

AGGREGATE PERFORMANCE OF COUNTRIES IN MANAGING THEIR EEZS¹

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ABSTRACT

Fourteen indicators of resource managements, expressive both of intention and effectiveness, and fully documented in the other contributions included in this report, were used to assess how 53 maritime countries, making up over 95% of the global catch, perform with regard to the resources in their Exclusive Economic Zone. Ranking of the 53 countries are presented for different weightings of the indicators, reflective of four scenarios also used in the Global Environment Outlook 4 (GEO4), i.e., Market First; Policy First; Security First, and Sustainability First. The rankings differed substantially between different scenarios for the top performing countries (New Zealand, Peru, Germany, Netherlands, USA) and less so for the poorer performing countries (Bangladesh, Faeroes Islands, India, Brazil, North Korea).

INTRODUCTION

The requirements of Ecosystem-Based Management of Fisheries (Pikitch *et al.*, 2004) have resulted in an increased demand for methods for assessing how well-managed are the marine ecosystems in which fisheries are embedded. In response, criteria for sustainable fisheries practices have been developed, e.g., by the Marine Stewardship Councils (May *et al.*, 2003), or in the form of a voluntary 'Code of Conduct for Responsible Fisheries' (FAO, 1995). These approaches are comprehensive in assessing capture fisheries and their collateral impacts on marine ecosystems, as well as the social and economic implications of fishing activities. However, they remain fishery-centric in that they do not explicitly consider other components of marine ecosystems, such as seabirds and marine mammals, and other sectors such as mariculture. This is a reflection of multiple agencies having partial and overlapping jurisdictions, but none being responsible for the EEZ as a whole. This makes a comprehensive assessment of the effectiveness of these agencies problematic, not to mention the ecosystems in the EEZs thus managed.

Over the last two years the *Sea Around Us* Project has supported a number of initiatives that are now contributing to broad-based assessments of the performance of a number of countries in managing marine resources (Pauly, 2007). A number of these studies are included in this report, and the present contribution is a preliminary synthesis of this work.

MATERIAL AND METHODS

The countries included in this study, and in all other contribution in this report, are listed, by region, in Table 1. These countries, which jointly account for 95% of world fisheries catches, were originally selected by Pitcher *et al.* (2008a) for scoring in terms of their compliance with FAO's Code of Conduct for Responsible Fisheries' (see above). They also represent a range of EEZ sizes, levels of economic development, management regimes and regions, and are thus considered representative of the world as a whole.

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Table 1. List of maritime countries (and territories¹) considered in this study.

Region	Countries (or Territories) ¹
Africa	Angola, Egypt, Ghana, Morocco, Namibia, Nigeria, Senegal, South Africa.
Asia	Bangladesh, China, India, Indonesia, Iran, Japan, Korea (North), Korea (South), Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka, Taiwan, Thailand, Turkey, Viet Nam, Yemen.
Europe	Denmark, Faeroes Islands, France, Germany, Iceland, Ireland, Italy, Latvia, Netherlands, Norway, Poland, Portugal, Russian Federation, Spain, Sweden, Ukraine, United Kingdom.
N. America	Canada, Mexico, Contiguous states of the USA.
Oceania	Australia, New Zealand.
S. America	Argentina, Brazil, Chile, Ecuador, Peru.

¹Used in cases where the ecosystems in the EEZs around the territories have distinct ecological features, differing from those of the core countries, and/or are managed separately.

A total of 14 indicators were assembled for this study, and assigned to one of three broad categories ('Biodiversity' 'Value' and 'Jobs'). They pertain largely to the period 2000-2004, and are briefly described in the following (bracketed acronyms refer to headers in Appendix 1):

Biodiversity-related indicators (b):

