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Report of the

**EXPERT WORKSHOP TO ESTIMATE THE MAGNITUDE OF
ILLEGAL, UNREPORTED AND UNREGULATED FISHING
GLOBALLY**

Rome, 2–4 February 2015

Report of the
Expert Workshop to Estimate the Magnitude of Illegal, Unreported and Unregulated Fishing Globally
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PREPARATION OF THIS DOCUMENT

This is the report of the Expert Workshop to Estimate the Magnitude of Illegal, Unreported and Unregulated Fishing Globally, held in Rome from 2 to 4 February 2015.

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ABSTRACT

Illegal, unreported and unregulated (IUU) fishing remains one of the greatest threats to aquatic ecosystems, undermining national and regional efforts to manage fisheries sustainably and conserve aquatic biodiversity. In 2003, it was estimated that the lower and upper estimates of the total value of IUU fishing worldwide were between US\$10bn and US\$23 billion annually, representing between 11.06 million and 25.91 million tonnes of fish. Recognizing that it is now more than ten years since the original study, the magnitude and characteristics of IUU fishing are likely to have changed significantly. Accordingly, a new estimate of IUU fishing involving FAO is timely. Within this context, FAO convened an Expert Workshop to consider approaches to developing a robust methodology to estimate IUU fishing globally. The workshop was held in Rome, from 2 to 4 February 2015 and was attended by key experts in their individual capacity. The main conclusions include the role of FAO in coordinating a global estimate of IUU fishing, through proposed actions that include *inter alia*: (i) FAO to prepare a report titled “A study of studies on IUU fishing estimation”, and to draft “technical guidelines to estimate IUU fishing”; and (ii) to further consider how the above actions could be combined to develop a global estimate of IUU fishing.

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Opening of the meeting and welcoming remarks

1. In 2003, at the Twenty-fifth Session of the Committee on Fisheries (COFI), the Committee expressed concern about the continuing high and growing incidence of illegal, unreported and unregulated (IUU) fishing and the lack of effective implementation of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA–IUU).
2. At the Twenty-seventh Session of COFI, its members agreed that the incidence and extent of IUU fishing remained a grave threat to sustainability and that it should be addressed comprehensively. At its Thirtieth Session, COFI reported that IUU fishing remained a persistent and pervasive problem in world fisheries. Exacerbating poverty and food insecurity, IUU fishing continues to be a major threat to the long-term sustainability of fisheries and to the maintenance of productive and healthy marine ecosystems, and it can cause unstable socio-economic conditions, in particular, in some developing countries where fisheries management capacity is inadequate or controls are weak.
3. In the ten years that have passed since the often-quoted global study on IUU fishing was published¹ and recognizing that various IUU fishing related instruments are now under implementation,² it is likely that the magnitude and characteristics of IUU fishing have changed. Accordingly, a new estimate of IUU fishing is timely.
4. An estimate of global IUU fishing would allow FAO and its Members to understand more effectively the current extent of the problem and to stimulate institutional, financial and technical support for new efforts to combat IUU fishing. Within this context, FAO convened an Expert Workshop to consider development of a methodology to estimate IUU fishing globally.
5. FAO technical officers, industry representatives, fisheries experts from Members, civil society, and fisheries consultants attended the workshop. The attendance list is provided in Appendix 1.
6. Mr Francis Chopin, Chief of FAO's Fishing Operations and Technology Branch, called the meeting to order and invited Mr Árni M. Mathiesen, Assistant Director-General (ADG), FAO Fisheries and Aquaculture Department, to make an opening statement on behalf of FAO Director-General, Mr José Graziano da Silva. In his opening remarks, Mr. Mathiesen reported that IUU fishing could occur in the exclusive economic zones (EEZs) of coastal States by national and foreign vessels, in inland fisheries as well as in the high seas. He noted that although FAO had not been directly involved in previous estimates of IUU fishing, others had reported that substantial IUU fishing occurs worldwide with lower and upper estimates of the total value of illegal and unreported fishing losses worldwide between US\$10 billion and US\$23.5 billion annually, representing between 11 million and 26 million tonnes of fish. Mr Mathiesen highlighted the fact that IUU fishing products often came from fisheries lacking the strong and effective enforcement of conservation and management measures to which the fishing industry was subject. Most often, IUU fishing violates conservation and management measures established under national law or through international agreements. By undermining domestic and international conservation and management efforts, IUU fishing seriously affects fish stocks and also the broader aquatic ecosystems and the food security and livelihoods of lacustrine, riparian and coastal communities dependent on them. Mr Mathiesen thanked the experts at the workshop for taking the time to consider these important issues and extended his sincere appreciation to the Pew Charitable Trusts for their financial support towards convening this workshop as well as investment in terms of time and travel made by each respective workshop participant. His statement is attached as Appendix 2.

¹ Agnew, D.J., Pearce, J., Pramod, G., Peatman, T., Watson, R., Beddington, J.R. & Pitcher, T.J. 2009. Estimating the worldwide extent of illegal fishing. *PLoS ONE*, 4(2): e4570 [online]. [Cited 3 July 2015]. <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0004570>

² FAO. 2005-2015. International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing - Web site. Illegal, Unreported and Unregulated (IUU) fishing. FI Institutional Websites. Text by David J. Douman. In: *FAO Fisheries and Aquaculture Department* [online]. Rome. Updated 30 June 2014. [Cited 3 July 2015]. www.fao.org/fishery/iuu-fishing/en

7. Mr. Joe Zelasney (Pew Charitable Trusts) thanked the participants for attending and for the opportunity to partner with FAO in supporting the workshop, and provided information about the Pew Charitable Trusts Stop IUU Fishing Project.
8. Participants attending in their individual capacity made short self-introductions, noting their interests in the problem of IUU fishing.

Arrangements of the workshop

9. The workshop prospectus and agenda were presented and are attached as Appendix 3.
10. The objectives of the workshop were presented by FAO, noting that the workshop intention was to: (i) develop an FAO-led methodology to estimate IUU fishing globally; and (ii) provide guidance on follow-up priority actions for a new global estimate, noting the need for an approach based on pragmatism and available funding for possible future FAO-coordinated activities.
11. Participants' attention was drawn to the three background papers prepared for the workshop and other materials made available. The background papers are attached as submitted as Appendix 4.
12. Background Paper 1³ was presented and participants were asked to consider the scope of future FAO work to estimate IUU fishing. Considerations presented to the workshop included *inter alia*:
 - methodological issues associated with estimating IUU fishing such as data sources, data availability and their robustness;
 - advocacy to generate a “big number” to motivate for action around the issue; this might require a global estimate, but could be difficult to achieve (given the need for multiple methods and complexities);
 - monitoring progress of the impacts of implementation of international instruments over time, e.g. for the IPOA-IUU, in which case some selected indicators might be sufficient;
 - understanding the characteristics and dynamics of IUU fishing at the global level because of the importance of all fisheries in terms of their contributions to food security and livelihoods, and to have a focus on improving overall data collection/reporting;
 - there are huge gaps in the knowledge on inland fisheries catches and this is an important area to include in a global assessment that has hitherto often been overlooked in the discussions on IUU;
 - develop technical guidelines for future studies trying to estimate IUU fishing;
 - the costs associated with estimating IUU fishing.
13. Discussions arising from the presentation included:
 - the drivers of IUU fishing (and how they have changed over time) may help to understand the methodology that might be appropriate to estimate IUU fishing;
 - the relevance of IUU activities after landing was noted, particularly because there is a lot of information available on trade, but incorporating this type of information (e.g. illegally traded) into global estimates would add a further degree of complexity;
 - data richness varies greatly among regions and types of IUU fishing. This would be the case even for specific regions over time. Different levels of data availability will to some extent determine the methodologies chosen, and may make a global estimate very problematic without considering regional specificities;
 - recreational and inland fisheries could be relatively important in value terms, in some countries, as could fisheries for ornamental fish, in terms of the magnitude of IUU fishing;

³ Background Paper 1 – Issues to be considered in the formulation of an analytical framework for the estimation of IUU fishing.

- from a policy and lobbying perspective, a financial estimate of the ex-vessel value of IUU catches (to accompany an estimate of weight) could be critical in generating momentum to act against IUU fishing;
- consideration of the metrics focusing not just on the weight of catch, but on the number of vessels, effort, etc., could assist in estimating IUU fishing;
- fuel suppliers could be a useful source of data;
- given the technical specificities of IUU fishing estimation methodologies, the preferred pathway for publishing would be to use standard FAO practices in preparing “technical guidelines” in support of FAO instruments such as the FAO Code of Conduct for Responsible Fisheries (the Code) and International Plans of Action (IPOAs). Following their completion, they could be presented to COFI for their consideration;
- care needs to be taken to ensure that the workshop and any future work do not seek to re-define the definitions of IUU fishing in the IPOA-IUU;
- consideration of developing separate methodologies for: (i) regional estimates (e.g. for data-rich/poor areas, marine/inland areas, etc.), and (ii) a global estimate based on regional estimates (using different proxies in data poor situations);
- one of the objectives of developing a methodological toolbox and estimating IUU fishing regionally and globally is that this would allow tracking changes over time. This is more interesting at the regional level than the global level. In this way, the IUU fishing drivers and effective actions taken can be better identified. This is a major benefit of developing a validated set of tools to apply to different situations.

How to define and distinguish between the I, the U, and the U of IUU fishing for the purposes of future estimates

14. Background Paper 2⁴ was presented to the workshop. It was reported that the IPOA-IUU provided only illustrative descriptions (not a definition of IUU fishing *per se*) of the concept of IUU fishing and its different components. It was highlighted that the IPOA-IUU descriptions were narrow and often overlapped, and that the definitions of unreported and unregulated may be less relevant than when they were initially proposed. The workshop was asked to decide whether IUU fishing should be considered as one concept, or whether the I, the U, and the U of IUU fishing, should be separately defined.
15. Participants generally agreed that defining the I, U and U separately might not be useful as the unreported and unregulated catches are often considered of interest only when they become illegal. However, excluding the unreported and unregulated fishing would be inadvisable given the existing international instruments and the intentions and momentum of States to act on the three descriptions of illegal, unreported and unregulated fishing together.
16. From a pragmatic perspective, it was agreed that the I, U and U fishing components be treated as a single concept, but that care should be taken in estimation methodologies to avoid double-counting.
17. It was noted that a list of IUU fishing activities could serve as a practical output of the workshop to inform the methodology discussion on future IUU fishing estimates.
18. Participants suggested that when developing a list of IUU fishing activities as the basis for IUU fishing estimates, the list should be informed by an explanatory text on whether a study was being carried out to determine whether catches were: (i) representative of egregious illegal activities conducted by fishers in contravention of international or national conservation and management measures; or (ii) unreported (by fishers) and/or unregulated by States, thereby undermining fisheries management.

⁴ Background Paper 2 – Defining illegal, unreported and unregulated (IUU) fishing.

19. It was observed that distinguishing between the I, U and U might inform the types of actions/responses to any identified IUU fishing, and be important in ensuring that IUU fishing trade sanctions designed to eliminate egregious illegal fishing activities did not adversely affect developing States dependent on fisheries for which limited financial and human resources were available to implement conservation actions associated with unreported and unregulated fishing (a disproportionate burden).
20. Several participants developed an indicative list of IUU fishing activities that could be considered for inclusion in future estimates. This list, along with some qualifying text, was then presented to all workshop participants and discussed both in plenary and by a subsequent break-out group (called the “policy and process group”). The text is included as part of Appendix 6.
21. A discussion took place to highlight the importance of distinguishing who is accountable when speaking of IUU fishing activities: either the State, that is not properly regulating the resources (therefore responsible for the unregulated part), or individuals, when they do not follow the rules established (thus responsible for the illegal and unreported portions).

Other recent, ongoing and planned studies to estimate IUU fishing

22. The workshop was informed about a number of completed or ongoing/planned studies to estimate the extent of IUU fishing in certain regions.
23. Concerning the redfish fishery in the Irminger Sea, the North East Atlantic Fisheries Commission (NEAFC) reported that previous work had used information on the presence of fishing vessels in the area from monitoring and control information. On the basis of estimates of catch per unit of effort (CPUE) obtained by vessels operating legally in the area, and on the basis of estimates of effort deployed by vessels fishing illegally, an estimate was produced of illegal catches. Market data obtained from legal operators were subsequently used to estimate the value of these illegal catches. For another evaluation of the extent of IUU fishing in Iceland, it was reported that trade data were useful given that most of the redfish is exported.
24. Two ongoing studies were presented on the extent of IUU fishing in: (i) the Bay of Bengal under the Bay of Bengal Large Marine Ecosystem (BOBLME) Project,⁵ and (ii) in tuna fisheries in the fishing areas covered by the member States of Pacific Islands Forum Fisheries Agency (FFA). Under the BOBLME project, it was noted that coastal States had different fleet management regimes and variable availability of catch data, and that in some countries official catch data were thought to be overestimated. One of the main tasks will be to revise official catch data by fishery using key informants in the countries in question, and then to evaluate the extent of illegal catches. Concerning the tuna FFA study, it was reported that there was a lot of potentially useful information on IUU fishing from monitoring and control activities deployed in the region, in particular from observer reports and from the centralized FFA-operated vessel monitoring system (VMS). The study will therefore utilize this information to identify IUU fishing risks and concentrate on the high-risk fisheries. Assigning a value to estimates of volumes of illegal catches should not be problematic given the reasonable availability of market and price data in the region.
25. The meeting was informed on the work of a new company, FishSpektrum, which is using Automatic Identification System (AIS) data from the Marine Traffic database,⁶ coupled with a fishing (carrier and service) vessel database with more than 700 000 references (compiled from a variety of sources such as lists of radio licences issued to fishing vessels, fuel subsidies provided to vessels, etc.) and various correction algorithms, to map fishing presence and pressure. It was noted that AIS transmissions could be deliberately manipulated, not all vessels sizes may require AIS equipment, and

⁵ www.boblme.org/

⁶ www.marinetraffic.com

that AIS data for some regions were not available. Currently, AIS information cannot be considered as evidence for IUU fishing cases but it can support risk assessment.

26. It was pointed out that the two ongoing aforementioned studies could contribute towards a new global estimate of IUU fishing.

Methodological options and data issues for estimating IUU fishing globally

27. Background Paper 3⁷ was presented to the workshop, highlighting some of the potential methodologies for estimating IUU fishing and their strengths and weaknesses. It was proposed that some of the key decisions the workshop should consider include:

- The merits of a single global study versus multiple studies feeding into a global estimate;
- The study scale (regional studies leading to a global estimate, and the types of IUU fishing (which might be determined by the data availability));
- The extent to which new studies are available or whether existing data can/should be used – some oversight will be required to ensure consistency / harmonization of data;
- Applying different approaches according to species characteristics (e.g. highly migratory, benthic, etc.) and elements of IUU fishing definitions;
- Robust approaches to combining different estimates and statistical properties (of variance, bias);
- Ways to avoid double counting; and
- Issues related to the formulation and presentation of results, especially in terms of transparency and minimum criteria requirements used in the preparation of estimates.

