/Mukah     | <i>R. kanagurta</i> , <i>R. brachysoma</i> , <i>D. maruadsi</i>                          |
|                         | 7. K. Kinabalu/Kudat | <i>R. kanagurta</i> , <i>D. macrosoma</i> , <i>D. maruadsi</i>                           |
| 5. The Philippines      | 8. Manila Bay        | <i>Rastrelliger kanagurta</i>  |
|                         | 9. Palawan Area      | <i>R. kanagurta</i> , <i>D. macrosoma</i> , <i>D. maruadsi</i>                           |
| 6. Thailand             | 10. Trat             | <i>R. kanagurta</i> , <i>R. brachysoma</i> , <i>D. maruadsi</i>                          |
|                         | 11. Songkhla         | <i>R. kanagurta</i> , <i>R. brachysoma</i> , <i>D. maruadsi</i>                          |
| 7. Vietnam              | 12. Nghe An          | <i>R. kanagurta</i> , <i>D. macrosoma</i> , <i>D. maruadsi</i>                           |
|                         | 13. Khanh Hoa        | <i>R. kanagurta</i> , <i>D. macrosoma</i> , <i>D. maruadsi</i>                           |
|                         | 14. Ben Tre          | <i>R. kanagurta</i> , <i>D. macrosoma</i> , <i>D. maruadsi</i>                           |
|                         | 15. Klen Giang       | <i>R. kanagurta</i> , <i>D. macrosoma</i> , <i>D. maruadsi</i>                           |
| <b>Andaman Sea:</b>     |                      |  |
| 1. Indonesia            | 1. Banda Aceh        | <i>R. kanagurta</i> , <i>R. brachysoma</i>   |
| 2. Malaysia             | 2. K. Perlis/Pangkor | <i>R. kanagurta</i> , <i>R. brachysoma</i>   |
| 3. Myanmar              | 3. Yangon            | <i>R. kanagurta</i> , <i>R. brachysoma</i>   |
|                         | 4. Myeik             | <i>R. kanagurta</i> , <i>R. brachysoma</i>   |
| 4. Thailand             | 5. Ranong            | <i>R. kanagurta</i> , <i>R. brachysoma</i>   |
|                         | 6. Satun             | <i>R. kanagurta</i> , <i>R. brachysoma</i>   |

Note:

*R.*: *Rastrelliger*; *D.*: *Decapterus*

|    | Jan   | Feb | Mac  | Apr | May | Jun |                      |                |
|----|---|-----|------|-----|-----|-----|----------------------|----------------|
|    | Jul   | Aug | Sept | Oct | Nov | Dec |                      |                |
|    | (Please tick “/”)   |     |      |     |     |     |                      |                |
|    | Possible reason for the lower catch: _____  |     |      |     |     |     |                      |                |
| 3. | Higher composition of juvenile / small size fish                                    |     |      |     |     |     | <b>Major Species</b> | <b>Month/s</b> |
|    | Jan   | Feb | Mac  | Apr | May | Jun |                      |                |
|    | Jul   | Aug | Sept | Oct | Nov | Dec |                      |                |
|    | (Please tick “/”)   |     |      |     |     |     |                      |                |
|    | Possible reason for the higher juvenile catch: _____<br>(Breeding or spawning seas) |     |      |     |     |     |                      |                |
| 4. | Higher composition of spawner / big size fish                                       |     |      |     |     |     | <b>Major Species</b> | <b>Month</b>   |
|    | Jan   | Feb | Mac  | Apr | May | Jun |                      |                |
|    | Jul   | Aug | Sept | Oct | Nov | Dec |                      |                |
|    | (Please tick “/”)   |     |      |     |     |     |                      |                |
|    | Possible reason for the higher spawner catch: _____<br>(Breeding or spawning seas)  |     |      |     |     |     |                      |                |

Note: 1. This information already collected during the 1<sup>st</sup> Phase of this project but only in the South China Sea area.

2. This information is purely from the local people view rather than from the landing data.

## C. LOCAL KNOWLEDGE: Mackerel and Scad

|    | Season Description                               | Month/s | Catch rate (kg/ trip) |
|----|--|---------|-----------------------|
| 1. | Higher catch season:                             |         |                       |
|    | i. Local Name (Short Mackerel)                   |         |                       |
|    | ii. Local Name (Indian Mackerel)                 |         |                       |
|    | iii. Local Name (Shortfin Scad)                  |         |                       |
|    | iv. Local Name (Japanese Scad)                   |         |                       |
| 2. | Lower catch season:                              | Month/s | Catch rate (kg/ trip) |
|    | i. Local Name (Short Mackerel)                   |         |                       |
|    | ii. Local Name (Indian Mackerel)                 |         |                       |
|    | iii. Local Name (Shortfin Scad)                  |         |                       |
|    | iv. Local Name (Japanese Scad)                   |         |                       |
| 3. | Higher composition of juvenile / small size fish | Month/s | Average size (cm)     |
|    | i. Local Name (Short Mackerel)                   |         |                       |
|    | ii. Local Name (Indian Mackerel)                 |         |                       |
|    | iii. Local Name (Shortfin Scad)                  |         |                       |
|    | iv. Local Name (Japanese Scad)                   |         |                       |

SERIAL NO:

