Safe Conduct?

Twelve years fishing under the UN Code

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Foreword

The FAO Code of Conduct for Responsible Fishing (CCRF, 'the Code') was produced in 1995. During the period of its ten year anniversary, WWF and the University of British Columbia (UBC) Fisheries Centre initiated this project to assess its implementation. Applying a consistent assessment protocol to data for 2003-2005, UBC analysed 53 countries, representing over 95% of the world's wild fisheries catch. This work offers a snapshot of where improvements might be necessary and against which new initiatives can be judged.

The Code was an important contribution to fisheries management at the time, and in fact, the Marine Stewardship Council and other initiatives to improve fisheries management are based upon it. For example, Denmark has adopted rights-based management, countries in the Eastern Pacific have initiatives to reduce bycatch, and Indonesia and the Philippines acknowledged overfishing and more recently, began championing the new Coral Triangle Initiative. However, the overall picture of compliance 12 years after the Code was published, presented in the following pages, is poor for the health of fisheries, fishing communities and the ecosystems they depend upon.

The best and worst countries in terms of compliance with the Code are identified; each country's intentions, as revealed by its laws, legislation and practices, is distinguished from the effectiveness of its management measures. Compliance with the Code in specific measures is evaluated, including the use of reference points; the precautionary approach; fishery impacts on biodiversity, discards and bycatch; implementation of marine Protected Areas (MPAs) and no-take areas; consideration given to small-scale fisheries, coastal communities and aboriginal peoples; the control of excess fishing capacity; the extent and control of illegal fishing; and the use of flags of convenience to circumvent regulations.

As is evident from the failure of 90% of countries to address overcapacity, the current 'fisheries management system' has institutionalised overfishing through the low political priority given to fisheries and a lack of accountability for sustainability across the spectrum of players. Fishing is often far away, out of sight from the capitals where politicians and stakeholders make decisions that affect ocean health. It is only now with increasing scrutiny by consumers, the supply chain and retailers that the few champions of seafood security can begin to inhibit illegal and irresponsible fishing or highlight simply poor management performance.

This analysis of countries' implementation of the Code was also used as a measure of their ability to 'do ecosystem-based management' (EBM), an approach to marine fisheries thought to have the elements needed to succeed where other approaches have failed. WWF has a comprehensive policy framework for EBM of fisheries and has also published case studies of EBM 'in action', showing that it is possible to do things differently and reverse the trajectory. This report and the 'open protocol' country case studies provide important baselines from which to measure future improvements in management. The country status reports are updated as new information comes to light: twelve countries have been updated to date.

Politically, it is time to link responsible fisheries with food security, legal fisheries with secure maritime borders and sustainable fisheries with stable coastal communities. Fishers and coastal communities can and should be the eyes and ears of a responsible society 'out there on the water' rather than an embarrassing excuse for shameful decline and a veil for criminal activity. WWF and the Fisheries Centre at UBC hope this analysis helps countries to take stock objectively of their current fisheries management situation, to seek the resources, guidance and support to design and implement improved approaches and to improve the profitability of their fisheries, the viability of their fishing communities and the health of the marine ecosystems they rely upon. This analysis clearly highlights the connection between good governance and responsible fisheries and raises the question of whether it may be time to make the implementation of the Code mandatory.

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Executive Summary

The FAO (UN) Code of Conduct for Responsible Fisheries ("the Code"), published in 1995, is widely acknowledged to be a broadly-based, detailed recipe for the sustainable, responsible and equitable exploitation of marine resources. Here we evaluate the degree to which the fisheries management of the 53 top fishing countries is in compliance with Article 7 of the Code. These countries land over 95% of the reported world marine fish catch with more than 150,000 tonnes each per year. This study uses 44 questions designed to capture the key features of the 46 clauses of Article 7 of the Code. Each question is scored against objective criteria on a scale of zero to ten, and a statistical ordination procedure incorporates the stated uncertainty of each score.

Information available from publications, reports, web sites, national legislation and from contacts in the target countries has been employed. Each country's scores were subjected to a formal drafting and cross-checking protocol, and most have been externally validated by independent experts from governmental agencies, non-governmental organizations, research institutes and universities. The 53 detailed country reports, comprising about 1200 pages and 2500 references, are published separately and are in the form of open 'living documents' that are revised in the light of fresh or corrected information. Analysis here is based on revisions to April 2008.

We identify the best and worst countries in terms of compliance with the Code; distinguish each country's intentions, as revealed by its laws, legislation and practices, from the effectiveness of its management measures; and we partition the results into six detailed evaluation fields.

Overall compliance with the Code is dismal: not one country out of the 53 achieves a "good" score of 70% or more. Only six countries (11%) have overall compliance scores whose confidence limits overlap 60% (Norway, USA, Canada, Australia, Iceland, Namibia). This means that, twelve years after the Code of Conduct was agreed, there is a great deal of room for improvement in compliance even among those countries at the top end of the rankings. At the lower end, the alarming finding is that 28 countries (53%) had 'fail grades' of less than 40% (Peru, Poland, India, Ghana, Taiwan, Latvia, Philippines, Brazil, Argentina, Morocco, Pakistan, Russia, Senegal, Ecuador, Indonesia, Iran, Thailand, Ukraine, Sri Lanka, Viet Nam, Turkey, Bangladesh, Egypt, Yemen, Nigeria, Angola, Myanmar, North Korea). In the middle range, disappointing scores from most developed European nations with the undoubted resources and know-how to implement the Code reinforce the low political priority given to improving fisheries management internationally. One encouraging finding is that some developing countries score more highly for the Code than many developed European countries, signifying that some elements of good fishery management can be achieved even with limited resources. A negative relationship with a marine biodiversity index suggests that management is weakest in the most species rich jurisdictions.

We also evaluate compliance with the Code in nine specific measures:

- **For Reference Points:** Over half of the countries had fail grades for compliance with the Codes reference points; a chronically poor performance on a basic prerequisite for effective fisheries management. Even some developed countries do not appear to take the use of limit reference points seriously and disconcertingly, over half of the countries exhibit no awareness of the critical importance of limit reference points.

- **For Irresponsible Fishing Methods:** over 80% have unsatisfactory overall scores for discards, bycatch, juvenile catches and damaging fishing methods. Moreover, low scores for many developed countries are of great concern: especially in the European Union where it appears that many by-catch and discard regulations are widely ignored.

- **For Ghost Fishing:** Only a few nations have good performance and have regular lost gear retrieval programmes or mandate biodegradable elements in traps. For most countries, scores for the "ghost fishing" issue were the lowest of any examined and many countries do not even recognize the problem.

- **For Protected Areas:** despite rather generous scoring that recognised any form of spatial management measures, only 15% of countries have reasonable scores Some developing nations have proved able to score as well as many developed ones,

- **For Small-Scale And Aboriginal Fisheries:** Small-scale fisheries issues receive good compliance scores in 19 countries, including both developed and developing nations but they are not necessarily supported by viable consultation with coastal communities. About half of the 53 countries have good scores for recognition of the rights of Aboriginal Peoples while poor compliance scores are found for those countries that do not recognise Indigenous Peoples rights.

- **For the Control of Overcapacity:** over 90% of the countries are failing to tackle excess fishing capacity, arguably one of the most important recommendations of the Code,

- **For Illegal Fishing:** Only a quarter of the countries have reasonable scores for IUU, while over a third have fail grades. Overall scores on this critical issue are among the worst scoring questions in the analysis and correlates with Transparency International's country Corruption Index.

- **For Flags of Convenience:** Three-quarters countries have acceptable scores but one in six countries has been awarded fail grades emphasising that it is a significant issue world-wide.

- **For Developing Countries:** Developed countries could target development aid to improve compliance in focal countries.

Using the same detailed country reports for 33 countries (the top 89% of the world catch), a separate analysis evaluates the implementation of Ecosystem-Based Fisheries Management according to WWF's 3-part framework. Results, reported in detail elsewhere, show an equally poor status for the implementation of EBM. Only four countries have 'passable' ratings for implementation of EBM, while over half of the countries were awarded "fail" grades.

There are significant correlations between the overall Code of Conduct compliance scores and four published, independent indicators of the quality of the government and environmental management (World Bank Governance Indicators aggregate index, Transparency International's Corruption Perceptions Index, UN Human Development Index, Yale Environmental Performance Index). Moreover a negative correlation with EEZ biodiversity shows that Code compliance is weakest in the most species-rich jurisdictions, exactly the opposite of what is desired.

To address the poor implementation of the Code two key recommendations are made. First, for developing countries, fisheries aid might be beneficially focused on specifically implementing the CCRF, especially as some developing countries have found it possible to achieve middle-ranking scores. Secondly, although the Code's origins a decade ago relied on its voluntary nature, attitudes have now changed and so, to encourage broad compliance in all countries, the time may have come to implement the essential features of fishery management, as set out in Article 7 of the Code of Conduct, in the form of a legally-binding international instrument.

Introduction and scope of the analysis

This report evaluates, in a semi-quantitative fashion, the compliance of 53 countries with the requirements of Article 7 of the UN Code of Conduct for Responsible Fisheries, published after all-nation agreement in 1995. The Code of Conduct is a voluntary agreement with no legal force in international law, but its scope and depth are far greater than the legal instruments which have been successfully negotiated, such as the UN Fish Stocks Agreement. Despite a rather legal tone to the language, the profundity and scope of the Code is striking. Most fisheries experts agree that the Code itself is fine piece of work and its widespread and meaningful implementation would likely solve most of the world's grave fisheries problems. Most nations belonging to FAO agree, and much national law drafted since the Code's publication reflects in large measure many of its recommendations: this in itself has created a success for the Code. But has it had an effect in practice? And, after twelve years, what is the situation like? Which countries exhibit good or poor compliance with Code, and does this differ among its many different parts? This report provides some answers to these questions.

Stimulated in 1993 by the poor state of some of the worlds most valuable fisheries (Doulman 1998), the development of the FAO Code of Conduct for Responsible Fisheries (CCRF) (FAO 1995) was designed to ensure the benefits of fisheries for future generations by encouraging responsible fishing practices. The ten objectives of the CCRF, succinctly listed in Article 2, are clear in scope and intention. The Code's overall goal is intrinsically linked to food security for the world's poor and to sustainable economic benefits. It was evident to those who drafted the Code that fundamental structural changes to the ways in which fisheries are prosecuted were required if the benefits to human society of fisheries were to be sustainable, an observation that has been echoed by many others concerned with fisheries (e.g., Pauly *et al*., 2002; Pitcher 2001; Pitcher and Pauly 1998).

Reporting to the Committee on Fisheries (COFI), FAO is mandated to monitor progress, and assist with implementation of the Code (Article 4.2)[1]. This requirement implies that there is, or should be, a reasonably objective way of evaluating compliance of a State's fishery regulations and actions with the Code. Progress in the evaluation of compliance with the Code has been slow, with only sixteen case studies noted by COFI in February 2003 (FAO, 2003). However, in the FAO material, compliance is subjectively assessed in a non-structured fashion by the countries themselves. The same Article 4.2 includes a requirement to monitor the effects of the implementation of the Code on fisheries, a much larger task, and one that that has been interpreted in its widest sense as the evaluation of sustainability indicators (FAO 1999). However, by no means all sustainability indicators, particularly those in the economic and stock assessment areas, are covered explicitly by the Code, or by various more recent commentaries (e.g., FAO 1999). Therefore, while such ongoing research work on fishery management indicators is of great value, it is neither sufficiently robust nor explicitly linked to the original text to be used to measure compliance with the Code, except in a very general fashion.

This report employs a set of 44 indicators, drawn directly from the text of the Code, and grouped into six evaluation fields, that can be assessed to express compliance with Article 7 of the Code of Conduct and its subsections in a quantitative fashion. Our method includes an expression of uncertainties deriving from the scoring process and from the statistical analysis procedure. Only those features that are mentioned in the Code are used, and each question is explicitly related to specific clauses. Accordingly, in order to express the dual aims of Article 4.2, the indicators have been split roughly equally into scores in the first three evaluation fields that express the intended effects of the implementation of fishing regulations ("Intentions"), and scores in the latter three evaluation fields that express the actual effects of those regulations on fisheries ("Actions").

Article 7 on Fisheries Management is central to the Code of Conduct for capture fisheries: compliance with its requirements is both necessary and sufficient for sustainable, equitable, secure and responsible fisheries

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[1] ARTICLE 4 - IMPLEMENTATION, MONITORING AND UPDATING. 4.2 FAO, in accordance with its role within the United Nations system, will monitor the application and implementation of the Code and its effects on fisheries and the Secretariat will report accordingly to the Committee on Fisheries (COFI). All States, whether members or non-members of FAO, as well as relevant international organizations, whether governmental or non-governmental should actively cooperate with FAO in this work.

that are in balance with the biodiversity and abundance of natural marine ecosystems. This review does not set out to cover Article 8 (Fishing Operations); Article 9 (Aquaculture); Article 10 (Coastal Zone Management); Article 11 (Post-harvest and Trade); or Article 12 (Fisheries Research). It is evident from some FAO documents that countries reporting on progress in achieving compliance with the Code may distract attention from failures in fisheries management covered by Article 7 by filing long reports with much documentation on issues covered in other Articles such as research, trade, post-harvest treatment and aquaculture. However, although Article 7 is covered, the compliance evaluations herein take into account Article 5, covering the Special Requirements of Developing Countries, and also Article 6, which sets out the general principles of the Code of Conduct, and the report notes where specific issues from Article 6 are emphasised.

As in Caddy (1996), the scope of this evaluation for scoring compliance by individual capture fisheries concentrates on Article 7 covering Fisheries Management, which, as acknowledged by many fishery experts, covers almost all conceivable fisheries management considerations. A small modification to Article 7.7.5 is introduced to emphasise re-flagging (this taken in fact from Article 8).

Methods

Unfortunately, much of the detail contained in the body of the Code is written in a way that makes a systematic scoring of compliance difficult. While some clauses relate to very specific points, others cover almost every fishery management device ever invented, and in addition many items are repeated. It has been noted several times that it seems almost impossible to use the clauses of the Code as they stand in a quantitative evaluation (e.g., Caddy 1996), and this may have inhibited attempts at evaluating compliance objectively.

In this work a technique, previously published by FAO (Pitcher 1999) has been adapted. It lists the essence of each of the Code's issues and themes whilst retaining the same overall balance of emphasis among the clauses. These are subsumed into 44 questions, each of which is scored on a scale of zero to ten to indicate degree of compliance. Full details of the methods used here are published in Pitcher, Kalikoski and Pramod (2006) and are described in more detail in Annex 1 and Annex 4 below.

An open protocol was adopted for all of the country compliance evaluations. Although the scores used in this report were fixed in April 2008 for the purposes of performing the analysis, the individual country reports and score sheets are maintained on an open FTP website (http://public.box.net/CodeofConduct), and the team remains open at any time to comments, corrections or adjustments[2]. The evaluations of each country are therefore "living documents" and may change with time. More details are provided in Annex 1.

[2] The statement reads, "This evaluation of compliance with Article 7 (Fishery Management) of the UN Code of Conduct for Responsible Fishing (FAO 1995) is a 'living document' and may change with time. Using a wide range of cited source material, the document represents the best attempt by the authors at presenting a fair and objective evaluation of compliance using 44 questions derived from the Code. Questions are divided into six evaluation fields, (Management Objectives; Framework (data & procedures); Precautionary Approach; Stocks, Fleets and Gear; Social and Economic factors, and Monitoring, Control and Surveillance): the derivation of the 44 questions is described in Pitcher (1999). The first three fields cover intentions of a country's legislation to adhere to the Code; while the last three evaluation fields are intended to rate actual performance. Full details of the methods are published in Pitcher, Kalikoski and Pramod (2006). This evaluation has been subjected to several internal cross-checks and, where stated, has been validated by experts familiar with the country concerned. Uncertainty in assigning each score is shown explicitly. However, the authors are aware that omissions and errors of interpretation may still remain for some countries. An open protocol has therefore been adopted for all country compliance evaluations, and the team remains open at any time to comments, corrections or adjustments."

Results

First, the overall compliance scores for our 53 countries are analysed: comparing the overall rankings, and partitioning intentions and implementation of the Code requirements for fishery management. Next, nine key issues in fishery management are analysed:

• the use of reference points in management,
• the reduction of irresponsible fishing, by-catch and discards, prevention of ghost fishing,
• the use of protected and no-take areas,
• the status of small-scale fisheries,
• the control of excess fishing capacity,
• the extent and control of illegal fishing,
• the use of flags of convenience,
• special considerations afforded to developing countries under Article 5 of the Code,
• implementation of ecosystem-based fishery management (under a slightly different protocol).

Finally, a number of conclusions and recommendations arising from this work are presented. Full details of the statistical ordinations for each of the six evaluation fields are presented in Annex 6.

Overall Compliance with The Code of Conduct

This section describes the combined results from separate ordinations in the six evaluation fields, encompassing scores from all of the 44 questions. The overall results are presented (Figure 1) using a 'Codeometer', a simple, thermometer-like bar graph showing the rank order of countries. Figure 2 shows the same results for the 53 countries together with their confidence limits. A complete questions by countries scores matrix is presented in Annex 5.

No country out of 53 achieves an overall compliance score that is rated as 'good' (70% or more). Only six countries (11%) have overall compliance scores whose confidence limits overlap the "passable" score of 60% (Norway, USA, Canada, Australia, Iceland, Namibia). This means that, twelve years after the Code of Conduct was agreed, there is a great deal of room for improvement in compliance even among those countries at the top end of the rankings.

At the lower end, 28 countries (53%) had 'fail grades' of less than 40% (Peru, Poland, India, Ghana, Taiwan, Latvia, Philippines, Brazil, Argentina, Morocco, Pakistan, Russia, Senegal, Ecuador, Indonesia, Iran, Thailand, Ukraine, Sri Lanka, Viet Nam, Turkey, Bangladesh, Egypt, Yemen, Nigeria, Angola, Myanmar, North Korea). Here drastic action is needed to focus improvements in fishery management on the issues clearly set out in the Code that can increase compliance

Figure 1. "Codeometer" showing estimated overall compliance of the top 53 marine fishing countries i with Article 7 (Fishery Management) of the FAO (UN) Code of Conduct for Responsible Fisheries. Overall scores were obtained from individual ratings and uncertainties on 44 questions ordinated by an anchored MDS with Monte Carlo simulations. Each score has its own confidence limits, but average limits are similar and are indicated by bar at lower right. Colours indicate good scores (70% and over), fail scores (40% and below) and intermediate values. Countries are given arbitrary left and right-hand positions for clarity.

Code Compliance

Compliance with CCRF, %

Left column (top to bottom):
USA, Australia, Namibia, NZeal'd, Denmark, Neth'land, S Korea UK, France, Germany, China, Italy, Peru, India, Taiwan, Philipp's, Argent'a, Pakistan, Senegal, Ind'nesia, Thailand, SriLanka, Turkey, Egypt, Nigeria, Myanmar

Right column (top to bottom):
Norway, Canada, Iceland, S Africa, Japan, Faroes, Chile, Portugal, Malaysia, Ireland, Sweden, Spain, Mexico, Poland, Ghana, Latvia, Brazil, Morocco, Russia, Ecuador, Iran, Ukraine, Viet Nam, B'desh, Yemen, Angola, N Korea

Figure 2. Bar chart showing status of compliance of the 53 top fishing countries with the FAO (UN) Code of Conduct for Responsible Fisheries (CCRF). Error bars are derived from Monte Carlo runs of the MDS ordination technique on the upper and lower score limits for each question and country (see Annex 5). Broken lines: green denotes 'good' compliance rating; red denotes 'fail' rating.

and therefore long term sustainability and food security. For developing countries, fisheries aid might be beneficially focused on this issue (see separate section on developing countries for further analysis).

Figure 3 shows an alternative way of ranking the compliance of countries by counting the number of 'good' and 'fail' grades over all of the 44 questions. Twelve countries are awarded fail grades in all or most parts of the compliance analysis, and these might be earmarked to receive special help and attention as required by Article 5 of the Code. In this analysis, especially poor compliance performance is evident in Thailand, Bangladesh, Egypt, Vietnam, Yemen, Angola, Turkey, North Korea, Indonesia, Ukraine, Nigeria and Myanmar.
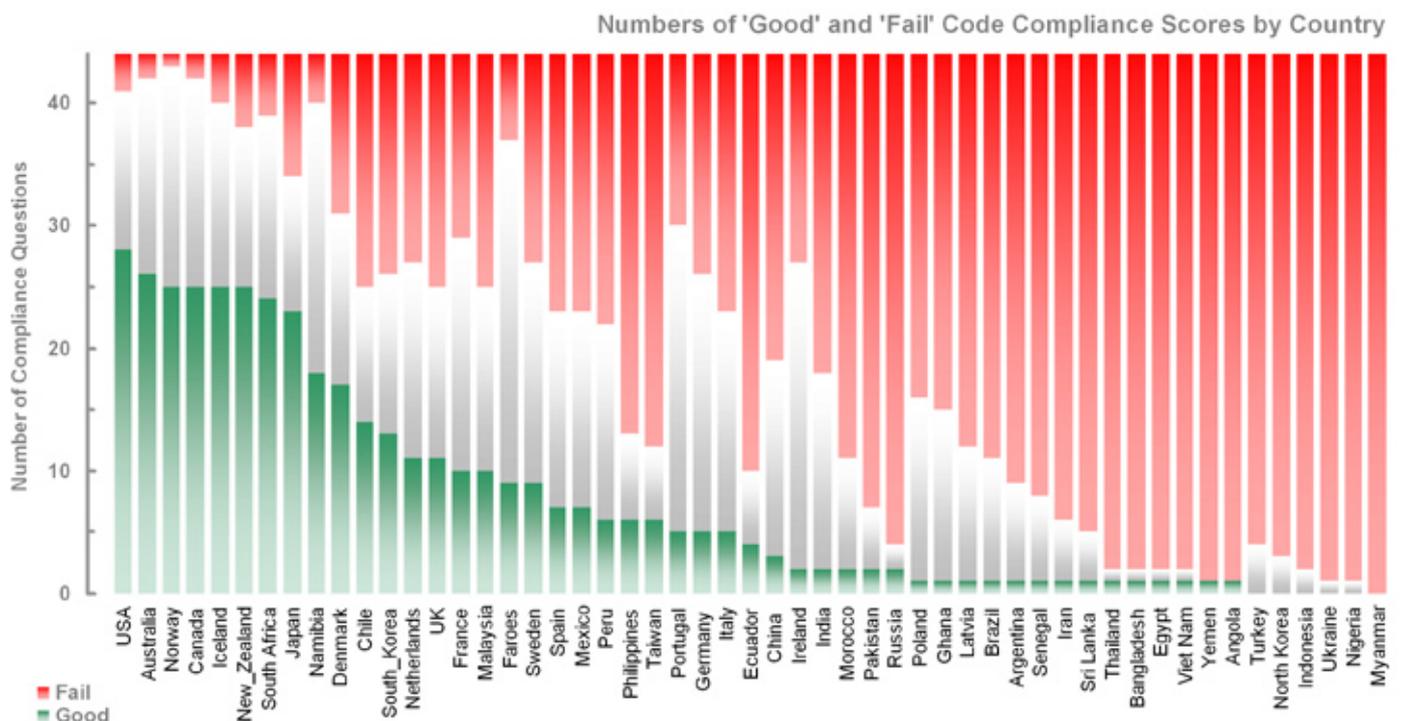

Figure 3. Bar chart showing number of 'good' and 'fail' compliance ratings for the top 53 fishing countries against 44 questions expressing Article 7 (Fishery Management) of the FAO (UN) Code of Conduct for Responsible Fishing.
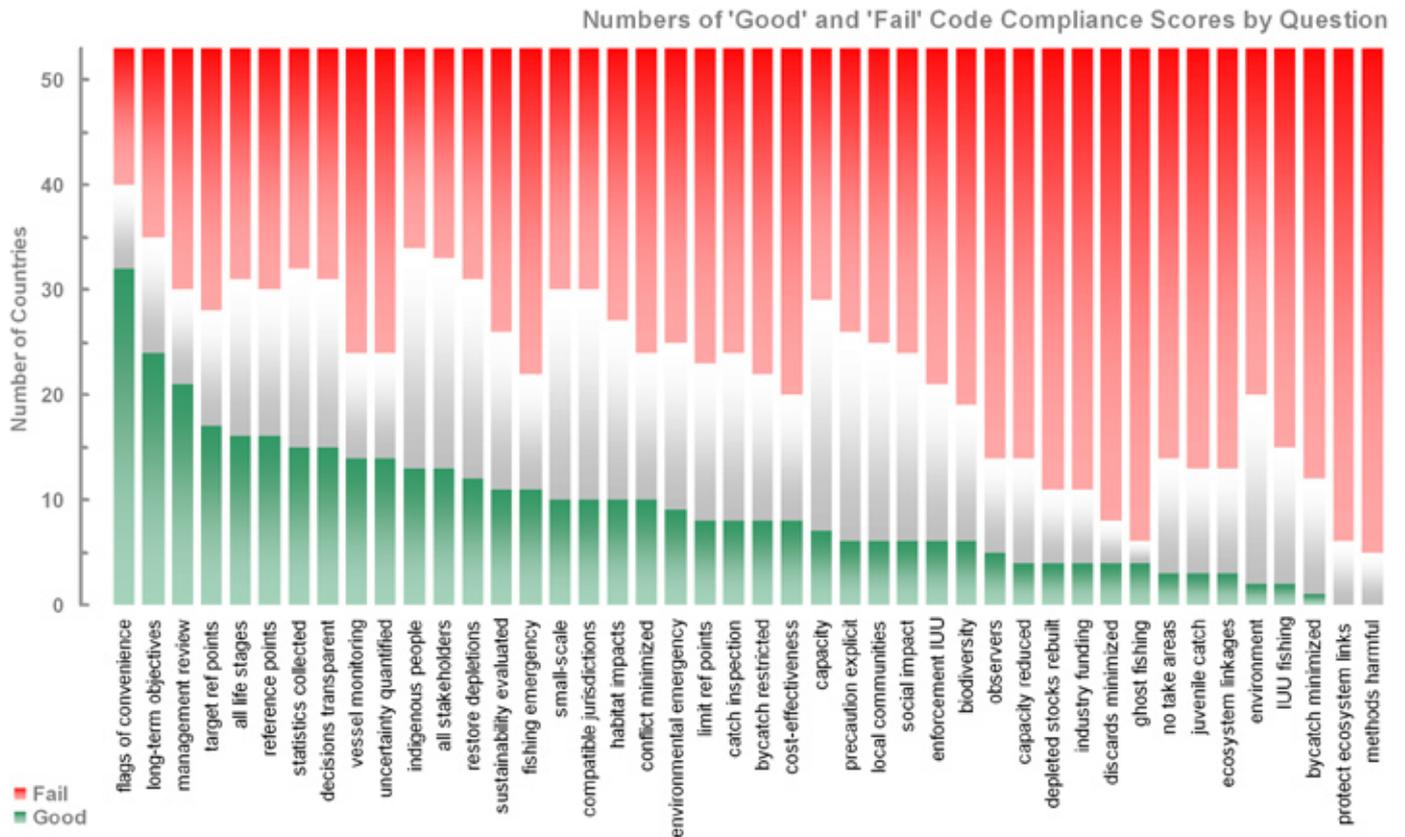
Figure 4. Bar chart showing number of 'good' and 'fail' compliance ratings for 44 questions against the top 53 fishing countries expressing Article 7 (Fishery Management) of the FAO (UN) Code of Conduct for Responsible Fishing.

The results show eight countries (USA, Australia, Norway, Canada, Iceland, New Zealand, South Africa and Japan) achieving more than 20 'good' compliance grades, a performance that is not especially impressive when one considers that is only 45% of all the questions. Moreover, four of these top ranking countries have been awarded at least 5 fail grades (11%, and Japan gets 10 fail grades!). Here two developing countries, Namibia, and Malaysia are worthy of note. Namibia has only 4 fail grades, while Malaysia has 19, but ranks overall as high as many European countries.

Comparisons Among Questions

Grades awarded for the 44 questions are shown in Figure 4. Only one of the 44 issues has 'good' compliance scores for more than half of the 32 countries (flags of convenience). Disconcertingly, almost half of the questions (19/44) have been awarded more than 50% fail grades for at least half of the countries. Two questions did not achieve a single "good" score (protection of ecosystem linkages and reduction of harmful fishing methods). Overall, analysis of grades awarded to the separate questions confirms a poor compliance with the Code of Conduct's carefully drafted requirements.

Comparison of Intentions with Implementation of Code Compliance Measures

Article 4.2 of the Code suggests that intentions and implementation of activities related to compliance with the Code may be evaluated separately, and so these issues have been partitioned in this analysis. Evaluation fields 1, 2 and 3 may be grouped into an overall score that expresses the intentions of fishery management to be in compliance with the Code of Conduct, based on the scores for the 25 questions in these three fields (see Pitcher 1999). The resulting 'intentions' scores of the 53 countries are shown in the solid (blue) columns in Figure 5 along with estimated confidence limits. Likewise, evaluation fields 4, 5 and 6 may be grouped into an overall score that expresses the results of 'implementation' of fishery management measures in compliance with the Code of Conduct, based on the scores for the 19 questions in these three fields. The results are shown in the open bars of Figure 5, along with confidence limits.

For "intentions", only one country (USA) has confidence limits that extend into the 'good' range. Seven countries have "passable" scores within range of 60% (Norway, Canada, Australia, Iceland, Japan, South
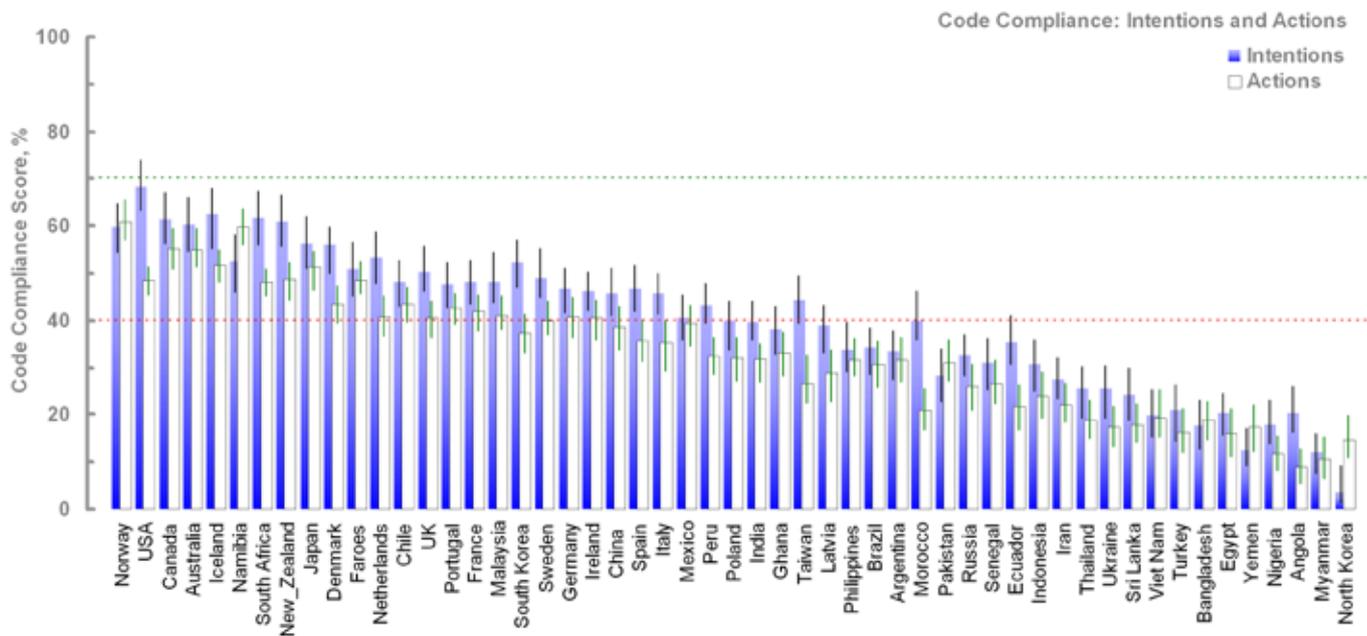
Figure 5. Bar chart showing status of 'intentions' and 'actions' parts of the compliance of the 53 top fishing countries with the FAO (UN) Code of Conduct for Responsible Fisheries (CCRF). Error bars are derived from Monte Carlo runs of the MDS ordination technique on the upper and lower score limits for each question and country (see Annex 5). Broken lines: green denotes 'good' compliance rating; red denotes 'fail' rating.

Africa and New Zealand). At the lower end, over one third of the countries (19, 36%) are awarded 'fail' grades of 40% or less for 'intentions' to comply with the Code. 'Intentions' are the easiest aspect to improve as they require legislation and management plans that follow the detailed requirements of the Code of Conduct, and these have been set out in explicit detail in a series of clearly written technical guides in support of the Code published by FAO (e.g., FAO 1997, 2002).

For "implementation", no country achieves a "good" score over 70%, while only two have "passable" scores within range of 60% (Norway and Namibia). At the lower end, over half of the countries (28: 53%) get "fail" grades of 40% or less.

Figure 5 shows that almost all countries score less for "implementation" than "intentions" (average 8% lower), and so this analysis supports the contention that actions to adopt the Code are harder to improve than demonstrating intentions to implement it.