28. Initial considerations on methodological issues proposed by participants related to:

- It will be challenging to combine outputs from multiple studies (bias, data quality, etc.).
- Estimating IUU fishing catches based on geographic areas rather than fleets might be preferable.
- It is advisable to develop formal methods that use qualitative data so as to improve their statistical properties.
- It is important to develop methods to estimate IUU fishing catch weights from different types of IUU activity, i.e. how to estimate the weight of IUU fishing catch from a vessel known to have fished illegally inside a closed area.
- Utilization of market information (rather than data on trade between countries) as a source of data is recommended whenever possible.
- Non-bounded (range) estimates of IUU fishing may be useful even when there is a high level of variation/range in derived estimates.
- All studies should include a specification of the origin of IUU fishing data utilized. This may contribute to ensuring transparency and avoiding double counting.
- Agreed inputs of the study: The methods, and data used, have to be able not only to estimate the amount of catch (and its value) but also the area and time for which those estimates and species apply.
- Agreed outputs of the study: Transparency is required when reporting accuracy and precision. The study has to be able to reflect the degree of uncertainty. Assumptions in the process of estimation have to be described.
- The importance of the toolbox of methods is that the outputs could be harmonized and be comparable.

29. The workshop discussed the focus of future FAO work. There was general agreement on two main streams of work (which need not be mutually exclusive):

⁷ Background Paper 3 – Estimating the extent of IUU fishing.

- i) an FAO-coordinated global study;
 - ii) development of technical guidelines for estimating IUU fishing (which could help ensure that multiple studies could be used to develop a global estimate).
30. It was suggested that because it might take time to obtain funding, a pragmatic approach for the next steps to be taken by FAO could be to:
- i) encourage new studies by regional fisheries management organizations (RFMOs) and others;
 - ii) carry out an FAO-led review of recent and ongoing studies, i.e. a “study of studies” to identify strengths and weaknesses associated with various approaches taken / being developed;
 - iii) use the “study of studies” as a valuable resource to prepare FAO technical guidelines on estimating IUU fishing, which would also support a global estimate.
31. It was proposed that technical guidelines on estimating IUU fishing should include advice on common harmonized reporting formats.
32. Following this discussion it was agreed that two workshop break-out groups would discuss different issues:
- i) a **methodology/technical guidelines group** to identify the technical elements that would form part of any guidelines that may be developed;
 - ii) a **policy and process group** to consider the characteristics of IUU fishing in the aquatic environment.
33. The guidelines group proposed a potential and non-exhaustive structure for the guidelines as provided in Appendix 5. It was noted that the guidelines:
- should include an introductory section clearly laying out that their purpose is not to be prescriptive but rather to 1) provide consideration of key issues when designing and implementing studies to estimate IUU fishing, and 2) to guide future studies that might wish to ensure their outputs would be usable as inputs to a global estimate;
 - would provide a practical toolbox of methodologies for estimating IUU fishing.
34. The guidelines group discussed the characteristics of a team to be recruited to develop the technical guidelines, suggesting that it would need to be comprised of at least:
- an overall project coordinator;
 - a statistician;
 - a monitoring, control and surveillance (MCS) compliance practitioner;
 - a trade specialist;
 - a fisheries specialist with developing-country experience;
 - other additional experts who might be called on to provide inputs to specific sections of the technical guidelines.
35. The group discussed potential recommendations for FAO in terms of how to develop a global estimate. One option would be to have a ‘design-based estimate’, which would combine the outputs of individual studies, while another (perhaps a more appropriate and more proactive approach) would be to generate a ‘model-based estimate’ using the outputs of studies that complied with the guidelines and could incorporate external covariates to assist in the estimation procedure.
36. The group advised that revised global estimates should not be generated too frequently (i.e. perhaps every 5–10 years) and that if FAO wished to track IUU estimates more regularly, it might wish to use some selective indicators based on estimates that are easily repeatable.
37. The policy and process group reported back in plenary stating that FAO had played a leading role in the development of the Code and related instruments to combat IUU fishing, and its mandate included

both the provision of statistics and actions to combat IUU fishing. FAO should therefore take a leading role in the process of estimating IUU fishing at different scales (regional and global). They proposed that FAO could lead the process to develop **technical** guidelines (under the Code), and that this should be preceded by a “study of studies” that would inform the technical guidelines by taking stock of previous experiences, and take advantage of the role key partners and informants could play in the development of these guidelines given other ongoing and planned studies. It was suggested that guidelines be in the form of a “living document”, evolving as new data, new technologies, and methods became available. The output of the policy and process group is presented in Appendix 6.

38. It was further suggested by this group that FAO could:

- play an important future role by reporting IUU fishing estimates on a recurrent basis in *The State of World Fisheries and Aquaculture* (SOFIA) publications and in FAO technical publications, following the principles to be outlined in the technical guidelines;
- act to facilitate a community of practice on estimation of IUU fishing. The group noted that there could be difficulties in combining the outputs of different studies given temporal effects and regional specificities, and proposed that aquaculture should be excluded from the estimates of IUU fishing (recognizing the linkages between capture fisheries and aquaculture in some instances). It was noted that it would be important to consider a potential role of the FAO Coordinating Working Party on Fisheries Statistics with regard to the harmonization of terms.

Workshop conclusions

39. Workshop participants considered future work streams associated with developing an FAO-led global estimate of IUU fishing. The following actions were proposed:

- FAO to lead a process to prepare a report titled “A study of studies on IUU fishing estimation”, and to draft “technical guidelines to estimate IUU fishing”;
- FAO to facilitate a peer review process of the draft guidelines and then their finalization;
- FAO to consider including IUU fishing indicators in the bi-annual SOFIA publications;
- FAO to further consider how the above actions could be combined to develop a global estimate of IUU fishing.

40. The workshop supported the composition of the study team to draft the “technical guidelines to estimate IUU fishing” as proposed by the guidelines group, and suggested that the same team of multidisciplinary experts should be involved in the “study of studies”.

41. The workshop participants saw merit in FAO outsourcing and partnering for this work (with FAO providing technical oversight and clearance responsibilities).

42. For the peer review process, it was noted that many other international experts had expressed a desire to participate in the workshop and that they could/should be involved in the peer review process. It may also be appropriate to involve private sector representatives, RFMOs, regional fishery bodies (RFBs), and MCS experts (through existing networks) in the peer review of the guidelines. In this regard, it was suggested that a global open-ended working group could also be an appropriate mechanism to refine the guidelines.

43. In terms of timeline, it was agreed that it would be beneficial if the guidelines were completed in time for presentation to COFI 2016. Consideration should also be given to convening a side event at COFI to raise awareness on this matter.

44. FAO was reminded that while the amount of work to develop draft guidelines need not be immense, external FAO experts and partners would need sufficient time to mobilize, given other work commitments.

45. It was indicated that the cost of the “study of studies” and the “technical guidelines to estimate IUU fishing” would be in the order of US\$120 000–250 000. Costs could be reduced by holding a remote peer-review meeting to consider the draft technical guidelines rather than a physical meeting of peer reviewers.
46. In reference to the potential use of SOFIA publications to publicize key IUU indicators, it was noted that SOFIA could also be used to describe the evolution of the IUU landscape as well as reporting on key indicators.

Closing remarks

47. In closing, Pew Charitable Trusts noted its satisfaction at the workshop outcomes, and the potential to build on current momentum to address IUU fishing, and thanked FAO and others for their work in preparing for the workshop. They noted that it was an appropriate time for FAO to lead a process to generate a community of practice around estimations of IUU fishing, and that the non-governmental organization (NGO) community would be keen to help galvanise action around future work.
48. FAO ADG Mr Árni M. Mathiesen thanked all those who had contributed to the planning for the workshop, those who had participated in the workshop, those who had covered their own travel costs, and Pew Charitable Trusts for its financial support for the workshop.

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Welcome remarks by Árni Mathiesen

Distinguished guests, ladies and gentlemen

In 1997, the term “IUU fishing” was new in the fisheries literature. Its origins can be traced to CCAMLR where it evolved from discussions concerning illegal and/or non CCAMLR-compliant fishing activities by Parties and non-Parties in the Convention area. Since then, the term IUU fishing has been diffused into international fisheries discussions. In 1999, the terminology found its way in meeting reports of FAO, IMO, CSD and regional fishery bodies. Furthermore, IUU fishing was addressed at length in the 1999 Secretary-General’s Report to the UNGA on Oceans and the Law of the Sea. Resolution 54/32 of the Assembly included references to combat IUU fishing. These reports and references to IUU fishing placed the issue on the international fisheries agenda.

Illegal, unreported and unregulated (IUU) fishing can occur in the exclusive economic zones (EEZs) of coastal States by national and foreign vessels, in river and inland fisheries as well as in the high seas. Although FAO has not been directly involved in previous estimates of IUU extent by country and region, others have reported that substantial IUU occurs worldwide with lower and upper estimates of the total value of illegal and unreported fishing losses worldwide between \$10 and \$23.5 billion annually, representing between 11 and 26 million tonnes of fish. Previous studies have tended to focus on Illegal and Unreported fishing rather than addressing all three components whether they occur in inland or marine fisheries.

IUU products often come from fisheries lacking the strong and effective conservation and management measures to which the fishing industry is subject. IUU fishing most often violates conservation and management measures established under national law or through international agreements. And by undermining domestic and international conservation and management efforts, IUU fishing not only seriously impacts fish stocks, but also the broader aquatic ecosystems and the food security and livelihoods of lacustrine, riparian and coastal communities dependent on them.

Accounting for the total extractions of living resources from aquatic ecosystems are fundamental to understanding the sustainability of fisheries both in terms of ecology and economics. Unfortunately, estimation of total catch is not easy because, for many of the world’s fisheries, an unknown amount is not reported to any official body. In some cases, unreported catch may be deliberately concealed by individuals, and in other cases, for certain species, there is no obligation to report catches. As a result, the total amount of fish and other animals removed from the aquatic environment may for some fisheries be significantly underestimated increasing uncertainty in management decision making and diminishing revenues generated through resource rents.

Distinguished guests, ladies and gentlemen, as you know, FAO is deeply involved in the fight against IUU fishing. As many of our Members have stated, illegal fishing is a crime which undermines the sustainability of fish stocks and marine ecosystems affecting the whole sector and the very foundation of any fisheries policy. In response to global concerns on this matter, the Food and Agricultural Organization of the United Nations have led the development of an international plan of action to address the problem; culminating in the FAO International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated Fishing (IPOA-IUU) adopted by FAO in 2001 . The IPOA-IUU succeeded in providing a rallying point and tool to address existing fisheries concerns in a more concerted manner. Downstream IUU products from this process include the development of the Port State Measures Agreement, Voluntary Guidelines for Flag State performance as well as various national and regionally initiated actions to combat IUU.

As the Committee on Fisheries has stated on many occasions, Illegal, unreported and unregulated (IUU) fishing remains a high priority and has called on the international community to take stronger actions to eradicate IUU fishing. One effective way of measuring progress towards this objective would be to have a robust global estimate of IUU that would represent the current baseline. If the estimate is developed through a methodology that is repeatable, pragmatic and cost effective, tracking progress towards IUU elimination over time may be within reach. In this regard, this workshop has brought together IUU fisheries experts for the sole purpose of developing a robust methodology to estimate IUU fishing globally.

Turning to this workshop. This workshop focuses its attention on one singular objective, developing a methodology to estimate IUU globally. As the acronym suggests, IUU is made up of three distinct components, and while a single value is often used to represent the overall magnitude of IUU, de-coupling the three sub-elements of I, U, and U could shed light on important differences in the management of marine and inland fisheries and the motivations / behaviors of the various stakeholders associated with each I, U or U sub component. However, identifying the most suitable methodology is no easy task. Some fisheries are well monitored using tools such as at sea observers, dockside monitors and vessel tracking systems. At the same time there are fisheries where fishing is poorly monitored and those where one or more components of the catch are less than adequately reported. Such situations include industrial fisheries on the high seas as well as small scale fisheries in inland waters and coastal waters. Being a pragmatist, I hope you weigh carefully the availability of reliable data, the time and costs associated with applying the methodology to develop a robust global IUU estimate at some future date.

Finally I wish to extend my sincere appreciation to the PEW Charitable Trusts for their financial support towards convening this workshop as well as investment of time and travel made by each respective workshop participant.

I wish you all well in your deliberations and look forward to the results.

Árni Mathiesen
Assistant Director General
Fisheries Department

Workshop prospectus and agenda Prospectus

Expert Workshop to Estimate the Magnitude of Illegal, Unreported and Unregulated Fishing Globally

February 2-4, 2015, Rome, Italy

Introduction

Illegal, unreported and unregulated (IUU) fishing remains one of the greatest threats to aquatic ecosystems, undermining national and regional efforts to manage fisheries sustainably and conserve aquatic biodiversity. Motivated by economic gain, IUU fishing takes advantage of corrupt administrations and exploits weak management regimes, especially those of developing countries lacking the capacity and resources for effective monitoring, control and surveillance (MCS). It is found in all types and dimensions of fisheries, occurs both on the high seas and in areas under national jurisdiction, concerns all aspects and stages of the capture and utilization of fish, and may sometimes be associated with organized crime.

Fisheries resources extracted by those engaged in IUU fishing, lead to reduced economic benefits being gained by bona fide fishers and contribute to the collapse of fisheries resources. IUU fishing also has implications in terms of the increased/high costs of MCS that then have to be deployed in attempts to ensure compliance. Moreover, products derived from IUU fishing illegally find their way into local and overseas markets, thus distorting prices, competition, and trade. Hence, IUU fishing threatens the livelihoods of bona fide fishers and other fishery-sector stakeholders, exacerbates poverty and food insecurity, and results in economic inefficiencies that might otherwise be avoided.

While the international community has made some progress towards understanding and combatting IUU fishing, the thirtieth session of COFI agreed that, despite some progress, IUU fishing continues to be a persistent and pressing problem which has a significant adverse impact on achieving sustainable fisheries and food security. Its dynamic, adaptable, highly mobile and clandestine nature prevents a straightforward estimation of its quantification, and impacts have been difficult to quantify due to its covert nature.

Notwithstanding, one of the most cited reports (and oft used by FAO) is the Agnew et al. paper titled “The Global Extent of Illegal Fishing”⁸. This paper estimated that the overall loss from studied fisheries was 11-19% of the reported catch, worth some \$5-11bn in 2003. Taking the total estimated value of illegal catch losses within the analysed fisheries and areas and raising by the proportion of the total world catch, the lower and upper estimates of the total value of current IUU losses worldwide were between \$10bn and \$23bn annually, representing between 11.06 and 25.91 million tonnes of fish.

While there was some degree of consistency with other studies prepared around the same time (MRAG, 2005, the European Commission, 2007 and Pauly *et al.* 2002), several concerns regarding the estimates include, amongst others: the raising methods; what forms of illegal, unreported and unregulated were accounted for in the study; and the wide range between the lower and upper estimates.

Recognizing that: (i) it is now over ten years since the original study, (ii) various global IUU related instruments have been developed under the auspices of FAO and the Committee on Fisheries, such as the FAO IPOA-IUU, the Port State Measures Agreement and augmented through IUU counter measures being implemented at national and regional levels, it is likely that the magnitude and characteristics of IUU have changed. Accordingly, a new estimate of IUU fishing involving FAO is timely. Such an estimate of IUU fishing would allow FAO and its Members to more effectively understand the current extent of the problem, but also to engender institutional, financial and technical support for efforts to combat IUU fishing.

⁸ Agnew DJ, Pearce J, Pramod G, Peatman T, Watson R, et al. (2009) Estimating the Worldwide Extent of Illegal Fishing. PLoS ONE 4(2): e4570.

Within this context, FAO will convene an expert workshop to develop the methodology to estimate IUU fishing globally and follow on actions associated with data collection and analysis (Phase I). The results will lead to the preparation of a report (Phase II) to include a global IUU estimate, which if ready in time could be presented to COFI in 2016.

I. WORKSHOP OBJECTIVES

The workshop will bring together an international cross-section of experts involved in counter-IUU fisheries work to exchange information, review previous literature and methods to estimate IUU fishing, and develop an FAO methodology for a study to estimate IUU fishing.