**7. QUESTIONNAIRE**

**TAGGING PROGRAM FOR ECONOMICALLY IMPORTANT PELAGIC SPECIES IN SOUTH CHINA SEA AND ANDAMAN SEA, JTF II**

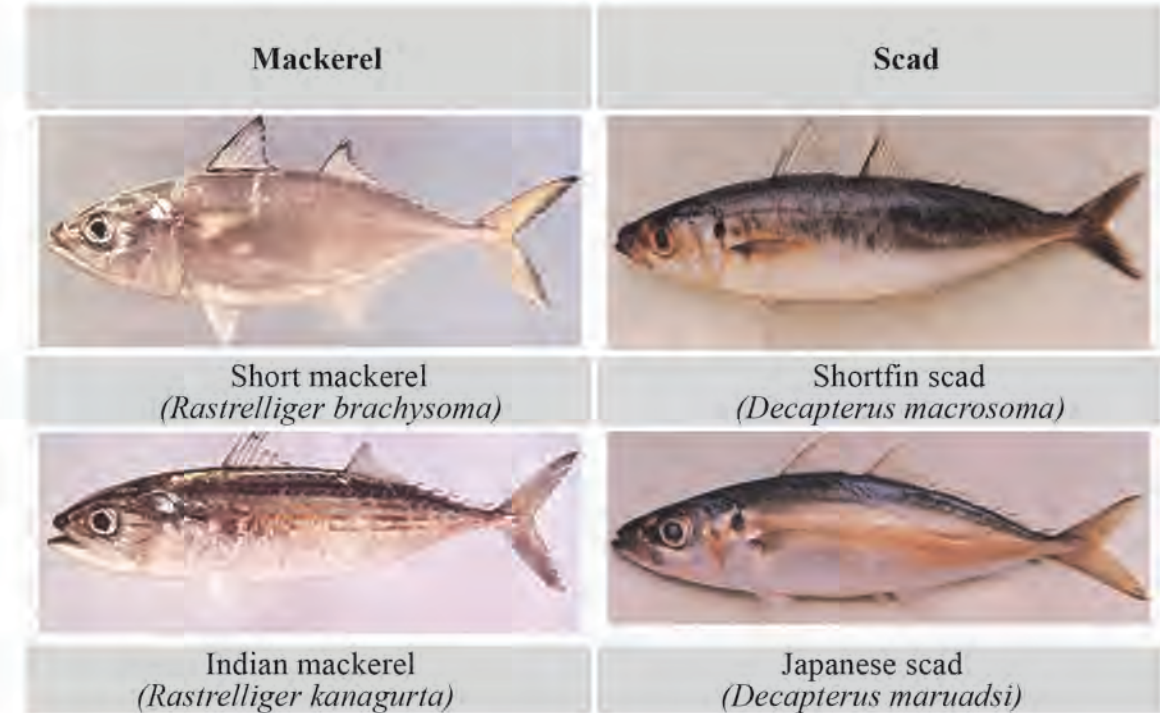
**A. PERSONAL INFORMATION**

| Enumerator & Respondent   | For official used  |                          |           |                          |              |                          |               |                          |            |                          |               |                          |                  |                          |               |
|---|--|--------------------------|-----------|--------------------------|--------------|--------------------------|---------------|--------------------------|------------|--------------------------|---------------|--------------------------|------------------|--------------------------|---------------|
| <p><b>Enumerator:</b></p> <p>1. Name (Enumerator): _____</p> <p>2. Tel. No: _____ E-mail Address: _____</p> <p>3. Place of Interview: _____ Country: _____</p> <p>4. Date: ___ / ___ / ___ Time : _____</p> <p><b>Respondent:</b></p> <p>1. Name (Respondent): _____</p> <p>2. Address : _____</p> <p>3. Tel. No: _____ E-mail Address: _____</p> <p>4. Year of experience: _____ Years</p> <p>5. Type of vessel / gear: Trawl / P-seine / Driftnet / Leftnet / Setnet / others _____</p> <p>6. Educational background: <u>No Formal / Primary / Secondary / Diploma / Degree &amp; above</u></p> | <p>_____</p> <p><b>Enumerator Category</b></p> <table border="1"> <tr><td><input type="checkbox"/></td><td>DoF Staff</td></tr> <tr><td><input type="checkbox"/></td><td>Local people</td></tr> <tr><td><input type="checkbox"/></td><td>Others: _____</td></tr> </table> <p><b>Respondent Category</b></p> <table border="1"> <tr><td><input type="checkbox"/></td><td>Boat Owner</td></tr> <tr><td><input type="checkbox"/></td><td>Boat Operator</td></tr> <tr><td><input type="checkbox"/></td><td>Part time Fisher</td></tr> <tr><td><input type="checkbox"/></td><td>Others: _____</td></tr> </table> | <input type="checkbox"/> | DoF Staff | <input type="checkbox"/> | Local people | <input type="checkbox"/> | Others: _____ | <input type="checkbox"/> | Boat Owner | <input type="checkbox"/> | Boat Operator | <input type="checkbox"/> | Part time Fisher | <input type="checkbox"/> | Others: _____ |
| <input type="checkbox"/>  | DoF Staff  |                          |           |                          |              |                          |               |                          |            |                          |               |                          |                  |                          |               |
| <input type="checkbox"/>  | Local people   |                          |           |                          |              |                          |               |                          |            |                          |               |                          |                  |                          |               |
| <input type="checkbox"/>  | Others: _____  |                          |           |                          |              |                          |               |                          |            |                          |               |                          |                  |                          |               |
| <input type="checkbox"/>  | Boat Owner   |                          |           |                          |              |                          |               |                          |            |                          |               |                          |                  |                          |               |
| <input type="checkbox"/>  | Boat Operator  |                          |           |                          |              |                          |               |                          |            |                          |               |                          |                  |                          |               |
| <input type="checkbox"/>  | Part time Fisher   |                          |           |                          |              |                          |               |                          |            |                          |               |                          |                  |                          |               |
| <input type="checkbox"/>  | Others: _____  |                          |           |                          |              |                          |               |                          |            |                          |               |                          |                  |                          |               |

**B. LOCAL KNOWLEDGE: Small Pelagic Fishes**

Fishing area: \_\_\_\_\_ Distant from shore: \_\_\_\_\_ nm

| Season Description  | Major Species | Catch rate (kg / trip) |     |     |     |     |     |     |      |     |     |     |  |  |
|---|---------------|------------------------|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|--|--|
| <p>1. Higher catch season of small pelagic fish</p> <table border="1"> <tr> <td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>Jun</td> </tr> <tr> <td>Jul</td><td>Aug</td><td>Sept</td><td>Oct</td><td>Nov</td><td>Dec</td> </tr> </table> <p>(Please thick “”) Possible reason for the higher catch: _____</p> | Jan           | Feb                    | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec |  |  |
| Jan   | Feb           | Mar                    | Apr | May | Jun |     |     |     |      |     |     |     |  |  |
| Jul   | Aug           | Sept                   | Oct | Nov | Dec |     |     |     |      |     |     |     |  |  |
| 2. Lower catch season of small pelagic fish   |               |                        |     |     |     |     |     |     |      |     |     |     |  |  |



**Figure 2: The four selected small pelagic fish species to be tagged in the tagging program in the South China Sea and the Andaman Sea, 2008-2010.**

**3. Equipment and materials for the fish tagging program**

**A. Fishing vessel**

Small to medium-sized fishing vessel of less than 25-m length is suitable to be used for the purpose of tagging operation of small pelagic fishes at sea. This size of vessel makes the release of tagged fish easier so as to minimize stress on the fish.