While there is a huge disparity between the best and worst scores, the average rating barely exceeds the 'fail' threshold (Figure 6). Not surprisingly, ratings in three fields expressing intentions in complying with the Code score higher (average of 7.9%, t=7.8, P=2x10-10) than ratings in the "implementation" fields. Taking averages for regions of the world, North America (n=2 countries) and Scandinavia (n= 5) score toward the top of the "pass" range in "intentions", and in the mid range for "implementation" (Figure 6b). Asian (n=20) and Latin American (n=7) countries have average compliance ratings that fail in almost all categories (Figure 6b). Australasia (2 countries) has quite high compliance ratings (Fig 6c), with "objectives" achieving the 'good' range. The average for African countries (n =7) on the other hand, fails in all six categories. Disappointing scores from European Union nations (n = 9, Figure 6c), with the undoubted resources and know-how to implement the Code, reinforce a low political priority given to improving fisheries management. The average compliance ratings for developing (n = 30), and intermediate (n=8) countries also fall in the fail range (Fig 6d). While the average for developed countries (n = 25) has passable scores for 'objectives', 'framework' and 'precaution', they also fail in one of the implementation fields.
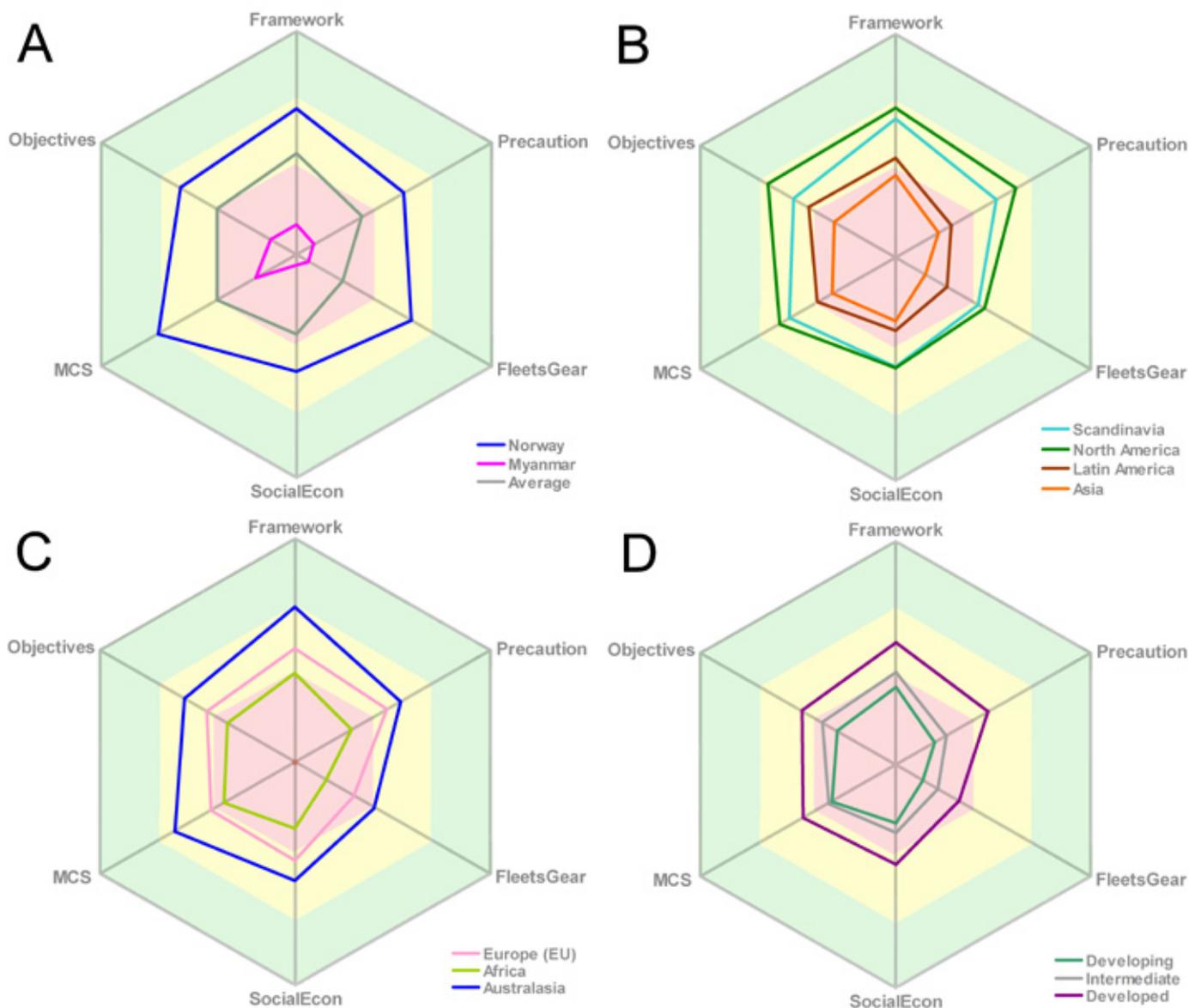
Figure 6 (a to d). Kite diagrams showing compliance ratings in the six evaluation fields used for the Code of Conduct (6 to 8 questions made up each field. See Annex 2). The three fields at the top express "intentions" in compliance with the Code of Conduct, while the three lower fields cover the success of actual implementation. In each field, compliance was estimated using an anchored MDS with Monte Carlo simulations. Background colour shading shows compliance status: good (green), fail (red hue) and pass (yellow hue). (a) Ratings for the one of the top, one of the bottom countries and the overall average; (b) & (c) seven regional analyses; (d) averages for countries grouped by development categories (based on to GNP/capita).

Analysis of key issues relating to compliance with the code of conduct

This section of the report uses the scoring results from the 53 country evaluations to examine nine important issues in compliance with Article 7 of the Code of Conduct for Responsible Fisheries. These issues highlight the state of play of fisheries management by the countries whose fishing fleets fish the most and who play a major role in the FAO's Committee on Fisheries.

Reference Points

Why are Reference Points Important?

Reference points are important because they are the defined outputs of stock assessment; without them managers cannot relate the amount currently being taken by fishing to any other state. The use of reference points is considered by the Code of Conduct to be fundamental to effective fisheries management and they are therefore featured explicitly in Article 6, which sets out the general principles of the Code: *"States and subregional or regional fisheries management organizations or arrangements should, inter alia, determine: (a)*
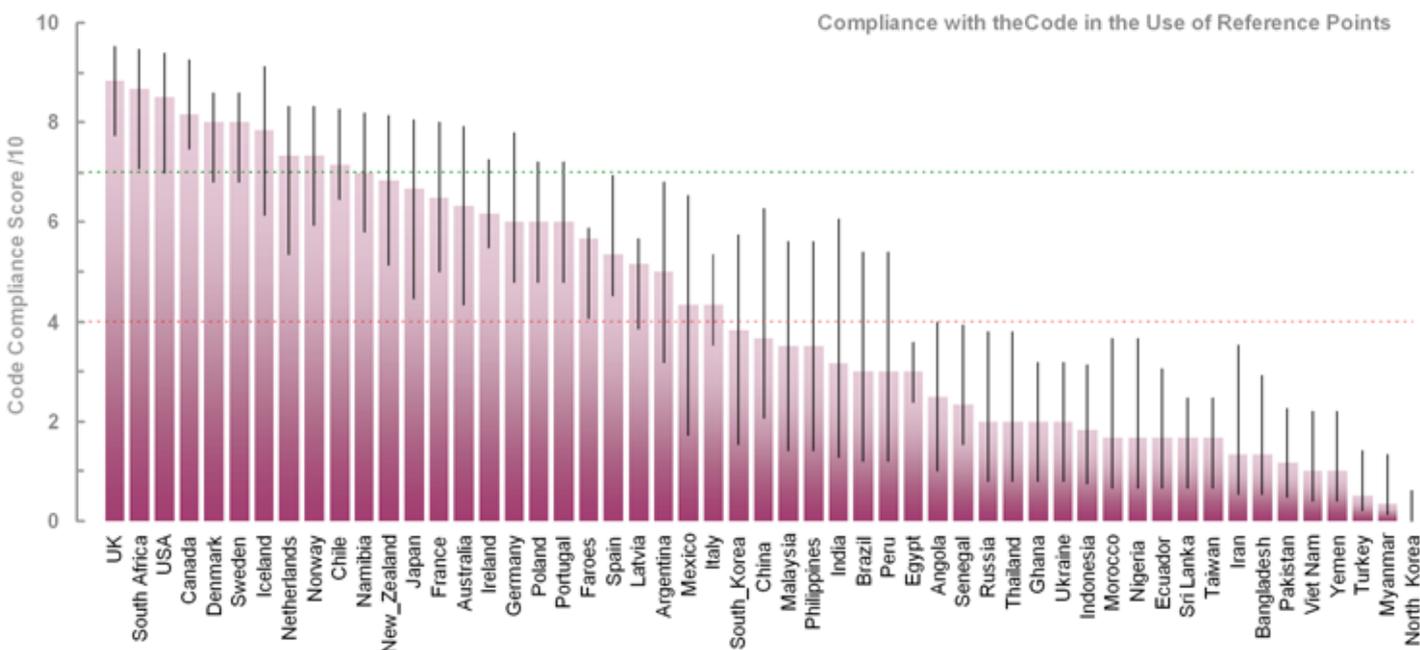
Figure 7. Bar chart showing compliance with the Code of Conduct in the use of reference points for the 53 top fishing countries. Error bars are derived from Monte Carlo runs of the MDS ordination technique on the upper and lower score limits for each question and country (see Annex 5). Broken lines: green denotes 'good' compliance rating; red denotes 'fail' rating.

stock-specific target reference points, and at the same time, the action to be taken if they are exceeded; (b) stock-specific limit reference points, and at the same time, the action to be taken if they are exceeded; when a limit reference point is approached, measures should be taken to ensure that it will not be exceeded."

Not surprisingly therefore, reference points are also prominent in FAO's technical guidelines issued in support of the Code (FAO 1997, 2003) and since the Code was developed in the early 1990s, the fisheries literature strongly supports this status. For example, Collie and Gislason (2001) state that, "Biological reference points (BRPs) are benchmarks against which the actual status of a fish stock can be measured", and that "The definition and widespread use of BRPs has greatly benefited fisheries management, especially in North America and Europe ... as a "control law" to specify fishing rates". Caddy and Mahon (1995) consider that "Reference points … are conceptual criteria which capture in broad terms the management objective for the fishery", and they are applicable even in data poor situations (Caddy 1998). Many further examples are provided by Caddy (1999), Richards and Maguire (1998) and Mace (1994), while criticisms of how they are applied are set out by Hilborn (2002).

The distinction between the two types of reference points is that *target reference points* express an optimal biomass, maximum catch or benefit in relation to risk, while *limit reference points* identify levels of biomass or fishing that may trigger dangerous and unwanted consequences such as stock collapse, or adverse impacts on species linked to the fishery through the food web. The management response to target reference points is to adjust quotas, fishing rates, gear or areas to approach the desired point from either direction. The speed of approach to the target biomass (or fishing rate) is generally adjusted in relation to appropriate social and economic trade-offs. Limit reference points, on the other hand, are for use in emergencies and are designed to trigger drastic and rapid management actions, such as closure of areas or the cessation of all fishing. Precautionary management for the sustainability and biodiversity of exploited marine ecosystems especially needs limit reference points, that when approached or exceeded, trigger emergency actions that avert local extinction. Some will be surprised to discover that this approach dates back to the work of Ray Beverton and Sidney Holt in the 1950s (Pitcher 1998).

Scoring Code Compliance on Reference Points

Compliance with the Code's requirements about reference points are covered in the analysis by three questions: 1.1, 3.2, and 3.4 (Annex 2).

The first question in this analysis (1.1), relating to Code clauses 7.2.1 and 7.1.1., covers the estimation of any type of reference points, such as MSY (mentioned in the Code), potential yield, or a target biomass. Scores were given for published reference points on a fishery by anyone in, or outside, the country. In many countries this type of work may be undertaken in universities (e.g., Philippines) or by quasi-independent

Figure 8. Histogram showing the number of countries employing some form reference points in fishery management, and the numbers adopting explicit target and limit reference points.

research institutes (e.g., China), just as much as, or in some cases even more than, by the government fishery management agencies (e.g., USA) or multi-country regional scientific working parties (e.g., ICES) that are more common in the west. If only a limited set of the principal fisheries in a country were covered by reference points, scores in the range of 4 to 7 were awarded. More sophisticated and robust methods of analysing reference points received higher scores: for example fitting a classical surplus production model, estimating MSY and optimal fishing effort for one or two fisheries would not normally be awarded more than 3/10 (e.g., Morocco); or for the same work on the majority of a countries fisheries up to 6/10 (e.g., Brazil). Top scores of 8/10 (e.g., Denmark), 9/10 (e.g., Canada) require most of a country's fisheries to be assessed using the latest numerical methods. The second (Q3.2) and third (Q3.4) questions are intended to cover the actual use of the two main types of management reference points; target reference points (Q3.2: relating to CCRF clause 7.5.3a) and limit reference points (Q3.3: relating to CCRF clause 7.5.3b).

Results on Reference Points

Average scores for the three reference points questions are shown for the 53 countries in Figure 7 (error bars are approximate confidence limits). It is encouraging that 21 countries have 'good' overall reference point scores within range of 7/10, and further 4 countries score as "passable" at 6/10, a total of 47% that have acceptable scores. An acceptable score here signifies that, although there may be room for improvement, these countries are estimating and using reference points in fishery management as required by the Code. Only one of these is a developing country (Namibia). However, 31 countries (58%) had completely unsatisfactory scores that are in or overlap the "fail" grade of less than 4/10, and all but two of these (Russia, Italy) are developing countries. This must be considered a poor performance on a basic prerequisite for effective management, especially considering the extensive fisheries training courses on reference points mounted by organisations like The World Fish Center and FAO.

High scores on Q3.2 are strongly correlated with high scores in Q1.1, indicating that most countries that make good estimations of reference points make use of them in management. But there are some exceptions. Negative differences between the scores for Questions 1.1 and 3.2 identify those countries which have some capacity for stock assessment, but have not been able to operationalise this into an equally effective use of target reference points in management. In this respect, nine countries were identified that scored at least 20% less for Question 3.2 than for Question 1.1. All but two are developing countries: Angola, Brazil, India, Malaysia, Morocco, Nigeria, Philippines. That Russia and China are also members of this group may be understandable on account of their deeply-flawed fisheries management infrastructure.

The distribution of the results over the 3 reference points questions from the 53 countries is shown in Figure 8: the bimodal distribution seems to reflect two groups of countries, one, largely developed countries (scoring over 6/10), that employ reference points in some form, and a group (scoring less than 5/10) of largely developing countries, that do not.

For limit reference points (Q3.3), the results are even more strongly bimodal. Moreover, it is incredible that over half of the countries (29, 55%) have completely unacceptable scores of 1, 2 or zero, indicating no awareness of the critical role that limit reference points can play in the effective recovery of fish stocks. It is ironic that most fish stocks are very heavily overexploited in all of these countries (Angola, Brazil, China, Ecuador, Ghana, India, Indonesia, Iran, Malaysia, Mexico, Morocco, Myanmar, Nigeria, North Korea, Pakistan, Peru, Philippines, Russia, Senegal, South Korea, Sri Lanka, Taiwan, Thailand, Turkey, Ukraine, Viet Nam, Yemen). Surely, this represents a major failure of communication of one of the essential features of fishery management. Even developing countries that perform quite well in many aspects of fisheries management, such as Mexico and Malaysia, fail on this question. The presence in this group of relatively developed countries like South Korea, Russia, China and India that clearly have the institutional capacity to estimate and use limit reference points reflects the low priority given to sound fisheries management.

Irresponsible Fishing Methods: By-Catch, Discards And Harmful Fishing Gear

Why are Irresponsible Fishing Methods Important?

In two of its ten general objectives set out in Article 2, the Code of Conduct states that countries should, *"establish principles and criteria for the elaboration and implementation of national policies for responsible conservation of fisheries resources and fisheries management and development (Article 2b)"; and "promote protection of living aquatic resources and their environments and coastal areas (Article 2g)". Moreover, Article 6, setting out the Code's principles in more detail, requires that, "States and users of living aquatic resources should conserve aquatic ecosystems (Article 6.1) … Management measures should not only ensure the conservation of target species but also of species belonging to the same ecosystem or associated with or dependent upon the target species (Article 6.2) … Selective and environmentally safe fishing gear and practices should be further developed and applied, to the extent practicable, in order to maintain biodiversity and to conserve the population structure and aquatic ecosystems and protect fish quality. Where proper selective and environmentally safe fishing gear and practices exist, they should be recognized and accorded a priority in establishing conservation and management measures for fisheries. States and users of aquatic ecosystems should minimize waste, catch of non-target species, both fish and nonfish species, and impacts on associated or dependent species (Article 6.6)."* Twelve years after it was published in 1995, this explicit emphasis on an ecosystem-based approach to the effects of irresponsible fishing gear shows that the Code was ahead of its time.

Moreover, FAO's own technical guidelines, issued in support of the Code, also emphasize these issues. For example page 17 of Fishing Operations (FAO 1996), and pages 26-27 and 30-32 of "The Ecosystem Approach To Management" (FAO 2003) contain some specific advice on by-catch reduction; *"The consequences for the*
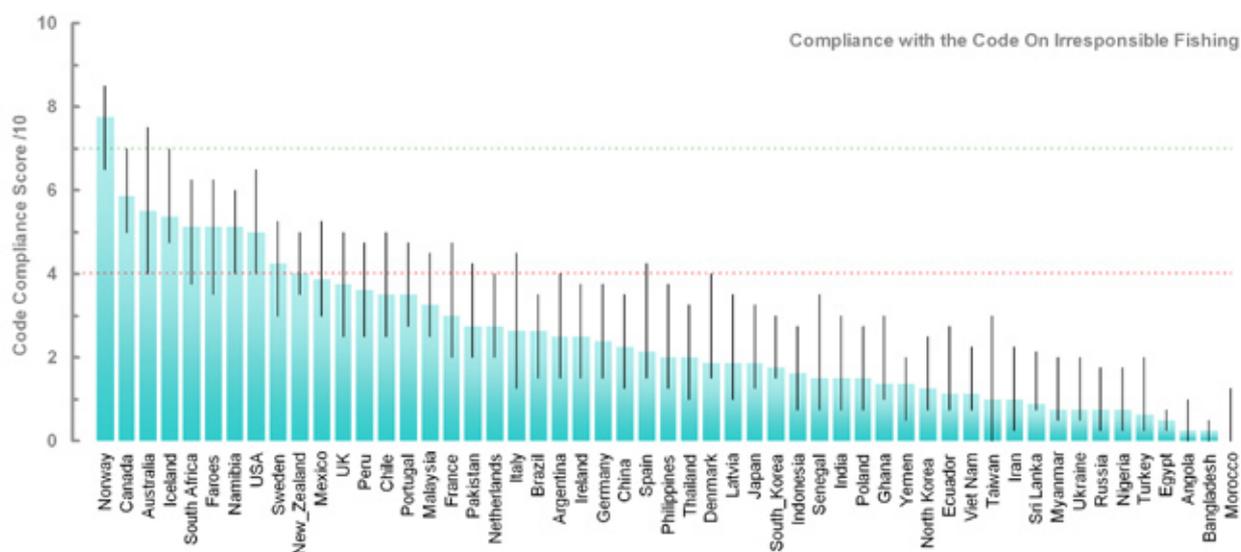

Figure 9. Bar chart showing compliance with the Code of Conduct in controlling irresponsible fishing for the 53 top fishing countries. Error bars are derived from Monte Carlo runs of the MDS ordination technique on the upper and lower score limits for each question and country (see Annex 5). Broken lines: green denotes 'good' compliance rating; red denotes 'fail' rating.
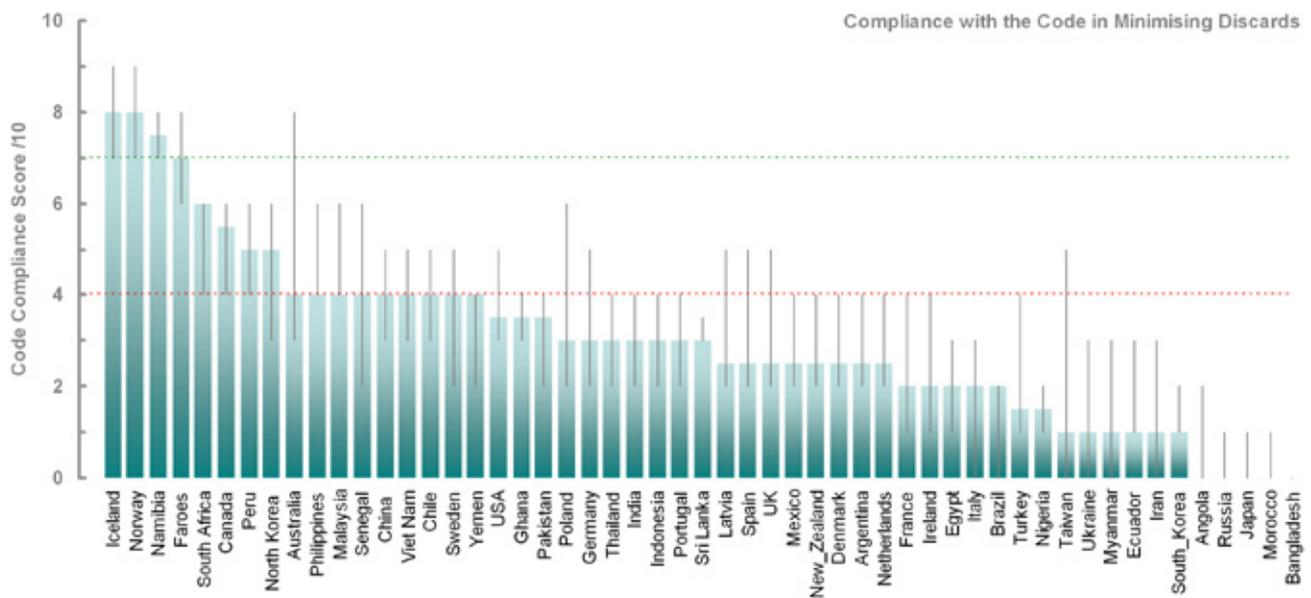
Figure 10. Bar chart showing compliance with the Code of Conduct in minimising discards for the 53 top fishing countries. Error bars are derived from Monte Carlo runs of the MDS ordination technique on the upper and lower score limits for each question and country (see Annex 5). Broken lines: green denotes 'good' compliance rating; red denotes 'fail' rating.

ecosystem can be severe. For example, discarding by-catch can often change the trophic structure of entire ecosystems with the encouragement of scavengers, as is seen in many shrimp fisheries around the world ... Tools that reduce capture of non-target species in fisheries are known as by-catch reduction devices. Some successful examples include: turtle excluder devices (TEDs); sorting grids that assist in allowing unwanted by-catch to escape; circle hooks and blue dyed baits that reduce incidental capture of turtles in longline fishing; scaring lines positioned above a longline gear during setting, thawed bait, night setting with minimum ship light, weighting the line, underwater setting, prohibition of dumping offal during setting to reduce catching seabirds; acoustic pingers to distract marine mammals from becoming entangled in gillnets; and modified operational methods and gear modifications that avoid capture of dolphins while purse-seining for tuna." Indeed, it is now widely evident that good compliance with the Code in these important issues is critical to the long term sustainability of fisheries and marine ecosystems *(e.g., Pauly et al. 2002).*

Scoring Code Compliance on Irresponsible Fishing Methods

Article 7 of the Code, detailing the responsible practices required for fisheries management, emphasises the use of gear that (a) does not have harmful effects on habitats or non-target organisms, (b) minimises by-catch of non-target species, (c) that minimises catches of juvenile fish, and (d), minimises discards of fish and other animals killed by the fishing gear back into the sea. Intentions of management are covered by Q1.7, "Is fishing gear mandated by the management plan to avoid by-catch of non-target species, environmental and habitat damage?" (Articles 7.2.2, 7.4.2). Results of management in this field are covered by 4 key questions: Q4.2, "Are fishing methods known to be harmful to habitats, to create by-catch problems, or whose high fishing capacity is difficult to control, being phased out?" (Article 7.6.3); Q4.3, "Is by-catch of non-target species minimised?" (Article 7.6.9); Q4.4, "Are discards minimised?" (Article 7.6.9.); and Q4.6, "Is the fishing of juveniles and spawners restricted to safe levels?" (Article 7.6.9). The analysis covers these issues with these five questions, hence the first of which is in the intentions of fishery management section, and the rest in the implementation of fishery management.

Results on Irresponsible Fishing Methods

An overall score for compliance with the Code in minimising irresponsible fishing practices and gear is provided in Figure 9, which shows the average and confidence limits for all 5 questions. Four countries receive 'good' scores over or within range of 70% (Norway, Canada, Australia and Iceland) and a further four countries have "passable" scores at 60%, (South Africa, Namibia, Faroes, USA), making 15% of the countries in reasonable compliance with the Code. Astonishingly, all other countries in the analysis (45, 85%) fall within range of below the "fail" grade of 40%. The presence of all 11 of the European Union countries analysed in this list reflects the poor adherence to EU regulation and the ineffective monitoring, control and surveillance system of European fleets (Sweden, UK, Portugal, France, Denmark, Netherlands, Italy, Ireland,
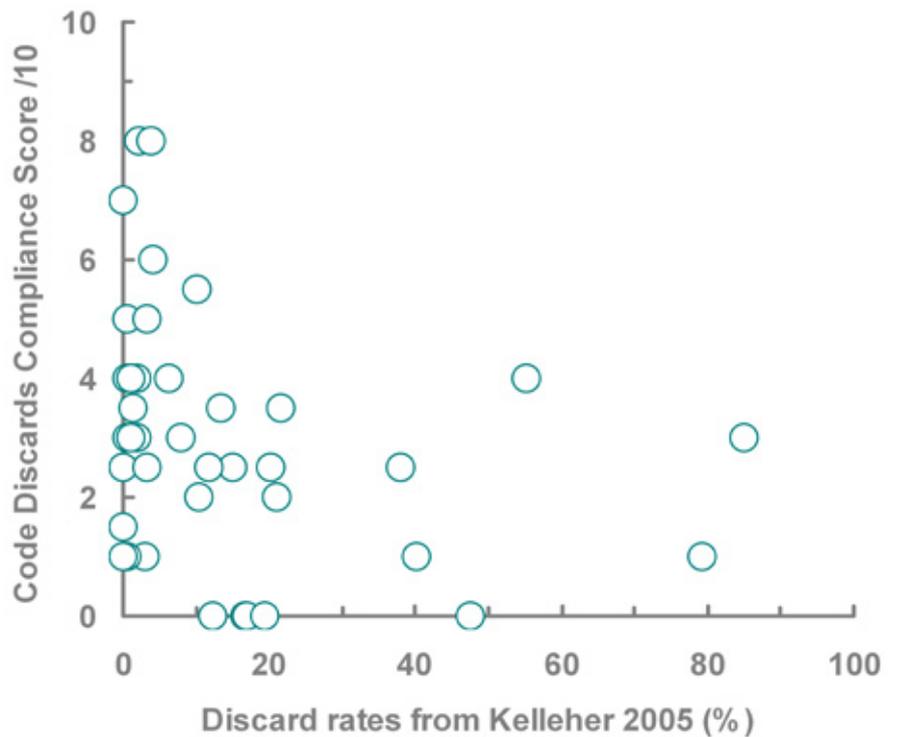
Figure 11. Discard rates from Kelleher (2005) do not correlate well with the Code compliance ratings for discards.

Germany, Spain, Poland); despite well-crafted European Union Common Fisheries Policy regulations, it appears that many by-catch and discard regulations are widely ignored.

It is ironic however that that irresponsible fishing gear, by-catch and discard issues are widely recognised in fishery management frameworks because, for the "intentions" question (Q1.7), just under half of the countries (23, 43%) have "passable" or better scores while 31 (58%) have "fail" grades. Indeed, "intentions" score 16% more on average than the other 4 questions.

The analysis suggests that most countries have taken almost no concerted or effective action on irresponsible fishing in terms of discards, juveniles, bycatch and environmental harmful fishing methods. Details of the scores for the 5 questions may be seen in Annex 4, but one issue, discards, is given a detailed examination here. Figure 10 shows the estimates of compliance with the Code's requirement to minimise discards. Four countries get good scores (Norway, Iceland, Namibia and Faroes)[3], while a further 8 are within range of "passable" scores. Most countries (46, 87%) are assessed with 'fail' grades for compliance with the Code on discards. Not only does this include all of the European Union countries included in the analysis, but also many other developed nations that could easily afford to implement the Code requirements. At first sight this does not accord with Kelleher's (2004) estimate that discards have decreased since the Alverson report in the mid 1990s (Alverson et al., 1994). These figures can be questioned; for example some large fishing countries appear to have no published estimates of discards (including, surprisingly, New Zealand), and in some countries careful estimation of discards reveal considerably higher values than those included in the Kelleher report (e.g., Harrington et al., 2005, give 28% rather than 22% for USA). Moreover, developing country discards figures, especially from shrimp and other trawls, may appear low as most of the catch is landed but used for livestock, chicken feed and export of 'trash' fish to Asian fish farming countries. Although not discarded, the effect on the ecosystem from these extractions is still very real as juveniles and many small species of fish are caught. In fact, shrimp trawl fisheries in some developing countries do not have the low discards assumed by Kelleher (e.g., India, Varkey et al. 2006; Pakistan; Thailand; Indonesia, Nurhakim et al. 2008), and in other places there can be considerable discards of small pelagic fish in 'glut' conditions (e.g., Bali Strait Indonesia, E. Buchary, pers. comm.). These caveats mean that the scores for compliance with the Code of Conduct's requirement to minimise discards may not be expected to correlate especially well with Kelleher's (2004) figures for discards for these countries, and Figure 11 shows that this is indeed the case.

[3] The upper confidence limits for Australia, which gets a fail grade overall, overlap "good" scores as well mainly because of variation and uncertainty in the many complex Australian fishery jurisdictions that had to be combined.
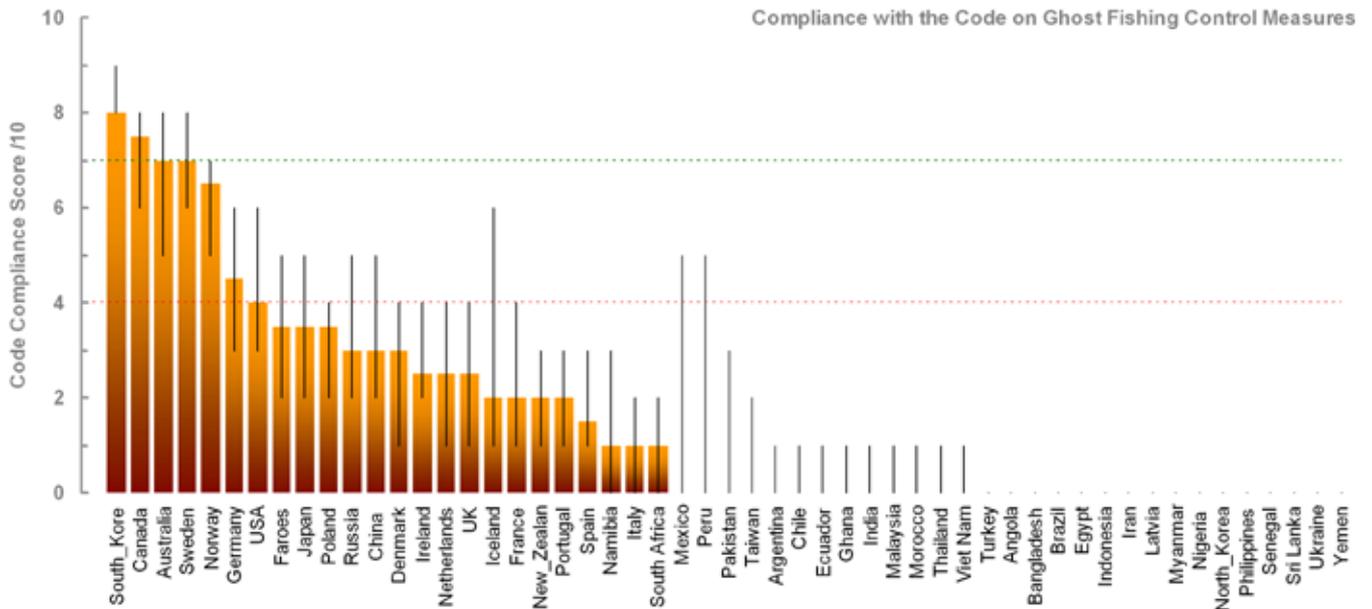
Figure 12. Bar chart showing compliance with the Code of Conduct in controlling ghost fishing for the 53 top fishing countries. Error bars are derived from Monte Carlo runs of the MDS ordination technique on the upper and lower score limits for each question and country (see Annex 5). Broken lines: green denotes 'good' compliance rating; red denotes 'fail' rating.

Ghost Fishing

Why is Ghost Fishing Important?