II. WORKSHOP INPUTS

- This prospectus;
- Workshop agenda;
- Background paper 1: FAO instruments related to IUU, definitions and terms related to IUU in the FAO lexicon, and potential definitions of I, U and U for the purposes of a future estimate;
- Background paper 2: Methods for estimating the extent of IUU fishing;
- Background paper 3: Issues to be considered in the formulation of an analytical framework for the estimation of IUU fishing.

III. WORKSHOP PARTICIPANTS

This workshop will comprise;

- FAO professionals with specialization in fisheries resource management, policy, economics, statistics, MCS operations, legal frameworks and IUU counter measures;
- International experts in one or more of the following IUU specializations: statistics, fisheries economics, value chain economics, MCS operations, IUU risk assessments and IUU threat reduction tools.

IV. WORKSHOP OUTPUTS

The output from the workshop will be a workshop report, which will include the background papers and other related material available from FAO and other contributors. The workshop report will inform further actions by FAO and tasks in estimating IUU fishing globally. The report will include:

- Lessons learned from previous estimates on IUU fishing
- Strengths / Weaknesses of previous estimates of IUU
- Agreed methodology to be adopted for estimating IUU fishing, including the use of case studies for IUU estimates in selected fisheries / regions
- The timeline and associated work plan to estimate IUU
- Terms of reference for FAO and external consultants involved in an estimate of IUU
- Identification of associated work that would form part of the proposed study and presented as standalone chapters in the FAO report on IUU.

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Workshop Agenda

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|---|
| Expert Workshop to estimate the magnitude of Illegal, Unreported and Unregulated fishing globally |
| 2-4 February 2015, Rome, Italy |
| Venue: Borgo di Tragliata, Rome, Italy |

Day 1, Monday 2 February

- 08h30 – 10h00** **Registration of participants**
- 10h00 - 10h15* *Tea/coffee break*
- 10h15 – 10h45** **Opening and Welcome remarks by**
 Árni Mathiesen (ADG, FI)
 Joe Zelasney (Pew Charitable Trusts)
- 10h45 – 12h00** **Introductions, objectives of workshop, future study, and workshop planning (Secretary, Frank Chopin)**
Intended output: Participants have collectively agreed the objective of the workshop, and the workshop agenda which makes best use of time and will result in the required workshop outputs.
- 12h00 - 13h30* *Lunch*
- 13h30 – 15h15** **Topic 1: How to define and distinguish between I, U, and U fishing for the purposes of the future study⁹** (Chair, Blaise Kuemlangan. Panelists: Martin Tsamenyi, Mathew Camilleri)
Intended output of Topic 1 discussions: Participants have discussed in plenary and arrived at differentiated operational definitions of illegal, unreported and unregulated fishing to inform and guide the methodology in the future study.
- 15h15 - 15h30* *Tea/coffee break*
- 15h30 – 17h30** **Topic 1 Cont.: How to define and distinguish between I, U, and U fishing for the purposes of the future study**
- 19h00 -* *Drinks and dinner* (continuing informal discussions on I, U and U fishing)

Day 2, Tuesday 3 February

- 08h45 – 09h45** **Topic 2: Other ongoing/planned studies to estimate IUU and their methodologies** (Chair, Alicia Mosteiro. Panelists: Roberto Mielgo (Fishspektrum / ODI project), John Pearce (FFA / BOBLME study), Stefan Asmundsson (NEAFC))
Intended output of Topic 2: Participants have been briefed on other ongoing work, and can assess the relevance of such work to the FAO study in terms of methodological approaches and potential incorporation of estimates of IUU fishing into the FAO study.
- 09h45-10h00* *Coffee*
- 10h00 – 12h00** **Topic 3: Methodological options and data issues for estimating IUU fishing globally¹⁰** (Chair, Alejandro Anganuzzi. Panelists: David Agnew)

⁹ See Background Paper 1

¹⁰ See Background Paper 2

Intended output of Topic 3 discussions: Participants have considered methodological options for the future study, their robustness, their data requirements, and the potential applicability to different ‘units of study’ for scaling up to global level.

12h00 – 13h30

Lunch

13h30 – 15h30

Topic 3 Cont. Methodological options and data issues for estimating IUU fishing globally

15h30-16h00

Tea/Coffee

16h00 – 17h30

Topic 4: The content of Technical Guidelines to estimate IUU fishing, and the role of FAO in the development of such guidelines and a global estimate

Group 1: Development of annotated methodology guidelines

Group 2: FAO’s role in future work to develop guidelines and a global estimate

Intended output of Topic 4: Break-out sessions will consider and then report back in plenary on the issues they are tasked with considering, so as to reach agreement on an outline for technical guidelines, and FAO’s future role.

19h00 -

Drinks and dinner

Day 3, Wednesday 4 February

08h30 – 10h30

Topic 4 Cont.: The content of Technical Guidelines to estimate IUU fishing, and the role of FAO in the development of such guidelines and a global estimate

10h30 – 10h45

Coffee

10h45-12h45

Topic 5 Post Workshop Next Steps (Chair, Frank Chopin, Frank Meare, Joe Zelasney)

Intended output of Topic 5: FAO has clear guidance from the workshop on its future tasks and work streams and some suggestions as to who might be involved, when tasks should be completed by, and potential costs.

12h45 – 14h00

Lunch

14h00 – 15h00

Workshop closing and final remarks

Frank Chopin

Árni Mathiesen FI-ADG

Background workshop papers

Issues to be considered in the formulation of an analytical framework for the estimation of IUU fishing

Background Paper 1 for the FAO Workshop on Estimating Worldwide IUU fishing

Graeme Macfadyen (Poseidon) and Frank Chopin (FAO)

The objective of the workshop is to exchange information, review previous literature and methods to estimate IUU fishing, and to develop a methodology for a future FAO study to estimate IUU fishing at the global level. The outputs from the workshop should provide guidance on the objectives, scope, and implementation methodologies (technical and logistical) for a future study to generate a global estimate of IUU fishing. This background paper therefore provides preliminary some thoughts on topics that will need to be discussed at the workshop in providing such outputs and achieving the workshop objective.¹¹

How broad should the scope of the future study be?

The workshop could potentially need to discuss and agree on a number of questions which are grouped into themes below, which may be relevant to Topic 4, Sessions 1 and 2 of the workshop agenda).

Geographical scope

Should the geographical scope of a global estimate include:

- *Inland fisheries as well marine fisheries.* It is assumed that both should be included given FAO's global mandate. Although inland fisheries catch is several orders of magnitude lower than marine catch, their immense importance as a source of food and livelihoods within poor rural communities makes them a candidate for study. Moreover, The sub-components of I, U and are likely to vary considerably in nature and extent between marine and freshwater fisheries e.g. unreported fishing may be of particular interest in inland freshwater fisheries;
- *territorial seas, EEZs, and high seas.* So as not to pre-judge the outputs of any future global study to estimate IUU fishing or to make assumptions about where the main IUU issues might occur, it is assumed that the future study will need to consider fisheries in all marine jurisdictional areas as defined in UNCLOS, but being cognizant of the fact that some species are highly migratory creating the potential for errors when generating estimates for trans-boundary fisheries.

Functional scope

The workshop will need to consider the functional scope of future study in terms of:

- *different types of I, U, and U* (see background paper 1 for discussion on the potential distinctions between, I, U and U, and what might be included in a definition of each for the future study). And should it include all forms of removals / mortality (such as discards, slipping of catches) that are regulated but may not be reported. The point being that such removals may increase the degree of uncertainty in management decision making. The future study will require clear guidance from the workshop on a working definition of I, U and U so as to preclude any uncertainty of what is included in each and whether the study will focus on catches and/or landings;
- *aquaculture and capture fisheries.* While some illegal activities may take place by aquaculture producers e.g. non-compliance with regulations related to fish health/husbandry, farm management, bio-security protocols, compliance with licence conditions, etc, IUU aquaculture production may be

¹¹ The workshop will not be expected to consider *methods of reducing IUU fishing* (except in so far as the global estimate may be used for benchmarking and advocacy to generate future funds and institutional action to combat IUU). Given the limited time available, the workshop will focus exclusively on the future work to *estimate IUU fishing*.

far less of a problem than IUU fishing in terms of volumes. Certainly the methodological issues associated with quantifying IUU aquaculture production (data sources, defining the I, U and U) would be very different to those for a future study focussing on capture fisheries. It is assumed that the focus of any future global estimate will be limited to capture fisheries only, but this assumption needs verification by the workshop. And in addition, some special issues, such as the capture of wild fish as inputs to fish farming operations (e.g. purse seining of Bluefin tuna for ranching, capture of wild grouper fingerlings for on-growing) could potentially fall within the future FAO study; and

- *commercial, subsistence and recreational fisheries.* Given the subsistence nature of many small-scale fisheries, it is assumed by the authors that subsistence fisheries would fall within the remit of a future FAO study, but the workshop will need to validate this assumption as well as consider the merits or not of including recreational fisheries as well.

Scale and granularity

This issue could affect both the *methodology* to be used as well as the *presentation* of a future study's outputs. The workshop might consider:

- Given the stakeholders involved in I, U and U and the motivations that contribute to I, U or U, are there some important reasons for de-coupling the three sub-elements of I, U, and U?;
- Could the potential impact of the study and the use of its outputs be enhanced if the outputs are presented so as to provide individual estimates of, for example of i) I, U and U fishing, ii) of IUU fishing in marine fisheries and inland fisheries, iii) of IUU fishing in small-scale fisheries, semi-industrial and industrial fisheries, iv) of IUU by different metier i.e. fleet/gear types? And would being able to present combinations of a selection of these variables be desirable e.g. I fishing in inland fisheries, U fisheries in tuna purse seine fishing, etc?;
- What should be the ambition of the study in terms of ocean/species/country coverage?;
- Bearing in mind that a large proportion of the FAO reported catch from some regions is NEI, how should such species be interpreted within the I, U and U domain?;
- If a sampling approach is taken, what should be the accepted accuracy of estimates at various levels: stocks, species, inland/coastal/EEZ fisheries, countries, RFMOs, regions/LMEs, oceans, world? Balancing precision versus pragmatism needs to be a foremost consideration when developing a cost-restricted methodology; and
- How will the methodology address bycatch species which includes inter alia juvenile fish, seabirds, turtles, coral and marine mammals? While fish landings are typically estimated by weight, the same is not the case for seabirds and turtles. Moreover, if the approach will attempt to derive a monetary value of the I, U and U components, how can this be applied to non-commercial species, endangered or otherwise?

Agreement over what is to be measured

Linked to the question about scale/granularity (above), a future study would need to understand what units it would use to quantify IUU. Most obviously will be the need to assess the *weight* of IUU catch based on an agreed definition of IUU for the purposes of the study (see background paper 1 for some proposals/possibilities).

However, perhaps less obvious is whether the study should also seek to derive the *ex-vessel value* of catches (for example by attributing a unit value to different types of species groups e.g. large pelagics, demersals, small pelagics, etc.), and how/whether such an approach would address non-commercial IUU catch (e.g. of juveniles, ETP species). The methodology for the future study could also consider *broader types of 'costs'* associated with IUU fishing. These broader types of costs might include:

- The cost to society of overfishing as a result of IUU activities in terms of lost future revenues to fishers, downstream actors in the processing/marketing chain, and Member States through reduced resource rents;
- The compliance costs related to combatting IUU fishing e.g. sea and aerial patrols and inspections, land-based inspection activities, VMS, and observer costs;
- Other institutional costs related to combatting IUU fishing e.g. administration costs, NGO activities, research costs, etc
- The reduced unit sales values to producers of IUU fish (where sales values are discounted because the fish is IUU);
- The lost revenues and/or value added (profits plus wages) to other operators of catches made by those engaged with IUU fishing not being available for catch by those that are acting legally, are reporting and are being regulated;
- The lost resource rents accrued to Member States, when rents are based on declared catch volumes or the sale of fishing licences; and
- The loss of critical elements of an ecosystem (loss of key species, loss of habitat, biodiversity).

The inclusion of an estimate of the value of IUU fish, and even more so the broader types of costs listed above, could increase the advocacy benefits of the study. However, while generating ex-vessel values from the weight of IUU fish should be less problematic, assessing the broader types of costs of IUU fishing would significantly increase the complexity of the future study (and therefore the study cost if a robust estimate is to be provided). The inclusion of broad economic costs of IUU fishing to society could potentially also serve to dilute a clear 'advocacy message' from the future study, by mixing estimations of the weight/value of IUU catch with downstream costs and other impacts.

Quantification of the weight of IUU catch may be considered sufficient if the intention of the study is to quantify the extent of IUU fishing, so as to mobilise action around the IPOA-IUU and related instruments and measure the extent of success in achieving their objectives. A global estimate of the weight of IUU fish could be considered sufficient on its own as a baseline for the future evaluation of success in meeting the IPOA-IUU's objective, which is 'to prevent, deter and eliminate IUU fishing'.

From a practical point of view too, only quantifying IUU catch weights (and potentially ex-vessel values) may be methodologically complex enough for the envisaged future study, given the potential timeframe and budget (see below), without committing the study to addressing the 'costs' of IUU fishing.

For all of the above reasons, the authors suggest that it may be advisable for the future study just to focus on the weight of IUU catch, and possibly the ex-vessel value of those catches with a commercial value, but not the broader 'costs' of IUU fishing (which may in any case also be considered the broader costs of the general failures in fisheries management).

Methodology

Choice of method and accessibility of data

The choice of methodology and data availability is intimately linked to the issue of the scope of the study discussed above. A decision to include inland fisheries for example could mean the use of different methods than for marine fisheries, if sources of data for assessing IUU fishing in marine fisheries, such as AIS/VMS data, may not be available for inland fisheries. Key issues will include the following:

- Background paper 2 presents a wide range of methodological approaches which could be used in the future estimation of global IUU fishing. Choosing between these approaches, or recommending options, may not be determined just by the methodological robustness of the estimate that might result from the different approaches, but also by issues of whether the data requirements for the different methodologies would require long or short timeframes for data provision, and what the costs might be of accessing data (both in terms of any potential need to purchase data, as well as the time inputs and staff costs associated with the work to access and process/analyse data e.g. can data be collected remotely, will country visits be necessary, etc.).
- Methodological choices/options may be in part determined by the workshop's perception about how willing data providers might be to provide the necessary data for the different methodological choices. The answer to this question may depend on commercial and data confidentiality issues, as well as the perceptions by data providers as to the motivations of FAO in supporting the study and the ultimate use and worth of the study's outputs.
- The prospectus seems clear that the future FAO study is not simply a repeat repeat/update the previous Agnew et al estimate of global IUU fishing. It is likely to be broader in scope (inland and marine) and is proposed to be used as a baseline against which future changes in IUU fishing might be monitored. Accordingly, the workshop will need to consider whether a new approach / new methodology is warranted, and whether it could provide tangible incremental benefits to previous approaches and be completed for a reasonable cost in a timely and pragmatic manner (see below).