**B. Holding tank with aeration and scoop net**

A dark colour round tank with diameter of about 1 meter is suitable for the holding of live pelagic fishes on board the vessel. The tank should contain water 60 to 80 cm in depth and covered with a net to prevent fish from jumping out of the tank. The tank must also be provided with strong and continuous air bubbles from approximately 3 to 4 air stones powered by a 12 volt DC air pump. The live fish should be kept in this aerated tank while waiting for the tagging operation to take place because dissolved oxygen (DO) in the rearing tank is a critical factor for mortality rate of small pelagic fish. The small pelagic fish is very vulnerable to low dissolved oxygen, so running sea water and air supply is very important.



Scoop nets should be used when catching the live fish from the holding tank. The net should be made of soft material (knotless) and covered with canvas at the middle to retain sea water during the transfer of the live fish for tagging. Handling of the fish also affects the mortality rate of the tagged fish.



**Figure 3:** Dark colour round tanks covered with dark nets and supplied with aeration are used to hold the live small pelagic fishes.



**Figure 4:** Scoop nets are used to transfer the live small pelagic fishes from the holding tank to operation area for tagging. The net should be made of soft material and covered with canvas at the middle to retain sea water.

**Table 11: Percentage of weight and number of occurrence of species prey in the fish stomach**

| Food content in stomach |                 | Digested food | Pernaeidae | Anchovy |  |  |  |  |  |
|-------------------------|-----------------|---------------|------------|---------|--|--|--|--|--|
| Species                 | No.             |               |            |         |  |  |  |  |  |
| <i>R. kanagurta</i>     | % of occurrence |               |            |         |  |  |  |  |  |
|                         | Weight          |               |            |         |  |  |  |  |  |
|                         | % of weight     |               |            |         |  |  |  |  |  |
| <i>R. brachysoma</i>    | No.             |               |            |         |  |  |  |  |  |
|                         | % of occurrence |               |            |         |  |  |  |  |  |
|                         | Weight          |               |            |         |  |  |  |  |  |
| <i>D. macrosoma</i>     | % of weight     |               |            |         |  |  |  |  |  |
|                         | No.             |               |            |         |  |  |  |  |  |
|                         | % of occurrence |               |            |         |  |  |  |  |  |
| <i>D. maruadsi</i>      | Weight          |               |            |         |  |  |  |  |  |
|                         | % of weight     |               |            |         |  |  |  |  |  |
|                         | No.             |               |            |         |  |  |  |  |  |
|                         | % of occurrence |               |            |         |  |  |  |  |  |
|                         | Weight          |               |            |         |  |  |  |  |  |
|                         | % of weight     |               |            |         |  |  |  |  |  |

6.2 Stomach Contents Study

**Sampling Procedure**

- Purchase fish samples at least 50 tails each species per trip (Fish samples for gonad maturity study can be used for this study). The samples stored in a box containing ice to avoid digestion process by bacteria in the stomach of the fish before further analysis at laboratory.
- In laboratory (or at field) intact stomach were removed by cutting above the cardiac sphincter (esophagus) and below the pyloric sphincter (large intestine) and placed in 70% alcohol to prevent any further digestion in stomach content.

**Equipment**

- Equipment; Ice box, microscope, measuring board, spring weighing balance, digital weighing balance, scissors, forceps, callipers, petri disc, alcohol 70% etc.

**Measurement**

- Measure and record Total Length (TL), Fork Length (FL) in millimeter and Body Weight (BW)
- Take weight of full stomach. The weight of the stomach content was derived by difference in weight of full stomach and stomach skin.
- Every item found in stomach counted and weighed.
- Identified all food items in the stomach to the precise taxonomic level; i.e. species, genera whenever possible.
- Record all occurrences and weights in Stomach Content Data Sheet (Table 10) and analyzed by percentage of both methods (Table 112).

Table 10: Stomach contents Data Sheet

Country: \_\_\_\_\_ Date of sampling: \_\_\_\_\_  
 Name of Sampling site: \_\_\_\_\_ Time of sampling: \_\_\_\_\_  
 Fishing area: \_\_\_\_\_ Type of fishing gear: \_\_\_\_\_  
 Name of enumerator: \_\_\_\_\_ Fish species: \_\_\_\_\_

| No. | Total length (mm) | Folk length (mm) | Sex | Stomach weight (0.1g) | Sac weight (0.1g) | Content weight (0.1g) | No. of Prey items | Detail Prey items (Fm/Genus/Sp.) |
|-----|-------------------|------------------|-----|-----------------------|-------------------|-----------------------|-------------------|----------------------------------|
|     |                   |                  |     |                       |                   |                       |                   |                                  |
|     |                   |                  |     |                       |                   |                       |                   |                                  |
|     |                   |                  |     |                       |                   |                       |                   |                                  |
|     |                   |                  |     |                       |                   |                       |                   |                                  |
|     |                   |                  |     |                       |                   |                       |                   |                                  |
|     |                   |                  |     |                       |                   |                       |                   |                                  |
|     |                   |                  |     |                       |                   |                       |                   |                                  |
|     |                   |                  |     |                       |                   |                       |                   |                                  |
|     |                   |                  |     |                       |                   |                       |                   |                                  |

**C. Measuring board, glove and wet cloth**

For better survival rate of the tagged fish, the handling of the fish during the tagging operation requires special attention. The person holding the fish for measurement must use cloth glove. The bare hands are not good to the fish because of it high temperature (36°C). The measuring equipment can be in the form of tape or board, which ever is convenient. The use of measuring board is encouraged. If the fish has to be place on the platform for measuring or for tagging, use damp sponge sheet / cloth to cover the surface of the platform.



Figure 5: Measuring tape, glove and wet cloth used in the handling and measuring of the live small pelagic fish in the tagging operation.