'Ghost fishing' is defined[4] as the mortality of fish and other species that takes place after all control of fishing gear is lost by a fisher. It occurs when passive gears such as gillnets, trammel nets, wreck nets, or traps are lost or discarded and continue to catch commercially important species of fish and crustaceans as well as non-commercial species including fish, crustaceans, birds, marine mammals and turtles. Ghost gears may also damage benthic habitats by abrasion and the translocation of sea-bed features and can potentially entangle active fishing gear and vessel propulsion systems, raising potential safety issues. Ghost fishing problems are especially persistent when gear is made from modern non-biodegradable synthetic fibres. Lost gear can attract scavenging organisms that become entrapped and subsequently die, forming new bait that kills other scavengers (Brown and Macfadyen 2007, Akiyama et al. 2007, Brown et al., 2005).

Ghost fishing is detailed in FAO's technical guidelines issued in support of the Code, *"When fishing gear like gillnets and traps/pots are lost during fishing operations, they may continue to capture fish for several weeks, months or even years, depending on the depth and prevailing environmental conditions (light level, temperature, current speed, etc). This "ghost fishing" can be partially limited by using biodegradable materials or some means to disable the gear, through increased effort to avoid losing them, or by facilitating the quick recovery of lost nets. In some areas, active campaigns are undertaken to "sweep" periodically for lost nets in known gillnet fishing grounds"* (FAO 2003; 1991).

The EU has recently sponsored some pilot fishing gear retrieval projects (Brown et al. 2005, ICES 2006), but only a few nations appear to regularly deal with this issue. The FAO have also recently commissioned an extensive review of the entire issue which will hopefully lead to new ways of meaningfully addressing the problem. The Code of Conduct (Articles 7.2 and 7.6.9) specifically recommends measures to evaluate the extent of, to mitigate, or to avoid mortality from, lost or discarded fishing gear. Hence, as a source of additional mortality with wider impacts on the marine environment, nations have a clear basis for employing measures to address ghost fishing. Unfortunately, very few do.

Results on Ghost Fishing

For the majority of countries, there is little or no mention of the topic of ghost fishing in any of the available literature, hence the uncertainty on many of the scores is generally quite wide. Indeed, ghost fishing has the

4 The first global recognition of the importance of ghost fishing was at the 16th Session of the FAO Committee on Fisheries in April 1985, a full ten years before the Code of Conduct.

lowest overall score of any of the 44 Code compliance questions (average 1.6/10; median 0/10). Only five countries (9%; South Korea, Canada, Australia, Sweden and Norway) have good compliance scores greater than 7/10 (Figure 12). These five highest scoring countries all have regular lost gear retrieval programmes, and some measures to ensure that traps or pots have biodegradable elements that reduce "ghost" mortality soon after their loss. Three more countries have upper confidence limits that touch a "passable" score of 6/10 (Iceland, Germany, USA), but their lower limits fall well into "fail" zone. The large majority of countries (45, 85%) have poor scores of 3/10 or below, and more than half of these (29 countries, 55%) have truly dreadful scores of zero on the ghost fishing issue.

In northern Europe, to the north and west of the British Isles, a considerable problem with illegally discarded deep water gillnets has recently been identified (Hareide *et al*., 2005). "… vessels, mostly based in Spain and registered in the UK, Germany and some countries outside the EU such as Panama … The amount of fishing gear … lengths of the nets, and the fact that nets are unattended much of the time, make it very likely that a large quantity of nets are lost, while there is also evidence of illegal dumping of sheet netting. The vessels are not capable of carrying their nets back to port and only the headline and footropes are brought ashore while the net sheets are discarded, either bagged on board, burnt or dumped at sea." Ghost fishing problems with this fishery have been identified, but it is likely that many similar issues are, as yet, unrecognised around the world.

The USA (with a 'fail' grade of 4/10) has a particularly poor record in crab trap fisheries that cause mortalities among juveniles of many commercially important fish species (Poon 2005). Indeed, in developed nations, depletions caused by ghost fishing likely bring about considerable economic losses. For developing countries, without the resources to mount gear retrieval programmes, this is an important issue that could be the subject of responsible development aid projects, focussed on practical retrieval methods and using traditional biodegradable twines in constructing traps, nets and pots.

Protected and No-take Areas

Why are Protected and No-take Areas Important?

No-take Marine Protected Areas are considered to provide a hedge against risk and uncertainty in stock assessments, to protect and encourage growth in depleted species, to protect and restore fish habitats, to provide protected source and/or settlement zone for larvae, and may create 'spill over' as fishers gather around the edges of the protected zone to catch fish emerging. Although trophic cascades may result from higher population densities inside the MPA, most studies suggest greater benefits from larger MPAs and for networks of MPAs that take advantage of oceanographic linkages (e.g., Roberts 2001, 2005; Russ 2002; Gell and Roberts 2003; Wood and Dragicevic 2007). Despite all these tangible and largely proven advantages, MPAs have been too small and too slow to arrest the decline of marine ecosystems (e.g., *Agardy et al*. 2003, Caddy 2005, Jones 2007, Ballentine and Langlois 2008).

Scoring Code Compliance On Protected And No-Take Areas

Article 7.6.9 mentions the establishment of no-take areas that are effective, policed and monitored. Although the Code of Conduct mentions only no-take areas, this question was given a broader interpretation so that some credit could be assigned for any type of fishery area closures and spatial gear restrictions, even partial ones, although full no-take received much higher credit. (As less than 0.1% of the world ocean is no-take, there would have hardly been any reasonable scores if this had not been done!). Because larger protected zones have invariably been shown to be more effective, scoring was done on the basis of the percentage of the EEZ that was included in the management zone (see Annex 2, Q3.8). Up to two bonus points were added for effective monitoring, and up to a two further additional points for effective enforcement. Much of the information used about MPAs in the list of countries analysed has come from a global database on this topic (Wood 2007).

Results On Protected And No-Take Areas

The analysis (Figure 13) reveals that 8 countries (15%; Norway, Netherlands, USA, Denmark, Germany, South Africa, Australia and South Korea) have "good" scores (within range of 7/10) for the setting up and monitoring of protected and no-take spatial management zones. All of these countries have progressive

legislation and an active programme of setting up spatial management restrictions and protected areas. A further 9 countries are within range of a "passable" score of 6/10. However, 9 of this set have lower confidence bounds that overlap the "fail" grade of 4/10 or less, and so the total number of countries that have unequivocally good or passable scores is best estimated as 8 (15%).

The analysis also reveals that 43 countries (81%) have low compliance scores within range of the fail grade of 4/10. It is of considerable concern that this list includes ten developed countries (Spain, Canada, Chile, France, Japan, Portugal, Iceland, UK, Italy, and Poland) including 6 from the EU, and all with the knowledge, resources and ability to set up protected marine areas, long known to provide essential buffers against both environmental changes and fisheries management mistakes, and to aid rebuilding of depleted populations of demersal and shore-based fishes and recovery of habitat. Scoring was quite generous for any form of protected zone; if the analysis had been restricted to purely no-take areas, the scores would have been much lower.

The USA (score 7/10, range 4-7) would have gained higher scores if the large closures in New England from the late 1990s had been maintained. Given the prominence that New Zealand has had in the pioneering introduction of no-take zones (Ballentine and Langlois 2008), its relatively modest score (4.5/10, range 3-6) may be surprising to some: the reason is that New Zealand has a very small area inside fishery management zones; its often-mentioned "no-take reserves" legislation only applies to territorial (inshore) seas, and its protected seamounts are only a small proportion of its total EEZ. Thailand and Malaysia score more or as well as developed countries like Canada and the USA largely as result of pioneering actions by a few individuals (such as the Princess Chulabhorn Marine Park Project patrolled by the Royal Thai navy).
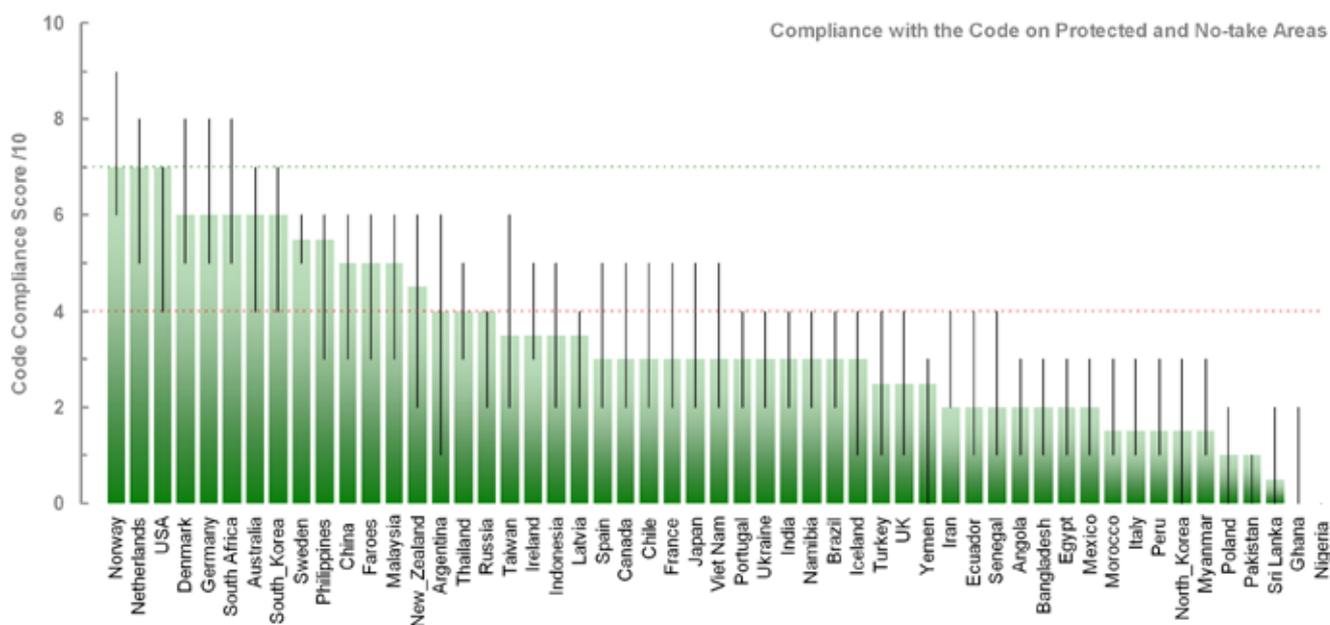
Figure 13. Bar chart showing compliance with the Code of Conduct in implementing protected and no-take areas for the 53 top fishing countries. Error bars are derived from Monte Carlo runs of the MDS ordination technique on the upper and lower score limits for each question and country (see Annex 5). Broken lines: green denotes 'good' compliance rating; red denotes 'fail' rating.

Small-Scale Fisheries

Why Are Small-Scale And Aboriginal Fisheries Important?

Currently, more than 60% of the word fish catch is taken by small scale fisheries, which consume less energy, have less subsides and create more employment than large-scale industrial fisheries (Ruttan *et al*. 2000). Hence they have attractive features for long-term sustainability as recognised by the Code of Conduct (Hauck 2008). Moreover, a much higher percentage of their catch is used for immediate food consumption, and so they have a pivotal role in the food security of poor coastal communities (Pauly 2006). Equally, Indigenous and Aboriginal peoples are non-dominant sectors of society determined to preserve, develop and transmit to future generations their ancestral fishing activities and ethnic identity as the basis of their continued existence as peoples, in accordance with their own cultural patterns, social institutions and legal system.

Figure 14. Bar chart showing compliance with the Code of Conduct in managing small-scale fisheries for the 53 top fishing countries. Error bars are derived from Monte Carlo runs of the MDS ordination technique on the upper and lower score limits for each question and country (see Annex 5). Broken lines: green denotes 'good' compliance rating; red denotes 'fail' rating
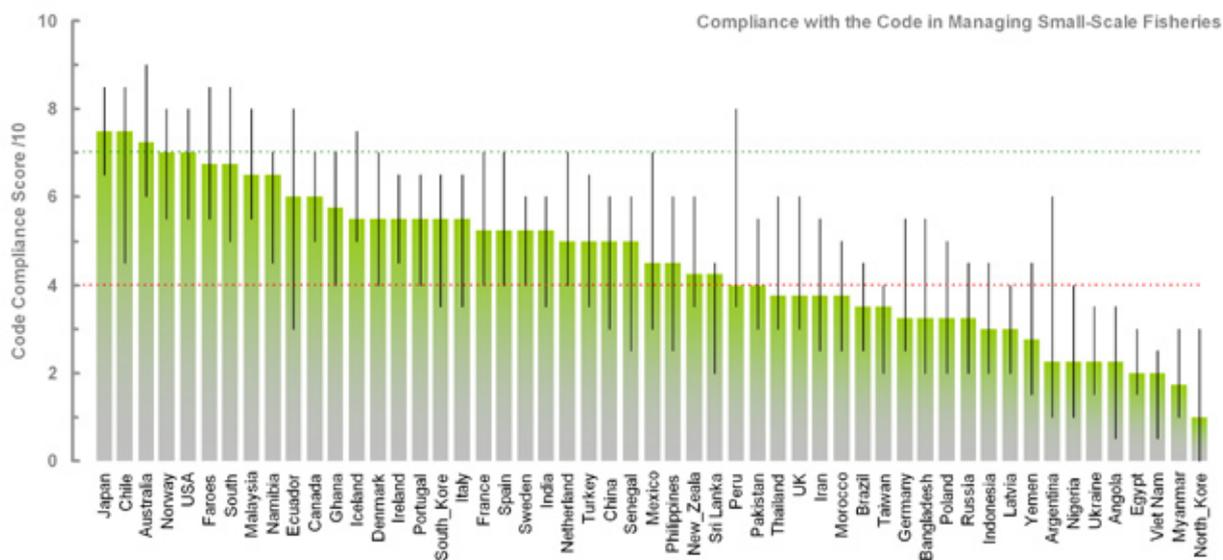
Scoring Code Compliance On Small-Scale And Aboriginal Fisheries

The importance of small-scale and artisanal fisheries is emphasised in Code Article 6.18, where the general principles of the Code are set out. In the detailed fishery management provisions of Article 7 (Articles 7.2.2, 7.1.2, 7.1.6, 7.4.5), Questions 1.5 and 5.3 cover the relevant material on this topic. In the analysis the results from these two questions were averaged (in fact, scores were quite well correlated, $r = 0.6*$).

Question 5.2 deals with the Code's requirement for the recognition of the rights of Aboriginal Peoples to be taken into account in fishery management. In the Code of Conduct itself this issue is combined with the needs of coastal communities in Article 7.6.6, but, as discussed in Pitcher 1999, in this analysis it was considered important enough to justify consideration as a separate issue. The UN definition of Indigenous Peoples[5] was used in the country analyses. For some countries the Indigenous Peoples issue was a moot; for example, Iceland might be considered to be entirely composed of Indigenous people, whereas in countries such as Germany, Italy, Poland, Ukraine, Portugal, Turkey and Iran, for example, complex movements of ancient peoples renders the question meaningless. Here, an 'average' score of 5/10 was assigned, but that country was eliminated from further analysis on this issue. In other countries the presence of indigenous peoples fitting the UN definition was considered (e.g., Norway, UK, France, Malaysia, Philippines, Vietnam, South Africa).

Results on Small-scale and Aboriginal Fisheries

The analysis (Figure 14) reveals that of the 53 countries, 19 (30%) received scores within range of the "good" grade of 7/10, scores that are higher than average for many questions indicating that small-scale fisheries (SSF) are considered more seriously in fisheries management by more countries than many other issues in the Code (this question was ranked 16th out of 53 overall –Figure 4).

[5] "Indigenous communities, peoples and nations are those which, having a historical continuity with pre-invasion and pre-colonial societies that developed on their territories, consider themselves distinct from other sectors of the societies now prevailing on those territories, or parts of them. They form at present non-dominant sectors of society and are determined to preserve, develop and transmit to future generations their ancestral territories, and their ethnic identity, as the basis of their continued existence as peoples, in accordance with their own cultural patterns, social institutions and legal system. This historical continuity may consist of the continuation, for an extended period reaching into the present of one or more of the following factors: a) Occupation of ancestral lands, or at least of part of them; b) Common ancestry with the original occupants of these lands; c) Culture in general, or in specific manifestations (such as religion, living under a tribal system, membership of an indigenous community, dress, means of livelihood, lifestyle, etc.); d) Language (whether used as the only language, as mother-tongue, as the habitual means of communication at home or in the family, or as the main, preferred, habitual, general or normal language); e) Residence on certain parts of the country, or in certain regions of the world; f) Other relevant factors. On an individual basis, an indigenous person is one who belongs to these indigenous populations through self-identification as indigenous (group consciousness) and is recognized and accepted by these populations as one of its members (acceptance by the group). This preserves for these communities the sovereign right and power to decide who belongs to them, without external interference" United Nations (2004).
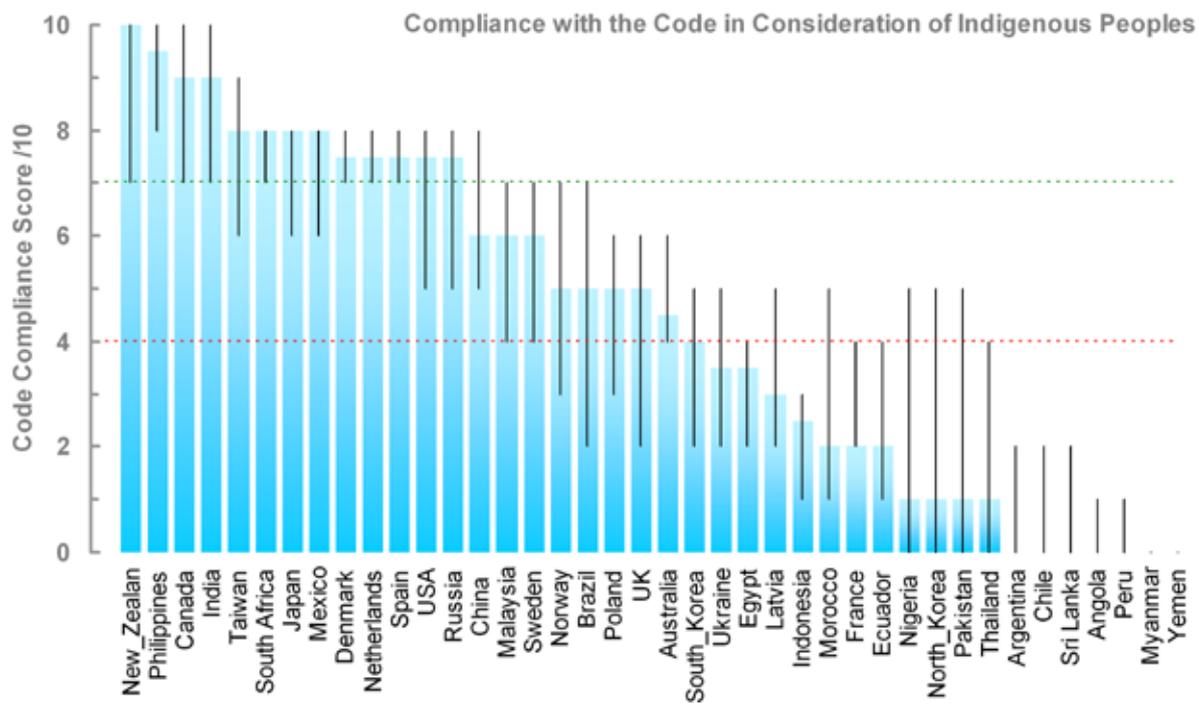
Figure 15. Bar chart showing compliance with the Code of Conduct in consideration of Indigenous Peoples for 40 of the 53 top fishing countries where this issue is relevant (see text). Error bars are derived from Monte Carlo runs of the MDS ordination technique on the upper and lower score limits for each question and country (see Annex 5). Broken lines: green denotes 'good' compliance rating; red denotes 'fail' rating.

Countries with unequivocal "good" scores are Japan, Chile, Australia, Norway and USA. Efforts by these countries to include small-scale fishers in management are well-known and involve fisheries policies that enable community-based and co-management to take place locally. In these countries there are institutional structures for ongoing consultation. For instance, in the case of Norway, regulations are implemented by a management committee at the county level often in response to demands from local fishermen. In Chile, the Management and Exploitation Areas for Benthic Resources is perhaps the most innovative new management instrument clearly based on the concept of Territorial User's Rights in Fisheries. In essence, these Management and Exploitation Areas give exclusive access to benthic resources in a portion of the coast, to a local organization of artisanal fishermen, for the purpose of accomplishing a stock enhancement programme and their benefiting by the exclusive exploitation of the resources in the Area under a technically approved management regime.

In countries that score very poorly for SSF measures, ground-based initiatives like these were not identified (the 8 lowest scoring nations; Argentina, Nigeria, Ukraine, Angola, Egypt, Myanmar, North Korea, and Viet Nam). The lack of attention to the small-scale fishing sector occurs despite the fact that small-scale fishers are very important as a source of food security and livelihoods in many of these countries (Myanmar, Nigeria, Indonesia and Viet Nam). In the case of Viet Nam, for instance, small-scale inshore fishers make up two thirds of the Vietnamese fishing fleet (FAO 1999). The absence of regulation controlling the access of bigger industrial vessels in shallow coastal waters (FAO, 1999), where small-scale fisheries operate, is an indication of the weak consideration of this sector in management plans and weak enforcement where zoning is in place. In Indonesia, the small-scale sector is huge (perhaps over 20 million people) and comprised largely of very poor people whose fisheries fall outside the ambit of formal management; in the past, their catches have been poorly reported or often not estimated at all. There are some recent improvements to the way in which small scale fishers are considered in Indonesia (scoring 2 to 4.5/10 here), with serious consideration now being given to devolve management powers to local government (for example, local regencies control marine areas within 4 nautical miles of the coast). However, these recent signs of improvement are not included in this scoring.

As expected there is a strong relationship between Questions 1.3 and 5.3, which cover respectively the consideration of small-scale fishers in management plans and to the extent that their needs are being met by fisheries management. Important outliers in this relationship are France and Spain, which score low on the consideration of SSF in management plans but relatively well in meeting the needs of communities. The opposite happens in countries such as Peru and Thailand, where despite the fact that SSF score relatively well in the consideration of fishers, their performance in meeting their need of small-scale fisheries is lower

than expected. These discrepancies could indicate on the one hand, the lack of information on SSF in these countries (such as in Peru and France), the difficulty of putting management plans in practice (as may be the case in Thailand) and, for some European countries, it could relate to the fact that despite the low consideration in plans, the overall needs of fishing communities are to some extent met by public policies. In Spain, for instance, after a situation of social crisis experienced by SSF due to the scarcity of the fish in the European waters, several socioeconomic measures were established by the government in support of fishers, such as early retirement schemes and a flat-rate individual premium for younger fishermen (European Commission, 2005).

For Aboriginal and Indigenous fisheries, 18 countries (45% of the countries scored on this issue) have 'good' scores within range of 7 (New Zealand, Philippines, Canada, India, Taiwan, South Africa, Japan, Mexico, Denmark, Netherlands, Spain, USA, and Russia, China, Malaysia, Sweden, Norway and Brazil (Figure 15). In addition, Poland, UK an Australia have upper confidence limits that lie in the "passable" area. Seven countries get outright fail grades of 4 and below (Argentina, Chile, Sri Lanka, Angola, Peru, Myanmar, Yemen), mainly because the governments of most of these countries do not specifically acknowledge the existence of Indigenous Peoples.

The Control Of Excess Fishing Capacity

Why Is Controlling Excess Fishing Capacity Important?

Overcapacity is widely agreed to be a major threat to fish stocks worldwide (Sinclair *et al*. 2002, Greboval 1999, Kirkley and Squires 1999, Hatcher and Robinson 1998), and is the subject of a global agreement negotiated through the FAO ten years ago, the International Plan of Action for the Management of Fishing Capacity (FAO 1999), which calls for all member states to achieve efficient, equitable and transparent management of fishing capacity by 2005. Although there appears to be little agreement on the actual levels of global fishing overcapacity (30%, Garcia and Newton 1997; 150%, Porter 1998), the problem is emphasised in the Code objectives set out in Article 6 (Art. 6.3), "Where excess fishing capacity exists, mechanisms should be established to reduce capacity to levels commensurate with the sustainable use of fisheries resources....", and this reflected in the management detail of Article 7 (Art. 7.2.2 and Art. 7.6.3). Possible management actions include measures such as economic incentives and disincentives, individual quotas, limited entry, and co-management (Cunningham and Greboval 2001), although where these measures require government subsidies they have been called into question (Clark *et al*. 2005), and industry-led buy-backs are thought to be more robust (Martell *et al*. 2008). In the EU, reduction of fishing capacity under Multi-Annual Guidance Programme (MAGP) has largely been ineffectual (e.g., DG Fish 2000), although a wide range of suitable
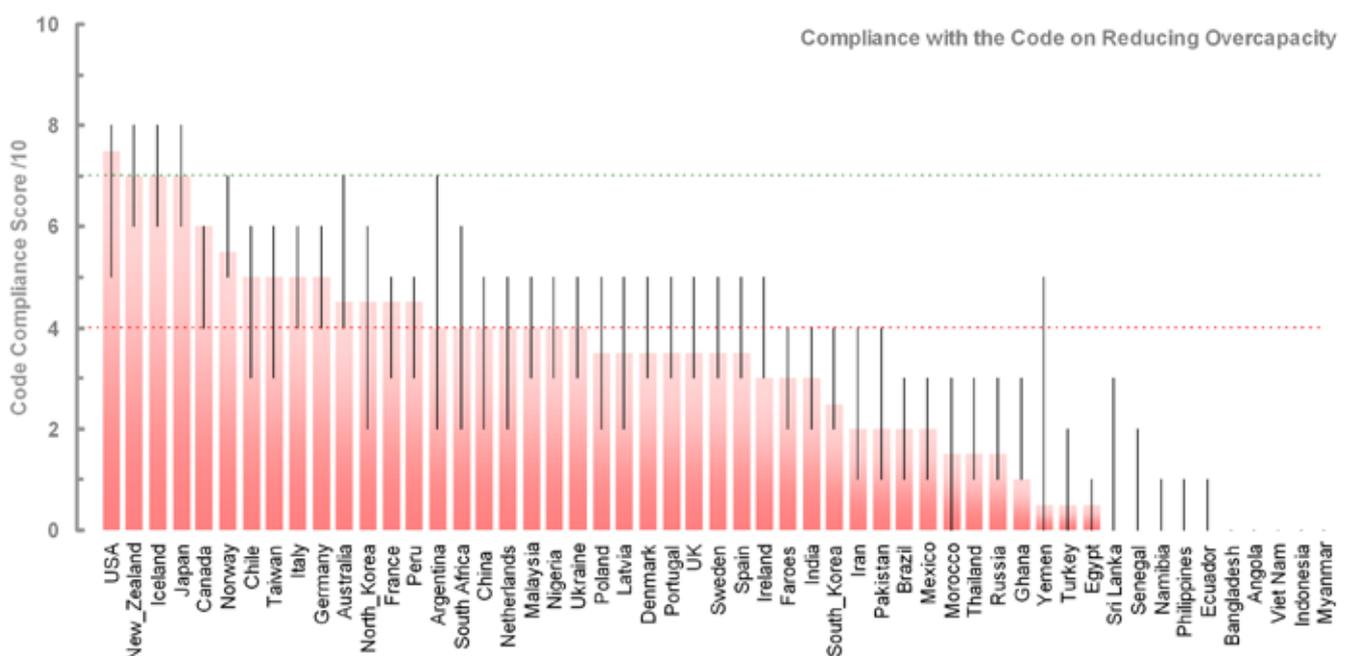

Figure 16. Bar chart showing compliance with the Code of Conduct in reducing excess fishing capacity for the 53 top fishing countries. Error bars are derived from Monte Carlo runs of the MDS ordination technique on the upper and lower score limits for each question and country (see Annex 5). Broken lines: green denotes 'good' compliance rating; red denotes 'fail' rating.

instruments appears to be available world-wide (Pascoe *et al*. 2002). Controlling and reducing capacity in developing countries may be more difficult (e.g., APFIC 2007, Reid *et al*. 2005, Kirkley *et al*. 2003).

Scoring Control of Overcapacity

Two questions in the framework address the issue of fishing capacity. Q1.2 examines whether present fleet capacity is calculated and if there are plans to reduce it to a target level. Detailed and effective measures to reduce capacity to a target of sustainability receive the highest scores, although any attempts to measure fishing capacity are given some credit. Q4.1 asks if excess fleet capacity is being reduced. The scoring attempts to reflect whether countries are acting to reduce capacity "commensurate with the sustainable use of fisheries resources". While reflecting this aim, the scoring has given some credit for attempts to reduce capacity, for "measures aimed at avoiding an increase in capacity", but awards higher scores for "measures actually aimed at capacity reduction".

Results On Excess Fishing Capacity

Only four countries have unequivocal "good" scores on this issue (Q4.1; USA, New Zealand, Iceland and Japan), while 48 countries (90%) are within range of a fail grade (Figure 16). On average, countries have scores 1.7 points higher for intentions under Question 1.2, for which 7 countries are awarded "good" scores (Malaysia, Sweden and Italy added to list above). A few countries appear to have better actions in reducing fishing capacity than their stated intentions: for example, Myanmar seems to have reduced fishing capacity inadvertently through neglect. Thus the global fish fleet is still dramatically more than is needed, and outside of a few developed countries, there is little effective action to reduce capacity to levels commensurate with the Code.

Illegal Fishing (IUU)

Why is IUU Fishing Important?