- 1) Marine Protected Area Coverage (MPA_{area}): the area formally protected in the EEZ of each country in Table 1, as assessed by data in www.seaaroundus.org, assembled by Wood *et al.* (2008), relative to the area of its EEZ (see Mondoux *et al.*, this vol.);
- 2) Investment to Marine Protected Areas (MPA_{inv}) an index of the cost of maintaining MPAs in the various countries, adapted from Balmford *et al.* (2004), relative to the value of their fisheries (Cullis-Suzuki and Pauly, this vol.);
- 3) Change in EEZ Area Trawled (EEZ_{trawl}), as assessed from trawl catches and related data (in www.seaaroundus.org), relative to the area of its EEZ (see Mondoux *et al.*, this vol.);
- 4) Ecological components of Mariculture Sustainability Index (MSI_{ecol}; Trujillo, this vol.);
- 5) Seabird Protection Index (BIRD_{prot}), composed of elements reflecting both intention and effectiveness on the ground (Karpouzi and Pauly, this vol.);
- 6) Marine Mammal Protection Index (MAM_{prot}), composed of elements reflecting both intention and effectiveness on the ground (Swartz *et al.*, this vol.);

Value-related indicators (v):

- 7) Landed Value Relative to GDP (LV_{GDP}), i.e., the ex-vessel value of the total catch of a country (Sumaila *et al.*, 2007) relative to Gross Domestic Product of that country (Mondoux *et al.*, this vol.);
- 8) The fishmeal consumption by Mariculture (MEAL_{mar}), relative to its mariculture production (Mondoux *et al.*, this vol.);
- 9) Compliance with the FAO Code of Conduct for Fisheries (CODE_{FAO}), as assessed by Pitcher *et al.* (2008a), and as reported here in Mondoux *et al.* (this vol.);
- 10) Context-Adjusted Fisheries Statistics Indicator (STAT_{rep}), which measures the effectiveness of countries' fisheries reporting systems (Pauly and Watson, this vol.)
- 11) 'Good' to 'Good + Bad' subsidies Ratio (SUB_{good}), which measures financial resource allocated to management and surveillance relative to the sum of such 'good' subsidies and 'bad' (capacity enhancing) subsidies (Mondoux *et al.*, this vol.).

Job-related indicators (j):

- 12) Catch Relative to Fuel Consumption (CATCH_{fuel}), based on Tyedmers *et al.* (2005; see Mondoux *et al.*, this vol.);
- 13) Subsidies Relative to Landed Value (SUB_{LV}), overall subsidies scaled by the value of the catch (Sumaila *et al.*, 2007; Mondoux *et al.*, this vol.);
- 14) Socioeconomic Component of Mariculture Sustainability Index (MSI_{soc}), as defined by Trujillo (this vol.).

For seabirds (5), marine mammals (6) and the code of conduct (9), the indicators initially consisted of multiple elements, reflecting a country's intentions to manage the resources and its actual implementation. However, a correlation analysis including these variables suggested strong auto-

correlation. Thus, single, combined indicators were used for seabirds, marine mammals and the code of conduct (Appendix 1), which removed the autocorrelation problem. Appendix 1 presents the values of these indicators for the 53 countries and territories.

Aggregate score were computed as the average score of the 14 indicators described above. (But note that Angola, Ghana and Latvia do not have a mariculture sectors, and their aggregate scores are based on 12 indicators instead). Pairwise correlation coefficients were calculated to investigate auto-correlation among the 14 variables. The behavior of the 14 indicators was investigated using a Principal Component Analysis using the STATA statistical package (see www.stata.com).

Other approaches could be taken to derive an aggregate score, e.g., through weighting the indicators. Here, however, the relative weightings to assign are a matter of perception; thus, people concerned with conservation weight indicators for seabirds and marine mammals much higher than people who are interested in managing the fishery industry (see below).

One solution to this problem, elaborated further below, is to make the data from this study (Appendix 1) widely available, including through the *Sea Around Us* Project web site (www.seararoundus.org) and allow users to determine their own weightings and conduct their own analysis (The FAO Code of Conduct data for the 53 countries of this study can be found in Pitcher *et al.*, 2008b).