Figure 6: Tagging of the small pelagic fish. The fish is gently but firmly held on wet sponge sheet or soft cloth to avoid further injury and to ensure better survival rate of the tagged fish

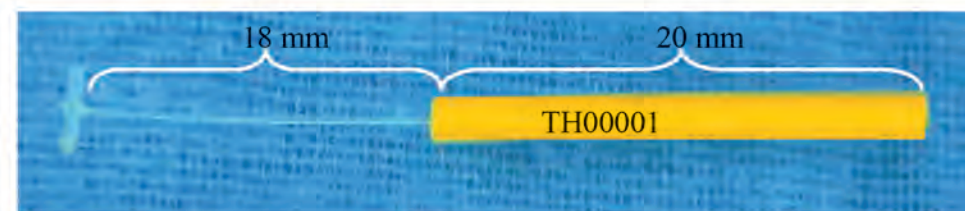
**D. Tag**

The T-bar 2 tag is constructed from a cylindrical marker, moulded to the filament of a “T” anchor which, for absolute security, has a knob formed at the distal end. Cylindrical markers are yellow in colour. Anchors are of standard size. Filament lengths – the distance from the “T” anchor to the start of the marker is 18 mm. Marker length is 20 mm with written information on the project that are ‘Country code’ and ‘Series number’. Table 2 below gives the country code used under this project. The first letter in South China Sea and the first two letters in the Andaman Sea represent the country code.

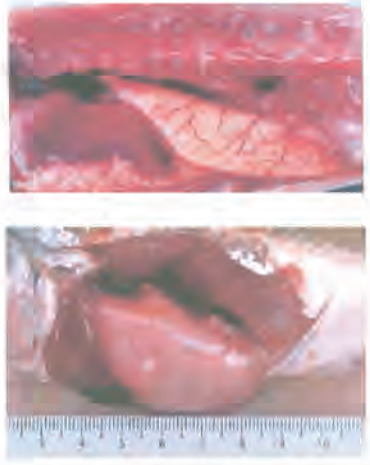

**Table 2: The written information on the T-bar 2 tag that indicates the country code and the series number of the tag.**

| South China Sea   |        | Andaman Sea |         |
|-------------------|--------|-------------|---------|
| Country           | Code   | Country     | Code    |
| Brunei Darussalam | B00001 |             |         |
| Cambodia          | C00001 |             |         |
| Indonesia         | I00001 | Indonesia   | ID00001 |
| Malaysia          | M00001 | Malaysia    | MY00001 |
|                   |        | Myanmar     | MM00001 |
| The Philippines   | P00001 |             |         |
| Thailand          | T00001 | Thailand    | TH00001 |
| Vietnam           | V00001 |             |         |

Tags are supplied in strips of 50, sequentially numbered tags. Twenty strips of tags are packed in a labelled and re-sealable plastic bag. These should be kept in a box to prevent crushing and misalignment. On completing a tagging session, replace any partly-used strip in its original labelled bag.



**Figure 7: T-bar 2 tag is a cylindrical marker used in this small pelagic fish tagging project. ‘TH’ refers to the country code for Thailand for the Andaman Sea and the five-digit is the tag serial number.**

|   |       |  |   |
|---|-------|--|---|
|   |       | in colour with conspicuous superficial blood vessels. Large transparent, ripe ova visible. Testis whitish-creamy soft.   |  |
| V | Spent | Ovary and Testis shrunken to about ½ length of body cavity. Wall loose. Ovary may contain remnants of disintegrating opaque and ripe ova, darkened or translucent. Testis blood shot and flabby. |  |

**Table 9: Gonad Maturity Data Sheet**

Country: \_\_\_\_\_ Date of sampling: \_\_\_\_\_  
 Sampling site: \_\_\_\_\_ Time of sampling: \_\_\_\_\_  
 Fishing area: \_\_\_\_\_ Type of fishing gear: \_\_\_\_\_  
 Name of enumerator: \_\_\_\_\_ Fish species: \_\_\_\_\_


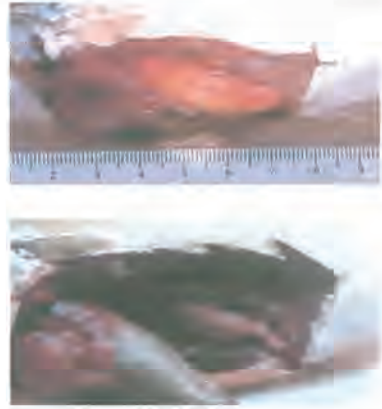

| No. | Total length (mm) | Fork Length (mm) | Body Weight (0.1 g) | Sex | Maturity Stage | Gonad weight (0.1 g) | GSI |
|-----|-------------------|------------------|---------------------|-----|----------------|----------------------|-----|
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |
|     |                   |                  |                     |     |                |                      |     |

Note:  
 Total male (n) = \_\_\_\_\_  
 Total GSI male (w) = \_\_\_\_\_  
 Average GSI male = (w/n)  
 GSI = (Gonad weight/Body weight) \* 100  
 Total female (n) = \_\_\_\_\_  
 Total GSI female (w) = \_\_\_\_\_  
 Average GSI female = (w/n)

**Measurements and data**

- Measure each fish samples for body size (Total Length, TL; Fork Length, FL; and Body Weight, BW).
- Identify sex and gonad stage of fish through visual censuses. As for the characteristic of gonad stages, refer to the standard maturity scale as provided in Table 8 (Five-Point Maturity Scale for Partial Spawners).
- Record all data and information onto 'Gonad Maturity Data Sheet' of Table 9.

Table 8: Five-point Maturity Scale for Partial Spawner

| Stage | State    | Description   |  |
|-------|----------|---|--|
| I     | Immature | Ovary and testis about 1/3 length of body cavity. Ovaries pinkish, translucent; Testis whitish. Ova not visible to naked eye.   |    |
| II    | Maturing | Ovary and Testis about 1/2 of body cavity. Ovary pinkish, translucent; Testis whitish, more or less symmetrical. Ova not visible to naked eye.                        |   |
| III   | Ripening | Ovary and testis about 2/3 of body cavity. Ovary pinkish-yellow colour with granular appearance, Testis whitish to creamy. No transparent or translucent ova visible. |  |
| IV    | Ripe     | Ovary and testis about 2/3 to full length of body cavity. Ovary orange-pink   |  |

**E. Tag Applicator**

The tag Applicator is also known as a “tagging gun”. Many standard guns are available in most countries from suppliers of the basic tagging system used in commerce and industries. The appropriate gun is the one supplied under this project to all participating member countries. Always carry at least one spare tagging gun and needle, as this will enable continuation of tagging operation in the case of applicator problems.

