






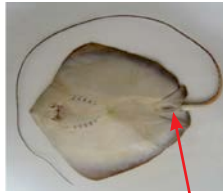
Application of Standard Operating Procedures for Collecting Data on Sharks and Rays in Southeast Asian Countries

Worawit Wanchana, Ahmad bin Ali and Sukchai Arnupapboon

The increasing pressure from international community to list several commercially-captured shark and ray species in the CITES Appendices has caused grave concern for many Southeast Asian countries. In their efforts of developing their respective management plans for sharks and rays, the ASEAN Member States (AMSs) sought the assistance of SEAFDEC in species identification of elasmobranchs as this is a fundamental step in efficient data collection and in the development of effective management measures for these species which are considered economically important in the Southeast Asian region. In response, SEAFDEC implemented a one-year SEAFDEC Regional Project on Sharks and Rays Data Collection which was financially supported by the Government of Japan (through the SEAFDEC Secretariat and MFRDMD) and the European Union (EU) through the CITES Secretariat. The one-year Project activities implemented from 2015 to 2016, were aimed at strengthening the expertise and capacity of the AMSs in species identification and compilation of biological data on sharks and rays for better management, conservation, and enforcement of the necessary management measures, and were carried out in pilot countries of the ASEAN, namely: Cambodia, Indonesia, Malaysia, Myanmar, Thailand, and Viet Nam.

The Southeast Asian waters have been reported to embrace the richest elasmobranch diversity in the world. However, the status of these resources and their utilization remain vague due to inadequate data on catch landings at species level. In addition, marketing, trade and utilization data are also very limited due to the inability of the countries to collect and compile the necessary data. Such limitations led to the difficulties encountered by many ASEAN Member States (AMSs) in carrying out stock assessment, fishers dependencies of sharks and rays as well as, and developing management measures for these economically-important species (Wanchana *et al.*, 2016). Nevertheless, in an effort to help out the AMSs address their concerns and comply with international requirements to avoid the possible listing of these species in the CITES Appendices, SEAFDEC launched a one-year project on sharks and rays data collection in Southeast Asia. Supported by the Japanese Trust Fund and the European Union, the SEAFDEC Regional Project on Sharks and Rays Data Collection was initially implemented in seven AMSs as pilot countries, namely: Cambodia, Indonesia, Malaysia, Myanmar, Thailand, Viet Nam, and the Philippines. However, the latter country was not able to complete the one-year data collection process of the Project as planned. During the implementation of the Project, the Standard

Box 1. Main Features of the Standard Operating Procedures (SOPs) on Sharks Data Collection in Southeast Asia