Illegal, unreported and unregulated fishing (IUU) covers illegal catches, unreported discards and unreported catches from fisheries that are not mandated for regulation. Serious economic losses from illegal catches world-wide are documented in recent reports by MRAG (2005), Sumaila *et al*., (2006) and by Agnew *et al*. (2008), based on a recent quantitative estimation method (Pitcher *et al*. 2001, Ainsworth and Pitcher 2005, Bailey *et al*. 2008): results suggest a global total of between 11 and 19% of the reported catch, worth around $10 - 25 billion annually in illegal catches. Real catches may often be much higher than those reported to FAO because of IUU (e.g., in the Arafura Sea, over 1.5 million tonnes per year of unreported catch has been estimated, Nurhakim *et al*. 2008), but this is not necessarily factored in to the recommended catches when setting legal limits (except by ICES, which tries to do this). Additionally, illegal fisheries are often prosecuted
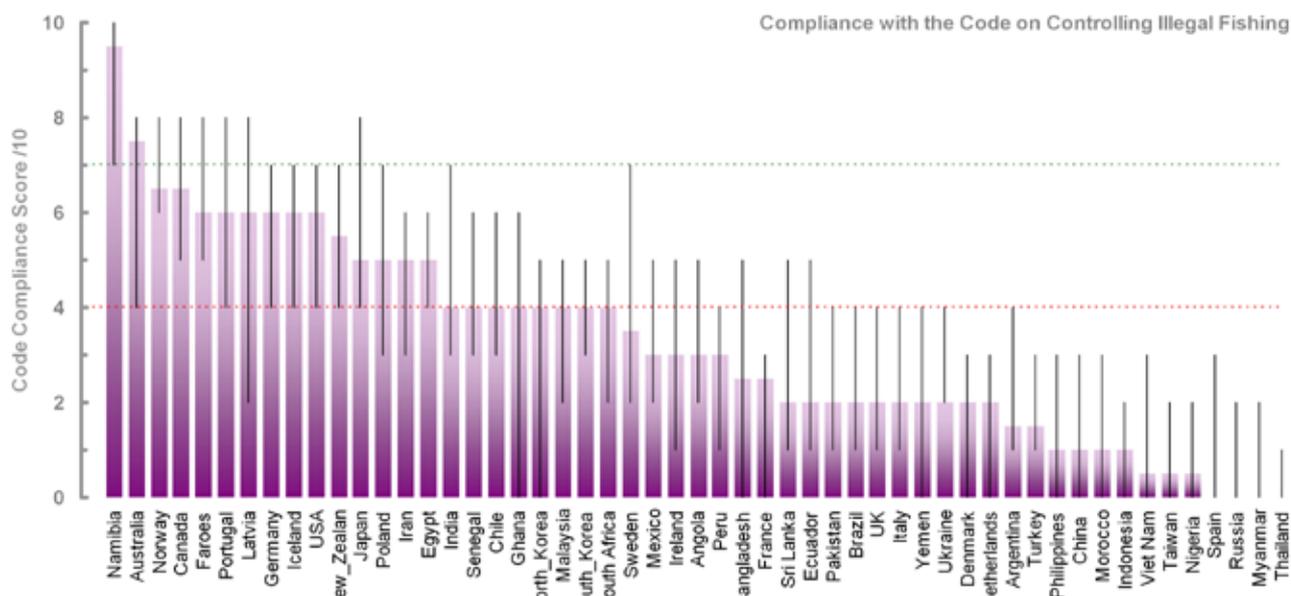
Figure 17. Bar chart showing compliance with the Code of Conduct in controlling illegal fishing for the 53 top fishing countries. Error bars are derived from Monte Carlo runs of the MDS ordination technique on the upper and lower score limits for each question and country (see Annex 5). Broken lines: green denotes 'good' compliance rating; red denotes 'fail' rating.
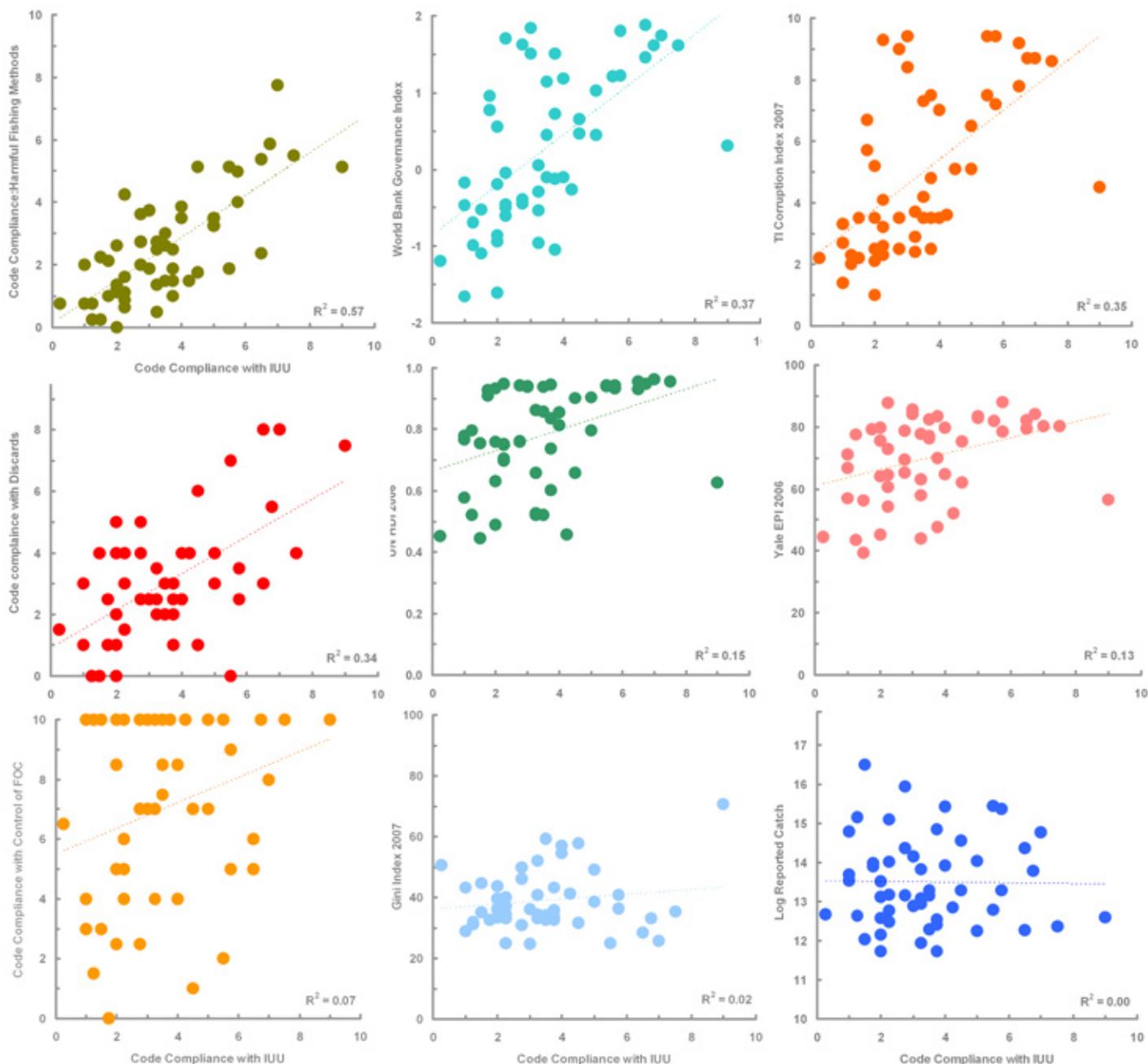
Figure 18. Correlation plots of Code compliance IUU scores (average of questions 6.4 and 6.5 on IUU occurence and IUU control) with nine other scores and indices. Shown in order of statistical significance from top left: Code compliance with harmful fishing methods, Q4.2; World Bank Composite Governance Index; Transparency International Corruption Perception Index 2007; Code compliance with discards, Q4.4; UNDP Human Development Index 2006; Yale Environmental Performance Index 2006; Code compliance with flags of convenience, Q6.6; Gini coefficient of income disparity; log reported catch.

by fishers who are either unable to take note of conservation measures (e.g., bycatch mitigation for small fish, seabirds, sharks or turtles), or who deliberately flaunt them to ensure lowest cost operations. Trans-national crime in fishing is increasingly apparent: sometimes, illegal armaments, people, drugs and fish are transhipped at sea out of sight of law enforcement (Putt and Anderson 2008, Vaisman 2001). In addition, unreported discards world-wide may be at least 40% (Pauly *et al*. 2002): discards in this analysis are dealt with under a separate section.

Scoring Code Compliance on IUU fishing

The importance of controlling illegal fishing is clearly emphasised by the Code, for example in the general principles of Article 6.10, and in the fishery management details of Articles 7.7.5, 7.7.1, 7.6.1 and 7.8.1, which are covered by Questions 6.4 and 6.5. Here the analysis is based on an average score for these two questions, which are quite well correlated (r=0.55*).

Results on IUU fishing

Figure 17 shows that 14 countries (26%) are within range of "good" scores of 7/10[6]; (Canada and Iceland), and only two more have acceptable scores over 6/10 (Namibia, Australia, Norway, Canada, Faroes, Portugal, Latvia, Germany, Iceland, USA, New Zealand, Japan, Poland, India). Senegal and Chile are in range of 6/10, while Ghana and Sweden have such a wide range of possible scores that estimates are very uncertain. However, no less than 30 countries (57%) have 'fail' grades on the illegal fishing issue, of which 16 countries (30%) have unequivocal fail grades (France, Denmark, Netherlands, Turkey, Philippines, China, Morocco, Indonesia, Viet Nam, Taiwan, Nigeria, Spain, Russia, Myanmar and Thailand). Moreover, for 18 countries (34%) countries the lower confidence limit includes zero. Despite these reasonable results across countries, the average score for compliance with the Code only 3.4/10, the fourth lowest score for all of the 44 questions. This review therefore reveals very poor compliance with the Code on illegal fishing. Paradoxically, this is an issue extensively recognized as one of the most important fisheries issues world wide.

The detailed country evaluations reveal a litany of anecdotes that support these poor figures for compliance with the Code's requirements on illegal fishing. For example, Viet Nam admits to missing 1 million tonnes of catch, Indonesia likely has over 3 million tones of unreported catch, Thai fleets appear to be out of control with 4000 illegal incursions into neighbouring EEZs per day, North Sea countries and much of Europe are riddled with mis-reporting. Indonesian ports are implicated in assisting illegal tuna catches to Japan and in illegal shipments of Antarctic toothfish: Gianni and Simpson (2005) state, "As for getting the right certification and documentation, it is generally regarded as a fairly simple task to get officials in agencies under inadequate central government control in … port states like Indonesia to generate 'appropriate' paperwork." A third example concerns Taiwan: "Taiwanese fishing companies have now deliberately built a fleet of vessels that fall just under the 24 meter minimum length for application of most ICCAT measures. These 23.9 meter vessels have operated extensively in the Caribbean decimating shark stocks and causing serious billfish by-catch problems. The government of Taiwan either lacks the means or will to control this situation" (Delaney, 2003). Full details of these and other examples from many other countries are presented in the country evaluation documents (Pitcher et al. 2006).

On account of the controversial nature of these illegal activity analyses, nine sets of correlations with the illegal fishing scores (average of questions 6.4 and 6.5 on IUU occurrence and IUU control) are shown in Figure 18. Shown in order of statistical significance from top left (significant relationships): Code compliance with harmful fishing methods, Q4.2; World Bank Composite Governance Index; Transparency International
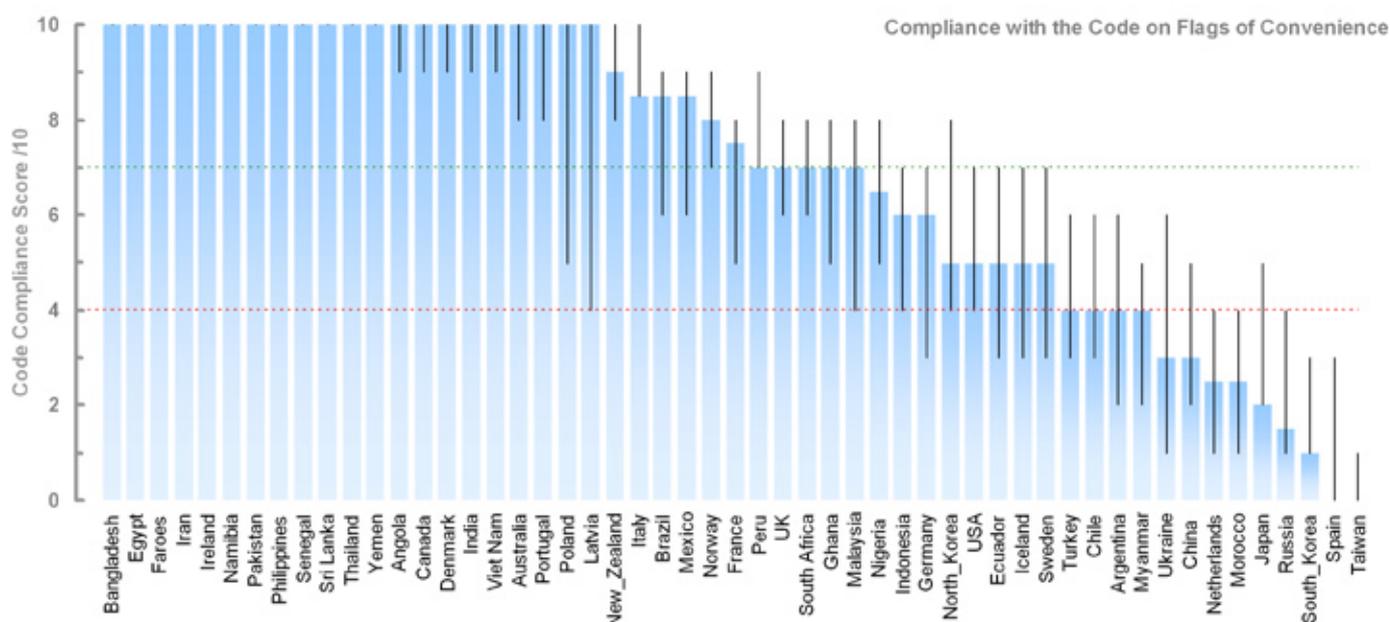
Figure 19. Bar chart showing compliance with the Code of Conduct on Flags of Convenience for the 53 top fishing countries. Error bars are derived from Monte Carlo runs of the MDS ordination technique on the upper and lower score limits for each question and country (see Annex 5). Broken lines: green denotes 'good' compliance rating; red denotes 'fail' rating.

[6] Values subtracted from ten because the original scoring scale awarded high scores for high amounts of illegal fishing (see Annex 2).

Corruption Perception Index 2007; Code compliance with discards, Q4.4; UNDP Human Development Index 2006; Yale Environmental Performance Index 2006; Code compliance with flags of convenience, Q6.6; (non-significant relationships): Gini coefficient of income disparity; log reported catch. The lack of correlation with the Gini coefficient shows that there is no correlation of IUU with the presence of a wealthy oligarchy, as has sometimes been suggested. The lack of a correlation with total reported catch shows that both large and small fishing countries are just as likely to exhibit illegal fishing.

Flags of Convenience

Why Are Flags Of Convenience Important?

Using a flag of convenience (FOC), where a vessel effectively buys the nationality of another flag, and nation, makes it harder to track illegal fishing or sources of fish, because the vessel can legally adopt what is usually a lack of flag state rules on compliance with international instruments, including vessel safety. The importance of addressing FOCs was reinforced by the Ministerial High Seas Task Force that ran during the period of this study (HSTF 2006).

Scoring Compliance On Flags Of Convenience

Control of the use FOCs is required by the Code under Article 7.7.5 and in Article 8 covering fishing operations, but is also emphasized in the general principles of Article 6.11. FOCs are defined by the Global Policy Forum (2003), which maintains a list of offending countries. The scoring is based on Q6.6 (see Annex 2).

Results On Flags Of Convenience

Analysis (Figure 19) reveals that 40 countries (75%) have scores within range of "good" (7/10). Indeed, this issue has the highest compliance scores of any of the 44 questions (Figure 5). However, nine countries (16%) have unacceptably low compliance scores (4 or less); these are Ukraine, China, Netherlands, Morocco, Japan, South Korea, Spain and Taiwan. As with illegal fishing there is no correlation with the amount of the catch but, surprisingly, there is almost no correlation with the scores for illegal fishing, but this may be because in countries with ineffective fishery management, the use of FOC as means of avoiding penalties is unnecessary.

MRAG (2005) reports, "While the registration nationalities of fishing vessels are located in around 80 countries, most of the beneficial owners are based in Taiwan, Japan and the European Union." Detailed information about FOC is hard to find, but, for many countries, the analysis relies to a considerable extent upon a detailed report by Gianni and Simpson (2005). For example, these authors state that the Netherlands Antilles have over 20 FOC vessels involved in illegal sashimi trade with Japan; moreover, five Spanish-owned vessels flagged in Netherlands Antilles are named. In another example, Japan comes eighth in a list of the top twenty countries involved in the marketing of fish illegally trans-shipped by FOC vessels. The size of this trade is exemplified by the finding that Japanese owners were identified in 63% (48 out of 77) of FOC vessels (many flagged in Panama) implicated in illegally trans-shipped sashimi-grade tuna, while 12% (17/132) were involved in illegal lower grade tuna shipments. These modus-operandi and other management failings have led to a high risk of fishery collapse in the Mediterranean Bluefin tuna fishery.

According to Gianni and Simpson (2005), many vessels registered to an FOC country, or listed as flag 'unknown' have been built in Taiwan. Of 51 vessels longer than 24 m built in Taiwan in the 1990s, only one was flagged to Taiwan; the remainder were flagged in known FOC countries immediately after launch. For example, the Lien Cherng Shipbuilding Co. Ltd. of Kaohsiung launched 18 vessels in 2000 -2003 that all flew FOCs when they left the shipyard and ten of these vessels were subsequently implicated in IUU fishing for Patagonian toothfish.

Some Issues of Compliance with the Code of Conduct in Developing Countries

Why is compliance with the Code important in developing countries?

Developing nations have limited financial and human resources for fisheries management and monitoring compliance with regulations. Many developing countries, however, probably on account of the importance
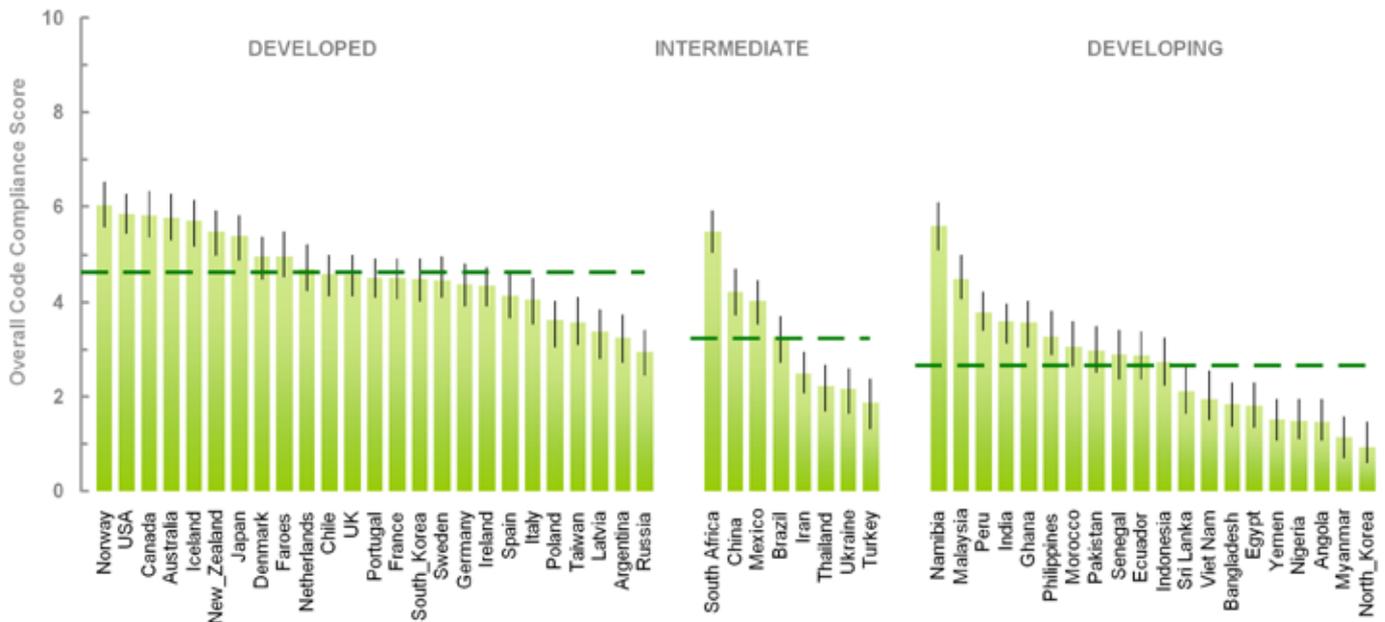
Figure 20. Bar charts showing overall compliance with the Code of Conduct for 53 developed, developing and intermediate fishing countries. Error bars are derived from Monte Carlo runs of the MDS ordination technique on the upper and lower score limits for each question and country (see Annex 5). Broken lines demote median for each category.

of fish protein in the diet, have a special focus on fisheries. Many have passed progressive laws relating to fisheries management (e.g., Namibia, Malaysia, India), and some developing countries even have an extensive data-gathering network of fishery recorders in place (e.g., Malawi, Indonesia). Some nations are in the process of developing precautionary new fishery laws, with considerable input from international experts and FAO (e.g., Thailand, Viet Nam, Indonesia).

Scoring Compliance with the Code in Developing Countries

In acknowledgement of these problems of capacity and infrastructure, the Code of Conduct itself sets out special requirements for developing countries (Article 5[7]). However, the phrase from Article 5.1, "taken duly into account", is open to interpretation. In this review it was not taken as meaning that developing countries are absolved from the need to comply with the code. Developing countries share the same ocean with developed countries and share the same, if not greater, need to deal with fisheries issues, especially in terms of food security and an increasing global fish trade. They also share the same responsibility for the fishery resources, and bear the same consequences of failure. In the last resort, if these countries are not able to devote sufficient resources to effective and sustainable management of fisheries, seafood security itself will be compromised, a potentially devastating outcome for the livelihoods of large numbers of extremely poor coastal populations. And because of increases in international trade, the status of fisheries is increasingly interdependent on a global scale. So if the considerable resources of developed nations can be used to improve fisheries status internationally, this is to some extent in their self interest. In fact, most developing countries (with a few exceptions of international pariahs like Myanmar) do have the opportunity to request development aid for this purpose. Hence, Article 5 of the Code is taken into account in the analysis and interpretation of the compliance scores, but it was not allowed to affect the scoring itself.

The 53 countries were divided into developed (25 countries), intermediate (8 countries) and developing (20 countries) based on GDP per capita, and the overall compliance ratings from the MDS ordination of the 44 scores were used, together with their upper and lower confidence limits.

[7] ARTICLE 5 - SPECIAL REQUIREMENTS OF DEVELOPING COUNTRIES: 5.1 The capacity of developing countries to implement the recommendations of this Code should be duly taken into account. 5.2 In order to achieve the objectives of this Code and to support its effective implementation, countries, relevant international' organizations, whether governmental or non-governmental, and financial institutions should give full recognition to the special circumstances and requirements of developing countries, including in particular the least-developed among them, and small island developing countries. States, relevant intergovernmental and non-governmental organizations and financial institutions should work for the adoption of measures to address the needs of developing countries, especially in the areas of financial and technical assistance, technology transfer, training and scientific cooperation and in enhancing their ability to develop their own fisheries as well as to participate in high seas fisheries, including access to such fisheries.

Our Results on Developing Countries

Overall compliance scores from the 44 questions are shown in Figure 20: it is evident that compliance among developed nations (average 4.6/10; range 2.9 to 6.0) is very poor and not as high as one might expect, but it is twice as high as average compliance values from developing nations (average 2.6/10; range 0.9 to 5.6). Why would this be, and what could be done about it?

The answer to this question lies within the high variance within each of the categories of countries. Many developing nations score as highly as developed ones, and, worse, many developed nations have lamentably low compliance ratings. It is interesting that, in the event, some developing countries with limited resources are able to score quite well in compliance; for example, Malaysia, Peru and India score higher than some developed nations like Russia and Taiwan, and almost as high as the United Kingdom, Spain and France. Two developing countries, Namibia, and Malaysia are worthy of note. Namibia has only 4 fail grades, while Malaysia has 19, but ranks overall as high as many European countries.

Implementation of Ecosystem-Based Management (EBM)[8]

Why is EBM Important?

The recent trend towards adopting ecosystem-based fishery management (EBM) reflects widespread agreement about the need to move towards a new fishery management system that recognises explicitly how food web linkages and human interventions may affect sustainability in aquatic ecosystems (Pikitch *et al*. 2004; Hilborn *et al*. 2004; Brodziak and Link 2002). There is an urgent need to manage fisheries in a more ecologically sensitive manner and this is the strength of the overarching concept of ecosystem-based management. Although there are a bewildering number of different definitions and shades of meaning of EBM (Ward *et al*. 2002, US Commission on Ocean Policy 2004, Hall and Mainprize 2005), many of the issues now considered vital for EBM are implicit in the Code. Aiming to operationalise this concept, FAO has also issued guidelines for an ecosystem approach to fisheries (FAO 2003). Implementation, however, of the FAO stock-specific 'traffic light' reference points approach will be difficult until clear and simply-measured EBFM indicators for management are agreed by the international community (Caddy and Mahon 1995, Collie and Gislason 2001), a task that has proved more difficult than some envisaged, especially in data-poor
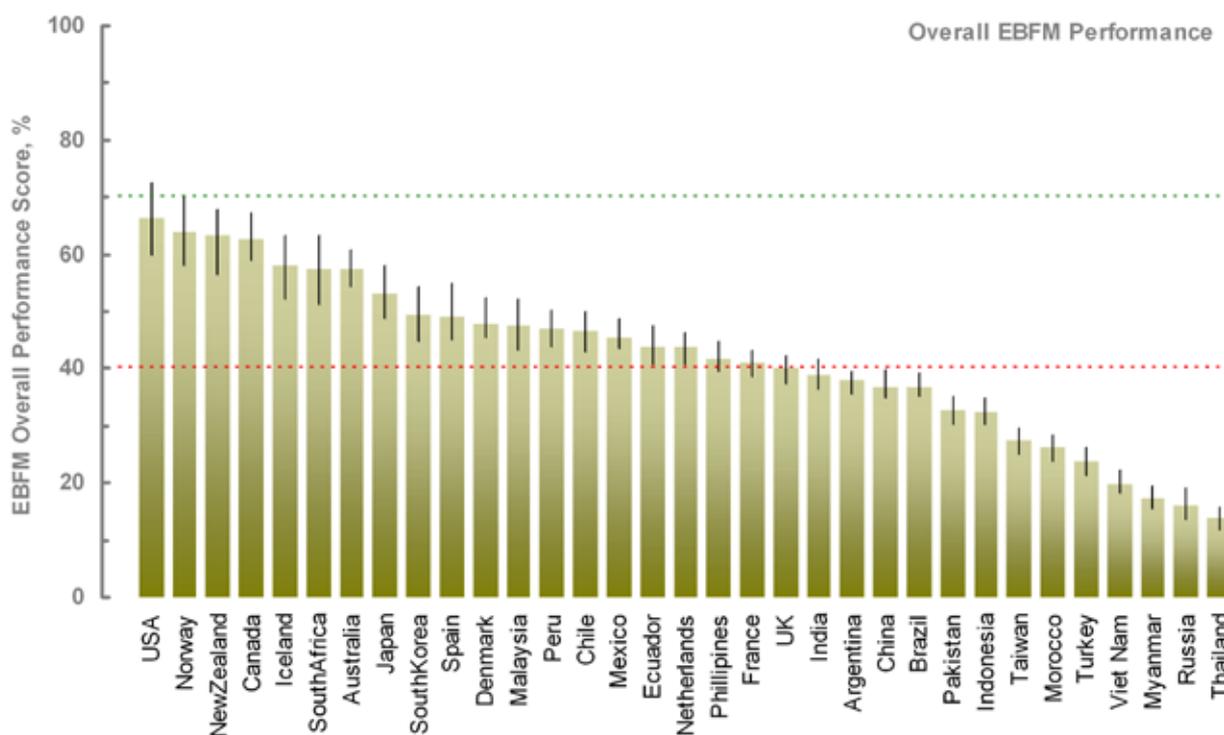
Figure 21. Bar chart showing status of implementation of Ecosystem Based (Fishery) Management for 33 top fishing countries. Error bars are derived from Monte Carlo runs of the MDS ordination technique on the upper and lower score limits for each question and country (Pitcher *et al*. 2008). Broken lines: green denotes 'good' compliance rating; red denotes 'fail' rating.

[8] Many wish to distinguish EBM from EBFM or the ecosystem approach to fishery management (EAFM): as in Ward *et al*. (2002), here we use EBM to denote a holistic approach to the management of fisheries, but not the management nor control of pollution, shipping lanes, recreation and other non-fisheries issues.

fisheries (Link 2005). In the meantime, the simple, practical approach published by Ward *et al*. (2002) has proven easier to adapt as a basis for evaluating status. In fact, the Ward *et al*. framework is largely based upon the FAO Code of Conduct which, although it originated in the early 1990s before ecosystem thinking became widespread, provides a very robust scheme of key elements such as ecological health, stakeholder involvement and spatial management.

Results for EBM

Full results for the three evaluation fields are published in Pitcher et al. (2008) together with test cases for sub-national regions of Australia and Indonesia. Overall scores for the implementation of EBM for 33 countries (Figure 21) show that no country scores a 'good' grade over 70%, and only four countries have 'reasonable' grades between 60 and 70% (Norway, USA, New Zealand and Canada), while three more have confidence limits that overlap 60% (Iceland, South Africa, and Australia). But about half (16, 48%) of the 33 countries have 'fail grades' of 40% and less (UK, Argentina, France, India, China, Brazil, Pakistan, Indonesia, Taiwan, Morocco, Turkey, Viet Nam, Myanmar, Russia and Thailand).
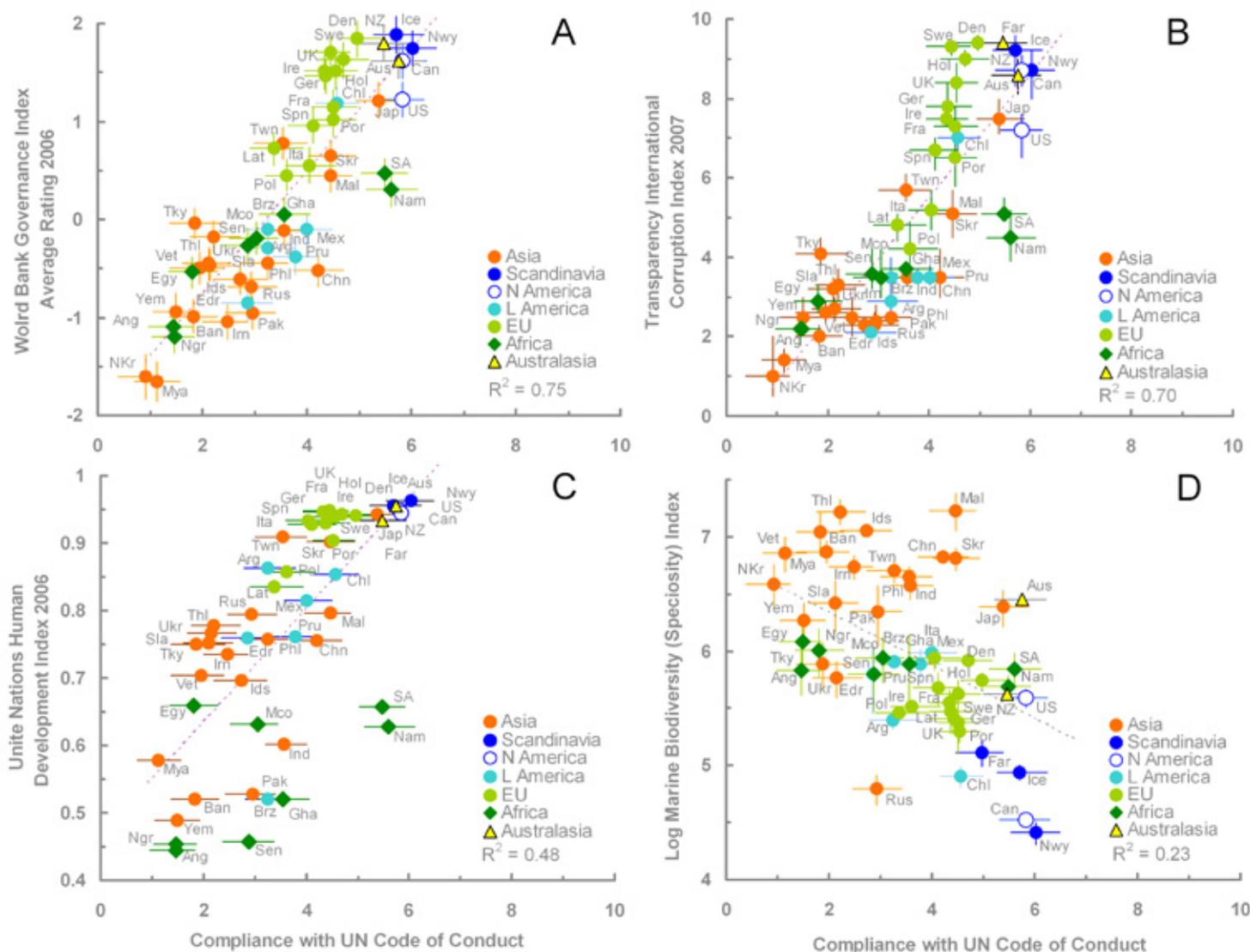
Figure 22 (a to d) Correlations of overall compliance with the FAO (UN) Code of Conduct for Responsible Fisheries with (a) World Bank Composite Governance Index 2006; (b) Transparency International Corruption Perception Index 2007; (c) UNDP Human Development Index 2006; (d) Biodiversity Index of country EEZs from Sea Around Us data. Country abbreviations: Angola = Ang; Australia = Aus; Bangladesh = Ban; Brazil = Brz; Canada = Can; Chile = Chl; China = Chn; Denmark = Den; Ecuador = Edr; Egypt = Egy; Faroes = Far; France = Fra; Germany = Ger; Ghana = Gha; Iceland = Ice; India = Ind; Indonesia = Ids; Iran = Irn; Ireland = Ire; Italy = Ita; Japan = Jap; Latvia = Lat; Malaysia = Mal; Mexico = Mex; Morocco = Mco; Myanmar = Mya; Namibia = Nam; Netherlands = Hol; New_Zealand = NZ; Nigeria = Ngr; North_Korea = NKr; Norway = Nwy; Pakistan = Pak; Peru = Pru; Philippines = Phl; Poland = Pol; Portugal = Por; Russia = Rus; Senegal = Sen; South Africa = SA; South_Korea = Skr; Spain = Spn; Sri Lanka = Sla; Sweden = Swe; Taiwan = Twn; Thailand = Thl; Turkey = Tky; United Kingdom = UK; Ukraine = Ukr; United States of America = US; Viet Nam = Vet; Yemen = Yem.

Conclusions

Whilst, like school examination boards, arguments can be made about what precisely is a fail mark, setting the bar for a "fail" slightly higher or lower than 40%, or the "good" score threshold at 70%, does not change the serious nature of the picture that this comprehensive analysis reveals: widespread poor compliance with the requirements of the Code of Conduct. In effect only six countries out of the 53, all of which had a role in developing the Code, are meaningfully applying it. Moreover, more than half (28) of the countries reporting the top 96% of the world fish catch have an overall "fail" and more than 2/3 of the world catch is caught by countries that fail to comply with the Code. This is a grave indictment of the performance of the world's fisheries managers and of the considerable sums spent on projects aiming to assist with the Code's implementation in the last twelve years. It might have been expected that the poor levels of compliance revealed by the analysis of "intentions" would at least have revealed higher ratings than these twelve years after the Codes' publication, reinforcing the notion that fisheries have low political priority in many countries.

The same picture emerges from an analysis of "good" and "fail" grades. Unlike school examinations, which can be re-taken, the marine ecosystems within which these non-complying fisheries operate will continue to decline. Not only does this review raise the issues of ecosystem degradation, stock depletions, collapse and food web erosion, but it also suggests that the very food security that was behind the drive for the Code of Conduct is being prejudiced. All fisheries stakeholders have an excellent and instructive "fisheries schoolmaster" in the form of the Code of Conduct: the analysis suggests that a widespread and systematic failure to heed its lessons. Many countries state that the aims of their fishery management are to increase food supplies, employment and economic benefits, but make little or no mention of the responsibility for precaution and conservation that must underpin such aspirations for long-term food security.