The other solution is to use weights reflecting different pre-existing scenarios and, because they include a framework for possible development, constrain the subjective component of assessments (see e.g. Pauly *et al.* 2003). As in Alder *et al.* (2007), we chose here to weight the indicators by mapping them onto the global scenarios used in the Global Environment Outlook 4 (GEO4; UNEP, 2007). The current four GEO4 scenarios represent 4 plausible futures for the world in terms of economic development, social policies, technological advances and ecosystem management.

Table 2. GEO4 scenario weightings (Alder *et al.*, 2007) mapped on 14 indicators of marine resources and ecosystem status in EEZs.

Criteria\GEO4 Scenarios	Market First	Policy First	Security First	Sustainability First
Biodiversity (b)	2.00	5.00	0.00	10.00
Value (v)	1.00	1.00	0.30	0.10
Jobs (j)	0.33	1.00	1.00	0.10
Indicator* (category)				
1) MPA _{area} (b)	2.00	5.00	0.00	10.00
2) MPA _{inv} (b)	2.00	5.00	0.00	10.00
3) EEZ _{trawl} (b)	2.00	5.00	0.00	10.00
4) MSI _{ecol} (b)	2.00	5.00	0.00	10.00
5) BIRD _{prot} (b)	2.00	5.00	0.00	10.00
6) MAM _{prot} (b)	2.00	5.00	0.00	10.00
7) LV _{GDP} (v)	1.00	1.00	0.30	0.10
8) MEAL _{mar} (v)	1.00	1.00	0.30	0.10
9) CODE _{FAO} (v)	1.00	1.00	0.30	0.10
10) STAT _{rep} (v)	1.00	1.00	0.30	0.10
11) SUB _{good} (v)	1.00	1.00	0.30	0.10
12) CATCH _{fuel} (j)	0.33	1.00	0.10	1.00
13) SUB _{LV} (j)	0.33	1.00	0.10	1.00
14) MSI _{soc} (j)	0.33	1.00	0.10	1.00

*The numbers refer to the bulleted definition in the text.

As the names suggest, the Market First future is focused on using economic policies to drive development, including economic incentives to improve environmental management and technology to mitigate impacts. In a Policy First future, the focus is on the economical and social policies that facilitate development and override environmental concerns. In the Security First world, it is the rich and powerful who seek to optimize their economic and social well-being; they support environmental policies only if it is for their benefit to do so. Finally, in a Sustainability First scenario, the mix of environmental and social policies are somehow balanced (UNEP, 2007).

RESULTS AND DISCUSSION

The correlation matrix of the 14 variables across the 53 countries indicated 7 of the 91 correlation coefficients (r) were greater than 0.40; the maximum r -value, pertaining to the correlation between the two mariculture indicators (ecological and socio-economic sustainability) was 0.72. The principal component analysis (PCA) of the unweighted scores accounted for more than 50% of the variation of the

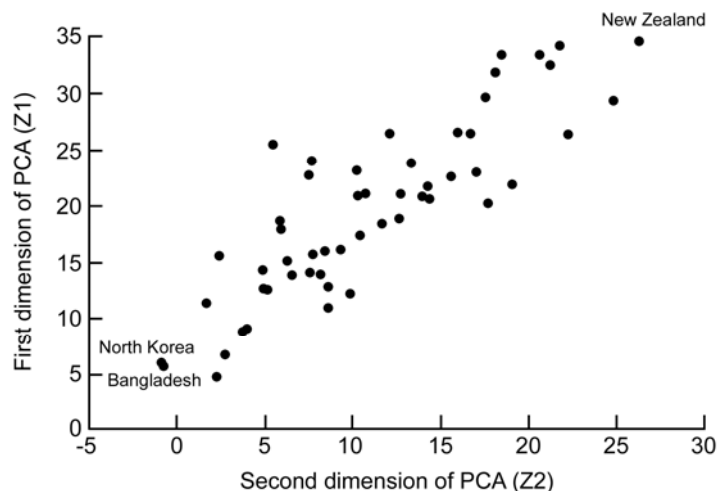


Figure 1. Principal component analysis of the unweighted score of 53 countries, showing the clear separation of countries in a plot of the first dimension (Z1) versus the second (Z2). Two countries characterizing the extreme are shown.