Attachment of needle and strip of tags to tag gun

1. Turn the revolver near the needle hole in the right side of the gun to loosen the stopper of a needle.
2. Insert a needle into the hole so as to align a slit of needle to a slit line of the gun.
3. Turn the revolver to lock the needle.
4. Align a marginal part (side of smaller number of tag) of strip with 50 tags to a T-shaped slit of gun and insert it into the slit completely (when the strip is attached in place completely a sound in low tone is audible).
5. Figure 8 shows the applicator in the ready state to be used in a tagging operation.

Removal of strip from gun

6. Slide the knob on the right side of gun backwards and pull the strip upward.

After using, remove the needle from gun, and rinse the needle and gun in warm fresh water for 10 minutes. Expose them to warm air to dry out the inside completely. Then, spray lightly with anti-rust, dry it out and place them in a storage container, separately. If engaged in a prolonged tagging session, occasionally flush the needle with fresh water. During the tagging operation, clean the needle with wet cotton soaked in ethanol to minimize the possibility of infection to the tagged fish and keep the mechanism free of foreign matter. Spare needles are supplied under the project.



**Figure 8: The applicator with T-bar 2 tag ready to be used in fish tagging operation.**

#### What to do when something goes wrong

1. Be gentle – do not use force as this will only make things worse.
2. If everything seems OK, but the next tag does not feed into the needle position, remove the strip and re-load. If the tag still does not feed into the correct position, resume tagging with the other end after checking for any evidence of grit etc. in the feed mechanism. Remember, you will then be working out of sequence and on the reversing numbers.
3. If a tag has started to feed out, but is jammed in the needle, do NOT try to force it through. Remove needle with jammed tag, then the strip of tags. Then prise out the jammed tag, taking care not to damage the needle. Inspect needle and ejector pin for damage or fouling. As a safety precaution, replace the needle with a spare one which should be carried with any tagging kit.
4. Flush out the gun in fresh water if possible, and operate the gun a few times without tags to ensure its mechanism is free. Replace the strip of tags and resume tagging.
5. If the previously jammed tag is in reasonable condition, it can often still be used by inserting the anchor into the pointed end of the needle and then applying it in the normal way.

## 6. Additional biological parameters

### 6.1 Gonad Maturity Study

Although histological examination of the ovaries or testes of fish are necessary to ascertain with certainty the development and ripeness of gametes and the states of sexual maturity, the relative size and macroscopic appearance of the gonads provide a reliable indication of a fish's reproductive state. An easily determined measure of the state of maturity in fish is given by the relative size of the gonads. This can be expressed as the gonadosomatic index (GSI), which is the ratio of gonad weight to somatic weight given as a percentage.

This study is proposed to ascertain stage of reproductive of the fish during tagging and at recaptured.

#### Sampling Procedure

- a). Samples taken from the same school of fish that were tagged
  - Fish samples should be taken from the same school of fish that were tagged during tagging operation. This is to ensure that the GSI obtained from these samples is representing the GSI of the tagged fishes.
  - Samples up to 50 individuals of fish are required for adequate population study. This means 50 individuals must be taken from each tagging operation, if strongly believed that the fish are belong to different school.
- b). Samples are the recovered tagged fish
  - Gonad study should be done for all recovered tagged fish (if the fish conditions allow)

#### Equipments

Measuring board, spring weighing balance, digital weighing balance, scissors, forceps, calipers etc.



**Figure 11: Among the equipment required for the gonad maturity study**

**Table 7: Number of tags, the applicator (gun) and needle by tagging sites provided under the project for the three years**

