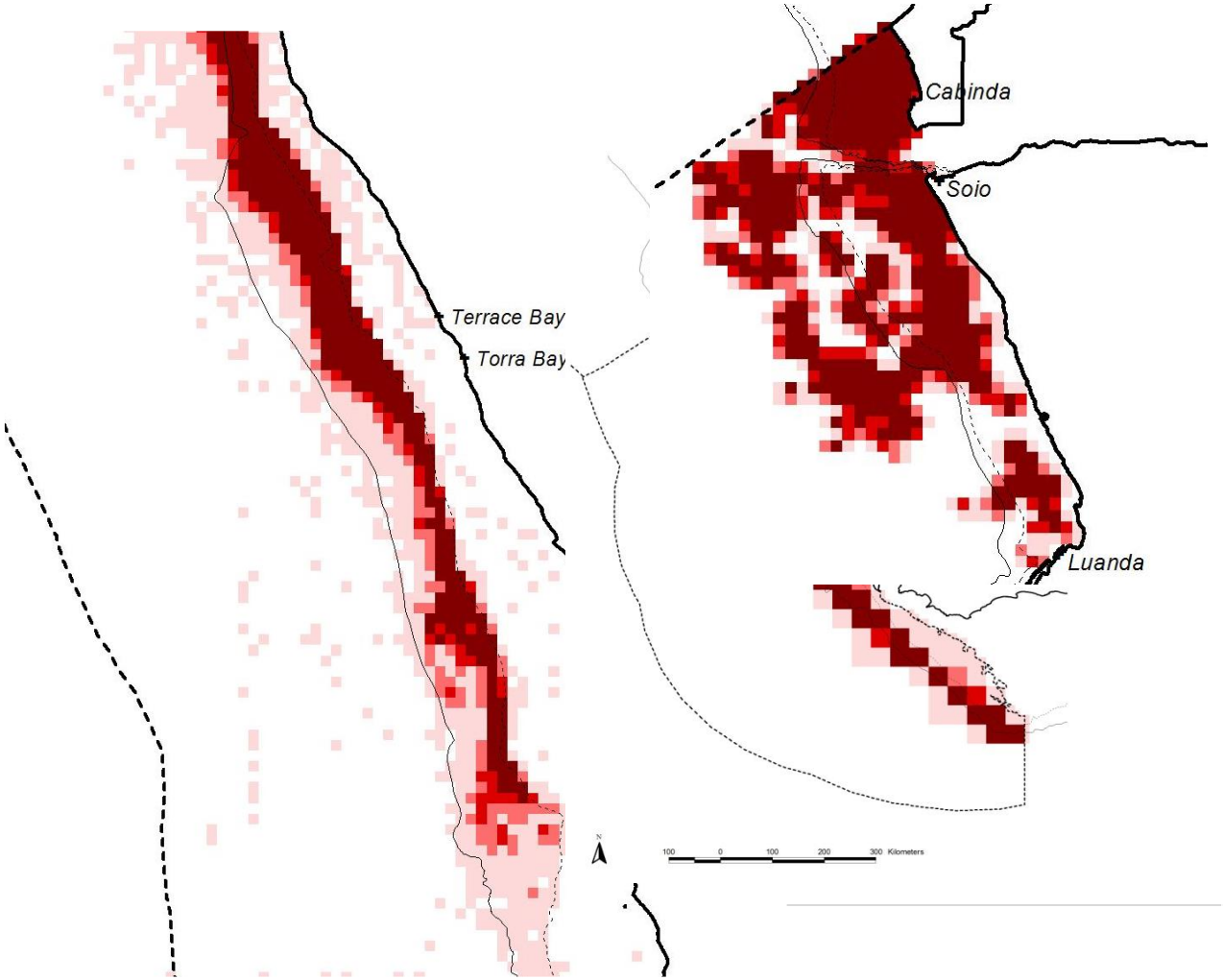
Appendix 5: Spatial Biodiversity Assessment and Spatial Management, including Marine Protected Areas: Spatial summary of pressures on marine systems



Conservation Systems:
Dr Stephen Holness, Trevor Wolf and Dr Mandy Lombard with Dr Carola Kirchner
Oceans and Coasts:
Dr Toufiek Samaai and Dr Steve Kirkman

Current pressures on marine and coastal biodiversity

Summary data layers were compiled of anthropogenic drivers of ecosystem change ("pressures"), broadly following the approach taken by Halpern et al[1] [2]. As the overall assessment is of current state rather than an assessment of risk, the analysis focuses on existing pressures and drivers (such as current fishing pressure and urban development) rather than potential threats (e.g. emergent threats such as climate change and related impacts such as coastal squeeze have not been included).