Approach	Procedure
<p>Sampling at Landing Sites</p>	<ul style="list-style-type: none"> • Identification of landing sites <ul style="list-style-type: none"> - Select the major landing sites/jetties of sharks and rays, which must be accessible to enumerators, must have good working condition/space area to record length-weight of sharks and rays specimens, and there must be good support, cooperation and communication with local fishers, traders and boat owners • Compilation of information at selected landing sites <ul style="list-style-type: none"> - Determine how many sites/jetties are suitable for data collection - Identify and record the main fishing gears used for catching fish landed at the jetties, e.g. gillnet, longline, trawl - Identify and record the main fishing gears used for catching sharks and rays landed at the jetties, e.g. gillnet, longline, trawl - Identify other fishing gears used for catching sharks and rays, e.g. bottom gillnet, traps, miscellaneous (harpoon, spear, etc) - Record data on fishing operations, i.e. how many days per trip of each fishing operation, length of trawling time - Record the time when all catches are landed • Sampling techniques <ul style="list-style-type: none"> - Sample size: target is 1-3 fishing boats per day (fishery profile of study sites is necessary for choosing the sample boats) - Sampling days: five days per month (although countries are encouraged to collect landing data more than 5 days/month if possible using national budget) <ul style="list-style-type: none"> - Sampling should be done for at least 12 fishing boats/month - In some cases, sampling the same boat every day or week is acceptable - Landing data must be collected from multi-gear (trawl, longline, gillnet) and if there are too many gears used, focus only on main gears that catch sharks and rays - Select boats that land catches separately from other boats at a jetty - If fishing boat is suspected to be IUU fishing boats or unlicensed or without registration, take note of the boat owner's name - Do not select landing sites where boat owner mixes catch of sharks and rays from other boats • Sampling of sharks and rays for recording of landing data <ul style="list-style-type: none"> - Separate sharks and rays by groups, i.e. sharks, rays - Separate sharks and rays by species - Separate sharks and rays by sex (male, female)
<p>Equipment and Techniques for Measuring Sharks and Rays</p>	<ul style="list-style-type: none"> • Measuring sharks <ul style="list-style-type: none"> - Measure total length (TL) of all shark species (except for <i>Alopias</i> spp or other sharks/rays species without caudal fin) where the pre-caudal length (PCL) is measured) as shown in Fig. 1 and Fig. 2, respectively, using measuring tape of ruler which must be put straight from shark head to tail in horizontal position (it is easy to measure if enumerators use a big caliper) - Do not put measuring tape on the dorsal nor ventral surface of shark because both areas are not flat • Measuring rays <ul style="list-style-type: none"> - Measure disc length (DL) of all rays and skates (except those from order Pristiformes, Rhinobatiformes and Torpediniformes where the total length (TL) is measured) as shown in Fig. 3 and Fig. 4, respectively, using measuring tape or ruler which must be put straight (it is easy to measure if enumerators use a big caliper) - Do not put measuring tape on the dorsal surface because this area is not flat - Measure DL of rays, eagle rays (Family Myliobatidae), Mobula and Manta Rays (Family Mobulidae) either from dorsal side or ventral side (Fig. 5, Fig. 6) • Recording sex of sharks and rays <ul style="list-style-type: none"> - Identify the sex of sharks and rays by looking for claspers (male) or cloaca (female) <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Male claspers</p> </div> <div style="text-align: center;">  <p>Female cloaca</p> </div> <div style="text-align: center;">  <p>Male claspers</p> </div> <div style="text-align: center;">  <p>Female cloaca</p> </div> </div>
<p>Photography Techniques for Unidentified Specimens</p>	<ul style="list-style-type: none"> • Difficulties in identifying some species Some species may be difficult to identify because enumerators are not well-trained: specimens are uncommon; specimens are probably new species; specimens are new record in country or region; specimens are newly-born or too old; specimens are not listed in the field guide prepared by SEAFDEC; specimens are in bad condition or already rotten; some body parts of specimens may be lost or broken.

Box 1. Main Features of the Standard Operating Procedures (SOPs) on Sharks Data Collection in Southeast Asia (Cont'd)

Approach	Procedure
<p>Photography Techniques for Unidentified Specimens (Cont'd)</p>	<ul style="list-style-type: none"> • Unidentified specimens For unidentified specimens, enumerators must take photographs and send these to national experts or regional expert for correct identification. • Use “Line” or “Whatsapp” applications or email For proper identification and verification of species using “Line” or “Whatsapp” applications or email and coordinate with national experts or the regional expert, using the following addresses: National Experts <i>Mr. Tassapon Krajangdara (Thailand)</i> Tel: +6676391138 (office), +66840542315 (private); Fax: +6676391139; Email: <i>tas19702011@hotmail.com</i> <i>Ms. Lim Pek Khiok (Malaysia)</i> Tel: +6082349533 (office), +60138068272 (private); Fax: 6082349686; Email: <i>pekhiok@hotmail.com</i> <i>Mr. Dharmadi (Indonesia)</i> Tel: +622164700929 (office), +6281389200731 (private); Fax: +62164700927; Email: <i>darma_ancol@yahoo.com</i> <i>Mr. Fahmi (Indonesia)</i> Tel: +622164713850 (office), +6281387889155; Fax: +622164711948; Email: <i>fahmi_lipi@yahoo.com</i> Regional Expert <i>Dr. Ahmad bin Ali</i> Tel: +6096171543/6096175940 (office), +6096173150 (private); Fax: +6096175136; Email: <i>aseafdec@seafdec.org.my</i>
<p>Photography Techniques</p>	<ul style="list-style-type: none"> • Photography techniques for recording sharks <ul style="list-style-type: none"> - Take photo of whole body of shark, identify the species or write the code number of species - Use white or dark background (polystyrene) depending on color of specimens - Take close up photo of the shark’s eye - Take close up photo of gill slits - Take close up photo of 1st dorsal fin - Take close up photo of 2nd dorsal fin (making sure that color of dorsal fin tip is clear) - Put white background so that the white color of tip could be clearly seen - Take close up photo of caudal fin - Take close up photo of 2nd dorsal fin and anal fin (to compare size of 2nd dorsal fin and anal fin) - Take close up photo of the free rear tip of second dorsal fin and anal fin - Take close up photo of whole body (top view) - Take photo of top view (whole body) and head - Take close up photo of inter-dorsal space - Take close up photo of inter-dorsal to check whether inter-dorsal ridge is present or not - Take close up photo showing shape of pre-caudal pit - Take close up photo of underside of head - Take close up photo of cloaca or claspers (to check whether shark is male or female) • Photography techniques for recording rays and skates <ul style="list-style-type: none"> - Take photo of whole body of rays/skates, identify the species or write the code number of species - Use white or dark background (polystyrene) depending on color of specimens - Take close up photo of the head - Take close up photo of the head side - Take close up photo of the center of disc - Take close up photo of the base of tail and end of tail - Take photo of ventral side (whole body) - Take close up photo of mouth • Difficulties in identifying species of sharks, rays and skates <ul style="list-style-type: none"> - When head is not in good position and fin(s) not complete - Photograph is taken only from ventral side - Photograph is taken with someone holding the specimen
<p>Data Key-in and Management</p>	<ul style="list-style-type: none"> • Data Management <ul style="list-style-type: none"> - Enumerator to key-in all data from field form in Microsoft Excel and email to National Coordinator at the end of each sampling month or within the first week of new sampling month - National Coordinator to verify all data and any miss-recording will be referred back to enumerator - Data are then keyed and arranged according to standard for “Pivot Table” analysis or for shark database managed by SEAFDEC • Expected Output <ul style="list-style-type: none"> - One national report published by each participating country on landing data of sharks and rays at species level and CPUE with corresponding percentages, prices at jetty and marketing information - One regional report published by SEAFDEC Secretariat on landing data of sharks and rays at species level and CPUE with corresponding percentages, prices at jetty and marketing information