|                         | Country           | Tagging Site             | Tag No.          | Gun & Needle      | Selected Species   |
|-------------------------|-------------------|--------------------------|------------------|-------------------|--|
| <b>South China Sea:</b> |                   |                          |                  |                   |  |
| 1.                      | Brunei Darussalam | 1. Muara                 | 6,000            | 2 & 6             | <i>Rastrelliger kanagurta</i> ,<br><i>D. maruadsi</i>                                    |
| 2.                      | Cambodia          | 2. Tomnop Rolok          | 5,000            | 2 & 6             | <i>R. kanagurta</i> , <i>R. brachysoma</i>   |
| 3.                      | Indonesia         | 4. Pemangkat             | -                | -                 | <i>Decapierus macrosoma</i>  |
| 4.                      | Malaysia          | 4. Tok Bali              | 7,500            | 2 & 6             | <i>R. kanagurta</i> , <i>R. brachysoma</i> ,<br><i>D. macrosoma</i> , <i>D. maruadsi</i> |
|                         |                   | 5. Kuantan               | 7,500            | -                 | <i>R. kanagurta</i> , <i>D. macrosoma</i> ,<br><i>D. maruadsi</i>                        |
|                         |                   | 6. Kuching / Mukah       | 7,500            | 2 & 6             | <i>R. kanagurta</i> , <i>R. brachysoma</i> ,<br><i>D. maruadsi</i>                       |
|                         |                   | 7. K. Kinabalu / Kudat   | 7,500            | 2 & 6             | <i>R. kanagurta</i> , <i>D. macrosoma</i> ,<br><i>D. maruadsi</i>                        |
| 5.                      | The Philippines   | 8. Manila Bay            | 3,000            | 2 & 6             | <i>Rastrelliger kanagurta</i>  |
|                         |                   | 9. Palawan Area          | 7,000            | 2 & 6             | <i>R. kanagurta</i> , <i>D. macrosoma</i> ,<br><i>D. maruadsi</i>                        |
| 6.                      | Thailand          | 10. Trat                 | 7,000            | 2 & 6             | <i>R. kanagurta</i> , <i>R. brachysoma</i> ,<br><i>D. maruadsi</i>                       |
|                         |                   | 11. Songkhla             | 7,000            | 2 & 6             | <i>R. kanagurta</i> , <i>R. brachysoma</i> ,<br><i>D. maruadsi</i>                       |
| 7.                      | Vietnam           | 12. Nghe An              | 8,000            | 2 & 6             | <i>R. kanagurta</i> , <i>D. macrosoma</i> ,<br><i>D. maruadsi</i>                        |
|                         |                   | 13. Khanh Hoa            | 8,000            | 2 & 6             | <i>R. kanagurta</i> , <i>D. macrosoma</i> ,<br><i>D. maruadsi</i>                        |
|                         |                   | 14. Ben Tre / Klen Giang | 9,000            | 2 & 6             | <i>R. kanagurta</i> , <i>D. macrosoma</i> ,<br><i>D. maruadsi</i>                        |
|                         |                   | Total                    | 90,000           | 24 & / 72         |  |
| <b>Andaman Sea:</b>     |                   |                          |                  |                   |  |
| 1.                      | Indonesia         | 1. Banda Aceh            | 6,000            | 2 & 6             | <i>R. kanagurta</i> , <i>R. brachysoma</i>   |
| 2.                      | Malaysia          | 2. K. Perlis / Pangkor   | 6,000            | 2 & 6             | <i>R. kanagurta</i> , <i>R. brachysoma</i>   |
| 3.                      | Myanmar           | 3. Yangon / Thandre      | 5,000            | 2 & 6             | <i>R. kanagurta</i> , <i>R. brachysoma</i>   |
| 4.                      | Thailand          | 4. Myeik                 | 5,000            | 2 & 6             | <i>R. kanagurta</i> , <i>R. brachysoma</i>   |
|                         |                   | 5. Satun                 | 5,000            | 2 & 6             | <i>R. kanagurta</i> , <i>R. brachysoma</i>   |
|                         |                   | 6. Ranong                | 5,000            | 2 & 6             | <i>R. kanagurta</i> , <i>R. brachysoma</i>   |
|                         |                   | Total                    | 32,000           | 18 & 36           |  |
|                         |                   | Grand Total              | 122,000          | 42 & 108          |  |
|                         |                   |                          | 2,440 stacks tag | 42 guns /36 boxes |  |

Note: 1 stack = 50 tags      1 boxes = 3 needles

- Always carry at least one spare tagging gun and needle, as this will enable you to rectify any problem after your tagging is finished for the day.

#### F. Tagging data forms

Information from this tagging program is collected using two dedicated forms. All data collected during the tagging operation is kept in 'Tagging Data Sheet' (Table 3). Data / information obtained on the recovery of the tagged fishes are gathered in 'Recovery Data Sheet' (Table 4).

'Tagging Data Sheet' is to be filled by the country conducting the tagging activities. The information includes tag number and size of the tagged fish (Fork-length, mm). The form also captures the date, the position of the tagging operation and the name of person who does the data recording.

'Recovery Data Sheet' is to gather information of the tagged fish either by the 'tagged' country or by another country where the fish was recaptured. Record/report on date, location, species, tag number, body length (Fork-length) and GSI of the recaptured fish are required.

Table 3: Tagging Data Sheet Form – records of the tagged fish

**REGIONAL SMALL PELAGIC FISH TAGGING PROGRAM IN THE SOUTH CHINA SEA AND ANDAMAN SEA**

**Tagging Data Sheet**

Country:  Sea Area:  SCS  Andaman Tagging site:

Country Code:  Numerals of the first 3 digits of tag number:

Releasing position: (Start Lat (N / S):  Long (E): )  
 (Time Start:  Time finish: )  
 (Vessel Reg. No.:  Gear Type: )  
 Tag Person's name:  Date(dd/mm/yy):

| No | FL (mm) | Species |    |     | Remarks | No | FL (mm) | Species |    |    | Remarks | No | FL (mm) | Species |     |    | Remarks |
|----|---------|---------|----|-----|---------|----|---------|---------|----|----|---------|----|---------|---------|-----|----|---------|
|    |         | Rk      | Rb | Dmc |         |    |         | Dmr     | Rk | Rb |         |    |         | Dmc     | Dmr | Rk |         |
| 0  |         |         |    |     |         | 25 |         |         |    |    |         | 50 |         |         |     |    |         |
| 1  |         |         |    |     |         | 26 |         |         |    |    |         | 51 |         |         |     |    |         |
| 2  |         |         |    |     |         | 27 |         |         |    |    |         | 52 |         |         |     |    |         |
| 3  |         |         |    |     |         | 28 |         |         |    |    |         | 53 |         |         |     |    |         |
| 4  |         |         |    |     |         | 29 |         |         |    |    |         | 54 |         |         |     |    |         |
| 5  |         |         |    |     |         | 30 |         |         |    |    |         | 55 |         |         |     |    |         |
| 6  |         |         |    |     |         | 31 |         |         |    |    |         | 56 |         |         |     |    |         |
| 7  |         |         |    |     |         | 32 |         |         |    |    |         | 57 |         |         |     |    |         |
| 8  |         |         |    |     |         | 33 |         |         |    |    |         | 58 |         |         |     |    |         |
| 9  |         |         |    |     |         | 34 |         |         |    |    |         | 59 |         |         |     |    |         |
| 10 |         |         |    |     |         | 35 |         |         |    |    |         | 60 |         |         |     |    |         |
| 11 |         |         |    |     |         | 36 |         |         |    |    |         | 61 |         |         |     |    |         |
| 12 |         |         |    |     |         | 37 |         |         |    |    |         | 62 |         |         |     |    |         |
| 13 |         |         |    |     |         | 38 |         |         |    |    |         | 63 |         |         |     |    |         |
| 14 |         |         |    |     |         | 39 |         |         |    |    |         | 64 |         |         |     |    |         |
| 15 |         |         |    |     |         | 40 |         |         |    |    |         | 65 |         |         |     |    |         |
| 16 |         |         |    |     |         | 41 |         |         |    |    |         | 66 |         |         |     |    |         |
| 17 |         |         |    |     |         | 42 |         |         |    |    |         | 67 |         |         |     |    |         |
| 18 |         |         |    |     |         | 43 |         |         |    |    |         | 68 |         |         |     |    |         |
| 19 |         |         |    |     |         | 44 |         |         |    |    |         | 69 |         |         |     |    |         |
| 20 |         |         |    |     |         | 45 |         |         |    |    |         | 70 |         |         |     |    |         |
| 21 |         |         |    |     |         | 46 |         |         |    |    |         | 71 |         |         |     |    |         |
| 22 |         |         |    |     |         | 47 |         |         |    |    |         | 72 |         |         |     |    |         |
| 23 |         |         |    |     |         | 48 |         |         |    |    |         | 73 |         |         |     |    |         |
| 24 |         |         |    |     |         | 49 |         |         |    |    |         | 74 |         |         |     |    |         |