Table 3. Aggregate scores (unweighted) for marine resources management for 53 maritime countries

Country	Aggregate Score	Country	Aggregate Score
New Zealand	5.5	Portugal	4.0
Peru	5.2	Latvia	3.9
Germany	5.2	Ukraine	3.9
Netherlands	5.1	Malaysia	3.9
USA	4.8	Philippines	3.9
South Africa	4.8	Morocco	3.9
Australia	4.8	Argentina	3.8
UK	4.8	Mexico	3.8
Sweden	4.6	China	3.7
Senegal	4.6	Turkey	3.6
Spain	4.5	Angola	3.6
Japan	4.5	Taiwan	3.6
Chile	4.4	Ghana	3.6
Namibia	4.4	Thailand	3.6
Canada	4.4	Indonesia	3.5
Ireland	4.4	Pakistan	3.4
France	4.4	Viet Nam	3.3
Denmark	4.4	Myanmar	3.3
Iceland	4.3	Yemen	3.3
South Korea	4.2	Sri Lanka	3.2
Poland	4.2	Iran	3.0
Norway	4.2	North Korea	2.8
Nigeria	4.1	Brazil	2.8
Russia	4.1	India	2.7
Egypt	4.0	Faeroes	2.7
Ecuador	4.0	Bangladesh	2.3
Italy	4.0	--	--

14 scores in 3 dimensions. A plot of the country scores in the first two dimensions (Figure 1) illustrates the relative positions of countries along the first and second dimensions of the PCA.

The results of the PCA correspond to the unweighted aggregate score of the 53 countries (Table 3) where New Zealand scored the highest (5.5 out of 10) and Bangladesh the lowest (2.3). There is a trend for the developed countries to score higher than developing countries. However, Peru, South Africa and Senegal were in the top 10 scoring countries, while the Faeroes Islands are among the lowest 10 scoring countries.

The suite of 14 indicators when aggregated to a single (unweighted) score appear to be consistent in identifying high, average and poor performers across the 53 countries. For example, countries that scored well on fisheries statistics reporting and mariculture tended to have a high overall score, and conversely.

The scores weighted according to the GEO4 scenarios resulted in different rankings from the unweighted analysis (Table 4). For example, in the Policy First scenario, Egypt was in the top 5, while in the Security First scenario, it was in the bottom 5. Overall, however, the countries that scored low tended to score low in all scenarios (including Bangladesh and Faeroes Island). The top and middle rankings of countries were not consistent, except for a few such as New Zealand in the top performing countries (average ranking = 9), and Portugal (average ranking = 25) and Malaysia (average ranking = 29) in the middle performing countries.

Table 4. The five top, middle, and bottom-ranked countries when the GEO4 weightings for different scenarios are applied.

Ranking	Market First	Policy First	Security First	Sustainability First
Top 5	Poland	Poland	New Zealand	Germany
	Senegal	Senegal	Peru	Australia
	South Africa	Egypt	Iceland	Sweden
	USA	Spain	USA	Denmark
	Spain	South Africa	Norway	Spain
Middle 5	N. Korea	France	Malaysia	Namibia
	France	Namibia	Morocco	Argentina
	UK	UK	Argentina	Canada
	Ireland	Taiwan	Philippines	Peru
	Taiwan	Ireland	Mexico	Malaysia
Bottom 5	Bangladesh	Bangladesh	Bangladesh	Bangladesh
	Iran	Iran	North Korea	Faeroes
	Ukraine	Argentina	India	Iran
	Argentina	Faeroes	Brazil	Myanmar
	Faeroes	Ukraine	Egypt	Iceland

The PCA analysis of the weighted indicators also illustrates the differences in country rankings between the four GEO4 scenarios (Figure 2). The trend in the four scenarios is less well defined than for the unweighted PCA analysis (Figure 1). As well, the PCA trend for Security First (Figure 2C) and Sustainability First (Figure 2D) are orthogonal to the Market First (Figure 2A) and Policy First (Figure 2B) scenarios, and different from the unweighted analysis (Figure 1). The Security First and Sustainability First scenarios were expressed as orthogonal or at the opposite end of the spectrum to Market First and Policy First scenarios, which is reflected in the PCA analysis (Figure 2).