Figure 22 shows some significant correlations between the overall Code of Conduct compliance scores and three published, independent indicators of the quality of the government and environmental management. The overall Code compliance ratings correlate highly significantly with the World Bank Governance Indicators aggregate index[9] (Figure 21a; r = 0.86; P < 0.00001), and with Transparency International's Corruption Perceptions Index[10] (Figure 21b; r = 0.84; P < 0.00001). Significant but lower correlations are found with the UN Human Development Index[11] (Figure 21c; r = 0.69; P < 0.0001), and with the Yale Environmental Performance Index[12] (not shown; r = 0.65; P < 0.0001).

A negative relationship with a marine biodiversity index (based on a speciosity score[13]; Figure 21d; r = 0.53; P < 0.001) suggests that management is weakest in the most species-rich jurisdictions, exactly the opposite of what is desired.

Residuals from these plots (Figure 22) reveal some interesting features. In all plots, European Union countries cluster near the top of the test index (y-axis, bottom left in Fig 22d), but well to the left of the regression line, indicating poorer Code compliance than would be expected. In contrast, South Africa and Namibia consistently appear higher on Code ratings (x-axis) than any of these four indices, indicating that Code compliance does not necessarily depend on wealth (HDI) or governance (WGI), honesty (CPI), and other environmental management (EPI). This also applies to Malaysia (except for EPI).

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[9] The World Bank Governance Indicators project (WGI, 2006) reports aggregate and individual governance indicators for 212 countries and territories over the period 1996–2006, for six dimensions of governance: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Control of Corruption and Rule of Law. Here, we took an average of the 6 indicators, with their average standard error (not available for Faroes).

[10] The Corruption Perceptions Index is published by Transparency International (CPI, 2007) and expresses the likelihood of business and government transactions following international norms of order and law without bribes or other forms of corrupt practices (not available for North Korea).

[11] The UN Human Development Index (HDI, 2006) is a index combining normalized measures of life expectancy, literacy, educational attainment, and GDP per capita and provides a comparative measure of development status for countries worldwide. It is published annually by the United Nations Development Programme in its annual Human Development Report (not available for North Korea).

[12] The Yale Environmental Performance Index (EPI, 2006) provides a composite index from six sub areas (not available for Faroes, Latvia, North Korea).

[13] Based on a count of species of marine fish, mammals, seabirds and reptiles in the 2008 Sea Around Us distribution map database, extracted for all 30 minute global marine cells by William Cheung (for a High Seas equivalent, see Cheung *et al*. 2005), and compiled here as a weighted average and variance for each area of a jurisdiction's EEZ.

There was no significant relationship with The Gini Index (Owang 2000), which expresses inequality of income distribution or inequality of wealth distribution, nor with catch or log catch, suggesting that Code compliance is not linked to the presence of a wealthy oligarchy or to the size of a country's fisheries.

Summary Of Findings For Reference Points

Over half of the countries (58%), mainly developing nations, had fail grades for compliance with the Codes reference points; a chronically poor performance on a basic prerequisite for effective fisheries management. Just under half had 'passable', and these were mainly developed nations. It was surprising that some developed countries do not appear to take the use of limit reference points as seriously as one might expect, but disconcertingly, over half of the countries (55%) seem to exhibit no awareness of the critical importance of limit reference points. This situation needs to be urgently addressed.

Summary Of Findings For Irresponsible Fishing Methods

Although about half of the countries have acceptable compliance scores for intentions in reducing irresponsible fishing practices, it is evident that these vital issues are widely ignored in practice because over 80% have unsatisfactory overall scores for discards, bycatch, juvenile catches and damaging fishing methods. Moreover, low scores for many developed countries are inexcusable: especially in the European Union where it appears that many by-catch and discard regulations are widely ignored.

Summary Of Findings For Ghost Fishing

A few nations have good performance on measures for reducing ghost fishing and have regular lost gear retrieval programmes and mandate biodegradable elements in traps, but for most countries, scores for the "ghost fishing" issue were the lowest of any examined. Many developed countries have poor compliance with the Code for reduction of ghost fishing, while many developing countries do not even recognize the problem.

Summary Of Findings For Protected Areas

Only 15% of the countries have unequivocally reasonable scores for compliance with the Code on no-take and protected zones. Over 80% are awarded fail grades for protected and monitored areas as set out in the Code, even though a broad interpretation was made of the Code text to include any type of spatial protection. Some developing nations have proved able to score as well as many developed ones, while the low scores of many developed countries, especially in the EU, again reflect the slow recognition of the value of these tools. MPAs have been in use now for long enough that there are few excuses except for the lack of accountability of managers and politicians in not using them.

Summary Of Findings For Small-Scale And Aboriginal Fisheries

Small-scale fisheries issues receive good compliance scores in 19 countries, including both developed and developing nations. In others, high scores for consideration of small-scale fisheries in management plans are not necessarily supported by viable and timely consultation mechanisms with coastal communities. About half of the 53 countries have good scores for recognition of the rights of Aboriginal Peoples while poor compliance scores are found for those countries that do not recognise Indigenous Peoples rights.

Summary Of Findings For The Control Of Overcapacity

Over 90% of the countries are failing to tackle excess fishing capacity, arguably one of the most important recommendations of the Code, while only four countries receive good scores on this issue.

Summary Of Findings For Illegal Fishing

Although about a quarter of the countries have reasonable scores for IUU, over a third have unequivocal fail grades. In consequence, overall scores on this critical issue are among the worst scoring questions in

the analysis. In the analysis, illegal fishing correlates with Transparency International's country Corruption Index.

Summary Of Findings For Flags Of Convenience

Three-quarters of the 53 countries analysed have acceptable scores for Code compliance on the issue of Flags of Convenience. However, one in six countries has been awarded fail grades for FOC, revealing that it is a significant issue world-wide.

Summary Of Findings For Developing Countries

In terms of recommendations and actions, this detailed analysis of compliance in each country pinpoints where improvements could be made. This is where the requirements of Article 5 can aid in targeting development aid to improve compliance in focal countries. Over the past ten years, there has been a large amount of fisheries aid to developing countries but, although some aid programmes have focused on popularizing the Code (e.g., The Bay Of Bengal Program), few have dealt effectively with the necessary changes in fisheries management. In the future, the situation could be improved if more aid were focussed on achieving tangible improvements to increase compliance with the Code of Conduct. For example, some countries have already operationalized improvements in compliance by charging costs of improvements to MCS to foreign nations fishing in the country's waters (e.g., Morocco), or have invested development aid in modern surveillance devices (e.g., Indonesia).

Summary Of Findings For EBM

No country (of the 33 chosen for this analysis) rated overall as 'good' for implementing EBM, only four countries were 'adequate', while over half received 'fail' grades. A few developing countries performed better than many developed nations.

Recommendations

Developing Nations

Compliance scores from developed nations are on average, twice as high as those from developing nations, although some notable developing countries with limited resources have scored quite well. MCS costs can be covered using targeted development aid and/or user fees, especially for fisheries where there are distant water fleets or joint venture agreements with developed nations seeking supplies for the burgeoning international seafood trade. Although too new to rate in the evaluations, new MCS developments in Indonesia and Morocco may signal a good way forward. These issues could be addressed through aid targeted on specific Code compliance issues.

Developed Nations

Although compliance scores from developed nations are on average, twice as high as those from developing nations, given the much higher level of resources accessible for fishery management, (see especially Figure 20c, plotting Code compliance against human development index) most developed nations have here little with which to congratulate themselves. Even the countries at the top of the rankings should undoubtedly be able to be do much better. Evidently, there are severe and chronic failings related to the control of overcapacity, to limit reference points, to discards and irresponsible fishing practices, to FOCs, to IUU and to MPAs in many developed countries.

Legal Instruments

The Code of Conduct is a voluntary instrument, indeed this has been cited as one of its "hidden strengths" (Edeson 1996). Its voluntary nature may well have been a necessary feature in getting all-nation agreement

to its wide scope when the Code was devised in the early 1990s, but today, the world and oceans have changed. In contrast to the early 1990s, there is now widespread scientific consensus on the ecological impacts of continued overfishing and the dangers to a sustainable global seafood supply, and widespread agreement on policy issues such curtailing illegal catches and minimising the impacts of fishing on marine ecosystems.

This analysis of Code compliance suggests that the time has come to encourage countries to take this voluntary agreement more seriously and to implement policies that will enhance the setting of quotas and fishery controls in the context of marine ecosystem linkages, that will minimize illegal fishing, strengthen the artisanal fisheries sector by sharing management responsibilities with fishing communities, and reduce irresponsible and harmful fishing methods. The international fisheries management community should also strengthen the implementation of the Code much more systematically, based on criteria such as food security, fishery recovery, unreported catches and the Code other issues analysed here.

Rather than a voluntary Code, which is still demonstrably ineffective in getting countries to tackle the key issues after twelve years in place, a more effective route to compliance with the Code may be through internationally-agreed legislation. Although this does not on its own guarantee high compliance, it is the method currently being attempted in a number of piecemeal initiatives that address some of the management issues covered by Article 7 of the Code of Conduct. Given the dismaying results of this analysis of present compliance with the voluntary instrument, the time may have come to use the elements of this well-written Article 7 of the Code of Conduct for Responsible Fisheries as a draft for an integrated international legal instrument covering all aspects of fisheries management.

References Cited

Agardy, T., Bridgewater. P., Crosby. M.P., Day, J., Dayton, P.K., Kenchington, R., Laffoley, D., McConney, P., Murray, P.A., Parks, J.E., and Peau, L. (2003) Dangerous targets? Unresolved issues and ideological clashes around marine protected areas. Aquatic Conservation: Marine and Freshwater Ecosystems 13(4): 353 – 367.

Agnew, D., Pearce, J., Peatman, T., Pitcher, T.J. and Pramod, G. (2008) The Global Extent of Illegal Fishing. MRAG, London, U.K., and FERR, Fisheries Centre, UBC, Vancouver, Canada. 32pp.

Ainsworth, C.H. and Pitcher, T.J. (2005) Estimating Illegal, Unreported and Unregulated Catch in British Columbia's Marine Fisheries. Fisheries Research 75: 40–55.

Akiyama, S., Saito, E. and Watanabe, T. (2007) Relationship between soak time and number of enmeshed animals in experimentally lost gill nets. Fisheries Science 73(4): 881-888.

Alverson, D.L., Freeberg, M.H., Murawski, S.A. and Pope, J.G. (1994) A global assessment of fisheries by-catch and discards. FAO Fisheries Technical Paper 339: 233pp.

APFIC (2007) Managing Fishing Capacity and IUU Fishing in the Asian Region. RAP 2007/18. FAO, Bangkok, 46pp.

Bailey, M., Rotinsulu, C. and Sumaila, U.R. (2008). The migrant anchovy fishery in Kabui Bay, Raja Ampat, Indonesia: catch, profitability and income distribution. Marine Policy 32(3): 483-488.

Ballentine, W.J. and Langlois, T.J. (2008) Marine Reserves: the need for systems. Hydrobiologia 606: 35-44.

Brodziak, J. and Link, J. (2002) Ecosystem-based fishery management: what is it and how can we do it? Bulletin of Marine Science 70(2): 589–611.

Brodziak. J. and Link, J. (2002) Ecosystem-based fishery management: what is it and how can we do it? Bulletin of Marine Science 2002; 70(2): 589–611.

Brown, J. and Macfadyen, G. (2007) Ghost fishing in European waters: Impacts and management responses. Marine Policy 31(4): 488-504.

Brown, J., Macfadyen, G., Huntington, T., Magnus, J. and Tumilty, J. (2005) Ghost Fishing by Lost Fishing Gear. Report to DG Fisheries and Maritime Affairs of the European Commission. Fish/2004/20. Institute for European Environmental Policy/Poseidon Aquatic Resource Management Ltd. 151pp.

Caddy, J.F. (1996) A checklist for fisheries resource management issues seen from the perspective of the FAO Code of Conduct for Responsible Fisheries. FAO Fisheries Circular 917: 22p.

Caddy, J.F. (1998) A short review of precautionary reference points and some proposals for their use in data-poor situations. FAO Fisheries Technical Paper 379: 30pp.

Caddy, J.F. (1999) Fisheries management in the twenty-first century: will new paradigms apply? Reviews in Fish Biology and Fisheries 9: 1–43.

Caddy, J.F. and Mahon, R. (1995) Reference points for fisheries management. FAO Fisheries Technical Paper 347: 83pp.

Caddy, J.F. and Seijo, J.C. (2005) This is more difficult than we thought! The responsibility of scientists, managers and stakeholders to mitigate the unsustainability of marine fisheries. Phil. Trans. Roy, Soc B 360(1453): 59–75.

Cimino, J., Pruett, L. and Palmer, H. (2000) Management of global maritime limits and boundaries using Geographical Information Systems. Veridian: Chantilly, Virginia, USA.

Clark, C.W., Munro, G.R. and Sumaila, U.R. (2005) Subsidies, buybacks, and sustainable fisheries, Journal of Environmental Economics and Management. 50(1): 47-58.

Clarke, K.R. (1993) Multivariate analyses of changes in community structure. Aust. J. Ecol. 19: 117-143.

Clarke, K.R. and Warwick, R.M. (1997) Change in marine communities: an approach to statistical analysis and interpretation. Plymouth Marine Laboratory, UK. 144pp.

Collie, J. and Gislason, H. (2001) Biological reference points for fish stocks in a multispecies context. Can. J. Fish. Aquat. Sci. 58: 2167-2176.

Cunningham, S. and Greboval, D. (2001) Managing fishing capacity: A review of policy and technical issues. FAO Fisheries Technical Paper 409: 60pp.

Delaney, Statement of Glenn Roger Delany (2003) U.S. Commissioner to ICCAT before the Committee on Resources. Subcommittee on Fisheries Conservation, Wildlife and Oceans, U.S House of Representatives, October 30, 2003. Washington, DC, USA.

DG Fish (2000) MAGP IV not effective enough in dealing with overcapacity. EU press release 01.10.2000. [available online from: europa.eu.int/comm/fisheries/pcp/faq2_en.htm]

Edeson, W.R. (1996) Current legal development: The Code of Conduct for Responsible Fisheries: an introduction. Intl J. Mar. Coastal Law 11: 233-38.

Esty, D.C., Srebotnjak, T., Kim, C.H., Levy, M.A., de Sherbinin, A. and Anderson, B. (2006) Pilot 2006 Environmental Performance Index. Yale Center for Environmental Law & Policy, New Haven, USA. 56pp.

FAO (1991) Recommendations for the Marking of Fishing Gear. Supplement to the Report of the Expert Consultation on the Marking of Fishing Gear. Victoria, British Colombia, Canada, 14-19 July 1991. 48pp.

FAO (1995) Code of Conduct for Responsible Fisheries. FAO, Rome. 41pp.

FAO (1996) Fishing operations. FAO Technical Guidelines for Responsible Fisheries 1, FAO, Rome. 26pp.

FAO (1997) Fisheries Management. FAO Technical Guidelines for Responsible Fisheries 4: 82pp.

FAO (1999) The development and use of Indicators for sustainable development of marine capture fisheries. FAO Technical Guidelines for Responsible Fisheries 8, FAO, Rome. 79pp.

FAO (1999) The International Plan of Action on the Measurement of Fishing Capacity. FAO, Rome, 26pp.

FAO (2003) Report of the twenty-fifth session of the Committee on Fisheries. FAO Fisheries Report 702.

FAO (2003) The ecosystem approach to fisheries. FAO Technical Guidelines for Responsible Fisheries 4 (Suppl. 2). Rome, FAO, 112pp.

Garcia, S.M. and Newton, C. (1997) Current Situation, Trends and Prospects in World Capture Fisheries. In E.K. PiKitch, E.D.Huppert and M.P. Sissenwine (eds), Global Trends: Fisheries Management. American Fisheries Society Bethesda, Maryland, USA. AFS Symposium 20.

Gell F.R. and Roberts, C.M. (2003) Benefits beyond boundaries: the fishery effects of marine reserves. Trends in Ecology and Evolution 18(9): 448-455.

Gianni, M. and Simpson, W. (2005) The Changing Nature of High Seas Fishing: how flags of convenience provide cover for illegal, unreported and unregulated fishing. Australian Department of Agriculture, Fisheries and Forestry, International Transport Workers' Federation, and WWF International. 83pp.

Global Policy Forum (2003) A Brief Guide to Flags of Convenience. www.globalpolicy.org/nations/flags/guide.htm

Greboval, D. (1999) Assessing Excess Fishing Capacity At A World-wide Level. FAO Fisheries Technical Paper 386: 201-206.

Hall, S.J., and Mainprize, B. (2005) Towards ecosystem-based fisheries management. Fish and Fisheries 5: 1-20.

Hareide, N-R., Garnes, G., Rihan, D., Mulligan, M., Tyndall, P., Clark, M., Connolly, P., Misund, R., McMullen, P., Furevik, D., Humborstad, O.B., Høydal, K. and Blasdale, T. (2005) A preliminary investigation on shelf edge and deepwater fixed net fisheries to the west and north of Great Britain, Ireland, around Rockall and Hatton Bank. Joint Nature Conservation Committee, U.K., 47pp.

Harrington, J.M., Myers, R.A. and Rosenberg, A.A. (2005) Wasted fishery resources: discarded by-catch in the USA. Fish and Fisheries 6: 350–361.

Hatcher, A. and Robinson, K. (1998) Overcapacity, Overcapitalisation and Subsidies in European Fisheries, Proceedings of the first Concerted Action workshop on Economic and the Common Fisheries Policy. Portsmouth, UK. pp. 28-30.

Hauck, M. (2008) Rethinking small-scale fisheries compliance. Marine Policy 32: 635–642.

Hilborn, R. (2002) The Dark Side Of Reference Points. Bulletin of Marine Science. 70(2): 403–408.

Hilborn, R., Punt, A.E. and Orensanz, J. (2004) Beyond band-aids in fisheries management: fixing world fisheries. Bulletin of Marine Science 74(3): 493–507.

HSTF (2006) Closing the net: Stopping illegal fishing on the high seas. Final report of the Ministerially-led Task Force on IUU Fishing on the High Seas. High Seas Task Force. Governments of Australia, Canada, Chile, Namibia, New Zealand, and the United Kingdom,

WWF, IUCN and the Earth Institute at Columbia University, USA. 116pp.

ICES (2006) Report of the ICES-FAO Working Group on Fishing Technology and Fish Behaviour (WGFTFB), 3–7 April 2006, Izmir, Turkey. ICES CM 2006/FTC:06, Ref. ACFM. 180 pp.

Jennings, S. (2005) Indicators to support an ecosystem approach to fisheries. Fish and Fisheries 6: 212–232.

Jones, P. (2007) Point-of-View: Arguments for conventional fisheries management and against no-take marine protected areas: only half of the story? Reviews in Fish Biology and Fisheries 17(1): 31-43.

Joseph, J. (2003) Managing fishing capacity of the world tuna fleet. FAO Fisheries Circular 982: 67pp.

Kavanagh, P. and Pitcher, T.J. (2004) Implementing Microsoft Excel Software for Rapfish: A Technique for the Rapid Appraisal of Fisheries Status. Fisheries Centre Research Reports 12(2): 75pp.

Kelleher, K. (2004) Collateral damage: discards in the world's marine fisheries. An update. FAO Technical Report 470: 131pp.

Kirkley, J. and Squires, D. (1999) Measuring Capacity and Capacity Utilization in Fisheries. FAO Fisheries Technical Paper 386: 75-191.

Kirkley, J.E., Squires, D., Alam, M.F. and Ishak, H.O. (2003) Excess Capacity and Asymmetric Information in Developing Country Fisheries: The Malaysian Purse Seine Fishery, American Journal of Agricultural Economics 85(3): 647-662.

Kruskal, J.B. and Wish, M. (1978) Multidimensional scaling. Sage Publications, Beverley Hills, CA, USA.

Link, J. (2005) Translating ecosystem indicators into decision criteria. ICES Journal of Marine Science 2005; 62: 569-576.

Mace, P. (1994) Relationship between common biological reference points used as thresholds and targets for fisheries management strategies. Can. J. Fish. Aquat. Sci. 42: 1066-1072.

Martell, S.J., Walters, C. and Sumaila, U.R. (2008) Industry-funded fishing license reduction good for both profits and conservation, Fish and Fisheries 9(3): in press.

MRAG (2005) IUU Fishing on the High Seas: Impacts on Ecosystems and Future Science Needs. MRAG, London, UK. 71 pp.

Nurhakim, S., Nikijuluw, V.P.H., Badrudin, Pitcher, T.J. and Wagey, G.A. (2008) A Study Of Illegal, Unreported And Unregulated (IUU) Fishing In The Arafura Sea, Indonesia. Report to FAO, Rome. 41pp. (in press).

Ogwang, T. (2000) A Convenient Method of Computing the Gini Index and its Standard Error. Oxford Bulletin of Economics and Statistics 62: 123–129.

Pascoe, S., Tingley, D. and Mardle, S. (2002) Appraisal of Alternative Policy Instruments to Regulate Fishing Capacity. DEFRA, UK. 119pp.

Pauly, D. (2006) Major trends in small-scale marine fisheries, with emphasis on developing countries, and some implications for the social sciences. Maritime Studies 4: 7–22.

Pauly, D., Christensen, V., Guénette, S., Pitcher, T.J., Sumaila, U.R., Walters, C.J., Watson, R. and Zeller, D. (2002) Towards sustainability in world fisheries. Nature 418: 689-695.

Pikitch EK, Santora C, Babcock EA, Bakun A, Bonfil R, Conover DO, Dayton P, Doukakis P, Fluharty D, Heneman B, Houde ED, Link J, Livingston PA, Mangel M, McAllister MK, Pope J, Sainsbury KJ. (2004) Ecosystem-based fishery management. Science 305: 346-347.

Pitcher, T.J. (1998) A cover story: fisheries may drive stocks to extinction. Reviews in Fish Biology and Fisheries 8(3): 367-370.

Pitcher, T.J. (1999) Rapfish, A Rapid Appraisal Technique For Fisheries, And Its Application To The Code Of Conduct For Responsible Fisheries. FAO Fisheries Circular No. 947: 47pp.

Pitcher, T.J. (2001) Fisheries Managed to Rebuild Ecosystems: Reconstructing the Past to Salvage The Future. Ecological Applications 11(2): 601-617.

Pitcher, T.J. and Pauly, D. (1998) Rebuilding ecosystems, not sustainability, as the proper goal of fishery management. Pages 311-329 in Pitcher, T.J. Hart, P.J.B. and Pauly, D. (eds) Reinventing Fisheries Management, Chapman and Hall, London. 435pp.

Pitcher, T.J. and Preikshot, D.B. (2001) Rapfish: A Rapid Appraisal Technique to Evaluate the Sustainability Status of Fisheries. Fisheries Research 49(3): 255-270.

Pitcher, T.J., Kalikoski, D. and Pramod, G. (eds) (2006) Evaluations of Compliance with the UN Code of Conduct for Responsible Fisheries. Fisheries Centre Research Reports 14(2): 1192pp.

Pitcher, T.J., Kalikoski, D., Short, K., Varkey, D. and Pramod, G. (2008) An evaluation of progress in implementing ecosystem-based management of fisheries in 33 countries. Marine Policy 33:223-232.

Poon, A. M-Y. (2005) Haunted waters: an estimate of ghost fishing of crabs and lobsters by traps. Masters Thesis, Fisheries Centre, University of British Columbia, Vancouver, Canada. 142pp.

Porter, G. (1998) Estimating Overcapacity in the Global Fishing Fleet. World Wildlife Fund.

Putt, J. and Anderson, K. (2008) A national study of crime in the Australian fishing industry. Australian Institute of Criminology, Canberra. Research and Public Policy Series 76: 120pp.

Reid, C., Kirkley, J., Squires, D. and Jun, Y. (2005) An analysis of the fishing capacity of the global tuna purse-seine fleet. In Bayliff, W.H., Moreno, J.I. de L. and Majkowski, J. (eds) Management of Tuna Fishing Capacity: Conservation and Socio-economics. FAO Fisheries Proceedings 2: 336p.

Richards, L.J. and Maguire, J-J. (1998) Recent international agreements and the precautionary approach: new directions for fisheries management science. Can. J. Fish. Aquat. Sci. 55: 1545-1552.

Roberts, C.M. (2001) Designing networks of marine reserves: why small, isolated protected areas are not enough. Conservation Biology in Practice 2: 10–17.

Roberts, C.M. (2005) The role of marine reserves in achieving sustainable fisheries. Phil. Trans. Roy. Soc. Lond. B. 360(1453):123-132.

Russ, G.R. (2002) Yet another review of marine reserves as reef fishery management tools. Pages 421–443 in P.F. Sale (ed.) Coral Reef Fishes: Dynamics and Diversity in a Complex Ecosystem. Academic Press.

Ruttan, L.M, Gayanilo Jr, F.C., Sumaila, U.R and Pauly, D. (2000) Small versus large-scale fisheries: a multi-species, multi-fleet model for evaluations and potential benefits. In Pauly, D. and Pitcher, T.J.(eds.) Methods for evaluation the impacts of fisheries on North Atlantic ecosystems. Fisheries Centre Research Reports, 8(2): 64-75.

Sainsbury, K. and Sumaila, U.R. (2003) Incorporating ecosystem objectives into management of sustainable marine fisheries, including 'best practice' reference points and use of marine protected areas. Pages 343-361 in Sinclair, M. and Valdimarson, G. (eds.) Responsible fisheries in the marine ecosystem. CAB International, USA.

Schiffman, S.S., Reynolds, M.L. and Young, F.W. (1981) Introduction to multidimensional scaling: theory, methods and applications. Academic Press, London, UK.

Sinclair, M., Arnason, R., Csirke, J., Karnickid, Z., Sigurjonsson, J., Skjoldalf, H.R. and Valdimarsson, G. (2002) Responsible fisheries in the marine ecosystem. Fisheries Research 58(3): 255-265.

Stalans, L.J. (1995) Multidimensional scaling. In Grimm, L.G. and Yarnold, P.R. (eds) Reading and Understanding Multivariate Statistics. American Psychological Association, Washington, USA. 373pp.

Sumaila U.R., Alder J. and Keith H. (2006) Global scope and economics of illegal fishing. Marine Policy 30: 696–703.

Transparency International (2007) Corruption Perceptions Index. www.transparency.org/cpi

UNDP (United Nations Development Programme) (2006) Human Development Index (HDI): Published at http://hdr.undp.org/en/statistics/indices/hdi/ 2006

United Nations (2004) The Concept Of Indigenous Peoples. Permanent Forum on Indigenous Issues. United Nations Department Of Economic And Social Affairs, PFII/2004/WS 1/3. 13pp.

US Commission on Ocean Policy (2004) An Ocean Blueprint for the 21st Century. Final Report of the USA Commission on Ocean Policy to the President and Congress, Washington DC, USA; 2004.

Vaisman, A. (2001) Trawling in the mist. Industrial fisheries in the Russian part of the Bering Sea. A TRAFFIC Network Report. Cambridge: TRAFFIC International, 79pp.

Varkey, D., Pramod, G. and Pitcher, T.J. (2006) An Estimation of Compliance of the Fisheries of India with Article 7 (Fisheries Management) of the UN Code of Conduct for Responsible Fishing. 28 pages in Pitcher, T.J., Kalikoski, D. and Pramod, G. (eds) Evaluations of Compliance with the FAO (UN) Code of Conduct for Responsible Fisheries. Fisheries Centre Research Reports 14(2): 1192pp.

Walters, C.J. and Martell, J.D.S. (2004) Fisheries Ecology And Management. Princeton University Press, USA. 423 pp.

Ward, T., Tarte, D., Hegerl, E., and Short, K, (2002) Policy Proposals and Operational Guidance for Ecosystem-Based Management of Marine Capture Fisheries. World Wide Fund for Nature, Sydney, Australia. 80pp.

Watson, R., Kitchingman, A., Gelchu, A. and Pauly, D. (2004) Mapping global fisheries: sharpening our focus. Fish and Fisheries 5: 168-177.

Wood, L.J. (2007) MPA Global: A database of the world's marine protected areas. Sea Around Us Project, UNEP-WCMC and WWF. [www.mpaglobal.org].

Wood, L.J. and Dragicevic, S. (2007) GIS-based multicriteria evaluation and fuzzy sets to identify priority sites for marine protection. Biodiversity and Conservation 16: 2539-2558.

World Bank Worldwide Governance Indicators (WGI) (2006) Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Control of Corruption and Rule of Law. Available on-line at http://info.worldbank.org/governance/

Compliance Score Questions

Article 7 contains eight sections; since the first section is introductory and the last contains only one financial clause, Article 7 may in effect be divided into six sections, each of which is evaluated separately in this analysis. These sections are Objectives; Framework; Precaution; Stocks, Fleets and Gear; Socio-economics; and Monitoring, Control and Surveillance. The first three of these sections ("evaluation fields") roughly correspond to the intentions of a state in ensuring compliance with the Code. The final three sections can be taken as measuring the effectiveness of compliance in practice. Ratings based on scores for each of the six sections, for intentions and effectiveness, and overall are provided for the 53 countries in this analysis. Each section has a number of questions to be scored.

Annex 2 shows the 44 questions used in scoring compliance with the Code; questions in each of the six fields vary between 6 and 9. The annex also shows the fixed reference points ('anchors' - see Annex 3) along with the principal and subsidiary Code clauses that are captured by each attribute (Pitcher 1999). Further detail is provided in Annex 1 and Pitcher, Kalikoski and Pramod (2006).

Scoring Guidelines

Questions for code compliance are designed, as far as possible, to be answered reasonably objectively, although it is inevitable that some scores will differ among different respondents partly on account of differences in interpretation, as discussed by Caddy (1996). To reduce this problem, guidelines for scoring on a scale of zero to ten are given in Annex 1: scores less than 4/10 signify 'fail' grades, while scores of 7/10 and over are regarded as showing good compliance. Scores of 60-70% are 'passable' or 'acceptable' but imply room for improvement.

Choice and Scoring of Countries

The selected 53 countries analysed for compliance with the Code correspond to the fishing countries that take 95% of the reported world catch (given that the study commenced ibn 2003, the reported catch in tonnes in 1999 was used). These countries are listed together with their reported catches in 1999 in Annex 3.

Scoring The Countries

A great variety of information was used in scoring the 44 questions for each country: in total therefore, this work reports the results of 2332 separate analyses including: national legislation, international treaties (taken from the Sea Around Us project database: www.searoundus.org), country synopses from FAO, reports to FAO and by NGOs, websites of national fisheries agencies, NGO websites, a great deal of other published and 'grey' literature, and information from fisheries experts.

A formal scoring protocol was employed to try to obtain the most accurate scores possible for each of the 44 questions. Each country was first scored by one of the five primary scorers, based on the FAO country synopsis and as much other material as could be located. Particular attention at this stage was given to defining the minimum and maximum possible scores for each question. Documentary material and reference lists supporting the score range was then assembled. In the next step, two or more members of the scoring team reviewed and adjusted this material, using their own knowledge and sources. The country evaluation then went back to the primary scorer for a second cut at finding missing information. This version was then checked again by the team, and then uploaded to the open project website (ftp://ftp.fisheries.ubc.ca/CodeConduct) so that they were available for any external scrutiny and comment. For example, requests for comments by in-country experts were made subsequent to the FAO COFI meeting in 2005.

Some of the country compliance analyses remain at this stage, while 33 of them have proceeded to the next stage of validation. The country scorecard was sent to fisheries experts within the country (or in some cases, experts known to be familiar with the country) for validation and comment. Some of the validators have been independent fisheries experts, while in some cases individuals within a country's national fisheries agency

helped with validation. Validators are named on the country score sheets and are herewith acknowledged in this report, but any requests for anonymity have been respected [1]. For some countries, language difficulties were encountered and here the process was aided by several national fisheries experts in drawing up the country reports[2].

Country scores and texts have been updated whenever new information became available, for example a report of world status of the use of flags of convenience. This has happened frequently over the past two years.

Country scores and texts have been updated whenever new information became available, for example a report of world status of the use of flags of convenience was released whilst this study was underway. This has happened frequently over the past five years. The scores determined in this way are based on the best available information about the fisheries management practice of each country, using available publications, reports, and expert contacts in the target countries as far as possible. Nevertheless, with so many different countries and questions, it is inevitable that some omissions, errors or misinterpretation of data may have arisen. Therefore an open protocol was adopted for all of the country compliance evaluations. Although the scores used in this report were fixed in April 2008 for the purposes of performing the analysis, the individual country reports and score sheets are maintained on an open FTP website (http://public.box.net/CodeofConduct), and the team remains open at any time to comments, corrections or adjustments[3]. The evaluations of each country are therefore "living documents" and may change with time.

The country compliance evaluations

In total the country compliance evaluations comprise over 1190 pages and over 1250 references (see Annex 4), and took the best part of 3 years to complete. These detailed compliance evaluations for our 53 countries are published separately as a Fisheries Centre Research Report (free download from website http://www.fisheries.ubc.ca/publications/reports/fcrr.php). As noted above, all of this source material is openly available for query and comment.

Comparisons and Analysis using Ordination

For overall comparisons among countries a statistical rapid appraisal technique was used, a flexible non-parametric ordination (anchored multi-dimensional scaling) which was devised for the rapid appraisal of status in relation to a defined goal or norm (Pitcher and Preikshot 1999; Pitcher 2003; Kavanagh and Pitcher 2004). This technique can take account of the uncertainty ("error") in each score, and also partition differences among countries into those due to compliance with the Code and those due to other factors (e.g., same average score but gained from different questions). Details of this method are summarized in Annex 4.