Others (Sea Condition, etc.):  
 Remarks: Condition of the tagged fish during the time of release: Code 1: Swim normally/healthily Code 2: Swim Sideway Code 3: Dying Code 4: Dead  
 Rk: *Rastrelliger kanagurta*; Rb: *Rastrelliger brachysoma*; Dmc: *Decapterus macrossoma*; Dmr: *Decapterus maruadsi*

Table 5: List of materials / equipments for tagging activities

| No. | Name of materials / equipments   | No. per tagging site | Responsibility of |
|-----|--|----------------------|-------------------|
| 1.  | Applicator / Tag Gun   | 2                    | MFRDMD            |
| 2.  | Fish Tag (in a plastic bag or in a box?)                                   | Ref. Table 7         | MFRDMD            |
| 3.  | Applicator Needle  | Ref. Table 7         | MFRDMD            |
| 4.  | Anti-rust spray  | 1 can                | Country           |
| 5.  | Ethanol (70%) & Cotton   | 500 ml               | Country           |
| 6.  | Live fish holding tank (dark colour round tank, about 1 meter in diameter) | 1                    | Country           |
| 7.  | Aeration system (pump & 2 air stones)                                      | 1                    | Country           |
| 8.  | Live fish holding Tank cover net (dark colour)                             | 1                    | Country           |
| 9.  | Scoop net  | 2                    | TD + Country      |
| 10. | Measuring board (in 1 mm scale)  | 1                    | Country           |
| 11. | Wet sponge sheet or soft cloth   | 1                    | Country           |
| 12. | Hand cloth glove   | 2                    | Country           |
| 13. | Writing board & writing materials  | 1                    | Country           |
| 14. | Tagging Forms  | 20 / sp. (?)         | Country           |
| 15. | Fresh water (for cleaning the tagging equipments)                          | 10 liters            | Country           |

Table 6: List of materials / equipments for recovery of tagged fish

| No. | Name of materials / equipments  | No. / site     | Responsibility of |
|-----|---------------------------------|----------------|-------------------|
| 1.  | Scissor                         | 1              | Country           |
| 2.  | Forceps                         | 1              | Country           |
| 3.  | Weighing balance (body & gonad) | 1              | Country           |
| 4.  | Recovery forms                  | 10 per sp. (?) | Country           |
| 5.  | Measuring board (in mm)         | 1              | Country           |

**5. Recovery procedure**

Data obtained from the recaptured of tagged fish forms the fundamental for understanding movement patterns, growth rates, seasonal variation and reasons for the migration of the small pelagic species under the study. Reward in terms of cash money will be paid to the individual who found and returned tagged fish to the project official. Therefore, publicity in the forms of poster distribution and news dissemination through mass media (radio, television, and newspaper) on the conduct of this tagging project is very important to create awareness among the general public.

The recovery of the tagged fish could happen in the same country that conduct the tagging (A) or from a country different than the tagging country (B). The diagrams below explain the steps need to be followed in the two scenarios.

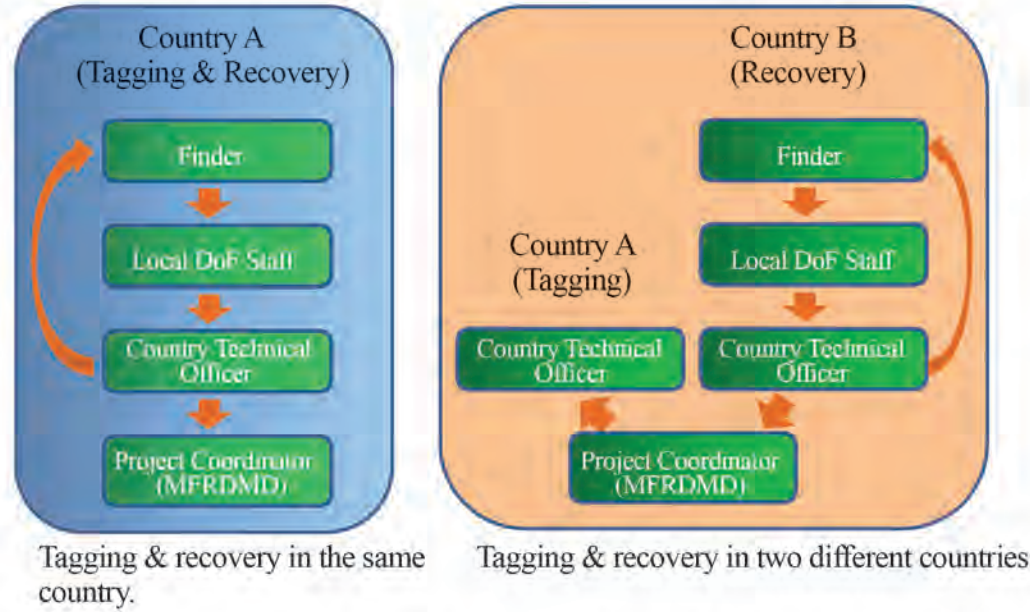


Figure 10: The procedures for recovery of tagged fish in two different scenarios. Arrow from Country Technical Officer to Finder indicates the flow of reward provision.