Operating Procedures (SOPs) on Sharks Data Collection in Southeast Asia was developed and was used to harmonize data collection, compilation, analysis, and reporting (Ali *et al.*, 2016).

Standard Operating Procedures on Sharks Data Collection in Southeast Asia

The Standard Operating Procedures (SOPs) on Sharks Data Collection in Southeast Asia was developed to serve as guide and reference for enumerators from the pilot countries during their sampling activities for data collection on sharks and rays. Specifically, the SOPs is also intended to guide the enumerators in recording the landing information at species level and corresponding local prices which could be used for developing management measures for sharks and rays. In order to achieve such objectives, the SOPs comprises five main approaches (Ali *et al.*, 2016) as shown in **Box 1**.

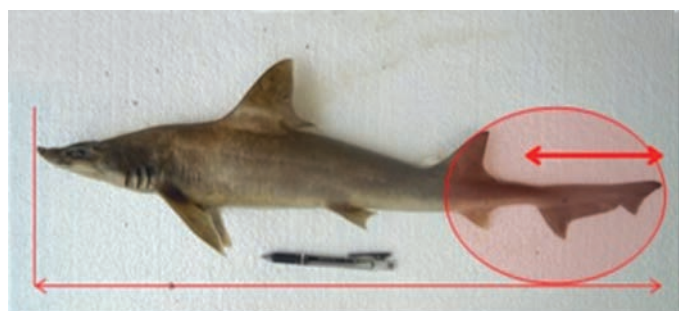


Fig. 1. Proper way of measuring the total length (TL) of sharks

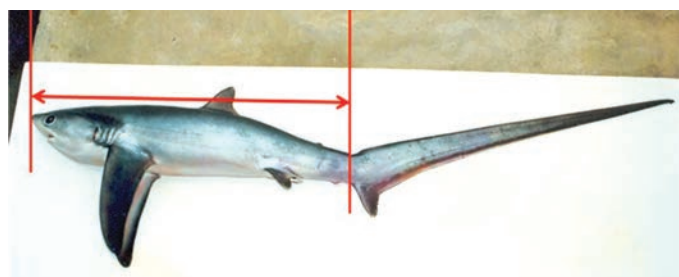


Fig. 2. Proper way of measuring the pre-caudal length (PCL) of *Alopias* spp. and other sharks without tail or with damaged tail