Scaling up

- Bearing in mind a potential timeframe and budget for the future study, the workshop will need to consider strategies for scaling up estimations of IUU fishing in particular areas/fleets, to a global level. This will require consideration of *units of study* i.e. fleet types targeting specific species and potentially in different ocean areas, for example Pacific purse seine tuna fleets. Guidance will be needed for the future study over what these discrete units of study might be, so as to be able to scale up to generate a global estimate. The workshop will need to consider:
 - ❖ How to define specific units of study, and by implication how many are needed so that a select few can be examined in detail before scaling up;
 - ❖ If units of study are based on fleet types/species targeting, and the future study explores IUU fishing in a particular ocean area, can estimates of IUU fishing in that ocean area necessarily be applied to other ocean areas. For example if an estimate of IUU fishing in Pacific longline tuna fisheries is obtained, can that be applied to longline tuna fleets in the Western Indian Ocean;
 - ❖ Should units of study focus just on those judged as being high risk in terms of IUU fishing, or should the study use a classification that encompasses all fishing globally. The former would require the study methodology to pre-judge IUU fishing hotspots rather than using the study to review all fisheries units for levels of IUU fishing. The latter could reduce the level of analysis possible on areas known to be high risk given a limited study budget. Could early decision making based on identifying and ranking fisheries, regions, fleets and gear types with the potential for significant impact (egregious violation of CMMs, loss of rents, biodiversity, livelihood impacts) arising from I, U and U, provide guidance on prioritizing fisheries, fleets and regions of most interest?; and
 - ❖ What will the statistical issues be associated with scaling up from a necessarily (given timeframe/budget) limited selection of case studies, and how important could it be to try to minimise the range in the global estimate of IUU;
- Since the objective is to develop an FAO-led approach to estimating IUU globally, are other ongoing/planned studies compatible with a proposed FAO methodology and for scaling up? The answer might depend on i) whether other studies meet or exceed a set of minimum criteria

outlined in the methodology for the FAO study, and ii) practical considerations of the advantages of doing so in terms of freeing up budget for other work to be completed by the FAO study. For example, if an ongoing FFA-supported study on IUU fishing in by tuna fleets is considered likely to generate results that are robust, can its outputs be used to i) preclude the need for the FAO study to undertake any work on tuna fisheries in the Western Central Pacific, and ii) apply any estimates of IUU fishing resulting from the study to tuna fisheries in other oceans. A technical oversight group engaged in FAO-led IUU studies might be one way of ensuring harmonization and compatibility.

Study timeframe and potential budget

The prospectus for this workshop states that the future study is intended to provide outputs to feed into the 32nd session of COFI in 2016 (potentially in April 2016). Given that the future study may need to be preceded by a detailed project design phase (see more discussion below on what can be expected from the workshop), as well as a period of time to put in place financing and mobilize staff, completion of a future study in time to publish study outputs in a form suitable for COFI, could require a study period of around only 9 months. The workshop may need to consider and discuss whether such a timeframe is realistic, whether it may be desirable to allow more time for the study to produce a robust estimate, or whether the inland and marine fisheries might be developed in different phases.

The potential timeframe proposed by the workshop would also have a strong bearing on the methodology and approach to be used in the future study.

The methodology and approach, while partly determined by the timeframe for the study, will also be strongly influenced by the potential funds available for the study. In this regard, based on *known* sources of funding (from FAO and donors¹²) which may be in the order of around \$300-400,000, as well as other donors who *could* be interested in contributing to the future study, the study methodology, approach, and workplan for the future study could be modular to provide for activities which are known could be funded, and others which may not necessarily be? In addition the workshop may find it helpful to discuss potential sources of funding and to propose specific actionable items by different participants in seeking to ensure that sufficient funds are made available to cover the proposed methodology/approach, if known FAO/donor funds are not considered sufficient, and such funds can be obtained within a specific timeframe.

The above discussion suggests that the workshop will need to consider carefully the extent to which the methodology and approach could *determine*, but also *be determined by*, a potential budget bearing in mind that a study budget of around \$300-400,000 may be most likely i.e. will the methodology and approach designed fit with an indicative budget?

How far can the workshop go towards agreeing the operational arrangements of a future study

The workshop prospectus implies that the outputs of the workshop should provide many of the components of a future study (e.g. agreed methodology, timeline, and workplan, ToRs). However, time is limited for discussions in Rome and it is likely that the workshop may only provide *options* for a future study and/or guidance on some key issues to be considered when formulating the phase two study. This in turn may limit the ability of the workshop to be specific about operational arrangements for the future study, and work carried out after the workshop by FAO will be required to develop a detailed project document.

Bearing these caveats in mind, the authors suggest that the workshop should nevertheless strive to provide as much agreed content of the future study as possible as a workshop output. This implies that the workshop could consider and provide some guidance for the future study on:

¹² International and bilateral donor agencies, foundations funding fisheries issues, NGOs, RFMOs, etc

- Phase II study objectives, outcomes, outputs and activities, potentially in the form of a logical framework;
- Modalities for implementing the study and linkages between possible partners;
- Specific methodological choices (see background paper 2) and potential links to other projects;
- A budget breakdown which could be provided to potential donors and for monitoring expenditure during the study;
- A timeline for the proposed study with phasing, milestones and outputs at different stages over the agreed study period;
- Study governance and oversight mechanisms e.g. the formation of Steering Committee, its composition, and its frequency and modality for supervision; and
- The ToRs for those implementing the study.

Defining Illegal, Unreported and Unregulated (IUU) Fishing

Background Paper 2 for the FAO Expert Workshop to estimate the magnitude of Illegal, Unreported and Unregulated fishing globally

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1. Introduction

There is global consensus that illegal, unreported and unregulated (IUU) fishing is one of the most severe problems affecting the sustainability of world fisheries.¹³ In response to these global concerns, the Food and Agricultural Organization of the United Nations (FAO) led the development of an international plan of action to address the problem, culminating in the FAO International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated Fishing (IPOA-IUU), adopted by FAO in 2001¹⁴. The IPOA-IUU succeeded in providing a rallying point and tool to address existing fisheries concerns in a more concerted way. After adopting the IPOA–IUU, the international community recognized the importance of developing internationally agreed standards for the implementation of port State measures, already a central feature of the IPOA–IUU, and engaged in drawing up the FAO Agreement on Port State Measures to Prevent, Deter and Eliminate IUU fishing (PSMA), approved by the FAO Conference on 22 November 2009¹⁵. In addition, the FAO Committee on Fisheries (COFI), at its thirty-first session in June 2014, endorsed the Voluntary Guidelines for Flag State Performance which is expected to be a valuable tool for strengthening compliance by flag States with their international duties and obligations regarding the flagging and control of fishing vessels.

This paper will examine the scope and characteristics of “illegal fishing”, “unreported fishing” and “unregulated fishing” with a view to better defining the broad coverage of these terms and to identify related elements which may be considered in efforts to develop sound methods to estimate the magnitude of IUU fishing worldwide.

¹³ UNGA, Fifty-fourth Session, Agenda Items 40(a) and (c), Oceans the Law of the Sea; Law of the Sea; Results of the Review by the Commission on Sustainable Development of the Sectoral Theme of “Oceans and Seas”, Oceans and the Law of the Sea, *Report of the Secretary-General, A/54/429*, 30 September 1999, para. 249.

¹⁴ FAO, *International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated Fishing*, adopted at the Twenty-fourth Session of COFI, Rome, Italy, 02 March 2001. *Hereinafter referred to as IPOA-IUU*.

¹⁵ The PSMA enters into force after the deposit of 25 instruments of ratification, acceptance, approval or accession. Through the effective implementation of the PSMA, fish caught from IUU fishing activities can be blocked from reaching national and international markets.

2. Brief Historical Background

The emergence of the “IUU fishing” notion and its particular elaboration in the IPOA-IUU was a reaction to the perceived inadequacies of the extant international legal and policy framework governing the exploitation of living marine resources. There were general concerns that the 1982 United Nations Convention on the Law of the Sea (hereafter, Law of the Sea Convention) did not adequately address global fisheries issues, despite its creation of the Exclusive Economic Zone (EEZ) concept, with detailed rights and responsibilities of coastal States and fishing States;¹⁶ provisions for cooperation to manage specific fish stocks¹⁷, and the imposition of conservation and management obligations for fishing on the high seas¹⁸. The gaps identified in the Law of the Sea framework centred around the application of three important principles of international law namely: the freedom of fishing on the high seas;¹⁹ the *pacta tertiis*²⁰ rule (the provisions of a treaty only apply to those States which have consented); and the primacy given to flag State jurisdiction on the high seas over their vessels²¹. In the specific fisheries context, there were increasing problems of registration and re-registration of fishing vessels by some “open registry” States and the non-participation of States in global fisheries management frameworks. Global efforts to address these concerns culminated in Chapter 17 of Agenda 21²² which identified a number of global fisheries management challenges as requiring urgent global attention²³.

At the regional level, efforts to fill the gaps in the Law of the Sea Convention identified above were championed especially by members of Regional Fisheries Management Organisations (RFMOs) such as the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) in their attempt to address the increasing uncontrolled fishing activities of several non-members and members alike in the Southern Ocean, which were undermining CCAMLR conservation and management measures²⁴. During the Fifteenth Meeting of CCAMLR in 1996, some delegations identified illegal and unreported fishing as the “greatest threat to the Commission”²⁵. During the Sixteenth Meeting of CCAMLR in 1997, specific references began to be made to “illegal fishing” and “unregulated fishing” in the CCAMLR context and a clear distinction was drawn between the two terms²⁶. Unregulated fishing was used to describe fishing activities of vessels flying the flags of non-CCAMLR members within areas under the national jurisdiction of members and on the high seas within the CCAMLR Convention area. “Illegal fishing” was used to describe fishing activities that undermined the conservation and management of the Patagonian toothfish²⁷. References were also made to “illegal catches,” defined as catches that went beyond the legal catch limits set by CCAMLR²⁸. At its Sixteenth Session, the Scientific Committee of CCAMLR also noted the high level of unreported catches in certain sub-areas covered by the Convention²⁹. From 1997, the term IUU fishing became regularly used at CCAMLR meetings to describe a combination of unsustainable fishing activities by both members and non-members³⁰.

¹⁶ United Nations Convention on the Law of the Sea 1982, Article 61-70 and 117-119.

¹⁷ Such as straddling fish stocks (Article 63), highly migratory species (Article 64), anadromous stocks (Article 66) and catadromous species (Article 67).

¹⁸ United Nations Convention on the Law of the Sea 1982 Article 116-119.

¹⁹ Fishing is one of the recognized freedoms of the high seas under Article 87. This freedom is not absolute. It is subject to the duty of States to cooperate to control the activities of their nationals fishing on the high seas (Article 117) and to cooperate to take management measures for high seas fisheries (Article 118 and 119).

²⁰ See Article 34, Vienna Convention on the Law of Treaties (1969 Vienna Convention).

²¹ Law of the Sea Convention Article 92.

²² Agenda 21, Chapter 17.45

²³ These include: inadequate monitoring and enforcement of effective conservation measures, unregulated fishing, overcapitalization, excessive fleet size, vessel reflagging to escape controls, insufficiently selective gear, unreliable databases and lack of sufficient cooperation between States.

²⁴ For a more exhaustive analysis see Palma M, Tsamenyi M and Edeson W, (2010), *Promoting Sustainable Fisheries: International Legal and Policy Framework to Combat Illegal, Unreported and Unregulated Fishing*, Martinus Nijhoff.

²⁵ See Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), *Report of the Fifteenth Meeting of the Commission*, Hobart, Australia, 21 October-01 November 1996, CCAMLR-XV, Tasmania, Australia, 1996, para. 12.13 and 13.24.

²⁶ *Ibid.*, Annex 6, SCOI Report, para. 1.20.

²⁷ *Ibid.*, para. 5.100.

²⁸ *Ibid.*, paras. 5.109 and 5.130.

²⁹ *Ibid.*, para. 2.9 and 4.5.

³⁰ Palma, M, Tsamenyi, M & Edeson, W, op cit Note 11.

The term “IUU fishing” was formally adopted by FAO and became a central part of the Organization’s international fisheries policy at the Twenty-third Session of the Committee on Fisheries (COFI) in February 1999, based on a paper submitted by Australia, urging FAO to develop an international plan of action to combat IUU fishing³¹. A series of rapid developments after the Twenty-third Session of COFI between 1999 and 2000 concretised the IUU fishing notion. These included commitment in the Rome Declaration on Responsible Fisheries in 1999 to develop a global plan of action to address IUU fishing³²; a global review of IUU fishing by FAO³³; the decision at the 116th Session of the FAO Council in June 1999, agreeing that the FAO develop an international plan of action to address the problem of IUU fishing within the framework of the FAO Code of Conduct for Responsible Fisheries (Code of Conduct)³⁴; a draft text of a plan entitled the “International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing” by the FAO Expert Consultation on IUU Fishing in May 2000³⁵; and two sessions of an FAO Technical Consultation on IUU fishing in 2000.³⁶ Finally, the FAO Council at its 120th Session in June 2001 adopted the text of the IPOA-IUU.

3. Defining IUU Fishing

3.1. Existing definition

The IPOA-IUU provides a tool-box of actions that may be applied at national, regional and global levels to address IUU fishing. The term “IUU fishing” is defined in the IPOA-IUU by describing a number of illustrative activities under each of the IUU fishing components. Paragraph 3 of the IPOA-IUU, which is generally accepted as the working “definition” of IUU fishing, and recognized as such in the Port State Measures Agreement, is as follows:

³¹ FAO, Committee on Fisheries, Twenty-fourth Session, Rome, Italy, 26 February-2 March 2001, *Illegal, Unreported and Unregulated Fishing: A Proposal for a Draft International Plan of Action*, COFI 2001/7.

³² *Rome Declaration on the Implementation of the Code of Conduct for Responsible Fisheries*, para. 12(j).

³³ Kevin Bray, comp. and ed. ‘A Global Review of Illegal, Unreported, and Unregulated Fishing.’ *Experts Consultation on Illegal, Unreported, and Unregulated Fishing Organised by the Government of Australia in Cooperation with FAO*, Sydney, Australia, 15-19 May 2000, AUS:IUU/2000/6, 2000, para. 7.

³⁴ *Ibid.*

³⁵ See FAO, ‘Report of the Expert Consultation,’ *Experts Consultation on Illegal, Unreported and Unregulated Fishing Organised by the Government of Australia in Cooperation with FAO*, Sydney, Australia, 15-19 May 2000, AUS:IUU/2000/3, 2000.

³⁶ See FAO, Report of the Technical Consultation on Illegal, Unreported and Unregulated Fishing, *FAO Fisheries Report No. 634*, Rome, Italy, 02-06 October 2000. Rome, FAO, 2000.

3. In this document:
 - 3.1 Illegal fishing refers to activities:
 - 3.1.1 conducted by national or foreign vessels in waters under the jurisdiction of a State, without the permission of that State, or in contravention of its laws and regulations;
 - 3.1.2 conducted by vessels flying the flag of States that are parties to a relevant regional fisheries management organization but operate in contravention of the conservation and management measures adopted by that organization and by which the States are bound, or relevant provisions of the applicable international law; or
 - 3.1.3 in violation of national laws or international obligations, including those undertaken by cooperating States to a relevant regional fisheries management organization.
 - 3.2 Unreported fishing refers to fishing activities:
 - 3.2.1 which have not been reported, or have been misreported, to the relevant national authority, in contravention of national laws and regulations; or
 - 3.2.2 undertaken in the area of competence of a relevant regional fisheries management organization which have not been reported or have been misreported, in contravention of the reporting procedures of that organization.
 - 3.3 Unregulated fishing refers to fishing activities:
 - 3.3.1 in the area of application of a relevant regional fisheries management organization that are conducted by vessels without nationality, or by those flying the flag of a State not party to that organization, or by a fishing entity, in a manner that is not consistent with or contravenes the conservation and management measures of that organization; or
 - 3.3.2 in areas or for fish stocks in relation to which there are no applicable conservation or management measures and where such fishing activities are conducted in a manner inconsistent with State responsibilities for the conservation of living marine resources under international law.