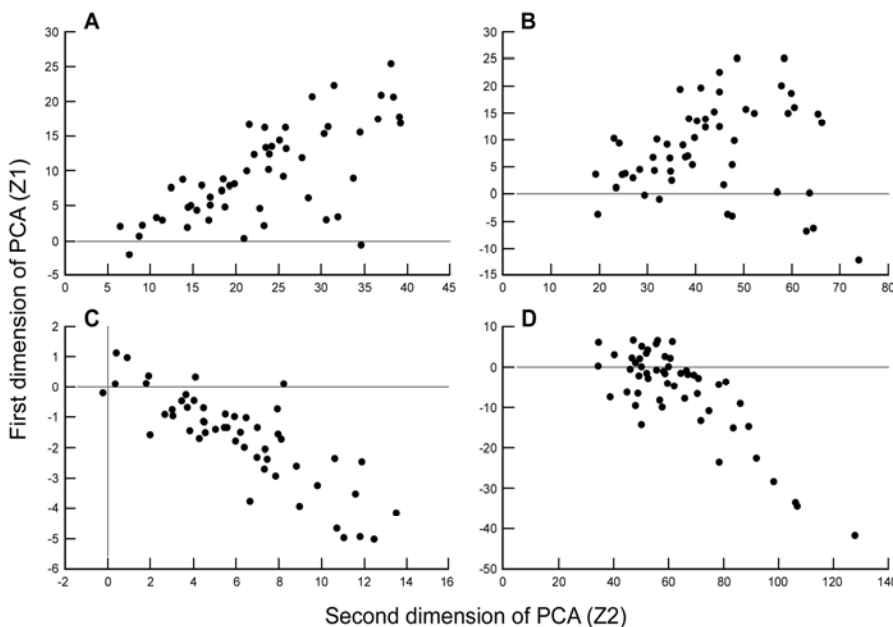


Figure 2. Principal component analysis of weighted scores of 53 countries based on the four GEO4 scenarios represented by 2A) market first scenario; 2B) policy first scenario; 2C) security first scenario; and 2) sustainability scenario.

first dimension and the $STAT_{rep}$ in the second dimension, while in Sustainability First (Figure 2D) it is MPA_{area} and MPA_{inv} along the first dimension and MAM_{prot} along the second.

The distribution of country scores in the PCA unweighted analysis is largely due to SUB_{good} and SUB_{LV} in the first and second dimensions. In the Market First analysis (Figure 2A), the same subsidies indicators have a strong effect on the distribution of the points (countries) along the first dimension. Along the second dimension, it is a combination of $CODE_{FAO}$ and $STAT_{rep}$ indicators, while in Policy First (Figure 2B) it is EEZ_{trawl} and other ecosystem related indicators and MSI_{ecol} in the second dimension. In the Security First (Figure 2C) analysis it is SUB_{good} and SUB_{LV} dominating the

Weighting has a significant impact on the ranking of all but the poorly performing countries. However, in the PCA analysis, for most scenarios, the countries that were the unweighted top performers were still positioned ahead of countries that performed poorly. Both analyses, using unweighted and weighted data, suggest that the 14 indicators used to estimate an aggregate marine resource management score do differentiate between performing countries in terms of how they manage the resource and ecosystems in their EEZs.

Although some indicators were explicitly designed to overcome this bias (e.g., STAT_{rep}, see Pauly and Watson, this vol.), the indicators, in the aggregate, appear to favor developed countries, which turn out mainly among the top performers. It could be argued that the reason why the poor performers were usually developing countries is because they do not have the funds to comply with the FAO Code of Conduct, and do not have the luxury of designating marine protected areas or financing their management. However, a closer look at the indicators suggests that this is not the case, since there is a range of indicators where developing countries are not disadvantaged, including marine mammal and seabird protection and status, use of fishmeal in aquaculture, and fisheries subsidies. (See other contributions in this report for details.)