Assessing The Implementation Of Ecosystem-Based Management

For performance in implementing ecosystem-based management, a slightly different procedure was used. The WWF framework for EBM (Ward et al. 2002) was adapted for use with the zero to ten scoring system, using three evaluation fields (overall principles: 5 attributes; page 19 in Ward et al., Ward's Table 2; criteria for success: 6 attributes; pages 19-20 in Ward et al., Ward's Table 3; implementation steps: 12 attributes; pages 50-51 in Ward et al., Ward's Table 6). Overall results were analysed using the "Rapfish" technique as for Code compliance. Effectively, this assessment covers ecosystem-based fishery management (sometimes termed EBFM). Only the top 33 countries (approx 90% of the world fish catch) were assessed for EBM. Full details of the method have been published in Pitcher et al. (2008).

Rapid appraisal scheme for of compliance with Article 7 of the FAO Code of Conduct for Responsible Fisheries, covering six evaluation fields of fisheries management in 44 questions. Specific clauses in the Code are indicated. Each question is scored on a scale of 0 to 10: 0 to 4 represent 'fail' scores; 7 and above are considered as 'good' scores. Sources of information that justify each score should be explicitly provided. Note that non-integer, intermediate scoring is encouraged where small differences among the fisheries evaluated can be justified. Relevant features additional to the criteria in these guidelines are taken into account in assigning final scores, for example where scores fall just short of pass grade (e.g., 3.5/10), but where such adjustments are made, sources of information should be carefully cited. For each question, a best estimate and an upper and lower range to the score is assigned. (Modified from Pitcher 1999.)

Evaluation Field 1: Management Objectives

		Scores Intentions Of Management	Reference Points		Code Clauses	
		Attributes	Worst	Best	Main	Other
	1	Are formal reference points for the fish stock in this fishery identified using best science available? No (0); partially (5); completely (10).	0	10	7.2.1	7.1.1
	2	Is present fleet capacity calculated and are there plans to reduce it? No (0); calculated (3.5); target capacity defined (7); planned measures to reduce capacity (10). NOTE: fishing capacity may be measured simply, as in numbers of vessels, or in a complex fashion, for example as true catching power. Within each grade, bonus points may be given for more accurate complex measures.	0	10	7.2.2	7.1.8
	3	Are small scale fishers considered in plan? No (0); considered but not consulted (2.5); consulted informally (5); institutional structures for ongoing consultation (7.5); plus extra points if small-scale fisher's opinions are often included in plans. (max 10).	0	10	7.2.2	7.1.2
	4	Impacts of fishery on biodiversity allowed for in plan? No (0); some impacts assessed (3.5); most impacts assessed and mitigated (7); full impacts mitigated in management plan (10).	0	10	7.2.2	7.2.3
	5	Does the management plan aim to restore depleted stocks in this fishery? No (0); slowly (5); rapidly (10).	0	10	7.2.2	7.1.1
	6	Are human impacts (pollution, waste) on the fishery habitat identified? No (0); partially identified (3.5); identified and plan includes measures to mitigate (7); complete mitigation in plan (10).	0	10	7.2.2	7.2.1
	7	Is fishing gear mandated by the management plan to avoid by-catch of non-target species, environmental and habitat damage? No (0); in part (5); totally (10).	0	10	7.2.2	7.4.2
	8	Are ecosystem linkages with this fishery made explicit in the management plan? No (0); identified (3.5); made fully explicit (7); & adverse ecosystem impacts minimised (10).	0	10	7.2.3	7.3.1
	9	Are environmental influences on this fishery made explicit in the management plan? No (0); identified (3.5); made fully explicit (7); & adverse impacts minimised (10).	0	10	7.2.3	7.2.1

Evaluation Field 2: Framework (Data & Procedures)

		Scores Ways Intentions Are Implemented	Reference Points		Code Clauses	
		Attributes	Worst	Best	Main	Other
	1	Are total & complete removals from this stock over the whole stock area and over whole life cycle accounted for in assessment? No (0); somewhat (3.5); mostly with a few omissions (7); almost completely (10).	0	10	7.3.1	7.4.2

			Reference Points		Code Clauses	
	2	Are management measures compatible with those of other jurisdictions concerned with this stock? No (0); in part (5); almost completely (10). (Score 10 if not applicable to this fishery, but eliminate attribute if not applicable to any other fisheries in analysis).	0	10	7.3.2	7.1.3
	3	Does the management plan have clearly stated long-term objectives? No (0); in part (5); absolutely clear (10).	0	10	7.3.3	7.1.1
	4	Are all the stakeholders in this fishery resource identified and considered? No, only government interests (0); score two for each group represented: large-scale industry, small-scale fishers, recreational fishers, local communities, conservation and public watchdog groups (Max = 10). (Score 2 for any one group that genuinely does not apply; Score 1 for any group only partially considered).	0	10	7.1.2	7.1.6
	5	Are data, management processes and decision-making open and transparent, including any international aspects? No, closed except to management (0); informed only when necessary (2.5); regularly consulted (5); participation in decisions (7.5); full co-management in decision-making (10).	0	10	7.1.9	7.1.6
	6	Are timely, complete and reliable statistics collected and verified? No (0); collected partially (2); collected almost completely (4); timely - add 1 if available in less than 1 year, add 2 if 6 months (6); add 2 if there are attempts at verification (8); add additional 1 to 2 if almost totally satisfactory verification (10).	0	10	7.4.4	7.1.4
	7	Are social, economic and institutional factors related to sustainability evaluated with data? No (0); score one or two points for each, plus up to additional 2 points for interdisciplinary analysis (10)	0	10	7.4.5	7.4.2

Evaluation Field 3: Precautionary Approach

Scores Precautionary Intentions And Actions			Reference Points		Code Clauses	
Attributes			Worst	Best	Main	Other
	1	Is precaution explicitly enshrined in legislation, or is precaution implicitly applied to management of the fisheries? No (0); implicit in some regulations or actions of the country (1-4); explicit in legislation, and partially applied in management (5-8); almost fully applied in regulations (9-10).	0	10	7.5.1	
	2	Is uncertainty, including lack of appropriate information, quantified and used to reduce fishing that might otherwise occur? No (0); in part (3.5); a great deal (7); add 1-3 points for degree of quantification of uncertainty (10).	0	10	7.5.1	7.4.3
	3	Are stock-specific target reference points estimated and employed? No (0); simple targets estimated (3.5); estimated and employed (7); almost totally satisfactory (10). Quality of targets is included in the evaluation: full statistical stock analysis gains bonus points while simple MSY or 'Gulland formula' calculations get less credit.	0	10	7.5.3	7.2.1
	4	Are stock-specific limit reference points estimated and employed? No (0); estimated (3.5); actively employed (7); working almost totally satisfactorily (10).	0	10	7.5.3	7.2.1
	5	Are there viable contingency plans to restrict fishing in the event of an environmental emergency? No (0); plan exists (3.5); a good plan with clearly identified rapid-acting triggers exists (7); almost completely satisfactory plan with triggers in place, and defined ways to validate trigger data (10).	0	10	7.5.5	
	6	Are there viable contingency plans to restrict fishing in the event of an unforeseen emergency caused by excess fishing? No (0); plan exists (3.5);a good plan with clearly identified rapid-acting triggers exists (7); almost completely satisfactory plan and triggers in place, and defined ways to validate trigger data (10).	0	10	7.5.5	
	7	Are management instruments under continuous review? No (0); infrequently and informal review (3.5); formal review (7); formal review every year (10).	0	10	7.6.8	7.1.4

			Reference Points		Code Clauses	
			Worst	Best	Main	Other
	8	Are no-take areas of sufficient size to work, established, policed and monitored? Add up to one two points for effective monitoring; add up to two points for effective enforcement. None (0); no-take areas less than 1% of EEZ (2); 1-5% of EEZ (4); >5% (6).	0	10	7.6.9	
	9	Are plans in place to restrict fishing if species linked through the ecosystem (predators, prey or competitors) to the target(s) of this fishery become threatened? Add up to two points for effective monitoring of potentially endangered species; add up to two points for effective enforcement. No plans (0); informal plans (2); formal plans in place (4); tested with models or simulations (6).	0	10	7.2.2	7.2.3

Evaluation Field 4: Stocks, fleets and gear

Scores Results Of Management			Reference Points		Code Clauses	
Attributes			Worst	Best	Main	Other
	1	Is excess fleet capacity being reduced? Scored on a graduated scale from: no (0); mainly measures aimed at avoiding an increase in capacity (3.5); measures actually aimed at capacity reduction (5); effective capacity reduction measures (7); completely effectively (10).	0	10	7.6.3	7.2.2
	2	Are fishing methods known to be harmful to habitats, to create by-catch problems, or whose high fishing capacity is difficult to control, being phased out? Score on a graduated scale from: no (0); partial phasing out (5); substantial, effective and monitored plans for phasing out (10). To gain maximum score in a category, all harmful gear types should be covered.	0	10	7.6.3	7.2.2
	3	Is by-catch of non-target species minimised? No, there are serious problems with by-catch (0); some attempts to assess and reduce by-catch (2); by-catch is estimated and reduction of by-catch is a priority (4); by-catch is very low or greatly reduced in this fishery (6). Score up to 2 extra points for gear that reduces by-catch (newly-introduced gear, or existing gear). Score up to an extra 2 points if by-catch reduction gear is mandatory	0	10	7.6.9	7.2.3
	4	Are discards minimised? No (0); some attempt to reduce discards (2); discards reduced or very small (4); discards almost non-existent or completely under control (6). Reduction of discards through utilising all the catch can count for categories 1 and 2. Score up to an extra 2 points if discards are effectively reported. Score an extra 2 points if discards are legally banned.	0	10	7.6.9	7.2.3
	5	Is the gear designed to minimise ghost fishing if lost? No (0); partially (5); effectively (10). (Score 10 for gear that cannot be lost, or cannot catch fish if lost).	0	10	7.6.9	7.2.2
	6	Is the fishing of juveniles and spawners restricted to safe levels? No (0); a little (2); partially (4); almost completely satisfactorily (6). Add up to 2 points for effective monitoring of under-age fish and spawners. Add up to 2 points for effective enforcement of restrictions on under-age fish and spawners.	0	10	7.6.9	7.2.2
	7	Are depleted stocks being rebuilt? Score on a graduated scale from; no (0); the intention is to rebuild, but it is not effective (2.5); some attempts at rebuilding with limited success in some stocks (5); some effective rebuilding of most depleted stocks (7.5); completely satisfactory rebuilding of all depleted stocks (10).	0	10	7.6.10	7.2.2

Evaluation Field 5: Social & Economic

Scores Results Of Management			Reference Points		Code Clauses	
Attributes			Worst	Best	main	other
	1	Is the fishery managed so as to minimise conflict among different sectors? No (0); partially (5); almost completely effective (10).	0	10	7.6.5	7.1.9
	2	Are Indigenous Peoples rights and needs being met? No (0); established and partially met (5); almost fully respected (10). (Score 5 if no Indigenous People present)	0	10	7.6.6	7.4.5

			Worst	Best	Main	Other
	3	Are the needs of local fishing communities being met? No (0); identified and partially met (5); almost completely met (10).	0	10	7.6.6	7.1.6
	4	When a change to the management of the fishery is made, is its cost-effectiveness evaluated? No (0); evaluated, but little modification of change (5); plans are modified according to the results (10).	0	10	7.6.7	7.2.2
	5	When a change to the management of the fishery is made, is its social impact evaluated? No (0); evaluated, but little modification (5); plans are always modified according to the results (10).	0	10	7.6.7	7.4.2
	6	Is funding for the research, observers and MCS programme for this fishery obtained by cost recovery from the industry? No (0); up to 30% (2); 30 - 50% (4); 50 - 70%; (6) 70 - 90% (8); more than 90% (10).	0	10	7.7.4	7.4.3

Evaluation Field 6: Monitoring, Control & Surveillance (MCS)

Scores Results Of Management			Reference Points		Code Clauses	
Attributes			Worst	Best	Main	Other
	1	On a scale of 0 to 10, how effective is the observer scheme? No scheme (0) to almost fully effective (10).	0	10	7.7.3	7.1.7
	2	On a scale of 0 to 10, how effective is the catch inspection scheme? No scheme (0) to almost fully effective (10).	0	10	7.7.3	7.4.4
	3	On a scale of 0 to 10, how effective is the vessel monitoring scheme? No scheme (0) to almost fully effective (10).	0	10	7.7.3	7.4.4
	4	Are vessels fishing illegally in the area of this fishery? No (0); occasionally (2.5); often (5); a great deal - half as much as legal vessels (7.5); almost as much as, or more than legal vessels (10). If no information is available, score 10. Note reverse direction of this question: this is allowed for in all analyses.	10	0	7.7.5	7.7.1
	5	How effective is control of access in stopping illegal fishing? Not at all effective (0), to almost fully effective (10).	0	10	7.6.2	7.8.1
	6	Are vessels that really derive from this jurisdiction re-flagged in States of Convenience to avoid reporting or other fishery regulations. Never (0), sometimes (1-5), often (6-7), practice is very common (8-10). Note reverse direction of this question: this is allowed for in all analyses.	10	0	7.7.5	8

ANNEX 3: Countries Scored: Catches and Rank Order

List of countries (jurisdictions) evaluated for compliance with Article 7 of the Code of Conduct for Responsible fisheries. Table shows 1999 reported marine catch in tonnes (rounded), catch rank, percentage of world total, jurisdictions validated external to the scoring team, number of pages in each report and number of references consulted.

Jurisdiction	1999 Catch, tonnes	% World Total	Rank	External Validation	Pages	References Cited
Angola	170,000	0.2	51	-	14	22
Argentina	1,013,000	1.2	20	Validated	18	23
Australia	237,000	0.3	46	Validated	64	179
Bangladesh	310,000	0.4	40	-	17	19
Brazil	518,000	0.6	29	Validated	16	45
Canada	977,000	1.2	21	Validated	16	47
Chile	4,989,000	5.9	4	Validated	22	29
China	14,552,000	17.3	1	Validated	19	62
Denmark	1,404,000	1.7	14	-	26	46
Ecuador	497,000	0.6	31	-	14	12
Egypt	153,000	0.2	52	Validated	19	65
Faeroes	359,000	0.4	37	Validated	26	48
France	586,000	0.7	27	Validated	27	65
Germany	214,000	0.3	48	-	22	58
Ghana	418,000	0.5	33	Validated	29	39
Iceland	1,736,000	2.1	12	-	26	64
India	2,776,000	3.3	8	Validated	28	73
Indonesia	3,621,000	4.3	7	Validated	38	114
Iran	244,000	0.3	45	-	17	20
Ireland	280,000	0.3	43	-	23	59
Italy	288,000	0.3	42	Validated	44	99
Korea, North	190,000	0.2	50	-	11	9
Korea, South	2,100,000	2.5	11	-	24	40
Japan	5,101,000	6.1	3	Validated	13	17
Latvia	124,000	0.1	56	-	15	33
Malaysia	1,240,000	1.5	15	-	17	34
Mexico	1,106,000	1.3	18	Validated	15	34
Morocco	743,000	0.9	24	Validated	23	64
Myanmar	759,000	0.9	23	Validated	13	22
Namibia	298,000	0.4	41	Validated	24	81
Netherlands	512,000	0.6	30	-	26	52
New Zealand	592,000	0.7	25	Validated	31	93
Nigeria	316,000	0.4	39	-	23	66
Norway	2,619,000	3.1	10	Validated	19	47
Pakistan	475,000	0.6	32	Validated	13	16

Peru	8,391,000	10.0	2	Validated	12	9
Philippines	1,725,000	2.1	13	Validated	18	34
Poland	217,000	0.3	47	-	19	52
Portugal	208,000	0.2	49	Validated	25	55
Russia	3,828,000	4.6	6	Validated	27	30
Senegal	376,000	0.4	35	Validated	25	42
South Africa	588,000	0.7	26	Validated	29	56
Spain	1,180,000	1.4	17	Validated	26	54
Sri Lanka	263,000	0.3	44	-	20	44
Sweden	349,000	0.4	38	-	20	44
Taiwan	1,099,000	1.3	19	-	25	41
Thailand	2,656,000	3.2	9	Validated	20	44
Turkey	523,000	0.6	28	-	14	24
Ukraine	397,000	0.5	34	-	20	27
UK	882,000	1.1	22	Validated	32	51
USA	4,691,000	5.6	5	Validated	16	13
Viet Nam	1,217,000	1.4	16	Validated	19	32
Yemen	124,000	0.1	55	Validated	17	28
TOTAL	83,981,000	96	53	33	1176	2476

Our analysis is mainly based on a rapid appraisal technique, Rapfish, which is an anchored non-parametric ordination technique for the rapid appraisal of fishery status in relation to some defined goal or norm (Pitcher and Preikshot 1998; Pitcher and Preikshot 1999; Pitcher 2003). The overarching principle used in designing attributes for a Rapfish analysis is sustainability. The number of attributes for an evaluation field is designed to maximize discriminating power in the ordination technique, where, for statistical rigour, a rule of thumb is to have three times as many fisheries as attributes used to ordinate among them (Stalans 1995). The version of Rapfish we have used here, as published by FAO (Pitcher 1999), is designed to score compliance with Article 7 (Fisheries Management) of the Code of Conduct for Responsible Fisheries, which includes 44 semi-quantitative questions (attributes of compliance) falling under the 6 topics or evaluation fields, with three fields corresponding roughly to the intentions of a country in ensuring compliance with the Code and three fields measuring the effectiveness of compliance in practice. Full details of the rationale used in dividing the Code clauses into concepts and issues are provided in Pitcher (1999).

Questions are designed, as far as possible, to be answered in a reasonably objective fashion, although it is inevitable that some scores will differ among different respondents partly on account of differences in interpretation, as discussed by Caddy (1996). Hence, our guidelines for scoring on a scale of zero to ten are also given in Annex 1, representing the way in which we have attempted to reduce this problem. A second way in which we have attempted to reduce uncertainty is the scoring and validation procedure, described in the text. Thirdly, we have included scoring uncertainty in a formal semi-Bayesian Monte Carlo analysis, also described below.

Ordination Method for Rapfish

After pilot work using principle components analysis produced arched, biased plots, nonparametric multidimensional scaling (MDS) (Kruskal and Wish 1978; Schiffman et al., 1981; Stalans 1995) has been employed. This is an ordination technique that can produce unbiased distance 'maps' of relative location (Clarke 1993). These maps may be rotated and shifted linearly with minimal disruption (Clarke and Warwick 1997). A squared Euclidean distance matrix with attribute scores normalised using Z-values is employed because pilot work suggested this produces the least disruption to monotonicity (Pitcher and Preikshot 2001). An MDS for ratio data in two dimensions is carried out for all the country points including the 'good', 'bad' and other anchor points (see below). Originally performed using the SPSS statistical package, the ordination is now carried out using purpose-written software run from inside an Excel spreadsheet (Kavanagh and Pitcher 2004).

Fixed Reference Points in Rapfish Ordination ('Anchors')

To provide the ordination with a fixed reference axis (degree of compliance with the Code in this case), status is assessed relative to the best and worst possible fisheries that may be constructed from the set of attributes for each field. Two hypothetical fishing nations, 'good' and 'bad', are simulated by choosing the extreme scores for each field. Note that 'good' and 'bad' are evaluated in terms of fisheries countries compliance with the code. The compliance axis is re-scaled to run from zero to 100% and the ordination positions of the 'good' and 'bad' countries are used to rotate the plot to facilitate interpretation. Note that we have chosen horizontal with zero compliance to the left and 100% to the right as our convention.

Additional fixed reference points, expressing two half-way scores that have the maximum mutual difference, are included in the ordination to ensure that new ordinations do not flip laterally to their mirror image – a common problem with the statistical technique employed. A second set of fixed reference points constructed from a series of combinations of good and bad scores provides a ring of "anchor points" that lock the MDS algorithm down into a consistent direction. The outcome of the anchor points procedure is that Rapfish scores are replicable, robust against small random changes, and replicable in the sense that different or subsequent analyses can be overlayed with confidence.

Validity of the Rapfish statistical ordinations

The sensitivity of the ordination to the original scored attributes can be determined, but is not as simple a procedure as with PCA. The method we have used is to run an MDS without the attribute in question and examine the change on scores. This is repeated for each attribute in turn and the root mean square of the differences in plot position along each of the ordination axes calculated: this provides a "leverage" value for each attribute: a value greater than 10% shows that this single attribute has an undue influence on the ordination. Goodness-of-fit is evaluated using stress values: values below 0.25 are considered acceptable by Clarke and Warwick (1997). MDS leverage values and stress factors have been estimated for all of the analyses described in this report, but are not presented here. All MDS stress values were lower than 0.25 and all attribute loadings were less than 10% (none exceeded 6% in fact) meaning that all of the ordinations in this work can be taken as statistically valid.

Monte Carlo technique for uncertainty

This method of evaluating compliance with the Code of Conduct for Responsible Fishing was published after a 2-month stay at FAO by the Principal Investigator as Visiting Expert under the Programme of Cooperation with Academic and Research Institutions scheme (Pitcher 1999). Since then, the mathematics of the underlying anchored ordination technique have been improved, and full Monte Carlo evaluation of errors have been used in this work (Kavanagh and Pitcher 2004). Two hundred Monte Carlo simulations were performed for each MDS ordination. The attribute values for each run were chosen at random from a triangular distribution whose apex represents the chosen 'best' score for each attribute (question) and whose left and right apices represent the "lowest possible" and "highest possible" scores allocated by the scorers. The upper and lower quartiles of the ordination positions for each country have been chosen to represent uncertainty in this analysis, rather than parametric standard errors. This is because the confidence areas were highly asymmetrical, reflecting the scorers choice of possible scores.

Representing the Results of Rapfish Ordinations

The most detailed expression of the results is as a two dimensional ordination plot; these plots are shown for each of the six evaluation fields in Annex 5. But for most of the analysis we have taken only the position of the country on the horizontal axis, indicating the level of compliance with the Code (0–100%), so that compliance can be drawn as a simple bar graph. Another presentation method is as a simple 'thermometer' ("Codeometer') bar graph showing the rank order of countries, and we have used that method to show the overall results (Figure 1). IN the main report delineating the individual country scores, we have used another graphic way of presenting the results of Rapfish ordinations as a kite drawn by joining the field scores plotted along the axes of a regular polygon (here a hexagon): each of the six axes represents one Rapfish evaluation field. Hence, kite diagrams can be used to compare the overall compliance of the countries with all 6 fields of the Code of Conduct for Responsible Fisheries evaluation.

UPPER BOUNDS	Objectives	Framework	Precaution	Regulations	Socio-econ	MCS
Norway	9 7 9 8 8 9 9 6 7	10 9 7 8 7 10 8	6 8 9 8 10 10 6 9 5	7 7 9 9 7 9 8	7 7 7 9 9 7	9 9 8 6 9 7
USA	9 8 9 9 10 9 9 9 9	10 8 10 8 8 10 9	10 9 10 9 8 9 9 6 8	8 6 7 5 6 8 8	9 8 7 9 9 5	7 7 7 4 9 4
Canada	10 9 8 7 9 7 9 6 6	9 9 10 10 10 8 7	9 10 10 8 8 9 9 5 7	6 5 8 6 8 9 7	7 10 6 6 8 7	8 9 8 5 8 9
Australia	9 9 9 9 6 8 9 8 6	9 10 9 9 10 10 9	10 7 9 7 10 10 10 7 6	7 6 8 8 8 8 7	9 6 9 8 8 8	8 9 8 4 9 8
Iceland	10 9 7 7 10 10 10 6 6	8 7 9 10 10 10 9	8 7 9 7 8 9 10 4 6	8 3 8 9 6 8 8	6 5 8 8 6 9	8 9 10 4 8 3
Namibia	8 6 6 6 7 6 7 7 6	9 7 9 6 6 9 8	6 8 9 8 6 6 9 4 6	1 6 6 8 3 4 6	9 5 8 9 7 7	9 9 8 7 9 10
South Africa	9 7 9 9 7 9 8 7 7	8 7 10 9 9 8 6	9 9 10 9 6 7 9 8 4	6 5 7 6 2 7 8	8 8 8 6 7 8	8 6 9 2 6 6
New_Zealand	9 8 6 8 8 9 9 6 6	8 8 9 7 10 10 9	8 7 9 7 8 9 10 6 6	8 5 6 4 3 5 7	9 10 6 5 5 10	10 7 8 4 7 8
Japan	9 7 9 6 7 7 5 4 5	8 9 9 8 8 9 7	6 8 8 6 8 8 8 5 6	8 3 3 1 5 6 5	8 8 8 9 9 7	6 8 9 4 8 2
Denmark	9 6 6 5 8 8 6 5 7	8 8 10 8 7 8 8	7 9 9 9 7 8 9 8 5	5 5 5 4 4 2 4	7 8 8 8 8 4	6 6 6 0 5 9
Faroes	6 6 8 6 6 7 6 7 6	8 10 9 10 8 8 8	6 6 6 6 5 6 6 6 6	4 5 5 8 5 7 6	9 5 9 9 8 5	8 8 7 5 7 10
Netherlands	9 6 6 5 8 8 5 5 7	8 8 10 8 7 8 8	7 9 9 7 7 7 9 8 5	5 3 5 4 4 4 5	7 8 8 8 8 4	6 6 6 0 5 1
Chile	9 4 9 6 9 3 8 6 7	9 7 4 4 8 9 7	7 9 8 8 3 8 5 5 3	6 5 5 5 1 5 6	8 2 8 7 8 6	4 8 9 3 5 3
UK	9 7 5 7 7 8 5 6 5	8 8 8 8 6 7 4	6 8 10 10 8 8 9 4 6	5 4 5 5 4 6 6	7 6 7 5 9 4	7 5 9 1 6 6
Portugal	6 6 6 5 7 6 6 5 6	8 6 8 6 5 6 5	7 8 8 6 7 8 7 9 4 5	5 6 4 3 5 5	5 5 7 7 7 3	6 6 5 4 6 8
France	8 6 6 5 6 6 5 5 6	8 6 8 6 6 7 7	6 9 9 7 7 8 9 5 5	5 5 6 4 4 4 5	6 4 8 8 6 4	6 6 8 0 5 5
Malaysia	7 8 10 8 6 7 7 7 6	7 6 9 10 10 8 5	3 1 6 0 2 6 8 6 4	5 5 4 6 1 3 1	8 7 6 4 7 4	0 7 8 2 7 4
South_Korea	6 6 8 7 9 9 7 7 8	5 8 8 9 8 7 6	6 4 7 0 8 8 7 7 6	4 2 0 2 9 8 5	6 5 5 5 6 2	5 7 9 3 6 1
Sweden	8 8 7 5 5 6 6 5 5	9 6 7 8 8 8 5	9 6 9 9 7 5 5 6 5	5 5 6 5 8 5 5	5 7 5 5 5 5	6 7 6 2 3 3
Germany	7 7 6 5 7 6 6 5 6	7 6 8 7 6 6 8	7 8 9 6 7 6 8 8 3	6 3 3 5 6 4 5	6 5 5 5 5 3	5 7 7 4 8 3
Ireland	8 6 6 6 7 6 6 5 5	6 7 8 6 7 7 6	6 7 7 6 5 6 8 5 5	5 3 4 4 4 4 5	6 5 7 5 6 5	7 7 7 1 6 10
China	8 7 7 7 7 7 5 4 3	4 5 8 7 7 6 8	3 6 5 3 6 4 8 6 4	5 5 2 5 5 2 5	7 8 5 6 8 5	3 6 6 0 4 2
Spain	8 6 6 5 8 8 5 5 7	8 6 10 6 6 7 7	8 9 6 7 7 8 9 5 3	5 3 3 5 3 6 3	5 8 8 8 8 3	6 6 5 0 5 0
Italy	6 8 7 6 4 6 4 5 5	6 8 8 7 7 6 6	6 7 6 6 8 7 9 3 3	6 5 5 3 2 5 2	6 5 6 8 5 1	3 5 4 1 3 9
Mexico	8 4 7 9 7 6 7 1 6	7 7 8 8 8 6 5	6 6 7 0 5 0 6 3 0	3 5 7 4 5 5 3	6 8 7 7 7 4	6 5 9 2 8 6
Peru	5 5 9 6 8 8 6 7 8	7 6 8 8 7 7 7	5 6 7 0 8 5 5 3 5	5 3 3 6 5 7 6	8 1 7 5 5 5	4 6 9 1 4 7
Poland	7 6 5 5 5 5 5 5 5	7 5 6 5 5 6 5	7 7 8 7 3 3 5 2 3	5 0 2 6 4 3 4	5 6 5 5 5 0	6 6 6 3 5 5
India	8 6 6 5 5 6 6 5 5	7 5 6 7 5 6 6	2 2 4 0 5 2 8 4 5	4 3 2 4 1 3 2	6 10 6 2 5 0	1 5 4 3 4 9
Ghana	4 5 8 4 7 5 5 6 6	5 7 7 7 5 6 7	3 3 4 0 3 3 6 2 3	3 2 3 4 1 3 2	6 5 6 4 6 3	5 5 5 0 5 5
Taiwan	3 6 4 6 6 6 3 4 5	3 5 7 7 10 10 9	4 4 3 1 8 9 7 6 5	6 3 2 5 2 2 4	5 9 4 4 4 2	4 6 5 0 4 0
Latvia	6 6 5 5 6 7 3 3 5	5 6 5 6 6 6 5	6 6 6 6 3 4 6 4 5	5 3 3 5 0 3 2	4 5 3 5 3 0	5 5 6 2 5 4
Philippines	7 2 7 5 3 4 4 4 3	3 5 9 6 9 7 9	3 1 4 0 1 0 6 6 0	1 4 3 6 0 2 0	6 10 5 4 7 3	0 6 6 0 6 10
Brazil	7 4 5 6 7 4 5 3 3	6 4 3 6 7 4 4	3 4 4 0 2 0 7 4 0	3 4 5 2 0 3 3	6 7 4 0 0 3	4 6 3 1 6 6
Argentina	8 4 5 9 7 7 5 2 7	8 6 7 6 6 5 5	2 5 6 5 7 7 6 6 5	7 4 5 4 1 3 3	5 2 7 7 7 5	7 4 5 1 5 2
Morocco	5 5 5 4 5 7 3 3 6	6 8 8 8 7 8 5	4 4 3 0 8 5 9 3 3	3 2 1 1 1 1 3	4 5 5 5 7 5	4 5 4 0 4 1
Pakistan	2 4 6 3 3 3 6 1 2	4 2 5 5 5 5 6	3 1 3 0 4 3 4 1 4	4 4 5 4 3 4 1	4 5 5 3 6 1	5 5 8 1 6 10
Russia	5 3 4 3 3 5 6 2 4	7 9 6 5 5 5 6	3 6 3 0 3 1 6 4 2	3 3 1 1 5 2 3	5 8 5 4 3 4	4 3 6 0 4 1
Senegal	5 5 6 3 3 4 2 1 3	4 6 6 8 6 4 3	0 2 4 3 0 4 5 4 2	2 4 3 6 0 1 1	4 5 6 1 0 1	4 4 4 3 6 10
Ecuador	4 5 8 7 7 9 6 5 5	5 8 8 7 3 5 5	4 3 3 1 7 3 3 4 2	1 4 3 3 1 1 3	8 4 8 1 1 6	5 6 1 1 3 3
Indonesia	3 3 5 3 3 3 4 3 5	4 5 7 5 4 4 5	4 4 4 0 3 0 5 5 3	0 3 3 4 0 1 2	0 3 4 3 3 6	2 4 6 0 5 4
Iran	3 5 6 4 6 5 5 3 3	3 4 6 5 5 5 5	2 3 5 4 5 1 5 4 0	4 3 3 3 0 0 2	6 5 5 1 2 0	3 6 3 3 4 10
Thailand	5 3 7 4 2 3 4 1 3	4 2 5 6 4 5 3	3 1 5 0 1 2 4 5 1	3 3 3 4 1 3 1	2 4 5 5 5 1	0 4 4 0 4 10
Ukraine	4 6 3 3 3 5 3 3 3	5 6 5 5 4 5 5	4 1 4 2 0 2 4 4 2	5 0 0 3 0 5 3	5 5 4 0 0 0	5 5 5 4 2 1
Sri Lanka	3 5 5 4 3 5 5 2 0	2 4 3 7 2 3 5	6 0 3 0 3 0 4 2 2	3 2 2 4 0 1 0	4 2 4 3 4 0	3 3 0 1 3 10
Viet Nam	2 5 3 3 1 3 1 2 3	3 3 4 4 3 4 4	0 1 3 0 0 0 2 5 0	0 1 1 5 1 2 0	3 5 2 4 3 3	0 3 4 0 6 9
Turkey	2 3 6 3 0 3 4 2 2	1 4 6 4 6 5 5	3 1 2 0 2 2 5 4 2	2 1 1 4 0 2 0	3 5 7 3 3 2	0 4 3 1 4 3
Bangladesh	4 4 6 4 4 6 2 2 2	2 0 2 2 4 3 3	0 0 0 4 0 0 4 3 0	0 0 2 0 0 0 2	5 5 5 5 5 0	2 3 1 0 2 10
Egypt	4 4 3 2 1 4 0 2 0	2 1 2 2 3 4 3	2 1 4 4 5 0 0 3 2	1 0 0 3 0 0 0	1 4 3 2 0 0	3 1 0 4 2 10
Yemen	2 1 5 3 6 3 2 0 1	1 2 1 2 0 2 4	2 2 3 0 0 3 2 3 1	5 2 0 4 0 2 2	1 0 4 2 2 3	5 2 5 0 4 10
Nigeria	5 4 5 2 0 4 3 2 4	4 3 4 4 2 4 0	2 0 4 0 0 0 2 0 3	5 1 2 2 0 2 0	2 5 3 3 3 1	1 1 0 0 1 5
Angola	5 2 4 3 4 2 0 2 3	3 5 4 4 4 4 4	2 0 5 0 2 0 0 3 4	0 0 0 2 0 2 3	2 1 3 1 1 1	2 3 1 2 1 9
Myanmar	2 4 3 2 0 2 3 1 1	2 0 0 5 0 3 2	2 0 0 0 1 1 4 3 3	0 1 2 3 0 2 2	2 0 3 0 0 2	0 4 3 0 4 2
North_Korea	1 1 3 2 0 4 0 0 1	1 0 1 2 0 0 0	2 0 0 0 0 0 2 3 2	6 1 3 6 0 0 0	5 5 3 0 0 0	2 2 2 0 2 4