Since the adoption of the IPOA-IUU, considerable implementation has evolved through national plans of action³⁷, regional plans of action³⁸, RFMO anti-IUU fishing measures³⁹, national legislation⁴⁰, and other mechanisms such as those implemented within the framework of the European Union's IUU fishing regulation⁴¹. An overwhelming majority of these actions have simply adopted the "definition" or description of IUU fishing as given in the IPOA-IUU, based on the three-tier approach of separating the "I", the "U" and the "U"⁴². Others adopt the three-tier approach to IUU fishing under the IPOA-IUU, but specify the activities which collectively constitute "IUU fishing" which are then characterised

³⁷ <http://www.fao.org/fishery/ipoa-iuu/npoa/en>

³⁸ <http://www.fao.org/fishery/ipoa-iuu/rpoa/en>

³⁹ See for example: WCPFC Conservation and Management Measure 2010-06; ICCAT Recommendation 09-10; IOTC, *Resolution 06/01*, CCAMLR, Conservation Measure 10-06.

⁴⁰ See for example: Ghana Fisheries (Amendment) Act 2014 (Act 880); Vanuatu Fisheries Act No.10 of 2014.

⁴¹ <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1408984470270&uri=CELEX:02008R1005-20110309>

⁴² For example. New Zealand, Ministry of Fisheries, *New Zealand Plan of Action to Prevent, Deter and Eliminate Illegal, Unregulated and Unreported Fishing*, May 2004, Sec. 1.3; Republic of Korea, Ministry of Maritime Affairs and Fisheries, *National Plan of Action to Prevent, Deter and Eliminate Illegal, Unregulated and Unreported Fishing*, Sec. 3; Kingdom of Tonga, *Plan of Action to Prevent, Deter and Eliminate Illegal, Unregulated and Unreported Fishing*, September 2004, Sec. 1.3; Ghana, *National Plan of Action to Prevent, Deter and Eliminate Illegal, Unregulated and Unreported Fishing*, June 2004, at 7. See Also For example, Council Regulation (EC) No 1005/2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing, amending Regulations (EEC) No 2847/93, (EC) No 1936/2001 and (EC) No 601/2004 and repealing Regulations (EC) No 1093/94 and (EC) No 1447/1999 *OJ EU L 286 of 29 October 2008*.

as “serious violations,” attracting dissuasive sanctions⁴³. At least one State has sought to redefine the concept of IUU fishing in national legislation⁴⁴.

3.2. Analysis of the Components of IUU Fishing

3.2.1. Illegal Fishing

The concept of “Illegal Fishing” under the IPOA-IUU is more complex than often understood. Whether a contravention or violation constitutes a crime *per se* (attracts a criminal liability/sanctions) or attracts civil or administrative sanctions is irrelevant to characterising it as an illegal fishing activity under the IPOA-IUU.

Based on paragraph 3.1 of the IPOA-IUU, three sub-categories of “illegal fishing” may be identified.

- a) Fishing activities undertaken by persons and vessels in waters under national jurisdiction of a State in contravention of national legislation;
- b) Fishing activities undertaken by vessels flagged to members of relevant RFMOs (including cooperating non-members) in contravention of applicable conservation and management measures instated by the RFMO; and
- c) Fishing activities in violation of the international obligations of States

The content of what constitutes “illegal fishing” under the IPOA-IUU varies according to the area of jurisdiction or area of competence in which the activity takes place.

3.2.1.1. *The Area of jurisdiction in which the activity is undertaken*

For the purpose of fisheries conservation and management, international law divides State jurisdiction and competence into a number of zones. States have full sovereignty over fisheries resources in their internal waters (including lakes and rivers), archipelagic waters and territorial sea and the continental shelf (for sedentary species). This provides States with considerable discretion to determine what constitutes an illegal fishing activity in these areas.

In the EEZ, States have sovereign rights over their fisheries resources and, in general, considerable discretion to determine management rules and the content of national legislation. In terms of their legislative power, Article 62(4) of the Law of the Sea Convention provides that:

Nationals of other States fishing in the exclusive economic zone shall comply with the conservation measures and with the other terms and conditions established in the laws and regulations of the coastal State. These laws and regulations shall be consistent with this Convention and may relate, *inter alia*, to the following:

- (a) licensing of fishermen, fishing vessels and equipment, including payment of fees and other forms of remuneration, which, in the case of developing coastal States, may consist of adequate compensation in the field of financing, equipment and technology relating to the fishing industry;
- (b) determining the species which may be caught, and fixing quotas of catch, whether in relation to particular stocks or groups of stocks or catch per vessel over a period of time or to the catch by nationals of any State during a specified period;
- (c) regulating seasons and areas of fishing, the types, sizes and amount of gear, and the types, sizes and number of fishing vessels that may be used;
- (d) fixing the age and size of fish and other species that may be caught;

⁴³ See Appendix 1 below.

⁴⁴ See Appendix 2 below

- (e) specifying information required of fishing vessels, including catch and effort statistics and vessel position reports;
- (f) requiring, under the authorization and control of the coastal State, the conduct of specified fisheries research programmes and regulating the conduct of such research, including the sampling of catches, disposition of samples and reporting of associated scientific data;
- (g) the placing of observers or trainees on board such vessels by the coastal State;
- (h) the landing of all or any part of the catch by such vessels in the ports of the coastal State;
- (i) terms and conditions relating to joint ventures or other cooperative arrangements;
- (j) requirements for the training of personnel and the transfer of fisheries technology, including enhancement of the coastal State's capability of undertaking fisheries research;
- (k) enforcement procedures.

Although Article 64(4) is directed at foreign fishing activities in the EEZ of the coastal State, it provides the basic content of national fisheries legislation in general. Arguably, Article 62(4) provides some guidance on the scope and content of national fisheries legislation and what may constitute the first component of “illegal fishing” in the EEZ of the coastal State under paragraph 3.1.1 of the IPOA-IUU. This may sound simple on the face of it, but is complex in practice. The complexities relate largely to the absence of definition of “fishing” under the Law of the Sea Convention and the IPOA-IUU and consequently, and what may constitute an “illegal fishing” activity. These complexities may also have a bearing on the definition of illegal fishing for the purpose of a global estimation. In practice, many States have defined “fishing” very broadly, an approach which is gaining currency in international instruments⁴⁵. The definition of the term “fishing” in the PSMA, the most recent binding international fisheries instrument, is given as “searching for, attracting, locating, catching, taking or harvesting fish or any activity which can reasonably be expected to result in the attracting, locating, catching, taking or harvesting of fish”. It is also relevant to consider whether “fishing related activities” should be included in the equation when quantifying IUU fishing⁴⁶. Elements of “fishing” commonly included in national legislation include⁴⁷:

- searching for, or taking, fish;
- attempting to search for, or take, fish;
- engaging in any other activities that can reasonably be expected to result in the locating, or taking, of fish;
- placing, searching for or recovering fish aggregating devices or associated electronic equipment such as radio beacons;
- any operations at sea directly in support of, or in preparation for, any activity described as fishing;
- aircraft use relating to any activity described in this definition except flights in emergencies involving the health or safety of crew members or the safety of a boat; and
- the processing, carrying or transshipping of fish that have been taken.

It can be argued that any of the above activities undertaken by foreign and national vessels in contravention with the laws of a State constitute “illegal fishing” within the scope of paragraph 3.1.1 of the IPOA-IUU. The practical challenge for the future study will be determining the exact scope of such activities. Another issue will be whether the scope of “illegal fishing” for the purpose of classifying an activity as “IUU fishing” should include

⁴⁵ See for example the Convention on the Conservation and Management of High Migratory Fish Stocks in the Western and Central Pacific Ocean (2000).

⁴⁶ “Any operation in support of, or in preparation for, fishing, including the landing, packaging, processing, transshipping or transporting of fish that have not been previously landed at a port, as well as the provisioning of personnel, fuel, gear and other supplies at sea” (as defined in the PSMA).

⁴⁷ For example: Australian Fisheries Management Act 1992; New Zealand Fisheries Act 1996.

everything referred to as a contravention of a law or defined as “illegal” by States under national legislation. Determining the valid scope and content of fisheries legislation and the link between a proscribed activity and IUU fishing concerns, is therefore fundamental.

3.2.1.2. *Activities in the area of competence of RFMOs by vessels flagged to members of RFMOs*

Under paragraph 3.1.2 of the IPOA-IUU, conservation and management measures established by RFMOs may also determine what activities constitute “illegal fishing” in areas of competence of the RFMO, including the high seas and in areas under national jurisdiction. Where the Convention Area of an RFMO includes EEZs of its members, especially in the case of straddling fish stocks and highly migratory species, the conservation and management measures of the RFMO will constitute minimum standards in the EEZ. By virtue of its sovereign rights, the coastal State’s management measures and legislation can exceed those of the RFMO. However, where the coastal State does not set a higher management standard in its EEZ, the standards set by the RFMO become the default standard in the EEZ of the coastal State. This interpretation reflects provisions under the Law of the Sea Convention (and elaborated in detail under the UN Fish Stocks Agreement and other international instruments). All States have a duty to cooperate through RFMOs to manage specific species or stocks, such as straddling fish stocks and highly migratory species.⁴⁸ Contracting Parties and Cooperating non-Contracting Parties are legally bound to observe conservation and management measures adopted by their respective RFMOs and to translate such measures into enforceable national legislation.

The UN Fish Stocks Agreement classified some activities as “a serious violation.” Such activities include fishing without a valid license; fishing in a closed area; fishing during a closed season or fishing without a quota established by relevant RFMOs; fishing for a stock which is subject to moratorium or for which fishing is prohibited; using prohibited gears; or other multiple violations which constitute a disregard of conservation and management measures⁴⁹. The 1993 FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (Compliance Agreement) obliges States to make any contravention of the Compliance Agreement an offence (and therefore illegal) where appropriate⁵⁰, including any act undermining conservation and management measures. Similarly, the FAO Code of Conduct urges Flag States to make the contravention of applicable conservation and management measures as “offences” where appropriate⁵¹. In addition to these international instruments, most RFMOs have adopted conservation and management measures which may determine the scope and content of “illegal fishing” on the high seas. Some RFMOs have specifically defined what constitutes illegal fishing activity, a fisheries offence, or a fisheries infringement, without any distinction between members and non-member vessels⁵². Such activities include:

- exceeding the agreed/regulated level of fishing effort;
- the use of certain/specific vessel types;

⁴⁸ See Law of the Sea Convention Articles 63, 64 and 118-119

⁴⁹ *UN Fish Stocks Agreement*, Arts. 18(3) and 21(11).

⁵⁰ *FAO Compliance Agreement*, Art. III(8).

⁵¹ *FAO Code of Conduct*, para. 8.2.7.

⁵² See for example: Northeast Atlantic Fisheries Commission (NEAFC), *Recommendation on a Scheme of Control and Enforcement in Respect of Fishing Vessels Fishing in Areas Beyond the Limits of National Fisheries Jurisdiction in the Convention Area*, 11 January 2005; Indian Ocean Tuna Commission (IOTC), *Resolution 02/04 on Establishing a List of Vessels Presumed to Have Carried Out Illegal, Unregulated and Unreported Fishing in the IOTC Area*, 2002; CCAMLR, Conservation Measure 32-01 (2001) on the Prohibition of Directed Fishing for Finfish in Statistical Subarea 48.1; 32-09 (2004) on the Prohibition of Directed Fishing for *Dissotichus spp.* Except in Accordance with Specific Conservation Measures in the 2004/05 Season; 32-17 (2003) on the Prohibition of Directed Fishing for *Electrona carlsbergi* in Statistical Subarea 48.3; Northwest Atlantic Fisheries Organisation (NAFO), *Conservation and Enforcement Measures*, NAFO/FC Doc. 05/1, Serial No. N5070. 2005; Western and Central Pacific Fisheries Commission, Boarding and Inspection Procedures, *Conservation and Management Measure 2006-08*.

- fishing without a valid authorisation to fish issued by the flag State;
- fishing without a quota;
- use of prohibited gear;
- directed fishing for a stock which is subject to a moratorium or for which fishing is prohibited;
- falsifying or concealing of the markings, identity or registration of a fishing vessel;
- concealing, tampering with or disposing of evidence relating to an investigation;
- assault, intimidation or sexually harassment of a high seas inspector⁵³; and
- intentionally tampering with or disabling the vessel monitoring system.

In view of the increasing broad scope of RFMO conservation and management measures (including for example, the protection of dependent and associated species, safety and welfare of fish workers, wider ecological issues and protection of cables, pipelines and data buoys), a practical issue to consider is whether the violation of every RFMO conservation and management measure will constitute “illegal fishing” for the purposes of a study to estimate the magnitude of IUU fishing.

3.2.1.3. *High Seas Fishing Activities of Non-members of RFMOs*

Under paragraph 3.1.3 of the IPOA-IUU, fishing activities undertaken on the high seas by vessels flagged to non-members of RFMOs may also constitute illegal fishing under certain circumstances. This is the case where such fishing activity undermines international conservation and management measures and is contrary to the general duties and responsibilities of the State, for example, under the Law of the Sea Convention or the UN Fish Stocks Agreement. This is by virtue of the general duty on States under the two instruments to cooperate to manage high seas fisheries and specific species of fish⁵⁴. The related practical consideration is whether a non-member State has made the contravention of international conservation and management measures by the vessels flying its flag, an illegal activity. Without this happening first, the obligation to not undermine international conservation and management measures or to act in conformity with the duties and responsibilities of States is simply that – a State obligation. A related practical issue (in addition to pertinent politico-legal considerations) is whether the non-conforming act of the vessel of a non-member flag State can be attributed to such State where it has not regulated against such “illegal fishing” or whether an act perceived to be a State’s non conformity with its duties and responsibilities be considered “illegal fishing”.

3.2.2. **Unreported Fishing**

According to the IPOA-IUU, “Unreported fishing” refers to fishing activities which have not been reported or misreported to the relevant national authority and / or relevant RFMOs in contravention of laws, regulations and procedures.

The concept of “Unreported fishing” may be confusing and overlap with “illegal fishing” and “unregulated fishing.” For example, failure to report or misreporting of information on fishing activities contrary to national laws will qualify the fishing activities concerned as “illegal fishing” under paragraph 3.1.1 of the IPOA-IUU. Similarly, information on any fishing activities undertaken in areas of competence of an RFMO by vessels of Contracting Parties and Cooperating non-Contracting Parties which has not been reported or has been misreported, in contravention of the reporting procedures of that RFMO will render the activities as “illegal fishing” under paragraph 3.1.2 of the IPOA-IUU. Additionally, in high seas areas not governed by an RFMO,

⁵³ This is unique to the WCPFC. WCPFC, *Conservation and Management Measure 2006-08*, para.37.

⁵⁴ See *The Law of the Sea Convention Art.117- 119*.

unreported fishing activities by vessels of States contrary to their wider international obligations may constitute “illegal fishing” under paragraph 3.1.3 or “unregulated fishing” under paragraph 3.3.2 of the IPOA-IUU⁵⁵.

The above interpretation arises because the act of reporting fishing activity or its outcomes (catch, by catch, discards or fishing location, date and time) is bundled together and considered or labelled as fishing, thus “unreported fishing”, as if it were a kind of fishing when it is not. It would be better and clearer if the term “unreported fishing” is rearticulated as “non-reporting of fishing activity” (i.e. reporting of location, date and time of fishing) and “non-reporting of catch”, “underreporting of catch” or “misreporting of catch” whether required or not by the applicable laws and regulations or RFMO conservation and management measures. This approach distinguishes non-reporting, underreporting or mis-reporting of activities that are not “fishing” *sensu stricto*. In this way, whereas, “illegal fishing” and “unregulated” fishing refers to actual fishing (including the searching for and taking of fish), the “unreported” aspect of the term “IUU fishing” refers to a non-fishing activity i.e. the act or omission of reporting of the fishing activity whether during or after the fishing activity has taken place.