Indeed, the countries that were found here to perform poorly include, at least for some scenarios, developed countries who could be expected to have better scores (e.g., Iceland, see Table 4), in addition to countries which, because of their crushing poverty (Bangladesh), sometimes combined with the stifling of civil society (North Korea, Myanmar), end up at the bottom of most lists of this sort.

On the other hand, the reason why countries such as New Zealand, the USA or Germany are among the top performers in Table 4 is mainly because these countries have been implementing, at least partly, measures to sustainably manage their marine resources, such as establishing networks of marine protected areas and financing their implementation, reducing or eliminating perverse subsidies, reducing trawling in their marine waters and reducing the fuel consumed in the fishing sector. These indeed, are the very actions whose full implementation is recommended in sector studies such as e.g., the Pew Ocean Commission for the USA (Anon., 2003). Some other countries – for example Peru - show up as top performers in Table 4 not because they are actively implementing such measures, but because the specific structure of their fisheries (overwhelmingly concentrated on anchovy in the case of Peru), and their state of development, happened to generate a high score under a given scenario, given the weights of each indicator (see Table 2). This emphasizes the need to screen the indicators and weighting factors used in a study of this type, our final theme.

These findings, and the quantitative data upon which they are based, suggest that ranking countries in terms of how sustainably they manage their EEZs is both straightforward and complex. It is straightforward – though work intensive – in term of specific indicators, which can be designed to capture a specific aspect of EEZs (e.g., their marine mammal populations, and how different countries manage them (see Swartz *et al.*, this vol.)). This is the reason why lots of indicators exist (see Cury and Christensen, 2005; Cury *et al.*, 2005). It is complex, and fraught with subjective hurdles, because it involves explicit values which are usually implicitly held (Rochet and Rice, 2005). This is why we used scenarios, with explicit emphasis on certain indicators and the consequent de-emphasis of others (Table 4).

Clearly, future work on the issue of indicators for EEZ management will have to focus on scenarios, and on the corresponding weighting schedule, which, this study show, are crucial to the credibility of any ranking schemes.

CONCLUSION

This assessment found that while we can rank countries from the highest to the lowest, the highest ranking country does not approach the high standards set either by international conventions or by consensus among scientists and managers. This is clearly seen in the area of MPAs set aside by countries compared to the CBD's interim target of 10% of national EEZs protected by 2010. In this study, only one country, Germany, stood above the rest with a score of 2 out of a possible 10, indicating that approximately 2% of its EEZ is protected. Similarly, only a few countries give subsidies that are considered beneficial to the sustainability fisheries, despite calls for the elimination of perverse subsidies.

Of the 53 countries of this study, only 4 had an unweighted score of more than 5 out of 10, and the maximum score was 5.5. These four countries are incorporating best practices in their management of marine resources, but with room for considerable improvement. The remaining countries have considerably more work to do in improving their practices and policies in managing fisheries, aquaculture development and marine mammals and seabirds. There are a number of initiatives that need to be developed especially in expanding MPA networks, reducing perverse subsidies and reducing areas available for trawling. The socio-economic impacts of these initiatives can be offset, especially in developed countries, by creating new opportunities in other sectors such as marine tourism and post-harvest processing to add value and jobs in existing fisheries, and in the fisheries of countries that have not been assessed.

It was also noted that many developing countries scored around the average; this is not necessarily a reflection of good marine resource management, but of the fact they cannot afford to undertake bad practices such as subsidizing fisheries, developing unsustainable aquaculture ventures and expanding trawling fleets. These countries are in the position not to repeat the mistakes of other countries, i.e., by overcapitalizing fisheries and establishing subsidy schemes that contribute to destructive fishing practices or overfishing. The indicators in this study can help these countries track how they are doing against such measures and take corrective action early rather than later, when it is more difficult to do. Many developing countries are also just beginning to develop their aquaculture sector. The two aquaculture indicators of this study can assist countries in tracking development in terms of ecological and socio-economic sustainability.