Country	Objectives	Framework	Precaution	Regulations	Socio-econ	MCS	All
Norway	9 6 8 8 6 8 8 5 5	9 8 6 7 6 9 7	5 6 8 6 9 9 5 7 3	6 6 9 8 7 9 7	7 5 6 6 8 5	9 9 8 7 8 8	6.0
USA	9 8 8 8 9 8 8 8 8	8 7 9 7 7 8 8	8 8 9 8 7 8 8 7 6	8 5 5 4 4 7 7	6 8 6 6 6 3	6 7 6 6 6 5	5.8
Canada	9 9 7 6 8 6 8 5 5	8 7 9 8 8 8 5	9 9 9 7 7 8 7 3 5	6 4 7 6 8 8 6	6 9 6 5 5 5	8 8 8 7 7 10	5.8
Australia	7 7 8 7 5 7 8 7 5	8 8 8 8 8 8 7	8 5 7 5 8 7 9 6 4	5 5 7 4 7 7 5	7 5 7 6 7 7	7 8 7 8 8 10	5.8
Iceland	8 8 6 6 8 8 9 5 5	7 6 8 8 9 9 8	7 7 9 7 7 7 9 3 4	7 0 7 8 2 7 7	6 5 6 5 5 8	5 7 9 6 7 5	5.7
Namibia	8 5 6 5 6 5 6 6 5	9 6 8 6 5 8 7	6 8 8 6 5 5 9 3 6	0 5 5 8 1 4 6	9 5 8 8 7 7	9 9 8 10 9 10	5.6
South Africa	9 6 8 8 7 8 8 6 8	7 5 9 9 8 8 5	8 8 9 8 6 7 9 6 0	4 4 5 6 1 6 7	8 8 6 5 6 7	6 5 8 4 5 7	5.5
New_Zealand	8 7 5 8 7 8 8 6 5	7 8 8 6 9 9 8	8 7 8 5 7 7 9 5 5	7 4 6 3 2 5 5	7 10 4 3 3 9	8 5 7 6 6 9	5.5
Japan	7 5 7 6 6 7 4 4 5	7 8 8 8 8 8 7	6 8 7 6 7 6 8 3 6	7 1 2 0 4 5 4	8 8 8 8 9 7	4 7 8 5 6 2	5.4
Denmark	8 5 4 5 7 7 5 4 6	7 7 9 7 6 7 7	6 8 8 7 7 9 6 2	4 3 3 3 3 0 2	6 8 7 7 7 3	5 5 5 2 4 10	5.0
Faroes	6 5 8 5 5 6 5 4 4	8 7 8 8 6 7 5	5 4 6 5 5 5 6 5 5	3 4 7 4 6 5	8 5 6 7 6 5	5 6 6 6 5 10	5.0
Netherlands	8 5 4 4 8 7 4 4 5	7 7 9 7 6 7 7	8 8 8 6 6 5 9 7 2	4 2 4 3 3 3 3	5 8 6 7 5 2	4 5 5 2 4 3	4.7
Chile	8 3 8 5 8 1 6 4 5	8 6 3 3 7 8 6	6 8 7 7 2 7 4 3 2	5 3 4 4 0 4 5	7 0 7 5 5 5	2 7 8 4 4 4	4.6
UK	9 7 3 5 7 6 4 4 3	8 7 7 5 4 6 3	5 6 9 9 7 7 9 3 3	4 3 5 3 3 5 4	4 5 5 3 7 1	6 3 8 2 4 7	4.5
Portugal	6 6 5 4 6 6 6 4 4	7 5 7 5 5 6 6	6 8 7 5 6 6 8 3 3	4 5 3 3 2 4 3	5 5 7 6 6 2	5 5 4 6 4 10	4.5
France	7 6 4 4 8 3 5 4 5	7 6 8 5 5 5 5	5 8 8 6 6 7 9 3 3	5 3 5 2 2 3 3	6 2 7 7 5 2	4 5 7 3 5 8	4.5
Malaysia	6 8 8 7 5 6 5 5 4	6 5 8 8 9 7 4	2 0 5 0 0 4 7 5 2	4 4 3 4 0 3 0	8 6 5 3 7 0	0 6 6 4 6 7	4.5
South_Korea	6 5 7 6 8 8 7 7 6	4 7 7 8 7 6 5	5 4 6 0 7 6 7 6 4	3 0 0 1 8 6 3	4 4 4 2 4 0	4 6 8 4 5 1	4.5
Sweden	8 7 6 4 4 5 5 4 4	7 5 6 6 7 7 5	8 6 9 8 6 4 5 6 4	4 4 5 4 7 5 4	2 6 5 5 4 1	4 6 4 4 1 5	4.4
Germany	6 6 4 4 7 5 4 4 4	6 3 7 3 5 6 5	6 8 8 5 6 6 8 6 2	5 2 2 3 5 3 3	5 5 3 4 4 2	4 5 6 6 7 6	4.4
Ireland	7 5 6 4 5 6 5 4 4	5 6 6 5 6 6 5	6 6 7 6 3 5 8 4 3	3 2 4 2 3 3 3	5 5 6 4 5 3	4 6 6 3 5 10	4.3
China	6 6 6 6 6 6 4 3 2	3 4 7 7 6 5 7	1 4 4 1 5 3 7 5 3	4 0 4 3 1 2 0	6 6 4 5 7 4	2 4 5 1 2 3	4.2
Spain	6 5 4 4 7 7 4 3 5	6 5 8 5 5 5 4	5 8 5 6 6 9 9 3 1	4 2 1 3 2 3 0	4 8 7 7 6 1	4 5 4 4 0 4	4.1
Italy	4 7 6 4 3 5 3 4 3	5 7 6 6 6 5 5	5 5 5 5 5 6 7 2 3	5 3 3 2 1 3 2	5 5 5 7 4 0	1 3 3 2 2 9	4.0
Mexico	7 2 5 7 6 4 6 0 5	5 5 7 7 7 5 4	5 5 6 0 2 0 1 2 0	2 4 6 3 0 3 1	5 8 4 5 5 0	4 2 5 3 5 9	4.0
Peru	4 4 6 5 6 7 5 6 6	6 5 7 7 5 4 5	4 1 5 0 6 2 3 2 2	5 3 1 5 0 6 5	7 0 2 3 1 1	0 4 8 3 3 7	3.8
Poland	6 6 4 4 5 3 2 3 3	5 4 5 4 4 6 4	6 6 7 6 2 2 4 1 3	4 0 0 3 4 3 2	2 5 3 2 3 0	5 5 5 5 2 10	3.6
India	6 5 6 4 3 5 5 5 4	6 4 6 5 5 5 6	1 0 4 0 4 0 6 3 4	3 1 1 3 0 1 1	5 9 5 0 3 0	0 5 3 4 4 10	3.6
Ghana	3 4 7 2 6 4 3 5 5	3 6 6 6 4 5 6	1 2 3 0 2 1 5 0 3	1 0 1 4 0 1 1	5 5 5 3 5 2	4 4 4 4 3 7	3.6
Taiwan	3 5 3 4 5 4 2 3 4	3 4 6 6 9 9 8	4 0 3 0 7 7 5 4 0	5 1 2 1 0 0 2	4 8 4 0 2 0	3 4 4 1 3 0	3.5
Latvia	6 5 4 4 5 4 1 3 3	5 2 4 3 4 5 3	5 5 6 5 2 2 5 4 4	4 2 3 3 1 1 1	2 3 3 3 3 0	2 3 2 6 2 10	3.4
Philippines	7 1 5 2 0 4 4 3 2	2 4 7 5 8 5 7	1 0 4 0 0 0 4 6 0	0 3 1 4 0 0 0	4 10 4 2 5 0	0 5 4 1 5 10	3.3
Brazil	6 3 4 5 6 3 5 2 3	5 3 2 5 5 3 3	2 2 3 0 0 6 3 0	2 3 4 2 0 2 2	4 5 3 0 0 2	3 4 2 2 5 9	3.3
Argentina	7 3 3 4 5 2 4 0 6	7 3 5 3 0 1 1	0 1 5 4 1 4 2 4 0	4 2 4 3 0 2 1	3 0 2 5 2 2	5 2 2 2 5 4	3.2
Morocco	4 3 4 2 4 6 2 1 5	5 7 7 6 5 5 4	3 3 2 0 7 3 8 2 2	2 0 0 0 0 0 1	3 2 4 0 6 1	2 4 2 1 3 3	3.0
Pakistan	1 3 5 1 2 2 5 0 0	3 1 4 4 5 4 4	0 0 3 0 3 2 4 1 3	2 2 4 0 3 0 0	2 1 3 0 5 0	3 3 8 2 5 10	3.0
Russia	4 3 3 1 3 4 4 1 2	6 8 4 3 3 3 4	3 5 2 0 2 0 4 4 0	2 2 0 0 3 1 0	4 8 4 3 2 3	3 2 4 0 3 2	2.9
Senegal	4 4 5 2 2 4 1 0 2	4 5 3 6 4 2 2	0 0 3 1 0 4 5 2 2	0 0 2 4 0 0 1	2 5 5 0 0 1	3 2 3 4 5 10	2.9
Ecuador	3 4 7 4 6 8 4 1 3	3 7 7 7 1 2 1	0 1 2 0 6 1 1 2 0	0 3 1 1 0 0 1	3 2 5 0 0 5	4 2 0 2 2 5	2.9
Indonesia	2 1 3 2 3 2 3 2 4	3 4 6 3 3 3 4	3 0 4 0 2 0 4 4 1	0 1 3 3 0 0 0	0 3 3 0 2 4	1 4 4 1 4 6	2.7
Iran	2 5 5 3 4 5 3 2 2	1 3 3 1 3 4 2	1 0 2 0 4 0 2 2 0	2 2 1 1 0 0 0	2 5 3 0 0 0	0 3 1 5 3 10	2.5
Thailand	3 2 6 1 2 1 3 0 1	3 1 3 4 2 3 3	1 0 3 0 0 0 4 3 0	2 2 2 3 0 1 1	0 1 2 3 2 0	1 2 3 0 2 10	
Ukraine	3 4 3 1 2 4 0 1 2	3 5 3 4 2 2 2	3 0 3 0 0 0 1 3 0	4 0 0 1 0 2 1	1 4 2 0 0 0	3 3 3 2 0 3	2.1
Sri Lanka	3 5 5 2 3 4 3 0 0	1 3 2 6 0 1 4	5 0 3 0 0 0 1 3 0	0 0 1 3 0 0 0	3 0 4 3 2 0	1 1 0 2 3 10	2.1
Viet Nam	2 4 2 2 1 2 0 1 1	2 1 3 3 2 3 2	1 0 1 0 0 0 1 3 0	0 0 0 4 0 1 0	2 5 2 1 1 1	0 1 2 1 4 10	2.0
Turkey	1 1 5 1 0 1 3 1 0	0 2 5 2 4 3 2	1 0 1 0 0 1 4 3 0	1 0 0 2 0 1 0	0 5 5 0 0 0	0 3 0 2 3 4	1.9
Bangladesh	2 3 3 4 2 4 0 0 1	0 0 1 2 2 2 2	0 0 0 2 0 0 2 2 0	0 0 1 0 0 0 0	2 5 4 4 4 0	1 2 0 3 0 10	1.8
Egypt	3 3 2 1 0 4 0 1 0	2 1 1 2 2 4 2	1 1 3 3 4 0 2 1	1 0 0 2 0 0 0	1 4 3 1 0 0	1 1 0 5 2 10	1.8
Yemen	2 1 4 0 3 1 1 0 0	0 0 0 2 0 1 3	0 1 2 0 0 2 1 3 0	1 1 0 4 0 1 0	0 0 2 1 1 2	4 2 1 2 2 10	1.6
Nigeria	4 4 3 2 0 3 2 2 3	2 0 3 3 1 2 0	1 0 2 0 0 0 1 0 2	4 0 1 2 0 1 0	1 1 2 2 1 1	0 0 0 1 0 7	1.6
Angola	4 1 3 2 3 0 0 1 2	1 3 2 2 3 2 3	1 0 4 0 2 0 0 2 1	0 0 0 0 0 1 1	0 0 2 0 0 0	0 1 0 3 0 10	1.5
Myanmar	1 3 3 1 0 1 2 0 0	1 0 0 3 0 2 1	1 0 0 0 0 2 2 2	0 0 1 1 0 1 0	0 0 1 0 0 1	0 3 2 0 2 4	1.1
North_Korea	0 0 1 1 0 3 0 0 0	0 0 0 0 0 0 0	1 0 0 0 0 0 2 0	5 0 0 5 0 0 0	4 1 1 0 0 0	0 0 0 4 0 5	0.9

Country	Objectives									Framework							Precaution									Regulations							Socio-econ						MCS					
Norway	5	4	7	6	4	5	7	3	4	8	7	3	4	3	7	5	4	4	7	5	8	8	4	6	0	5	5	7	7	5	7	6	4	3	4	5	7	3	7	7	7	8	7	9
USA	7	6	6	6	8	6	6	6	6	7	5	8	6	5	7	6	7	7	8	6	6	6	6	4	5	5	4	4	3	3	5	6	2	5	5	2	2	2	4	6	4	7	2	7
Canada	8	8	6	5	7	4	7	4	3	8	7	8	7	7	6	4	8	9	9	7	6	7	6	2	4	4	3	6	4	6	7	5	3	7	4	4	4	4	6	6	6	8	5	10
Australia	5	6	7	6	4	6	7	5	3	7	7	6	6	7	5	4	5	4	5	3	6	4	8	4	3	4	3	6	3	5	4	4	5	4	5	4	5	6	6	5	5	8	5	10
Iceland	7	7	5	5	7	7	9	4	3	6	5	7	7	8	7	7	6	6	7	5	6	7	8	1	3	6	0	6	7	1	6	6	4	5	5	4	4	7	3	7	9	7	6	7
Namibia	6	4	3	3	4	4	4	4	4	7	4	6	4	4	7	7	4	6	6	5	4	4	6	2	4	0	3	3	7	0	3	4	7	5	6	7	6	4	7	7	6	10	8	10
South Africa	6	5	6	6	5	6	6	5	5	6	5	8	6	7	6	4	7	7	7	6	4	5	8	5	0	2	2	4	4	0	5	5	6	7	4	4	4	5	5	3	6	5	3	8
New_Zealand	7	6	3	6	6	6	5	4	3	6	6	7	5	8	8	7	7	6	7	4	6	7	8	2	3	6	3	5	2	1	4	5	5	7	4	2	2	8	8	4	6	7	5	10
Japan	7	5	7	4	3	6	3	2	2	5	6	6	6	5	6	4	4	7	5	3	5	4	5	2	5	6	0	1	0	2	4	4	5	6	6	7	7	5	4	5	7	8	5	5
Denmark	6	5	3	3	5	5	4	3	3	6	5	8	5	4	5	5	5	7	7	6	5	5	8	5	0	3	2	2	2	1	0	1	4	7	5	5	5	1	3	3	4	3	2	10
Faroes	4	3	6	3	3	5	4	3	3	5	6	5	7	5	4	6	3	3	4	3	3	3	4	3	3	2	2	2	6	2	4	3	6	5	5	6	5	5	3	4	5	8	3	10
Netherlands	6	5	3	3	5	5	3	3	4	6	5	8	5	4	5	5	5	7	7	4	5	5	8	5	0	2	1	3	2	1	2	2	4	7	5	5	4	1	3	3	4	3	2	4
Chile	6	2	5	4	7	0	4	3	3	7	5	2	2	6	6	5	5	7	6	6	0	6	3	2	1	3	2	3	3	0	2	3	5	0	4	3	2	3	1	4	7	6	3	6
UK	7	5	2	5	5	5	2	4	2	6	4	6	3	3	4	2	5	6	8	8	5	5	8	1	1	3	1	3	2	1	4	3	3	2	4	2	6	0	5	2	6	4	3	8
Portugal	4	4	3	3	5	4	4	3	2	5	4	5	4	3	4	3	5	6	5	4	5	5	7	2	2	3	4	2	2	1	3	2	2	5	5	5	5	1	4	3	3	8	2	10
France	6	5	3	3	5	2	3	4	2	5	4	6	4	4	4	5	4	7	7	4	5	5	8	2	0	3	2	3	1	1	2	2	4	2	5	5	5	1	3	3	6	3	2	8
Malaysia	5	5	5	7	6	4	5	4	3	4	3	6	7	9	4	4	1	0	4	0	0	3	6	3	3	3	2	2	4	0	2	0	6	4	4	2	5	0	0	4	5	5	3	8
South_Korea	4	4	5	5	7	7	5	5	4	2	5	5	6	6	4	4	4	2	5	0	5	5	5	4	3	2	0	0	1	8	5	2	3	2	2	2	0	0	3	5	8	5	3	3
Sweden	6	5	5	3	2	3	3	3	3	5	3	4	5	6	5	3	5	4	6	6	4	2	4	5	2	3	3	4	2	6	3	3	1	4	3	3	3	0	2	3	3	7	0	7
Germany	5	5	3	3	5	2	2	2	3	5	2	5	2	4	3	3	5	6	6	4	3	4	4	5	1	4	1	1	2	3	2	1	3	5	2	2	1	0	1	5	3	7	2	7
Ireland	6	4	4	3	5	4	5	2	3	3	4	5	4	5	4	4	5	5	5	5	2	3	5	3	2	3	1	2	1	2	2	0	4	5	5	3	4	1	3	4	5	5	4	10
China	5	5	4	4	4	3	3	2	1	2	3	5	4	3	3	5	0	2	3	1	4	2	6	3	1	2	2	0	3	2	0	2	5	5	2	4	5	3	0	3	4	3	1	5
Spain	6	4	3	3	5	5	4	3	4	6	3	8	4	4	4	3	4	7	4	4	5	5	8	2	0	3	1	0	2	1	3	0	3	7	5	5	5	0	3	3	2	3	2	3
Italy	3	5	4	3	2	3	2	2	2	4	5	6	5	5	4	2	5	4	4	4	4	4	6	1	1	1	4	2	0	0	2	0	3	5	3	5	2	0	0	2	1	4	1	10
Mexico	6	1	3	6	5	3	5	0	4	2	2	5	6	5	4	2	3	2	5	0	0	0	1	1	0	1	3	5	2	0	2	0	2	6	3	2	0	0	3	1	2	5	3	9
Peru	2	3	6	5	5	4	4	5		5	4	6	5	3	2	2	2	0	4	0	5	0	2	1	0	3	1	0	4	0	5	4	4	0	1	0	0	0	0	2	7	4	2	9
Poland	4	4	3	2	2	1	2	2	2	4	3	3	2	4	1	0	4	4	4	1	1	4	0	1		2	0	0	2	2	1	1	1	3	2	1	2	0	3	3	3	7	1	10
India	5	4	4	2	2	4	3	3	3	4	3	4	4	3	4	4	0	0	3	0	2	0	5	2	2	2	0	1	0	0	0	0	3	7	3	0	3	0	0	2	2	7	3	10
Ghana	2	3	5	1	4	3	3	4	4	2	4	4	5	3	4	5	0	1	2	0	1	0	3	0	2	1	0	1	3	0	1	1	4	5	3	1	3	1	3	3	3	6	1	8
Taiwan	2	4	2	2	4	2	0	1	2	1	3	4	4	8	7	7	1	0	1	0	6	7	4	2	0	3	0	0	0	0	0	1	2	6	2	0	1	0	2	3	2	2	1	1
Latvia	4	3	2	2	4	3	0	1	2	3	1	2	2	2	4	3	5	3	3	3	1	1	1	2	2	2	1	1	2	0	0	1	1	2	2	2	2	0	1	2	1	8	1	10
Philippines	5	0	3	2	0	2	1	1	0	1	2	6	3	6	4	6	0	0	2	0	0	0	2	3	0	0	1	0	0	0	0	0	3	8	2	2	5	0	0	3	2	3	2	10
Brazil	5	1	3	4	5	2	4	1	1	4	1	1	4	3	2	2	0	1	2	0	0	0	5	2	0	1	2	3	0	0	1	1	2	2	2	0	0	1	2	2	1	4	4	9
Argentina	5	2	1	2	3	0	2	0	5	6	1	3	1	0	1	0	0	0	4	0	2	2	1	1	0	2	1	2	2	0	1	0	1	0	1	1	1	1	4	1	1	4	1	6
Morocco	2	2	3	1	3	5	0	0	4	3	5	6	5	4	5	2	1	1	1	0	6	1	7	1	0	0	0	0	0	0	0	0	1	1	2	0	4	0	0	2	1	3	1	4
Pakistan	1	2	4	0	1	0	4	0	0	1	0	2	2	3	3	4	0	0	0	0	1	0	1	0	2	1	1	3	2	0	2	0	1	0	2	0	3	0	2	2	5	4	3	10
Russia	2	1	2	1	1	3	3	0	0	5	5	2	1	2	1	2	1	3	1	0	1	0	2	2	0	1	1	0	0	2	0	0	2	5	2	1	0	2	0	1	3	2	2	4
Senegal	3	2	3	1	0	2	0	0	1	2	2	2	2	2	1	1	0	0	2	1	0	2	2	1	1	0	0	1	2	0	0	0	0	5	2	0	0	0	2	1	1	6	3	10
Ecuador	2	3	4	2	4	6	4	0	2	2	5	5	4	0	1	0	0	0	1	0	5	0	0	1	0	0	2	0	1	0	0	0	2	1	2	0	0	4	3	1	0	5	0	7
Indonesia	1	0	2	1	1	0	2	0	3	2	2	5	2	2	1	4	2	0	3	0	0	0	2	2	0	0	0	1	2	0	0	0	0	1	0	0	0	2	0	1	2	2	2	7
Iran	1	3	3	2	3	3	2	1	1	1	2	2	0	1	2	1	0	0	2	0	3	0	1	2	0	1	1	0	0	0	0	0	1	5	2	0	0	0	0	2	0	6	0	10
Thailand	2	1	5	0	0	1	2	0	1	2	0	1	3	1	2	1	0	0	2	0	0	0	1	3	0	1	1	2	0	0	0	0	0	1	2	1	1	1	0	1	2	1	1	10
Ukraine	2	3	2	0	1	3	0	0	1	2	3	2	2	1	1	1	1	0	2	0	0	0	1	2	0	3	0	0	0	2	0	0	0	2	1	0	0	0	2	1	2	4	0	6
Sri Lanka	1	3	3	1	1	2	2	0	0	0	0	1	4	0	1	2	5	0	1	0	0	0	2	0	0	0	0	3	0	0	0	0	2	0	1	2	1	0	0	0	0	5	2	10
Viet Nam	1	3	1	1	0	1	0	0	0	1	1	1	2	1	1	0	0	0	1	0	0	0	1	2	0	0	0	0	0	0	0	0	1	5	0	0	0	0	0	1	1	3	2	10
Turkey	0	0	3	0	0	0	1	0	0	0	0	4	1	2	2	0	0	0	0	0	0	0	2	1	0	0	0	1	0	0	0	0	0	5	4	0	0	0	0	1	0	3	1	6
Bangladesh	1	2	2	2	1	3	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	1	5	2	2	2	0	0	1	0	5	0	10
Egypt	2	2	1	0	0	2	0	0	0	1	0	0	1	2	1	0	0	0	2	2	3	0	0	1	0	0	0	1	0	0	0	0	0	2	2	0	0	0	0	0	0	6	1	10
Yemen	1	0	2	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	1		2	1	1	4	0	10
Nigeria	3	2	1	0	0	2	1	1	2	2	0	2	2	0	1	0	0	0	1	0	0	0	0	0	2	3	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	2	0	8
Angola	2	0	1	1	2	0	0	0	1	0	2	1	1	1	1	2	0	0	2	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	10	
Myanmar	0	2	1	0	0	0	0	0	0	0	0	0	2	0	1	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	2	1	2	0	5
North_Korea	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3	0	0	0	2	0	0	0	0	0	0	0	0	5	0	8

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Management Objectives: Code Compliance Evaluation Field 1

Evaluation of compliance for fishery management objectives in this field addresses Code of Conduct clauses 7.1.1; 7.1.8; 7.2.1; 7.2.2; 7.2.3; 7.3.1 and 7.4.2, and is based on scores for nine questions:

Are formal reference points for the fish stock in this fishery identified using the best science available?

Is present fleet capacity defined and calculated?

Are small scale fishers considered in the management plan?

Are impacts of the fishery on biodiversity allowed for in the management plan?

Does the management plan aim to restore depleted stocks in this fishery?

Are human impacts (pollution, waste) on the fishery habitat identified and mitigated?

Is fishing gear mandated by the management plan to avoid by-catch of non-target species, environmental and habitat damage?

Are ecosystem linkages with this fishery made explicit in the management plan?

Are environmental influences on this fishery made explicit in the management plan?

(Note that full details of the questions and scoring guidelines are given in Annex 1). Results of the MDS ordination for this evaluation field are shown below complete with confidence limits, together with the rank order and overall compliance scores of our 53 countries.

The ordination plot shows that the exact position of most countries on the y-axis is quite uncertain (vertical confidence limits bars), but this does not affect the Code compliance results since uncertainly in the x-axis is much smaller. The confidence bars in the centre of the cluster of countries overlap somewhat, suggesting that the exact rank order is uncertain, but the scores are sufficiently distinct to distinguish countries with higher, high-medium, low-medium, and lower compliance. Therefore the compliance ratings maybe used with reasonable confidence are used.

This Code field, management objectives, is perhaps the easiest evaluation field in which to score well since it expresses the intentions put into fisheries legislation and management plans. It is therefore disappointing that only one country of the 53 (USA) manages a "good" score over 70%. Six more countries (South Africa, Canada, New Zealand, Norway, South Korea and Iceland) achieve passable compliance scores within range of 60%. The presence of the top developing country, Malaysia, near this group testifies to its progressive fisheries legislation. However, it is most unfortunate that many developed nations, especially those from the European Union, do not even come close to achieving even a passable compliance score. Although management objectives in EU countries are set by central policy, the implementation of that policy is under the member states and, moreover, inshore and high seas fisheries remain under national control.

The analysis shows that almost third of the countries (16/53, 30%) fall below the fail grade in compliance with Code's requirement on management objectives, a situation that could easily be improved with attention to the focus of new legislation. Many of these countries state that the aims of their fishery management are to increase food supplies, employment and economic benefits, but make little or no mention of the responsibility for conservation that must underpin such aspirations for long-term food security.

Code Management Objectives
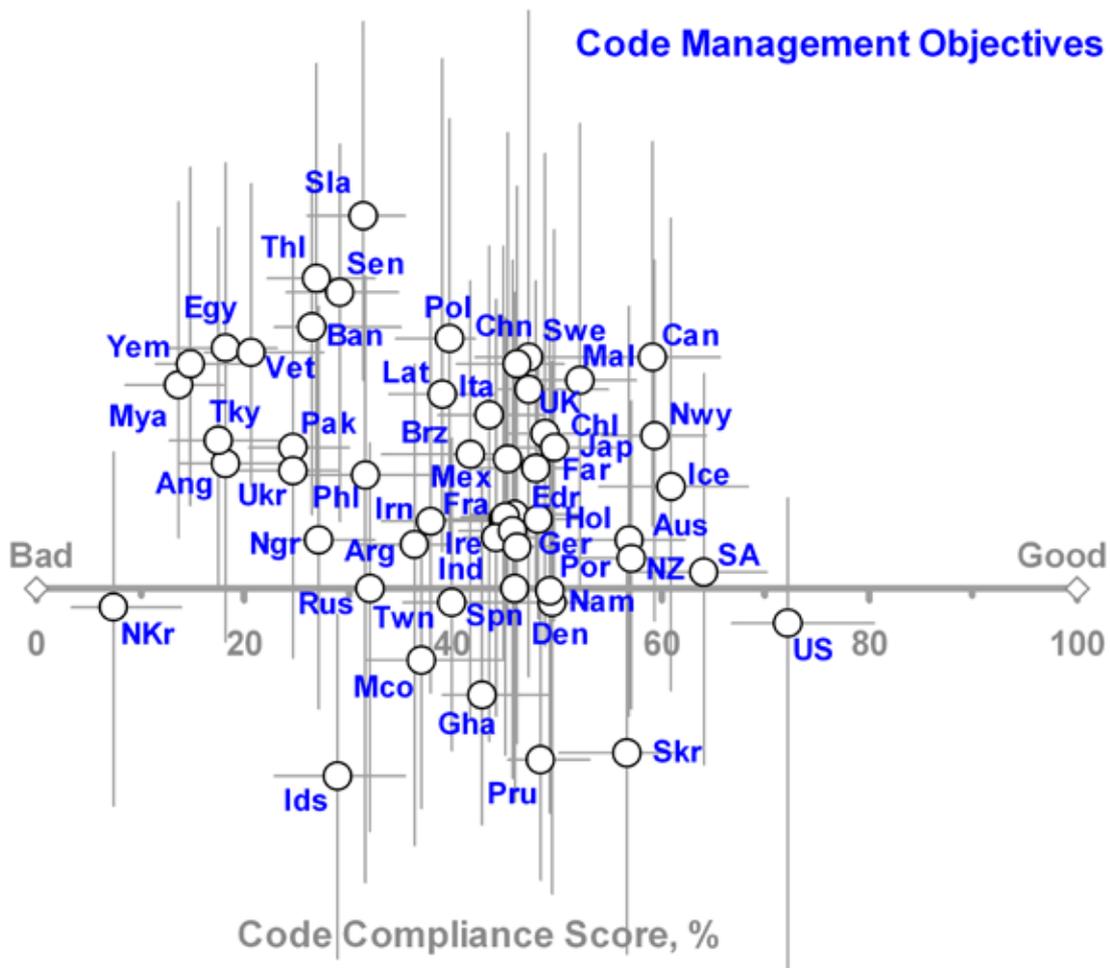
Code Management Objectives
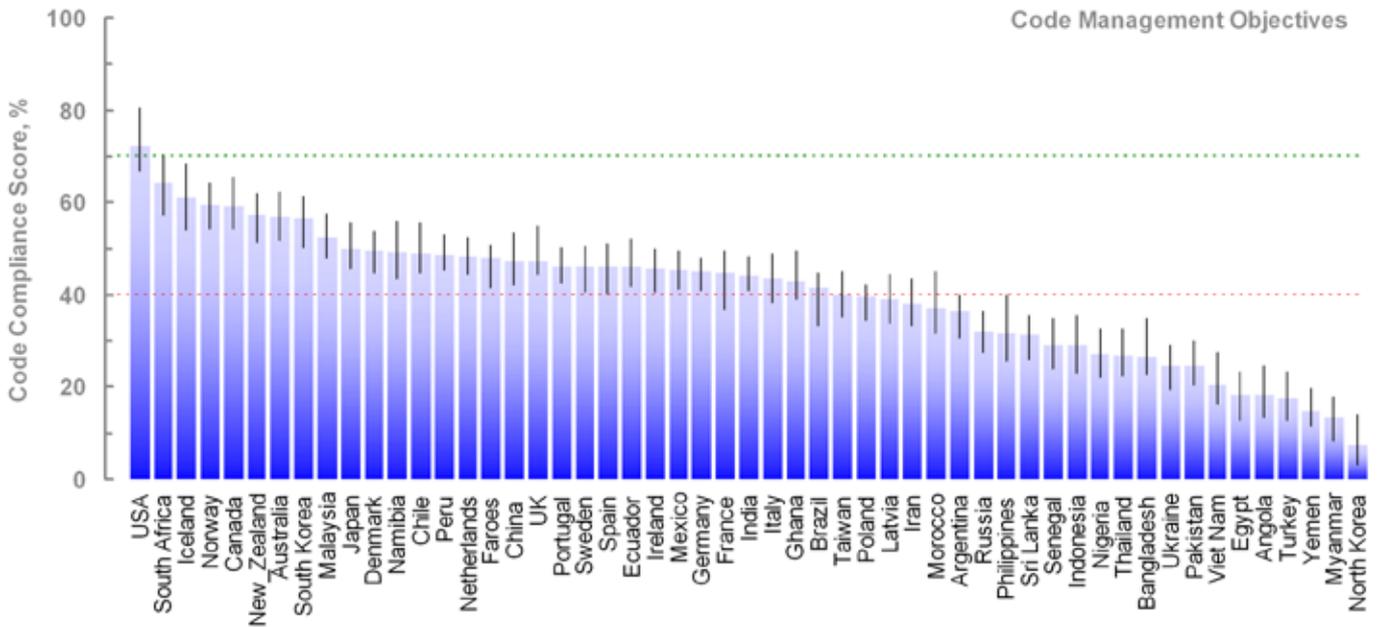
Management Framework: Code Compliance Evaluation Field 2

Evaluation of compliance for fishery management objectives in this field addresses Code of Conduct clauses 7.1.1; 7.1.2; 7.1.3; 7.1.4; 7.1.6; 7.1.9; 7.3.1; 7.3.2; 7.3.3; 7.4.2; 7.4.4 and 7.4.5, and is based on scores for seven questions:

Are total & complete removals from this stock over the whole stock area and over whole life cycle accounted for in assessment?