3.2.3. Unregulated Fishing

Under paragraph 3.3 of the IPOA-IUU, there are two components of unregulated fishing. The first component includes fishing activities undertaken by non-State Party vessels in a manner not consistent with or in contravention of measures adopted by the relevant RFMO; and the second covers fishing activities which are deemed inconsistent with relevant provisions of international law in areas for which there are no conservation or management measures.

“Unregulated fishing” is a very narrow component of IUU fishing which, in practice, overlaps with “illegal fishing” and “unreported fishing” (as explained in section 3.2.2 above). Fishing activities undertaken by vessels of non-members of relevant RFMOs which are inconsistent with their State responsibility under international law constitute “illegal fishing” under paragraph 3.1.3. Fishing activities in high seas areas where no RFMOs have been established which are inconsistent with the State responsibilities also constitute “illegal fishing” under paragraph 3.1.3 of the IPOA-IUU.

Under paragraphs 3.3.1 and 3.3.2 of the IPOA-IUU, “Unregulated fishing” appears to apply essentially to four scenarios:

- fishing activities of Stateless vessels on the high seas;
- fishing activities by vessels of fishing entities who are not Cooperating non-Contracting Parties of an RFMO;
- fishing activities on the high seas by vessels whose flag States do not exercise control over such vessels in accordance with the obligations of States under international law including the Law of the Sea Convention; and
- fishing activities in areas under national jurisdiction (including inland fisheries) which are not prohibited or regulated by national legislation or conservation and management measures of an RFMO, but which are contrary to the general international obligations of States⁵⁶.

This limited scope of “unregulated fishing” and its links with “illegal Fishing” is underscored by paragraph 3.4 of the IPOA-IUU which states: “Notwithstanding paragraph 3.3, certain unregulated fishing may take place in a manner which is not in violation of applicable international law, and may not require the application of measures envisaged under the

⁵⁵ For further discussion see: Palma, M, Tsamenyi, M & Edeson, W; op cit Note 11.

⁵⁶ Examples of this may include transshipment activities which are not regulated by law, failure to declare the total allowable catch, failure to collect relevant scientific data etc. under Article 61 of the Law of the Sea Convention.

International Plan of Action (IPOA).”

The concept of “unregulated fishing” needs to be understood against the background of the historical development of the IUU fishing notion outlined earlier, particularly international concerns in the 1990s about the scope and content of the freedom of fishing on the high seas⁵⁷ and indiscriminate high seas fishing activities of States and fishing entities that were not members of relevant RFMOs. Such concerns led to the development of international instruments such as Agenda 21 (Chapter 17), the FAO Code of Conduct for Responsible Fisheries, the FAO Compliance Agreement and the UN Fish Stocks Agreement. It can be argued that the problem of “unregulated fishing” on the high seas has been controlled through a number of approaches, including the implementation of the UN Fish Stocks Agreement, contemporary RFMO practices such as granting Cooperating non-Contracting Party status, IUU fishing vessel lists (black lists) of both member and non-member vessels, the development of enhanced port State measures and the implementation of market State measures. What is problematic is “unregulated fishing” taking place in areas under national jurisdiction where States have sovereignty and sovereign rights and the discretion to regulate or not to regulate.

4. Elements for consideration in estimating IUU Fishing

Any estimate of IUU fishing, to be credible, must be based on the internationally accepted notion of IUU fishing under the IPOA-IUU. However, as explained above, the IUU fishing term is broad and, due to the diversity in governance frameworks, national legislation, fishing operations throughout the globe, and RFMO conservation and management measures, there are a number of grey areas and overlapping situations among the three components of IUU fishing. In addition, whilst the IPOA-IUU describes a number of illustrative activities under each of the IUU fishing components, it does not completely cover all possible scenarios and does not address the issue of overlap among the three IUU fishing components.

Based on the discussion of the three constituent elements of IUU fishing in section 3 above, a synthesis of the possible elements that may be considered for inclusion in any such future estimate of IUU fishing, in order to provide a uniform and consistent basis for estimation, is set out below. It should be noted that these proposed working elements for IUU fishing for estimating quantities (volumes and values) of IUU fishing are preliminary and merely intended to distinguish between the “I”, the “U” and “U” for the purpose of any such exercise.

4.1. Illegal fishing

“Illegal fishing” could cover the following situations:-

- Fishing activities by all vessels (national and foreign) in areas under national jurisdiction, including inland fisheries, in contravention of national laws. The activities to be measured will largely be determined by what is stated in national legislation as a violation. Whether the contravention or violation constitutes a crime (attracts criminal liability/sanctions) or attracts civil or administrative sanctions is irrelevant.
- Fishing activities in contravention of RFMO conservation and management measures to which a State is a Contracting Party or Cooperating non-Contracting Party or which are contrary to the relevant provisions of the applicable international laws. Under this sub-category, the contravention need not be “illegal” per se (contrary to an enforceable law) but is a contravention or violation that may go un-enforced or not penalised. The content of RFMO conservation and management measures will determine the scope of activities to be considered for the purpose of estimation. Although the fishing activity will be undertaken by a

⁵⁷ See Law of the Sea Convention Article 86

vessel, the “offender” will include States as a result of their failure to implement their international obligations through domestic legislation.

- There are, however, some ‘grey’ areas within national laws and RFMO conservation and management measures as to whether something should be considered illegal for the purposes of any estimation of IUU fishing. For example, where a vessel catches over quota but then comes back to port and arranges to purchase quota, would such an act be deemed illegal? Should the classification of act as illegal for the purpose of the study be based on serious intent to evade rules, or would minor digressions or administrative errors be equally important?

4.2. Unreported Fishing

- “Unreported fishing” should be re-casted as “non-reporting, underreporting or misreporting “of any information related to the fishing activity. Non reporting, underreporting or misreporting occur if they are:
 - in contravention of a law (illegal under national law) or regional/international conservation and management measure. Examples here may include non-reporting of catch (amount, composition of target, non target catch, bycatch or discards or non-reporting of fishing location, date and time contrary to a law, relevant RFMO conservation and management measures or other rules of international law; and
 - non reporting of all information related to the fishing activity that is not in contravention/violation of a national law or RFMO conservation and management measures to which a State is a member or which are contrary to the relevant provisions of the applicable international laws (i.e. unregulated non reporting).

If fishing is defined to include transshipment and transporting of fish, then “unreported” would include the no-reporting, misreporting or underreporting of these activities and of the catches involved in these activities i.e. the transhipped or transported catches.

4.3. Unregulated Fishing

- Unregulated fishing would appear to be largely an issue of governance failure which would cover other types of activities that are not regulated, or that are taking place in areas without a fisheries governance framework. Examples may include a specific activity that is not regulated by a law or regional/international conservation and management measure (but against general conservation and biodiversity principles or proven to be detrimental to the stocks/environment). Unregulated fishing would also cover fishing activities in internal waters (lakes and rivers) where there are no management plans or legislation. Practically, measuring the contribution of governance failure to IUU fishing may be difficult in practice.

5. Conclusion

Analysis of the three components of the IUU fishing notion has demonstrated that there are practical challenges that have to be overcome in respect of the working “definitions” of I, U and U fishing. The discussion in the paper may be summed up as follows:

- Illegal fishing can cover many types of offences in contravention of national laws or RFMO conservation and management measures, especially when a wide definition of fishing and related activities is included. Each of these activities may need to be listed and prioritised in terms of what can be measured.
- The proposed “definition” of “unreported fishing” is to recast this term as “non-reporting of all information related to the fishing activity”. This term would refer to and is restricted to activities that are not “fishing” *sensu stricto* but a specific activity that is distinct but associated to fishing and can occur during or after the act of fishing occurs. It includes non-reporting, misreporting or under-

reporting in contravention of laws and RFMO conservation and management measures (illegal) and reporting that is not required by law or an RFMO conservation and management (unregulated) but is advisable. However, pinning down realistic examples of what may constitute “unreported fishing” and agreement on which of these can be measured may be difficult.

- “Unregulated fishing” relates largely to the activities of Stateless vessels and non-parties to RFMOs and the failure by States to regulate certain activities which cannot be easily monitored and accounted for. The question for consideration will be whether an attempt should be made to measure or identify “unregulated” activity?

A pragmatic approach in determining what is IUU fishing for the purposes of estimating the magnitude of IUU fishing would be to use the categories referred to above relating to the “I”, the “U” and the “U” and list what specific activities fall within each category. This will make it possible to measure and compute the magnitude of each activity. A helpful approach to developing such a list of activities is to use the definition of “fishing” as set out in the PSMA. Alternatively, a combined list of activities could be developed instead of placing them separately under the “I”, the “U” and the “U”. What is eventually placed on the list however depends on whether there is a practical way of estimating the value of its impact.

Annex 1 to Appendix 4 – Paper 2

Council Regulation (EC) No 1005/2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing, amending Regulations

Article 3

Fishing vessels engaged in IUU fishing

1. A fishing vessel shall be presumed to be engaged in IUU fishing if it is shown that, contrary to the conservation and management measures applicable in the fishing area concerned, it has:

- (a) fished without a valid licence, authorisation or permit issued by the flag State or the relevant coastal State; or
- (b) not fulfilled its obligations to record and report catch or catch-related data, including data to be transmitted by satellite vessel monitoring system, or prior notices under Article 6; or
- (c) fished in a closed area, during a closed season, without or after attainment of a quota or beyond a closed depth; or
- (d) engaged in directed fishing for a stock which is subject to a moratorium or for which fishing is prohibited; or
- (e) used prohibited or non-compliant fishing gear; or
- (f) falsified or concealed its markings, identity or registration; or
- (g) concealed, tampered with or disposed of evidence relating to an investigation; or
- (h) obstructed the work of officials in the exercise of their duties in inspecting for compliance with the applicable conservation and management measures; or the work of observers in the exercise of their duties of observing compliance with the applicable Community rules; or
- (i) taken on board, transhipped or landed undersized fish in contravention of the legislation in force; or
- (j) transhipped or participated in joint fishing operations with, supported or re-supplied other fishing vessels identified as having engaged in IUU fishing under this Regulation, in particular those included in the Community IUU vessel list or in the IUU vessel list of a regional fisheries management organisation; or
- (k) carried out fishing activities in the area of a regional fisheries management organisation in a manner inconsistent with or in contravention of the conservation and management measures of that organisation and is flagged to a State not party to that organisation, or not cooperating with that organisation as established by that organisation; or
- (l) no nationality and is therefore a stateless vessel, in accordance with international law.

2. The activities set out in paragraph 1 shall be considered as serious infringements in accordance with Article 42 depending on the gravity of the infringement in question which shall be determined by the competent authority of the Member State, taking into account the criteria such as the damage done, its value, the extent of the infringement or its repetition.

Annex 2 to Appendix 4 – Paper 2

United States Magnuson-Stevens Fishery Conservation and Management Reauthorisation Act ((2006) (16 USC 1826j HSDFMFA §609(e)(3)), 16 U.S. CODE § 1826J –Illegal, Unreported, or Unregulated Fishing

The following definition is provided pursuant to section 609(e)(3) of the Moratorium Protection Act

- fishing activities that violate conservation and management measures required under an international fishery management agreement to which the United States is a party, including *but not limited to* catch limits or quotas, capacity restrictions, and bycatch reduction requirements;
- overfishing of fish stocks shared by the United States, for which there are no applicable international conservation and management measures or in areas with no applicable international fishery management organization or agreement, that has adverse impacts on such stocks; and
- fishing activity that has a *significant* adverse impact on seamounts, hydrothermal vents, cold water corals *and other vulnerable marine ecosystems* located beyond *any* national jurisdiction, for which there are no applicable conservation or management measures, *including those* in areas with no applicable international fishery management or agreement.

Estimating the extent of IUU fishing

Background Paper 3 for the FAO Workshop on Estimating Worldwide IUU fishing

D J Agnew

Previous studies and available estimation methods

Previous global and regional estimates of IUU fishing have made use of multiple data sources and methodologies to estimate illegal and unreported fishing for specific countries, species and times. The individual methods available at this level of specification range from direct, statistically robust estimation methods which yield point estimates and confidence intervals, to anecdotal, patchy and biased methods which yield a poorly defined point estimate only.

The following sections describe some of the properties of methods of estimating IUU on a species- or situation basis as well as on a global basis. Table 1 presents a summary of the strengths and weaknesses of the methods.

Scientific methods based on population dynamic models

Method:

Stock assessments generally assume perfect knowledge of catches, and use either trends in fishery dependent indicators (such as catch per unit effort, mark-recapture studies) or fishery-independent indicators (such as survey density estimates) to generate plausible estimates of the current and past state of the stock. They can incorporate observation and process error in these indicators but rarely do so for catches. However, if there is external knowledge of unreported data this can be estimated by stock assessment models. This usually works best if at least there are some periods of assumed accurate recording of catches, such that the IUU estimated period is constrained. In these circumstances the model uses information from the “good” bits of the assessment – for instance knowledge about variability in natural mortality or fishing mortality – to help it estimate the catches in the uncertain period.

Examples:

There are a number of examples of the use of these techniques; Plaganyi et al (2011) used an assessment model in conjunction with an analysis of trade data to estimate the quantity of illegal poaching of abalone in South Africa, Payne et al (2005) used a production model to estimate IUU catch of toothfish over a 2 year period in the SW Atlantic, and ICES has used the technique to estimate unreported catches during the early 2000s. While the precise methodology used in each study does differ, the latest ICES assessment for cod in the North Sea gives a good description of the issues (ICES, 2014).

Facing a rapid decline in cod stock size in the North Sea, in the 2000s the European Commission implemented a number of measures which aimed to recover stocks, including area closures, restrictions in effort and reductions in total allowable catch (Mardle et al, 2008). The substantial reduction in TACs in the early 2000s are judged likely to have led to significant under-reporting, whether illegal (landings) or not illegal (discarding). Scottish compliance authorities tracked illegal landings, and through a series of

measures were able to reduce them to the extent that in 2006 they were thought to have been eliminated, real fishing mortality dropped rapidly and the stock has been recovering from about that time. The ICES working group in 2014 used a model called SAM. Instead of assuming catches to be known without error and simply subtracting those, SAM assumes that catches include observation noise. This has the consequence that estimated F-at-age paths display less inter-annual variability with SAM than with deterministic assessment models, because part of the observed fluctuations in catch-at-age are arising from observation noise instead of from changes in F. Application of the model assuming unknown catch observation noise for a very long period of time (1993 to the present) did not lead to satisfactory results, but constraining the “uncertain” time to 1993 – 2005 allowed ICES to estimate that during the period of most rapid management action, the early 2000s, real catches were up to 68% higher than the combined declared catches (including discards).

Plaganyi et al (2011) used a different approach. While ICES (2014) assumed no actual knowledge of the magnitude of unreported catch except that it probably happened, Plaganyi et al (2011) took an index of illegal activity, from compliance/inspection records (confiscations per unit policing effort), and used this to tune the estimated catch in each year, again within the framework of a population dynamics model. The results were cross-checked against estimates of illegal catches/exports generated through a review of trade data.