This study has set the baseline for measuring how well countries manage a range of marine resources and issues, and demonstrated that much more work needs to be done to improve performance among the 53 countries assessed. There is no single recommendation on what are the priority actions to improve these scores; this will vary between countries, as they have different priorities, resources and values. Some actions will require few resources and have minimal impact on communities, either socially or economically, while others will require greater investment and produce larger impacts. However, a range of actions, from reducing perverse subsidies to better reporting of fisheries statistics, will need to be taken eventually if marine resources are to be sustained in the foreseeable future.

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Appendix 1: Fourteen indicators used to estimate the aggregate marine resources management performance score. Numbers in the headers refer the bulleted definitions in the text, and to Table 2

Country	(1) MPA area	(2) MPA inv	(3) EEZ trawl	(4) MSI ecol	(5) BIRD prot	(6) MAM prot	(7) LV GDP	(8) MEAL mar	(9) CODE FAO	(10) STAT rep	(11) SUB good	(12) CATCH fuel	(13) SUB LV	(14) MSI soc	Aggregate score
Angola	1	0	4	--	2.6	6.0	6	10	1.2	27.4	2	0	8		3.6
Argentina	0	1	0	7.4	4.0	7.1	5	8	3.4	36.7	1	0	7	5.9	3.8
Australia	1	10	3	3.9	4.9	8.9	4	7	6.2	26.0	3	0	8	5.1	4.8
Bangladesh	0	0	0	2.3	3.1	5.1	1	9	1.4	2.2	1	0	6	2.7	2.3
Brazil	1	1	3	2.5	1.7	7.0	1	9	3.1	45.8	0	0	0	4.8	2.8
Canada	1	3	4	4.1	4.1	4.4	4	6	6.8	37.4	4	4	8	4.6	4.4
Chile	0	0	4	2.9	4.4	7.0	6	5	5.4	62.3	0	7	10	4.1	4.4
China	0	0	4	5.2	3.7	5.1	3	10	4.7	15.1	0	0	8	6.1	3.7
Denmark	1	8	3	5.5	4.3	7.8	5	5	5.7	41.6	1	4	0	6.5	4.4
Ecuador	0	1	5	4.5	4.0	6.4	6	8	3.0	34.6	2	0	8	4.9	4.0
Egypt	1	5	4	5.4	5.5	5.9	1	10	1.4	15.6	2	0	8	6.0	4.0
Faroese	0	0	3	4.5	3.4	5.2	1	3	5.3	40.7	1	4	0	3.0	2.7
France	0	1	3	6.4	5.9	7.4	1	9	5.0	63.6	1	0	8	7.0	4.4
Germany	2	10	2	9.0	5.3	8.8	1	8	4.2	26.9	1	4	8	7.1	5.2
Ghana	0	0	4	--	4.2	4.9	4	10	3.7	20.1	1	4	5		3.6
Iceland	0	0	4	5.4	2.5	4.6	9	4	6.6	35.7	1	4	9	7.1	4.3
India	1	0	3	2.8	3.8	6.1	1	10	3.6	15.8	0	0	0	5.0	2.7
Indonesia	1	1	4	4.9	2.8	5.0	3	9	2.4	27.0	1	0	7	5.3	3.5
Iran	1	1	0	3.7	2.8	5.3	1	9	2.0	22.6	2	0	7	4.8	3.0
Ireland	0	1	3	7.4	4.1	6.6	3	8	0.0	51.1	7	4	6	6.1	4.4
Italy	1	3	4	5.3	4.8	6.4	1	9	4.2	23.1	3	0	6	5.9	4.0
Japan	0	1	4	7.5	3.5	4.4	5	8	6.3	36.8	6	0	7	6.5	4.5
Latvia	0	1	1		3.6	7.1	3	10	2.4	20.2	2	7	8		3.9
Malaysia	1	2	3	5.1	2.6	5.1	7	9	4.7	20.7	0	0	8	4.9	3.9
Mexico	1	1	3	4.9	4.2	6.9	2	7	4.5	44.1	1	0	8	5.2	3.8
Morocco	0	1	3	5.5	3.4	5.8	4	6	3.5	29.3	2	4	7	5.8	3.9
Myanmar	0	0	4	2.8	2.8	5.5	7	10	1.0	1.4	2	0	7	3.7	3.3
Namibia	0	0	3	7.2	2.9	6.3	7	10	5.8	38.0	1	4	6	4.8	4.4
Netherlands	1	3	0	9.0	4.3	7.9	5	10	5.5	31.8	1	4	10	7.1	5.1
New Zealand	0	1	3	5.7	4.1	6.7	7	10	6.4	73.1	10	0	10	6.1	5.5