Are management measures compatible with those of other jurisdictions concerned with this stock?

Does the management plan have clearly stated long-term objectives?

Are all the stakeholders in this fishery resource identified and considered?

Are data, management processes and decision-making open and transparent, including any international aspects?

Are timely, complete and reliable statistics collected and verified?

Are social, economic and institutional factors related to sustainability evaluated with data?

(Note that full details of the questions and scoring guidelines are given in Annex 1). Results of the statistical ordination for this evaluation field are shown below complete with confidence limits, together with the rank order and overall compliance scores of our 53 countries

The ordination plot (below) shows that the position of most countries on the y-axis is reasonably certain (vertical confidence limit bars), although Canada, UK, Ecuador and Russia have larger limits. As in field 1, uncertainly in the x-axis is much smaller, and this is the ordination axis that our method has set as expressing Code compliance. Overall, the compliance ratings shown in may be used with reasonable confidence.

For a country with reasonably progressive legislation and management capacity, this field, management framework, should be an easy one in which to which to score well. However, the analysis finds that only 9 (16%) of countries are within range of good compliance scores (Iceland, New Zealand, Australia, USA, Japan, Canada, Norway, South Africa, Faroes and Malaysia.

The analysis identifies a quarter of the countries (13, 25%) that fall below the fail grade in compliance with Code's requirement on management objectives (Thailand, Turkey, Argentina, Viet Nam, Iran, Angola, Sri Lanka, Egypt, Nigeria, Bangladesh, Myanmar, Yemen, and North Korea).

Code Framework

Other Distingishing Features — Bad / Good

Code Compliance Score, %

CCRF Compliance Score, %
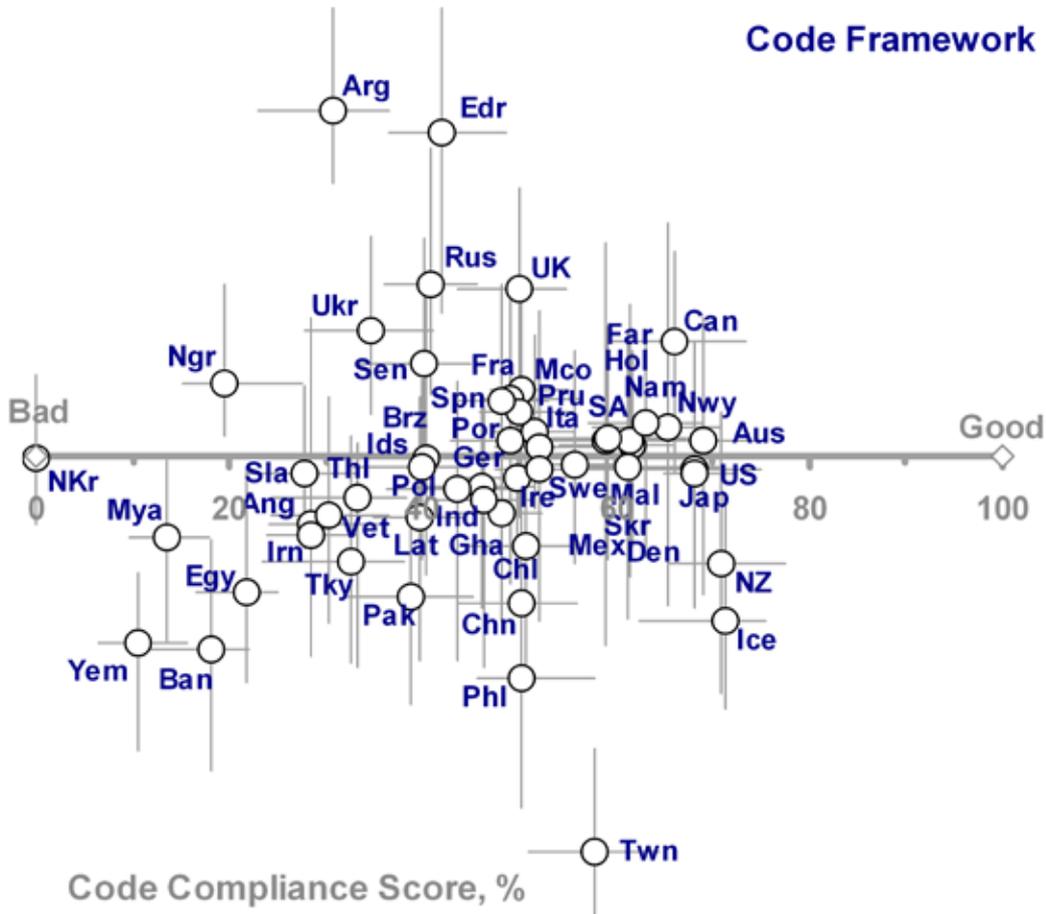
Code Framework
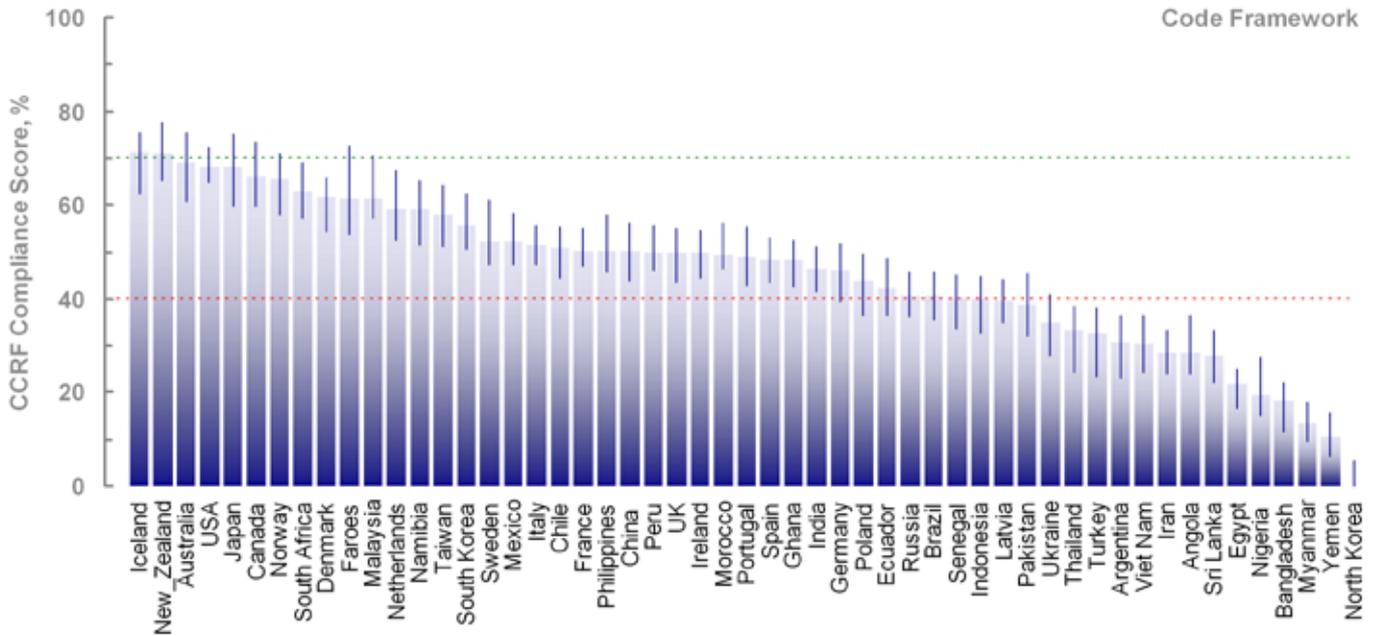
The Precautionary Approach: Code Compliance Evaluation Field 3

Evaluation of compliance for fishery management objectives in this field addresses Code of Conduct clauses 7.1.4; 7.2.1; 7.2.2; 7.2.3; 7.4.3; 7.5.1; 7.5.3; 7.5.5; 7.6.8 and 7.6.9, and is based on scores for nine questions:

Is precaution explicitly enshrined in legislation, and is precaution applied to management of this country's fishery stocks?

Is uncertainty, including lack of appropriate information, quantified and used to reduce fishing that might otherwise occur?

Are stock-specific target reference points estimated and employed?

Are stock-specific limit reference points estimated and employed?

Are there viable contingency plans to restrict fishing in the event of an environmental emergency?

Are there viable contingency plans to restrict fishing in the event of an unforeseen emergency caused by excess fishing?

Are management instruments under continuous review?

Are no-take areas of sufficient size to work, established and effectively policed and monitored?

Are plans in place to restrict fishing if species linked through the ecosystem (predators, prey or competitors) with the target species become threatened?

(Note that full details of the questions and scoring guidelines are given in Annex 1). Results of the statistical ordination for this evaluation field are shown below complete with confidence limits, together with the rank order and overall compliance scores of our 53 countries.

For this field, the ordination plot (below) shows that the position of most countries on the y-axis is reasonably certain (vertical confidence limit bars), although Iceland, Chile and Philippines have larger limits. Uncertainly in the x-axis is somewhat less, and this is the ordination axis that our method has set as expressing compliance. Most of the countries spread out well on the ordination, but there is a small cluster of overlapping error bars for mainly European countries top right. Overall the plot suggests that we may use the compliance ratings with reasonable confidence.

A precautionary approach is quite hard to achieve using the classical techniques of single species stock assessment, gear restrictions and quota management. Moreover, its conceptual basis is less than solid given its origin in a diluted and more practical version of the much stronger Precautionary Principle. Nevertheless, the Code of Conduct is quite clear about how and when it should be applied to fishery management and this is captured by our nine questions.

It is therefore not surprising that compliance evaluations in this field are lower than the others in this 'intentions of management' section. We find that only one country (USA) is with range of "good", and only seven (13%) were rated as "passable" (Canada, South Africa, Denmark, Iceland, Australia, Norway, New Zealand). Canada's higher rating in the field relies largely on its well-drafted fisheries legislation, which explicitly mentions precaution.

The analysis shows that about half of the countries (26/53, 49%) get a "fail grade" for compliance with Code's requirement on precaution. Given the importance of the precautionary approach in achieving sustainable fisheries, this bad performance is lamentable. At least in part, it likely reflects a failure to communicate precisely what the precautionary approach means in terms of fishery management. For example, many of these 'fail grade' countries express the objectives of their national fishery management as securing more food and economic wealth with no mention of the need for precaution. The Code of Conduct makes the necessary approach abundantly clear and it is therefore a shame that it has not been read properly or thoroughly.

Code Precautionary Approach
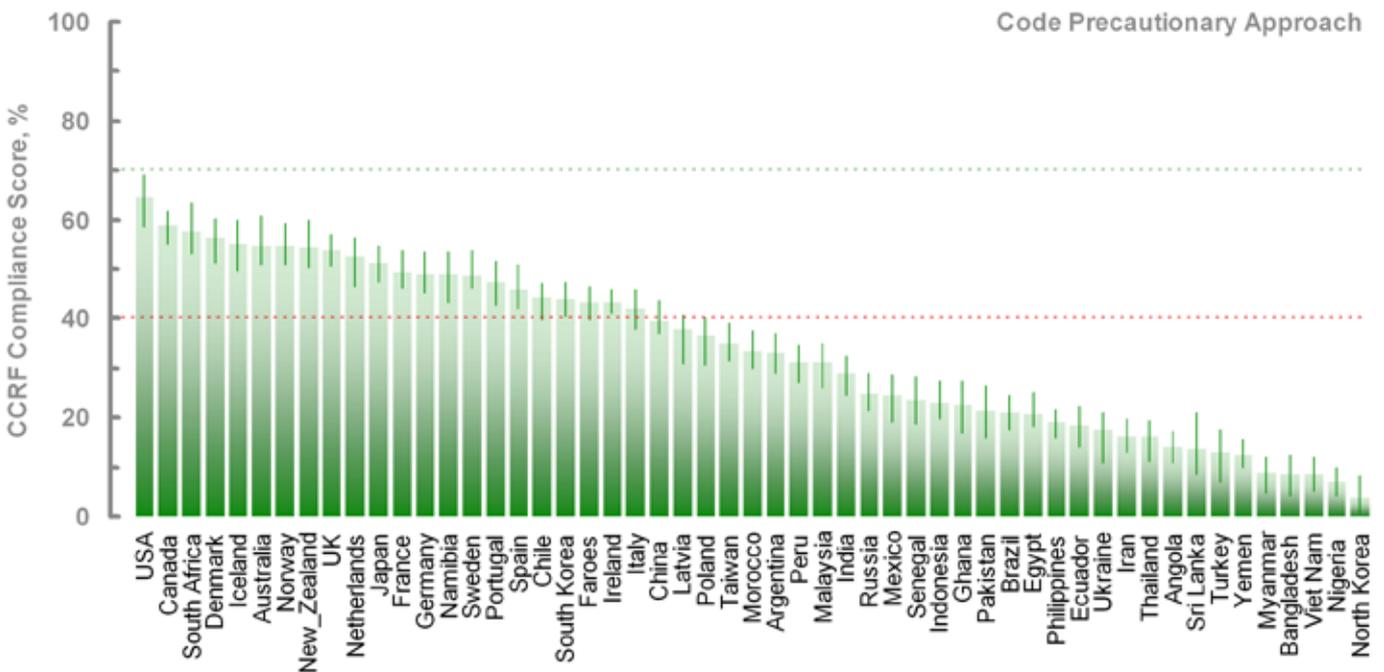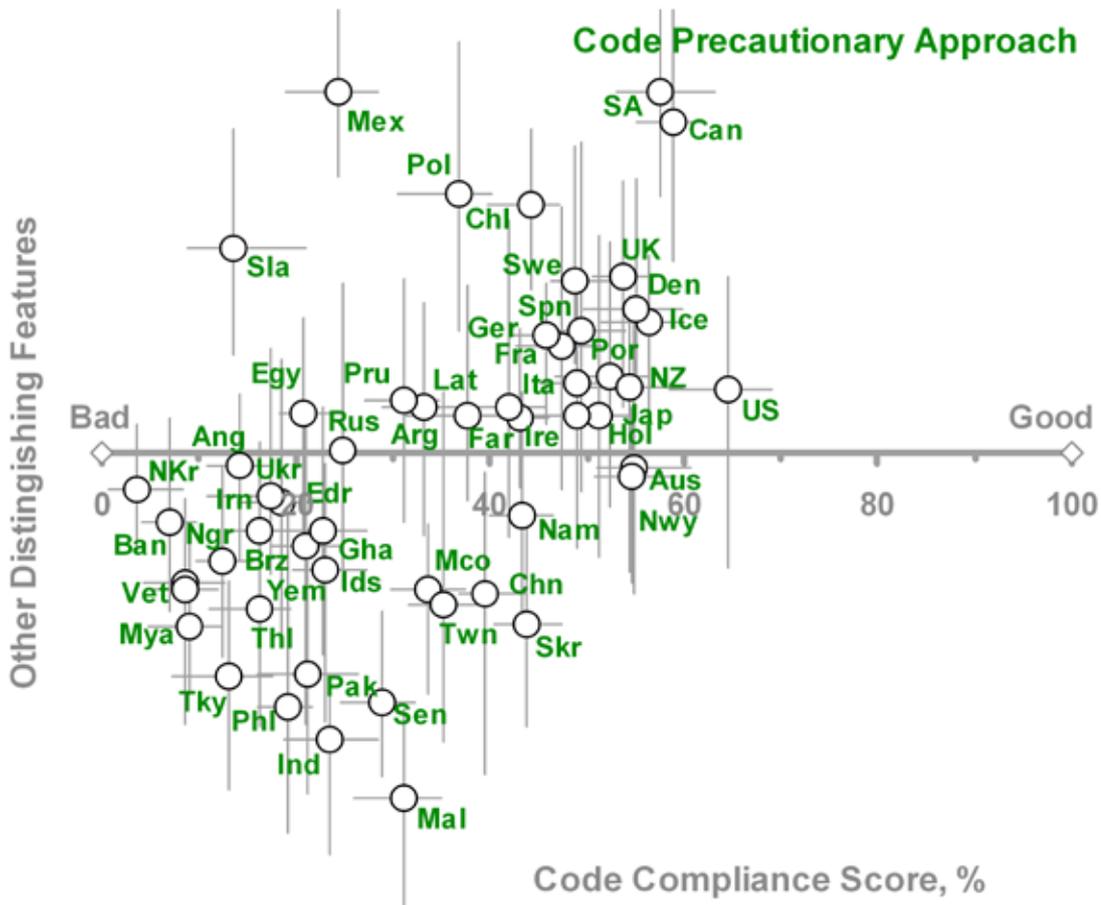
Stocks, Fleets and Gear: Code Compliance Evaluation Field 4

Evaluation of compliance for fishery management objectives in this field addresses Code of Conduct clauses 7.2.2; 7.2.3; 7.6.3; 7.6.9 and 7.6.10 and is based on scores for seven questions:
Is excess fleet capacity being reduced?
Are fishing methods known to be harmful to habitats, to create by-catch problems, or whose high fishing capacity is difficult to control, being phased out?
Is by-catch of non-target species minimized and is by-catch reduction gear mandatory?
Are discards minimized, effectively reported, or mandated at zero or low levels?
Is the gear designed to minimise ghost fishing if lost?
Is the fishing of juveniles and spawners restricted to safe levels and is there effective enforcement of the regulations?
Are depleted stocks being effectively rebuilt?
(Note that full details of the questions and scoring guidelines are given in Annex 1). Results of the statistical ordination for this evaluation field are shown below complete with confidence limits, together with the rank order and overall compliance scores of our 53 countries

The ordination plot shows that the exact position of most countries on the y-axis is quite uncertain (vertical confidence limits bars), but this does not affect our analysis since uncertainly in the x-axis is much smaller, which is the direction that our method has set as expressing compliance. The confidence bars in the centre of the cluster of countries overlap somewhat, suggesting that the exact rank order is uncertain, but the scores are sufficiently distinct to distinguish countries with higher, medium, low-medium, and low compliance. Therefore the compliance ratings may be are used with reasonable confidence.

This field, compliance with the Code requirements in stock, fleet and gear management, should be easy to comply with, since it covers very traditional areas of fisheries management, such as permitted gears, overcapacity and discards, where good practice is largely based on single species and has been well known since the work of Beverton and Holt, Ricker and others in the 1950s.

It is therefore very disappointing, and somewhat surprising, that none of the 32 countries manages a "good" compliance score over 70%. Only one country (Norway) achieves a passable compliance score over 60%. Moreover, the analysis shows that no less than 81% (43/53) of the 32 countries fall below the fail grade in compliance with Code's requirements on stock, fleet and gear management. The widespread failure to address ghost fishing, discards and by-catch (see separate topics sections) is especially lamentable, as is the presence in this of list of 'fail grades' from 12 developed nations, mainly from Europe.

Code Stocks, Fleets & Gear

Other Distingishing Features

Code Compliance Score, %

Good

NKr, Twn, Mal, Irn, Lat, Mex, Ngr, Brz, Phl, Ita, Ind, Arg, Chn, Edr, Ukr, Spn, NZ, Thl, Pak, Ban, Ids, Fra, Mco, Rus, Chl, Por, Egy, Ger, US, Sla, Sen, Den, Hol, Mya, Yem, UK, Tky, Ire, Jap, Aus, Vet, Gha, Swe, SA, Nam, Ang, Pol, Far, Pru, Nwy, Can, Ice

Code Stocks, Fleets & Gear

Code Compliance Score, %

Norway, Canada, Iceland, Australia, USA, Faroes, South Africa, Sweden, Namibia, New_Zealand, UK, Chile, Portugal, Peru, Germany, France, Denmark, Netherlands, China, Mexico, Argentina, Ireland, Malaysia, Italy, Japan, South Korea, Brazil, Pakistan, Poland, Spain, Latvia, Thailand, India, Taiwan, Philippines, North Korea, Ghana, Indonesia, Senegal, Russia, Iran, Nigeria, Yemen, Ukraine, Ecuador, Viet Nam, Sri Lanka, Myanmar, Turkey, Egypt, Angola, Morocco, Bangladesh

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Social and Economic Factors: Code Compliance Evaluation Field 5

Evaluation of compliance for fishery management objectives in this field addresses Code of Conduct clauses 7.1.6; 7.1.9; 7.2.2; 7.4.2; 7.4.3; 7.4.5; 7.6.5; 7.6.6; 7.6.7 and 7.7.4, and is based on scores for six questions:

Is the fishery managed so as to minimise conflict among different sectors?

Are Indigenous Peoples rights and needs being met?

Are the needs of local fishing communities being met?

When a change to the management of the fishery is made, is its cost-effectiveness evaluated?

When a change to the management of the fishery is made, is its social impact evaluated?

Is funding for the research, observers and MCS programme for this fishery obtained by cost recovery from the industry?

(Note that full details of the questions and scoring guidelines are given in Annex 1). Results of the statistical ordination for this evaluation field are shown below complete with confidence limits, together with the rank order and overall compliance scores of our 53 countries

The ordination (below) shows that the exact position of most countries on the y-axis is quite uncertain (vertical confidence limits bars), but, as in other fields where this occurs, this does not affect the analysis since uncertainly in the x-axis is much smaller, which is the direction that the method has set as expressing compliance. The x-axis confidence bars in the centre of the cluster of countries at right centre overlap somewhat, suggesting that the exact rank order is uncertain, but the scores are sufficiently distinct to distinguish countries with higher, medium, low-medium, and low compliance. Therefore the compliance ratings may be used with reasonable confidence.

This field, encompassing how local fishing communities, indigenous peoples are dealt with, social and economic cost effectiveness, covers areas that have long been of concern in fishery management. The Code emphasizes their importance for long term sustainability. It is therefore surprising that only one country (Japan) achieves a "good" compliance score in this field, probably on account of the traditional community management in its domestic fisheries. Only one other country (Namibia) makes the 'passable' grade of over 60%. Again, almost half (23/53, 44%) countries are awarded a fail grade in this field

Code Social & Economic

Code Compliance Score, %

Code Social & Economic
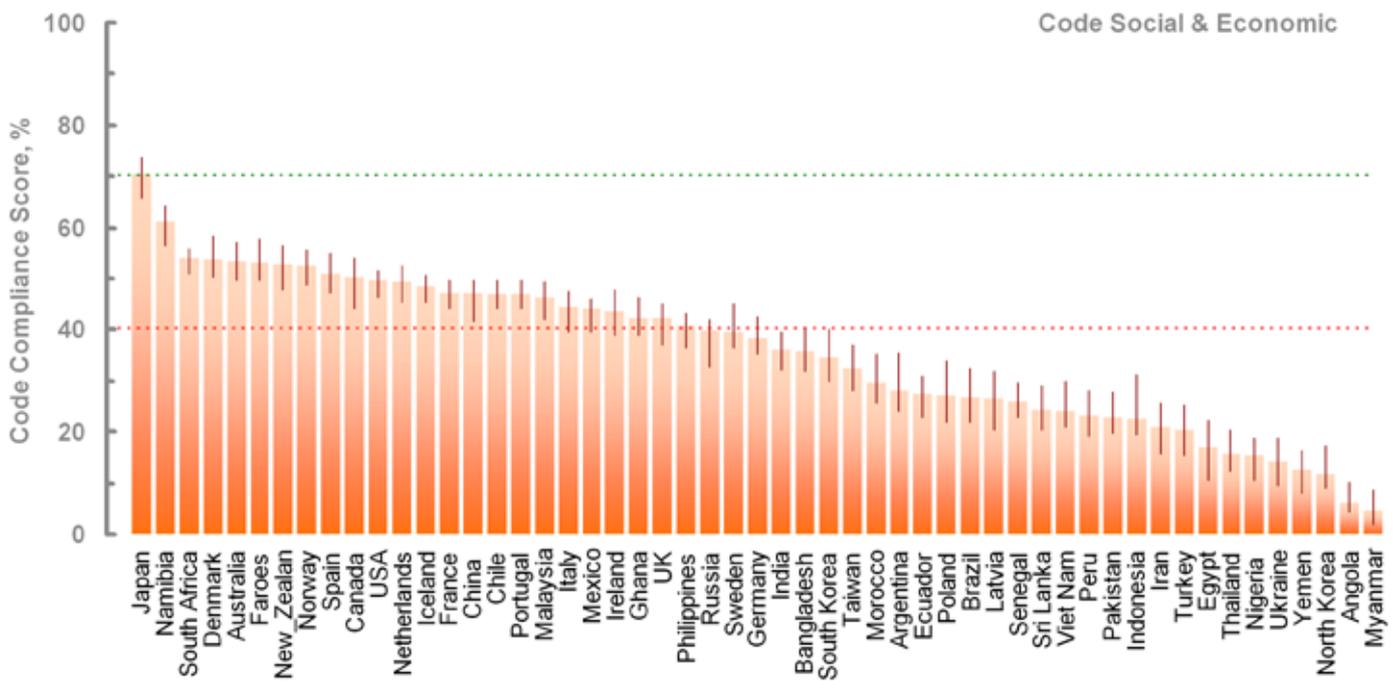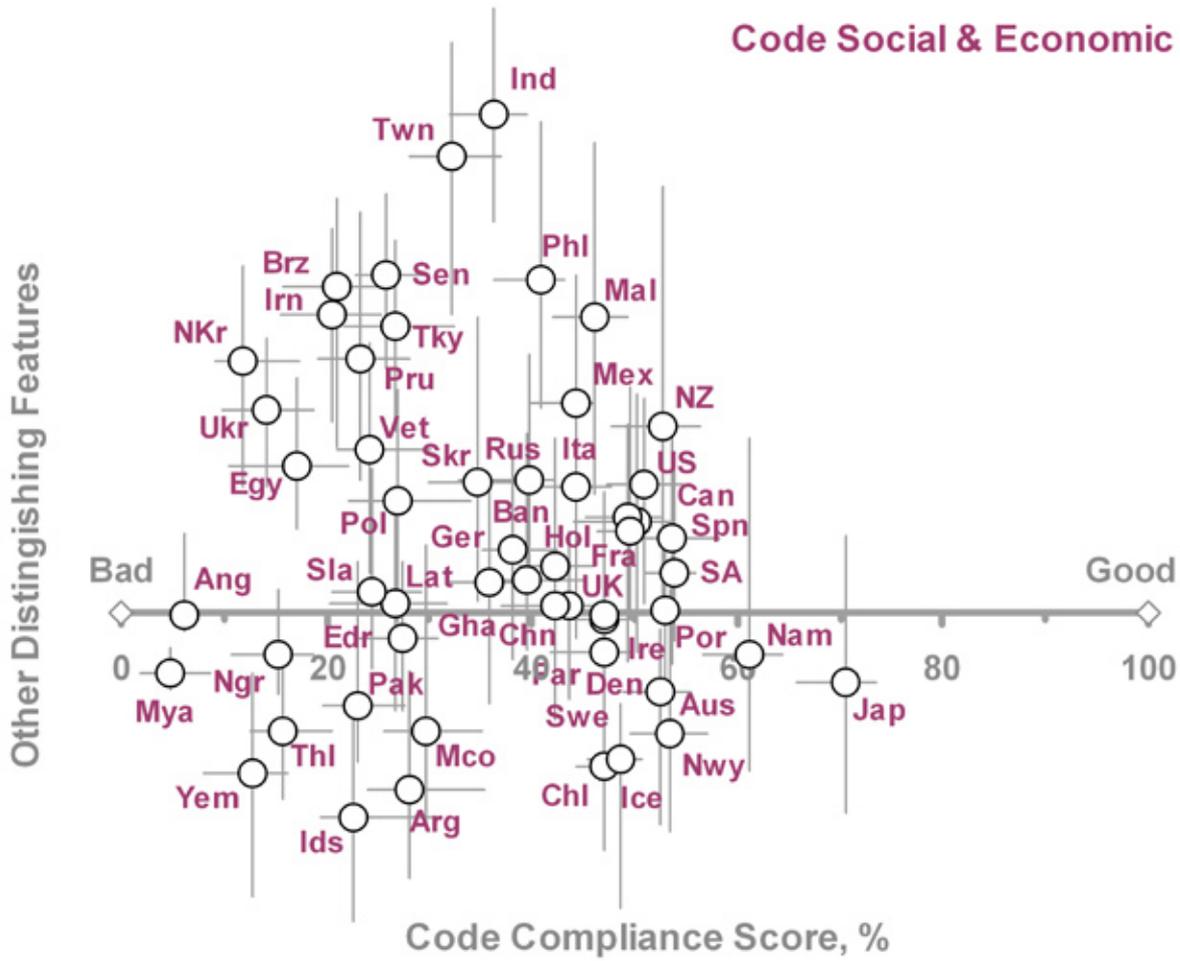
Monitoring, Control & Surveillance: Code Compliance Evaluation Field 6

Evaluation of compliance for fishery management objectives in this field addresses Code of Conduct clauses 7.1.7; 7.4.4; 7.6.2; 7.7.1; 7.7.3; 7.7.5 and 7.8.1; parts of Article 8; and is based on scores for six questions:
How effective is the observer scheme?
How effective is the catch inspection scheme?
How effective is the vessel monitoring scheme?
Are vessels fishing illegally in the area of this fishery?
How effective is control of access in stopping illegal fishing?
Are vessels that really derive from this jurisdiction re-flagged in states of convenience to avoid reporting or other fishery regulations.
(Note that full details of the questions and scoring guidelines are given in Annex 1). Results of the statistical ordination for this evaluation field are shown below complete with confidence limits, together with the rank order and overall compliance scores of our 53 countries.

The ordination plot (below) shows that most countries have quite large error bars on the y-axis (vertical confidence limits bars), but, as in other fields where this occurs, this does not affect the analysis since uncertainly in the x-axis is much smaller, which is the direction that our method has set as expressing compliance. The x-axis confidence bars for the cluster of countries at the centre of the plot right centre overlap somewhat, suggesting that the exact rank order is uncertain, but the scores are sufficiently distinct to distinguish countries with higher, medium and low compliance. Therefore the compliance ratings may be used with reasonable confidence.

This field encompasses high-tech MCS measures such as observers, data and VMS schemes balanced with scores for the amount of illegal fishing, its effective control, and the use of Flags of Convenience (see Annex 1). It therefore covers areas that have only recently been widely recognized as important for long term sustainability in fishery management. Nevertheless, the Code of Conduct puts great weight on their importance.

Four countries (Namibia, Norway, Australia and Canada) achieve "good" scores for MCS of 70% or over, while another 5 countries (Japan, Iceland, US, faroes and New Zealand) achieve a "passable" grade of over 60%. Two developing nations, Malaysia and Pakistan, deserve credit for gaining intermediate scores. Fifteen countries (28%) get a fail grade in this field. MCS is expensive, but costs can be covered using targeted development aid and/or user fees, especially for fisheries where there are distant water fleets or joint venture agreements with developed nations seeking supplies for the burgeoning international seafood trade. Although too new to rate in our evaluations, new MCS developments in Indonesia and Morocco may signal a good way forward.

Code Monitoring, Control & Surveillance

Other Distingishing Features — Bad ... Good

Code Compliance Score, %

Spn, Twn, Skr, Jap, Nwy, Rus, Swe, Hol, Ice, Ukr, Mco, Chn, Chl, US, Edr, Arg, UK, NZ, Can, Gha, Fra, SA, Mya, Den, Ger, Pol, Ire, Aus, Ids, Pru, Por, Nam, Tky, Far, Brz, Mex, Mal, Ngr, Ita, Pak, Yem, Sen, Ban, Ind, Thl, Lat, Phl, Ang, Sla, Irn, Vet

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Code Monitoring, Control & Surveillance

Code Compliance Score, %

Namibia, Norway, Australia, Canada, Iceland, New_Zealand, Japan, USA, Faroes, Germany, South Africa, South Korea, Chile, Malaysia, Ireland, Portugal, France, Poland, Pakistan, UK, Denmark, Mexico, Ghana, Peru, Netherlands, Sweden, Senegal, India, Brazil, China, Philippines, Latvia, Argentina, Indonesia, Iran, Italy, Spain, Taiwan, Morocco, Yemen, Ecuador, Ukraine, Russia, Egypt, Viet Nam, Turkey, Sri Lanka, Thailand, Myanmar, Bangladesh, North Korea, Angola, Nigeria

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