Some estimates of IUU fishing have used logical assumptions about continuity in catch – which is akin to the above-mentioned assumption of some inter-year or inter-cohort consistency in fishing mortality – to reconstruct catch series based on existing data and plausible argument/ancillary data. The most recent and comprehensive study appears to be Cisneros-Montemayor et al (2013) but for the Baltic Zeller et al (2011) conducted a similarly robust analysis.

Pros and cons:

Using stock assessments to estimate illegal or unreported catch have the advantage that they can be accurate when the illegal activity is known to have happened but unknown in magnitude. They benefit from being a statistical method framed within a model of the dynamics of fish populations, and so cannot estimate biologically unreasonable levels of illegal catch. However, they are computationally intensive, rely on there being a stock assessment approach that can be used, and cannot distinguish between illegal activities and legal activities.

MCS Inspection and intelligence data

Method:

There are many ways that MCS data can be used to generate information on illegal activity but one of the biggest challenges is to understand whether the methods are able to objectively estimate IUU catches. This depends on whether they have been generated in a way that allows reasonable extrapolation to the entire population of fishers. Most MCS systems take a targeted approach to policing, meaning that the data they develop are not random, and will need to be stratified before they could be applied to the entire fleet. Nevertheless, they can provide very high quality data on the types of offences detected, from which a deliberate categorisation of I, U and U is possible, and the consequences of the action, in terms of under-reporting, using illegal gear, contravention of discarding rules, using gears in prohibited areas, etc. Note that the two most common inspection types, at-sea and dockside inspections, have the ability to detect different types of violation: dockside inspections are cheaper and can cover overall landing regulations, but at-sea inspections, or observer systems, are required to detect issues such as illegal discarding, slippage, handling of protected species and gear use.

Examples:

Although some other referenced material was used, 41 individual interviews were used by Pramod et al (2014) in their study of IUU imports to the USA, of which 32 were confidential. These were of varying quality, but did allow for the determination of specific IUU problems, such as illegal discarding during Russian Pollock fishery aimed at retention only of roe for market. In that same study, the authors report reductions in violations from inspections in the Sea of Okhotsk from 3.4% in 2008 to 1.7% in 2010, but note discrepancies with other data sources. Understanding such estimates also requires that we understand the sampling approach taken by inspectors, coverage and statistical reliability. In some cases reports of inspection activities are made publicly available (eg the European Fisheries Control Agency), but in most cases it is difficult to acquire raw data on inspections, overall fleet disposition and the other elements that would allow a statistically robust estimate of IUU activity to be made.

Surveillance data may be acquired by non-surveillance authorities, but its translation into absolute estimates of catch requires a statistical approach. Between 1st January 2010 and 31st July 2012, EJF's community surveillance project in southern Sierra Leone received 252 reports of pirate fishing by industrial vessels in inshore areas (EJF, 2012). These data could form the basis of an estimate of total IUU activity and catch.

Anecdotal information from MCS and other government employees and from non-MCS professionals and the general press is of perhaps limited value in estimating IUU activity, because it is even more difficult to analyse and understand statistically. However, widely applied, statistically designed surveys of fishers themselves may yield more accurate data than one would expect. King et al (2009) report that their surveys of fishers suggest that in the US non-compliance is more prevalent than previously thought, accounting for 10-20% of the overall harvest. Recent court cases (such as the American Seafoods case (2013) where the company was found guilty of having flow scales erroneously calibrated such that catches were under-reported) may support these results.

Pros and cons:

MSC inspection data can provide accurate information, but the statistical basis of extrapolation to the entire fleet requires that details of inspection strategy and probability of detection of different violations needs to be known; and acquiring raw data from which these estimates can be made is often difficult. Fisher surveys may provide an alternative, but other anecdotal data arising from interviews with MCS professionals or the press on a one-off basis, with no cross-validation, should be treated with caution.

Remote sensing*Method:*

This method includes all elements of remote sensing: at-sea sightings not followed by inspections, overflight sightings, satellite transponder information (active reporting) and remote sensing satellite imagery (passive reporting). Using scientific observers to identify illegal vessels fishing within a fleet has not proven particularly successful to this author's knowledge, mainly because unlike observers/inspectors on patrol vessels observers on fishing vessels have no way to confirm the identity of sighted vessels. Clearly there are very large differences between these different methods, but what they have in common is a potentially wide scale of application and ability to detect vessels that are fishing where they should not, balanced against an inability to determine the activity that is being undertaken – they are even more removed from being able to identify specific issues of illegal practice than shore based landing inspections. Thus they need to be matched with ways of determining what vessels that are not meant to be in an area are actually doing. Determining if they are fishing is possible through some remote sensing methods, but determining likely catch quantities, composition and interaction with non-target species such as birds and bycatch, requires extrapolation from data acquired on legal vessels, either by fisher or observer reporting.

Examples:

MRAG (2005) used data from overflights to estimate the number of unlicensed vessels fishing in west Africa. CCAMLR uses anecdotal information on IUU vessels fishing in CCAMLR waters, matched with national patrol vessel sightings, to estimate the number of vessels still fishing illegally in the Antarctic. Estimates of likely catch are also required, which can be acquired from catch rates of legal (observed) vessels or estimates of trip length, hold volume, etc (CCAMLR, 2013). IOTC used the same approach to generate early estimates of IUU (unreported) catches in the Indian ocean by combining knowledge of active vessels whose catch was known not to be reported to the Commission with estimates of the likely catch of those vessels during the year. (while not strictly being a “remote sensing” methodology, having some close links to the port inspection data described above, the basic philosophy behind the approach was similar to IOTCs). Agnew & Kirkwood (2002) used patrol vessel sightings of illegal vessels and gear in the water, embedded within a model of vessel movements and catch quantities calibrated using legal vessels, to statistically estimate the amount of IUU fishing at South Georgia (South Atlantic). These methods suffer from the problem of null sightings, which in reality does not always translate to no IUU fishing. To the author’s knowledge this approach has also been used by FFA in the past to estimate IUU activity and catches in FFA waters.

In the mid-2000s a number of systems were developed to match synthetic aperture radar (SAR) satellite imagery with the known position of legal and illegal vessels, the former through their transponder reporting systems (VMS or AIS) and the latter by a process of elimination. The EU’s Joint Research Centre’s VDS (Vessel Detection System), which uses SAR, VMS, AIS and other information from inspection services, continues to be developed (see Greidanus et al⁵⁸). Skytruth used an AIS/SAR approach to monitor the waters around Easter Island in 2013, detecting more than 40 possible vessels fishing without a licence⁵⁹. These systems suffer from an inability of SAR to detect small vessels or those with a very low radar image (eg wood, glass fibre), and to be confused by some sea states and by icebergs and bergy bits with the same reflectance and size properties as vessels, the cost of SAR imagery, the necessity of pre-ordering image capture and download from the satellite, and the voluntary nature of AIS particularly for fishing vessels. On the other hand, SAR is widely available, and has the big advantage that it is not hindered by clouds, and is available at a number of different satellite resolutions. VDS also provides the possibility of generating excellent quality statistical information on IUU, and might be available in some areas.

The implementation of AIS has been used by a number of specialist organisations seeking to match the following information: freely available AIS data tracking large vessel movements (eg marinetraffic.com); algorithms able to detect fishing activities (as opposed to steaming, transshipping, etc) with reasonable accuracy; information on prohibited fishing areas (MPAs, other management areas); fishing vessel licence authorisations. Such programs include Global Fishing Watch (Google, Oceana, Skytruth) and Fish Spektrum. These are emerging technologies, and to my knowledge have not yet been used to estimate the extent of IUU fishing in particular areas, although they have demonstrated their ability to identify potential IUU activities by individual vessels.

Pros and cons:

I describe a large number of different applications of remote sensing data, and many of them have different properties. However, by their nature the power of all these remote sensing techniques is their ability to cover large spatial and temporal scales with unbiased statistical accuracy. Their drawback is that it is often difficult to establish what IUU activity is being undertaken, if any, and ancillary data need to be used to translate presence/absence into catches (eg data from legal, observed vessels).

⁵⁸ Harm Greidanus, Marlene Alvarez, Jean-Noel Druon; Space-based surveillance tools for fisheries control. Available at <http://151.1.154.86/GfcmWebSite/VMS/2012/ppt/GFCM-VMS-Rome-April2012-Greidanus.pdf>

⁵⁹ See http://skytruth.org/wordpress/wp-content/uploads/2013/07/SkyTruth.About_IUU_.2013.FINAL_.pdf

Trade data analysis

Method:

Trade statistics analysis examines the level of trade in a species, matching exports and imports against government records of catches (Willock, 2004). These core activities can be supported by observer/MSC data, and inspection/customs service information on seizures, etc. Because international trade statistics are often publicly available, particularly for high profile species, these methods can have some power, and TRAFFIC have developed a guide to sourcing and analysing fisheries trade data⁶⁰. However, there is often a mismatch between the catch period and the export/import periods; not all fish may be exported; exports are by product, necessitating assumptions about conversion rates between whole fish weights and various product types. The advent of catch documentation systems for high profile species and, in the EU at least for all species imported into the EU, should provide more granularity to such data, and allow better statistical estimates of IUU fishing to be made. However, the objective of catch document schemes is to eliminate IUU fishing by insisting on declaration and accounting on import, and as such they may be unable to detect IUU fish that does not go to export, or is otherwise misdeclared, illegally discarded, etc.

Examples:

Global trade analyses were used to estimate the mismatch between declared (legal) and traded toothfish by Lack & Sant (2001) and abalone (Plaganyi et al, 2011). Shelley Clarke has applied trade analysis to Russian sockeye salmon (Clarke et al, 2009) and sharks (Clarke et al, 2006). The TRAFFIC approach has been successfully applied to squid and abalone in South Africa (Bergener, 2010). Where specific statistical document schemes exist, they are used to derive trade-based estimates of illegal/unreported catches, or to augment other estimates. For instance, in ICCAT the statistical document scheme was used to identify underreporting of catches in the mid-2000s (Restrepo, 2004) and it is still used by the ICCAT statistical committee in conjunction with other data (estimates of total catch based on capacity and fishing power of the fleet, for instance).

Pros and cons:

Trade data are increasingly easy to access electronically, making desktop studies easy, particularly with the electronic guide produced by TRAFFIC. However, there are limitations to the methodology: the method requires that there are recognised customs codes for the species in question, and for some this may be “miscellaneous”; misdeclared products are not captured; and assumptions must be made about conversion rates (unless whole fish are traded) and the time periods represented by capture and import data. Finally, catch document schemes can work well to capture the global trade in a particular commodity only where most or all of the product is imported by countries requiring use of the document.

Anecdotal reports

Many citations for IUU fishing come from individual reports: press articles centred on individual arrests or IUU fishing cases; interviews with individual ministers, fishery management or compliance officers. These data are difficult to validate, and have none of the robust properties associated with the other types of data and analyses described above, but have the benefit of being searchable on the web and very common. Nevertheless they are sometimes useful to cross check other data.

Global estimates using meta-data

Methods:

There have been very few attempts to estimate the global extent of IUU fishing, but most studies have had to use a mix of the methods described above to generate a global estimate of IUU fishing, with the sources generally coming from other published studies. Pauly et al (2002) make reference to IUU catches worth

⁶⁰ http://www.fisheries-trade-data.org/menu_guide.html?guide

\$25m globally, but the methodological basis for this estimate is not clear. Agnew et al (2009) is perhaps the most comprehensive, making an explicit consideration of 54 EEZs and 15 high seas regions and supporting the final paper with an extremely detailed review of grey literature on IUU fishing giving all supporting references. An earlier publication (MRAG 2005) had attempted to do this for Africa only.

Examples:

In their global study, Agnew et al (2009) employed a mixture of methods depending upon the data availability for specific countries or commodities, covering all the above potential estimation methods. They combined the data, from published sources, to produce estimated historical trends using the “anchor points and influence table” approach of Pitcher et al (2002). Because the estimation methods were so varied, and delivered quite different levels of confidence and bias (both statistical and assumed), the authors used extreme upper and lower estimates to generate a uniform bound of confidence for each species group and country, integrating the whole into a global estimate by pro-rating monte-carlo derived median and upper/lower confidence intervals to the entire global catch from 54% of the global catch represented in the studied EEZs and RFMOs. Importantly, all source information was available in a 242 page report accompanying the main paper (Pramod et al, 2008) and detailing the data sources available for each country/ area studied, and explaining how estimates of IUU by country/species were arrived at based on the many hundreds of citations. However, both this paper and an earlier study of IUU fishing in Africa (MRAG 2005) had identified a significant negative correlation between IUU fishing and governance (eg the World Bank governance indices), which could be used to more intelligently pro-rate the results.

The most recent IUU publication (Pramod et al, 2014) also uses multiple different data sources and the combinative approach used by Agnew et al (2011), but unfortunately the exact application of the methods, and the detail of the assumptions and estimates of confidence levels surrounding the combination of data from information sources with widely varying likely accuracy, bias, temporal and spatial resolution, is hidden from the reader in this study.

Perhaps the most comprehensive recent study on a country scale (although not a global scale) is that of Cisneros-Montemayor (2013), in respect of Mexico. The authors identified situations where catch in official statistics is incomplete but the magnitude of missing catch unknown, and used well-informed estimate to replace these zero values. Reconstruction of catch series was by species rather than fishing sector, and where there were obvious gaps in catch series either these were linearly interpolated or other information was used to correct unreported catch. Information from fisher and other experts surveys was also used.

Pros and cons:

It is difficult to avoid using multiple data sources when compiling global estimates of IUU fishing, so much thought must go into how they are combined. Although Agnew et al (2009) is the most commonly cited report on global IUU estimation, the paper suffers precisely from being global. Good quality data are simply not available for every country in the world. Even acquiring data for the 54 EEZs necessitated recourse to low quality anecdotal or un-validatable data on a number of occasions, which was treated as uncertain in the analysis and attracted wide confidence (min-max) intervals. Acquiring source/raw data and understanding the reliability of any analysis, whether peer reviewed or not, is key.

Having to use multiple data sources for each country also leads to a mix of estimated quantities – reflecting the types of estimates shown in Table 1. For instance, for one country a good estimate of total illegal catch of demersal species may be available from remote surveys and interpolated catch rates derived from legal vessel observer records, and for one species total extractions may be available from a population dynamics model. The difference between these two estimates might represent unreported discarding/black fishing by the legal fleet, or it may represent errors in one methodology or another, and it is very difficult to separate these issues, or to accurately identify, for each fishery and species, the precise

mix of illegal and non-illegal unreported catches. Similarly there may be overlaps between studies on specific EEZs, RFMOs which cover high seas and EEZ fishing, and studies of individual flag performance, and it is difficult to separate these estimates to avoid double counting unless detailed sources are known.

On the other hand, the strength of the method used in Agnew (2009) is that cross-checking was high from the multiple data sources used, and the overall conclusion about global IUU catches, and particularly the relationship between IUU and governance, is probably correct at a global scale even if use of the results on an individual country fishery scale may be difficult. Furthermore, to guard against misinterpretation, a description of the content, and interpretation, of the supporting references was presented in Pramod et al (2008).