Appendix 1 (cont'd).

Country	(1) MPA area	(2) MPA inv	(3) EEZ trawl	(4) MSI ecol	(5) BIRD prot	(6) MAM prot	(7) LV GDP	(8) MEAL mar	(9) CODE FAO*	(10) STAT rep	(11) SUB good	(12) CATCH fuel	(13) SUB tot	(14) MSI soc	Aggregate score
Nigeria	0	0	4	5.3	3.7	4.6	3	9	1.6	17.4	9	0	10	5.7	4.1
North Korea	0	0	4	7.4	2.0	4.0	4	10	0.7	4.1	0	0	0	6.4	2.8
Norway	0	1	4	3.5	4.0	5.1	6	4	6.7	53.4	3	4	8	3.7	4.2
Pakistan	1	0	4	3.8	3.9	5.9	2	10	2.5	17.7	2	0	7	4.2	3.4
Peru	0	0	4	4.3	4.1	6.3	7	8	4.3	36.0	8	10	9	4.9	5.2
Philippines	1	1	4	4.7	4.1	5.7	6	9	3.2	26.0	1	0	6	5.8	3.9
Poland	1	1	6	5.2	3.7	7.6	1	9	2.5	16.2	5	4	6	5.2	4.2
Portugal	0	1	4	6.8	3.3	7.4	2	6	4.1	70.0	2	0	6	5.7	4.0
Russia	1	0	4	8.7	3.4	5.2	3	10	3.4	56.4	3	0	4	5.4	4.1
Senegal	0	0	5	6.6	3.7	6.3	7	10	2.6	46.8	1	4	8	5.3	4.6
South Africa	0	2	4	7.0	5.0	7.7	1	9	6.1	53.1	3	4	8	5.5	4.8
South Korea	1	0	4	7.1	2.8	5.3	5	10	5.5	39.8	0	0	8	6.4	4.2
Spain	1	2	4	8.7	4.8	7.1	2	9	5.2	67.5	0	0	6	7.1	4.5
Sri Lanka	0	1	3	2.5	3.7	5.9	5	7	1.5	7.6	2	0	8	5.0	3.2
Sweden	1	10	3	5.4	4.2	8.0	1	5	4.5	27.5	6	0	8	6.2	4.6
Taiwan	0	1	4	5.0	1.6	6.0	4	8	4.0	27.5	0	0	8	5.7	3.6
Thailand	1	2	3	3.3	3.3	6.3	6	9	2.0	22.1	0	0	7	4.9	3.6
Turkey	1	1	4	5.0	3.4	4.9	2	6	1.8	28.0	0	4	10	5.0	3.6
UK	1	5	4	4.5	5.3	8.0	1	5	5.2	60.8	5	4	9	4.2	4.8
Ukraine	1	4	0	6.2	3.7	6.5	2	10	2.2	26.5	1	4	6	5.5	3.9
USA	1	3	4	6.1	3.9	5.0	1	9	6.8	69.4	7	0	8	6.1	4.8
Viet Nam	0	0	4	3.7	3.6	6.1	6	7	1.6	1.5	1	0	8	5.0	3.3
Yemen	0	0	3	3.7	2.8	6.0	6	10	0.9	11.6	0	0	7	5.0	3.3

*data from: Pitcher et al. (2008b)