Table 4: Recovery Data Sheet Form – records information of the recaptured tagged fish

| Country | Tag No. | Species <sup>1</sup> | FL (mm) | Sex (M/F) | Reported by:         |      | GSI* | Recapture date |   |   | Recapture location**/ site | Submitted date |                        |      |                   |            |  |  |
|---------|---------|----------------------|---------|-----------|----------------------|------|------|----------------|---|---|----------------------------|----------------|------------------------|------|-------------------|------------|--|--|
|         |         |                      |         |           | Weight (gm)<br>Gonad | Body |      | D              | M | Y |                            | Country        | Vessel Name / Reg. No. | Gear | Port <sup>2</sup> | Descoverer |  |  |
|         |         |                      |         |           |                      |      |      |                |   |   |                            |                |                        |      |                   |            |  |  |
|         |         |                      |         |           |                      |      |      |                |   |   |                            |                |                        |      |                   |            |  |  |
|         |         |                      |         |           |                      |      |      |                |   |   |                            |                |                        |      |                   |            |  |  |
|         |         |                      |         |           |                      |      |      |                |   |   |                            |                |                        |      |                   |            |  |  |
|         |         |                      |         |           |                      |      |      |                |   |   |                            |                |                        |      |                   |            |  |  |
|         |         |                      |         |           |                      |      |      |                |   |   |                            |                |                        |      |                   |            |  |  |
|         |         |                      |         |           |                      |      |      |                |   |   |                            |                |                        |      |                   |            |  |  |
|         |         |                      |         |           |                      |      |      |                |   |   |                            |                |                        |      |                   |            |  |  |
|         |         |                      |         |           |                      |      |      |                |   |   |                            |                |                        |      |                   |            |  |  |
|         |         |                      |         |           |                      |      |      |                |   |   |                            |                |                        |      |                   |            |  |  |
|         |         |                      |         |           |                      |      |      |                |   |   |                            |                |                        |      |                   |            |  |  |
|         |         |                      |         |           |                      |      |      |                |   |   |                            |                |                        |      |                   |            |  |  |
|         |         |                      |         |           |                      |      |      |                |   |   |                            |                |                        |      |                   |            |  |  |
|         |         |                      |         |           |                      |      |      |                |   |   |                            |                |                        |      |                   |            |  |  |

Species<sup>1</sup>: Rk (*Rastrelliger kanagurta*); Rb (*Rastrelliger brachysoma*); Dmc (*Decapterus macrossoma*); Dmr (*Decapterus maruadsi*)  
Port<sup>2</sup>: Fish landing port  
\*GSI: (weight of reproductive organ / body weight) x 100      \*\* Recapture location: Lat: \_\_\_\_\_



**4. Tagging procedure**

Ideally, the live fish should be kept in a round aerated tank on board the vessel deployed for the tagging operation. At least four persons are required for a tagging operation: Person 1 - to scoop the live fish and identify its species, Person 2 - to hold the fish and do the measurement, Person 3 - to carry out tagging work, Person 4 - to record data / information including condition of the tagged fish during the release.

Tags along with tag applicator, measuring tape / board and data sheets should be organized before beginning the tagging operation. Following the tagging gun instructions, ensure that the strip of tags is correctly inserted (the lowest tag number is inserted first). Also make sure the needle locating knob is in the locked position. The tagging procedure is elaborated in nine steps as listed below:

- i. Normal procedures for minimizing trauma and damage to the fish should be employed. The fish scooped by a net from the tank should be handled with cloth gloves to minimize damage to the skin and protective slime of the fish. Control the fish, gently but firmly, so it cannot “flop” around and cause any further injury to itself. Weak and stunned fish should not be used for tagging. Call out species name for data recording.
- ii. Measure fish on measuring board or horizontal tape, preferably with head pressed gently against perpendicular surface (measuring board is preferred). Call out fork length (mm) for data recording.



Measuring fork-length of the fish before the tagging operation.

- iii. Stand the fish with both hands to give support to tag entry. The best position to insert the needle is at the dorso-lateral portion of the trunk just below a mid point of the first dorsal-fin base.

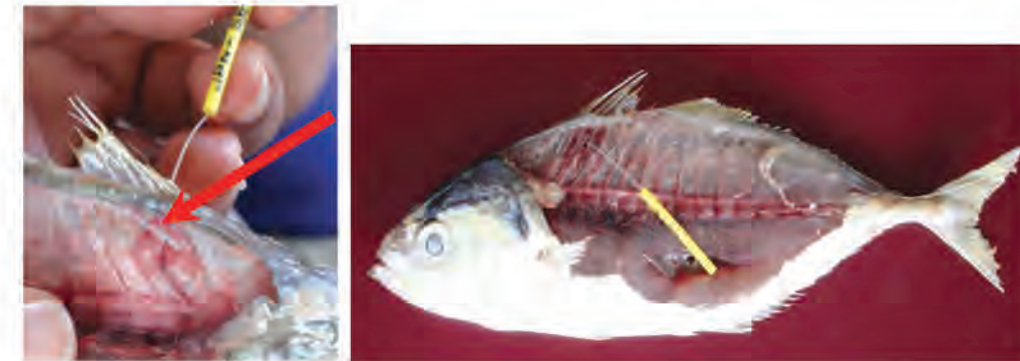


The best position to insert the T-bar 2 tag just below the base of the first dorsal fin



The T-bar 2 tag inserted in the fish musculature just below dorsal-fin base.

- iv. At the point of tagging the fish should be under as much control as possible. Push the needle towards the head at as shallow an angle as possible ( $45^{\circ}$  angle frontward), until the anterior part of the needle penetrates the fish body.
- v. Hold the gun steady and squeeze the handle fully so as to eject the tag. After ensuring that “T” anchor penetrates the fish body, the needle should be withdrawn from the body.
- vi. Always remember to call out the tag number and to check it again to ensure the correct tag number was recorded before the release of the fish.



**Figure 9:** The T-bar 2 tag anchored just below dorsal-fin base of the small pelagic fish.

- vii. If the anchor is still in the body and is not pulled out of the muscle, record this as a successful tag in the data sheet form. If tag pulls completely out of muscle and is only just under the skin, pull out and discard tag (note your discarded tag no. on data form). Retag fish with another tag. If you feel the fish is becoming overly stressed, simply release the fish without a tag, and then tag the next one.
- viii. Releasing the tagged fish should be done gently. If the fish floats away on its side / back and does not quickly swim normally, note this on the data form.