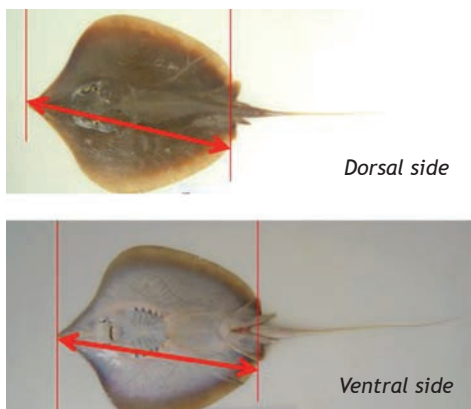


Fig. 3. Proper way of measuring the disc length (DL) of rays (measure either from dorsal or ventral side)



Order Pristiformes



Order Rhinobatiformes



Order Torpediniformes

Fig. 4. Proper way of measuring the total length (TL) of rays from Order Pristiformes, Rhinobatiformes and Torpediniformes

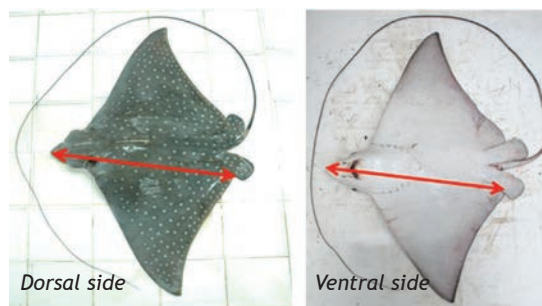


Fig. 5. Proper way of measuring the disc length (DL) of eagle rays from Family Myliobatidae (measure either from dorsal or ventral side)

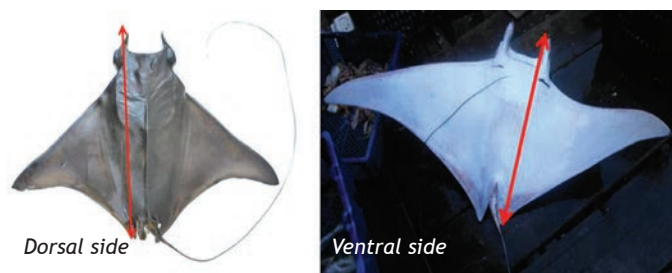


Fig. 6. Proper way of measuring the disc length (DL) of mobula and manta rays from Family Mobulidae (measure either from dorsal or ventral side)

Conclusion and Recommendations

While the one-year SEAFDEC Regional Project on Sharks and Rays Data Collection has come to an end, a Project-End Meeting was convened in August 2016 to provide a forum

for the Project's participating countries to report and discuss the results of their one-year data collection from selected landing sites in their respective countries. It was also the most appropriate time to validate the data collected which would be compiled for the regional report on the Project which would be disseminated to the Southeast Asian countries.

During the data validation and verification however, the general consensus was for the countries to harmonize the data collected based on the SOPs to ensure that these could be used for the computation of CPUEs required for stock assessment of sharks and rays in the respective countries (SEAFDEC, 2016). Nevertheless, the SOPs developed through this one-year Project could also be used as reference and/or guide for the development of similar SOPs for other economically-important aquatic species, especially freshwater species. As noted in various reports, difficulties have been encountered by the AMSs in fisheries data collection as many countries have insufficient expertise in aquatic species identification, e.g. in the case of catadromous eels. Therefore, fisheries data collection in inland fisheries could be improved with the development and use of relevant SOPs.

Way Forward

The Project Report would be published, including the Standard Operating Procedures (SOPs) on Sharks Data Collection in Southeast Asia, which would be disseminated to the countries in Southeast Asia. Nonetheless, during the August 2016 Project-End Meeting, the AMSs strongly indicated the need to organize a regional training-workshop on stock assessment and data collection of total fishing effort of common fish species. Moreover, the AMSs also asked SEAFDEC to publish a manual or guidebook for species identification of sharks and rays which could national enumerators could use to enhance their capacities in this aspect. For other aquatic species that are commercially important in the region, similar effort could be exerted, especially for freshwater aquatic species. Meanwhile, the AMSs have also asked SEAFDEC to continue supporting human resource development on sharks and rays species identification even after the completion of the SEAFDEC Project, as well as continue enhancing the region's capacity in data collection and analysis for stock assessment. The AMSs on their part, agreed to continue improving their data collection on sharks and rays based on the SOPs which would include compilation of total fishing effort for CPUE analysis and stock assessment. Lessons could therefore be learned by the AMSs from this Project's experience for similar initiatives to be undertaken for other economically-important aquatic species especially those in inland fisheries.

References

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