Table 1: Summary table of the ability of the methods above to generate good information on catch volumes by species, including interactions with non-fish species, and with attribution of specific IUU activity.

| Data type/source | Potential elements being estimated | strengths | weaknesses |
|-------------------------|--|--|---|
| Stock assessment data | <ul style="list-style-type: none"> Estimates of total unreported catches of fish | <ul style="list-style-type: none"> Statistically robust estimates Good spatial and temporal coverage: coverage of the whole of the stock, over all years Potentially applicable to all species caught by the fleet if they are assessed | <ul style="list-style-type: none"> Unable to identify violation type, eg to separate illegal from legal unreported Should be used in conjunction with other information on relative levels of IUU activity to anchor the estimates Best to estimate significant periodic IUU, rather than long term constant IUU No information on collateral damage by IUU fishing to nontarget species and habitats |
| MCS inspection data | <ul style="list-style-type: none"> Accurate recording of individual violations (IUU or non-IUU) in practice on land and sea | <ul style="list-style-type: none"> High resolution data attributing IUU catches to actual fishing activity and violation type Large sample sizes from fishery surveys may be statistically unbiased Possibly information on damage to non-target species and habitats | <ul style="list-style-type: none"> Underlying statistical framework unlikely to be appropriate when arising from targeted MCS activities Catches from different activities may not be recordable by inspectors at sea |
| Remote sensing | <ul style="list-style-type: none"> Estimates of number of vessels | <ul style="list-style-type: none"> Possibility of repeat synoptic surveys, generating high quality | <ul style="list-style-type: none"> Computationally and electronically intensive/expensive Identification of actual fishing |

| Data type/source | Potential elements being estimated | strengths | weaknesses |
|-----------------------------|--|--|--|
| | fishing without licences or in areas that are prohibited | statistical data <ul style="list-style-type: none"> • Offers the possibility of matching various data sources – anecdotal and objective. • Can detect and track individual vessels globally, not just in area of study | activity is lacking <ul style="list-style-type: none"> • Cannot detect non-positional violations (eg gear, misreporting, discarding) • Must be matched with other estimates of catch rate, species, etc from legal vessels |
| Trade analysis | <ul style="list-style-type: none"> • Estimate of total IUU catch by species | <ul style="list-style-type: none"> • Easy access to global data • Accurate data if declared on catch/import documents by all countries importing | <ul style="list-style-type: none"> • Misdeclared products not captured • Specific violations (except import violations) cannot be detected • Catch document schemes ineffective if large numbers of importing countries do not subscribe • Relies on exporting - cannot detect IUU where fish are consumed locally |
| Anecdotal reports | <ul style="list-style-type: none"> • Individual point estimates of IUU | <ul style="list-style-type: none"> • Easily searched | <ul style="list-style-type: none"> • Difficult to validate or understand in the context of any objective, comprehensive and statistical analysis. |
| Global meta-data approaches | <ul style="list-style-type: none"> • Total extractions by country/global | <ul style="list-style-type: none"> • Use of many different sources allows cross-checks • Different data sources can be given different quality markings and assigned confidence | <ul style="list-style-type: none"> • Difficult to consistently separate different types of IUU fishing • Establishing quality and overlap of individual contributing studies is difficult |

Lessons learned from previous studies

All previous global or country studies have had to confront the quantity that they are interested in estimating. For instance, it makes a big difference whether we are interested in the volume of catches not declared, or the lost value to legitimate industries. The former can include catches taken by unlicensed vessels and by licensed vessels using illegal gear or, for instance, discarding whether illegal or not, that are not landed or otherwise accounted for within the statistics used by management authorities, either for their statistical purposes or for the purpose of setting quotas for legitimate vessels.

The important defining element of these catches (whether I or U) is that they are not accounted for. Agnew et al (2009) confined their analysis to illegal and unreported catches (IU), namely those taken within an EEZ which are both illegal and retained, and which are usually unreported, and all unreported catches taken in high seas waters subject to a Regional Fisheries Management Organisation's (RFMO) jurisdiction, but acknowledge that many of the supportive analytical methods (listed above) cannot distinguish between whether something is illegal or not (or what type of illegality) simply whether it is unreported.

The time period of estimates is of key importance, and one that is very difficult to control within global meta-analyses. IUU fishing patterns can change quite rapidly. In the North Sea, the peak IUU catch was in 2003 and by 2006 it was estimated to be zero. In the Antarctic the IUU catch of toothfish rose from less than 5000 t/year in the split-years 1994/95 and 1995/96, to more than 30,000 in 1996/97, and following increased surveillance and industry/NGO activity dropped to about 7000 t again in 1998/99 and 1999/2000 (Agnew, 2000; CCAMLR, 2008).

The Agnew et al (2009) and Pramod et al (2014) studies used “anchor points and influence factors” to rebuild trends. The theory behind this is that if one has only very few high quality estimates of IUU, from a few species and from a few years only, and very few of these estimates are coincident (in time, space, species etc) then it should be possible to assume some interpolative or extrapolated trend based on whether management systems are known to have changed. For instance, it would not be unreasonable to assume a reduction in IUU activity in the Baltic from the mid-2000s when the EC started its high scrutiny of the fleet behaviour in the region, the buyers started to require non-IUU catches, and the Community Fisheries Control Agency started its joint MCS activities in the area, but before this time it would be defensible to assume that an estimate of IUU activity in 1999 should equally well apply to 2005. In reality, the level of information and argumentation to translate these assumptions to quantitative corrections is rarely met, and even more rarely explained in publications of IUU fishing trends. However, where it is used in combination with statistical or other estimation methods, such as the stock assessment or catch interpolation methods that carry some underlying assumption about fishing mortality, the results can be quite plausible.

Conclusions

In considering all of the above-mentioned studies, the following overall conclusions can be made:

1. While there will be specific, very good quality studies available for some commodities/species/areas, where objective statistical estimates can be made, when confronted with attempting to derive an estimate for a country/RFMO/the world it will be inevitable that a wide variety of different data sources will need to be used. Any method to combine these sources needs to be able to characterise the uncertainty/bias in them.
2. Published and peer reviewed reports are useful, and should be accessed whenever possible. However, it is extremely rare that the detailed assumptions, and descriptions of data quality, can be accommodated in peer reviewed literature. Even published data should be scrutinised well and its validity and appropriateness assessed.

3. In many cases it will be difficult not to use anecdotal data, from fisher/MCS professional surveys and interviews, or from press reports. The most important thing about publication of any report on global IUU fishing by FAO should be complete transparency about all data sources and if they are to be used, interviews with key MSC professionals should be supported with at least some corroborative/cross check data.
4. IUU fishing can change focus very rapidly, from one year to the next, in response to management actions, but multiple data sources of IUU estimates will be unlikely to be coincident in time. Any estimate of “current” IUU status should nominate a relatively short applicable time window (within the last 2-3 most recent years) and be very careful in its assumptions of the current level of IUU if this is based on studies that took place before that time window.

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Outputs of the break-out group on a possible structure for technical guidelines on estimating IUU fishing (“guidelines group”)

Preamble

This section would describe the policy context and background to the development of the guidelines. It would also explain the key intention of the guidelines in providing:

- Advice on the format in which study results/outputs could support contributions to a global estimate;
- Ideas and best practice for those planning and implementing studies to estimate IUU fishing, and for those organizations/researchers which may benefit from such guidance; and
- A toolbox of different estimation methodologies.

Chapter on design and intent of studies

This section would guide readers on the need for their studies to clearly articulate the objectives of their study, the types of IUU to be estimated, and the scope of studies.

It would consider the need to ensure that key informants/participants are involved in the study so as to ensure that studies involve the appropriate data holders/sources of information and stakeholders.

It would highlight the potential need for, and benefits of, a risk-analysis (which could be completed as a workshop activity of relevant partners) as part of the design process, given the potential benefits of such an analysis in:

- i) developing a conceptual model of how the fishery operates and identifying likely IUU issues (e.g. problem fleets, species, areas, financial rewards of infringements, etc.).
- ii) informing stratification and where to sample. (e.g. what activities are likely to be occurring - under-reporting, fishing with illegal gears etc.?).
- iii) providing guidance on data sources and suitable methods.

Some key characteristics of the studies should include:

- Reproducibility.
- Risk assessment (pre-stratify for different risk categories) and action to mitigate that risk.
- Potential bias.
- Different raising factors used (depending on source of data: census, random sampling, risk-based)

Chapter(s) on methodology toolbox/options

This section would represent the main body of the guidelines. Separate sub-sections could be provided for different methods, and for each there would be specific guidance on issues such as:

- data quantity and quality, sources, and standards of data to be used;
- a single ‘best practice study’ to provide an indicative methodology;
- a flow chart to explain how a particular method could be undertaken and the data sources that might be used;
- capturing the opportunity for using evolving technology and the impact on methodologies e.g. electronic monitoring, reporting and real time data [e.g. the FFA experience], where such possibilities exist (may be more applicable to data rich fisheries rather than small-scale or data-poor fisheries);
- considerations of cost effectiveness;
- IUU indicators (what can be measured, how can indicators be interpreted)

- how to address issues of uncertainty e.g. i) if you have a point estimate, ii) the more uncertain the thing you are trying to estimate is, the more you need additional methods or ways to validate or triangulate the estimation.

Chapter on combining data/estimates

This section would explain:

- How to combine independent estimates with different confidence levels.
- how studies may combine different sources of information;
- combining different sources of data to get an estimate, combining different data sets;
- the use of co-variance; and
- how to upscale estimates to cover broader geographic scales, or from a subset of vessels/fishers to a fleet/population.

Chapter on concerns regarding double counting

This section would characterize double counting issues, particularly related to the metric used to estimate the IUU activity (e.g. measuring illegal activity in a fishery and then applying to the catch of the fishery). It would note that using vessels in a fleet that have more than one type of violation could result in double counting. Other issues might include, for example, when three sets of lines are put out in one trip, but only one of them is illegal, is the whole catch for the trip illegal?.

Chapter on data output format for sharing

This section would highlight that the ability to contribute/generate any global estimate of IUU fishing compiled from a range of different studies, would require and be facilitated by consistent outputs. It would therefore advise on consistency in certain parameters for those studies wishing to be considered for use in such a global estimate.

It would also highlight the need for studies to provide a full description of: all assumptions; the methodologies used; the data used and not used; potential biases; and a full list of references. In support of transparency and replicability, it would also suggest that methodology should be described in sufficient detail to enable any another group to use the same data and come up with the same estimate.

Chapter on special considerations

This would give some additional information on study design in some specific cases where generic advice may be insufficient. Specific issues might for example include:

- how to deal with numbers versus weights of special species (sea cucumber, turtles etc.);
- small scale fisheries, subsistence fisheries;
- inland fisheries;
- directed shark fisheries;
- recreational fisheries;
- live reef fish;
- data poor fisheries;
- how to determine inclusion/exclusion of unregulated fisheries (especially small-scale/inland fisheries)

Chapter on the presentation of results

This section would describe best practice in displaying results in a meaningful and understandable format, and would also provide guidance on the importance of thinking about communications issues associated with the results and how they might be released.

Useful Annexes

The guidelines would be likely to include a number of relevant Annexes (e.g. references, although a list of useful reading/references could also be provided at the end of each chapter.

Outputs of the break-out group on IUU issues that frame the IUU estimation process and which could potentially be used as introductory text in FAO Guidelines (“policy and process group”)

Any estimate of IUU fishing, to be credible, must be based on the internationally accepted concept of IUU fishing under the IPOA-IUU. However, as we have seen, the IUU concept is not precise, resulting in possible grey areas. Another area of uncertainty relates to the fact that the IPOA-IUU does not offer a precise definition of IUU fishing as such, but merely provides examples of what may constitute the various elements of the concept.

For the purpose of identifying specific elements of IUU fishing and in order to provide a uniform and consistent basis for future estimates, the following text was proposed.⁶¹

Illegal fishing

- Fishing activities by all vessels (national and foreign) in areas under national jurisdiction in contravention of national law. The activities to be measured will largely be determined by what is stated in national legislation as a violation. Whether the contravention or violation can constitute a crime (attracts a criminal liability/sanctions) or attracts civil or administrative sanctions is irrelevant.
- Fishing activities in contravention of RFMO conservation and management measures to which a State is a member or which are contrary to the relevant provisions of the applicable international laws. The fishing activity will be undertaken by a vessel, but the “offender” will be the State as a result of its failure to implement its international obligations through domestic legislation. Under this sub-category, the contravention need not be “illegal” per se (contrary to an enforceable law) but is a contravention or violation that may go un-enforced or not penalized. The content of RFMO conservation and management measures will determine the scope of activities to be considered for the purpose of estimation. This sub-category will also include “unreported fishing” which is illegal (reporting is required by a law or regional/international conservation and management measure but the laws and conservation and management measures are not enforced or complied with).

Unreported Fishing

This will include reporting that is not required by a law (not illegal under national law) or regional/international conservation and management measure but is recognized as essential that it be regulated (including needing to be converted into a legal requirement so that non-compliance becomes an illegal activity). Examples here may include non-reporting of catch or discards that is not contrary to law, RFMO conservation and management measures or other rules of international law.

Unregulated Fishing

This will cover other types of activities (other than reporting) that are not regulated. Examples may include specific (possibly unregulated) activity (other than unregulated reporting) that is not required by a law or regional/international conservation and management measure but is recognized by fisheries management experts or competent international organizations as essential that it be regulated (including needing to be converted into a legal requirement so that non-compliance becomes an illegal activity).

For the purpose of any future FAO study to estimate levels of IUU fishing, IUU fishing activities could be considered to include the following:

- i. fishing without a valid licence, authorisation or permit by the relevant national authority, where required;

⁶¹ This text is preliminary and merely intended to distinguish between the “T”, the “U” and “U” components

- ii. not fulfilling requirements to record and report activity and catch or catch-related data (including catches of target and non-target species, bycatch of unwanted species, discards, endangered, threatened and protected species (ETPs)), or submitting false reports, including catch certificates;
- iii. fishing in an area and/or season in contravention of management measures;
- iv. engaging in directed fishing for a stock or species which is subject to a moratorium or for which fishing is prohibited; or
- v. using prohibited or non-compliant fishing gear with applicable laws and conservation and management measures ;
- vi. falsifying or concealing the markings, identity (including electronic reporting) or registration of fishing vessels, vessels engaged in fishing related activities, or fishing gear, in contravention of applicable laws and conservation and management measures;
- vii. taking on board or landing fish in contravention of applicable laws and conservation and management measures (e.g. species for which there is no remaining quota, under-sized fish, fish not landed in designated landing centres, landing of shark fins;
- viii. transshipping and transporting in contravention of applicable laws or conservation and management measures;
- ix. Fishing and fishing related activities, including transshipping, in the area of a regional fisheries management organisation in contravention of the conservation and management measures of that organisation and flagged to a Contracting Party or Cooperating non-Contracting Party to that organisation,
- x. Fishing activities by vessels in areas under the jurisdiction of an RFMO where the flag State of the vessel is not a member or not cooperating with that organisation.
- xi. Fishing activities by vessels having no nationality (stateless vessel) or being registered at the same time in more than one registry and therefore being a stateless vessel, in accordance with international law.
- xii. Lack of reporting of fishing activities and catches in areas under national jurisdiction including EEZ, territorial seas, archipelagic waters, internal waters and inland waters (e.g. in recreational fisheries, coastal fisheries), where such reporting is not required under national laws and regulations.
- xiii. Lack of reporting of fishing activities and catches in areas beyond national jurisdiction, whether covered or not by an RFMO, and where such reporting is not required under any law.

Illegal, unreported and unregulated (IUU) fishing remains one of the greatest threats to aquatic ecosystems. In 2003, it was estimated that the lower and upper estimates of the total value of IUU fishing worldwide were between US\$10 billion and US\$23 billion annually, representing between 11.06 million and 25.91 million tonnes of fish. A new estimate of IUU fishing is now timely, and, accordingly, FAO convened an Expert Workshop to consider approaches to developing a robust methodology to estimate IUU fishing and possibly coordinate a new global estimate of IUU fishing.

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