Key data sources:

The data sources and derivation are given for each pressure layer. Data for South Africa were largely sourced from data compiled for the OMPA (Offshore Marine Protected Area) project[3] and the South African NBA (National Biodiversity Assessment)[4]. Existing spatial data on pressures for Namibia and Angola were sourced from the data collated by Vera De Cauwer as part of the BCLME Physical mapping project[5]. Significant additional data on fisheries for Angola and Namibia were gathered for this project from the relevant national fisheries institutes. NatMIRC (National Marine Information and Research Centre) was the key data source for Namibian fisheries, while IPA (Instituto de Pesca Artesanal/ Institute for the Development of Artisanal Fisheries) and INIP (National Fisheries Research Institute) were the key data providers for Angola. Where national level data were not available (e.g. of shipping lanes), layers were derived from international datasets.

General summary method:

Data on the each of the pressures were summarized to 5' grids (approximately 8km x 8km). This scale represented a compromise between the finer data available for coastal pressures and the coarser offshore fishing data, and corresponded with the data collation scale of the major base data sources for the South African portions of this project, viz. the OMPA project and the NBA. Pressure values were normalized to a 0-1 range using the formula p=d1/d80, where d1 is the raw pressure data in a 5' grid and d80 is the 80th percentile of the pressure values for that data set, with resultant values over 1 being assigned a 1 value. This method was required as certain of the datasets contained some very high values which would have masked the impact of moderate levels of impact. The compilation of the individual pressure layers into this consistent format and range was necessary to allow spatial patterns of intensity of different pressures to be compared and cumulative pressures to be calculated.

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[1] Halpern BS, Walbridge S, Selkoe KA, Kappel CV, Micheli F, D, Agrosa C, Bruno JF, Casey KS, Ebert C, Fox HE, Fujita R, Heinemann D, Lenihan HS, Madin EMP, Perry MT, Selig ER, Spalding M, Steneck R, & Watson R. 2008. A Global Map of Human Impact on Marine Ecosystems. Science. 319: 948-952.

[2] Halpern BS, Kappel CV, Selkoe KA, Micheli F, Ebert CM, Kontgis C, Crain CM, Martone RG, Shearer C, & Teck SJ. 2009. Mapping cumulative human impacts to California Current marine ecosystems. Conservation Letters. 2: 138–148.

[3] Sink KJ, Attwood CG, Lombard AT, Grantham H, Leslie R, Samaai T, Kerwath S, Majiedt P, Fairweather T, Hutchings L, van der Lingen C, Atkinson LJ, Wilkinson S, Holness S, Wolf T. 2011. Spatial planning to identify focus areas for offshore biodiversity protection in South Africa. Unpublished Report. Cape Town: South African National Biodiversity Institute.

[4] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

[5] De Cauwer, V. 2007. BEP/BAC/03/02 Mapping of the BCLME Shoreline, Shallow Water & Marine Habitats: Physical mapping project. Project in collaboration with the Benguela Environment Fisheries Interaction & Training Programme (BENEFIT) for the Benguela Current Large Marine Ecosystem (BCLME) Programme.

Angola – Artisanal Fisheries

Fisheries in inshore Angolan waters are dominated by intensive boat-based artisanal fisheries. Key biodiversity concerns are impacts on specific target species including reef fish stocks.

Base data source:

Data on artisanal fisheries were sourced from the IPA (Instituto de Pesca Artesanal/ Institute for the Development of Artisanal Fisheries) in Luanda. A summary of the landing sites, numbers of fisherman, numbers and type of artisanal vessels and available catch data, was prepared by Pedro Afonso Kingombo of IPA.

Methods:

The analysis focused on the numbers of artisanal fishers because catch data were not available for all areas. The coastline of Angola was buffered by creating a zone with a width of 12 nautical miles (north of Luanda) or 8 nautical miles (south of Luanda) inland from the coastline. The widths of the buffer zone was based on expert inputs at the Luanda workshop (March 2012). The length of coastline was then sectioned according to the artisanal fisheries reporting sections. A Euclidean shortest distance approach was taken to allocate areas within the coastal buffer zone to the nearest applicable section of coast. This was used to define fishing areas. Fishing intensity was calculated based on the number of artisanal fishers per km^2 of fishing area. Resultant values were normalized using the d/d80 method, and converted to a 0-1 range. The analysis would have been improved by using catch data, however this is not collected at all sites.

Data archiving and GIS data links:

Shapefile: Angola_Pressures_Grids.shp
Field: ipa_pes

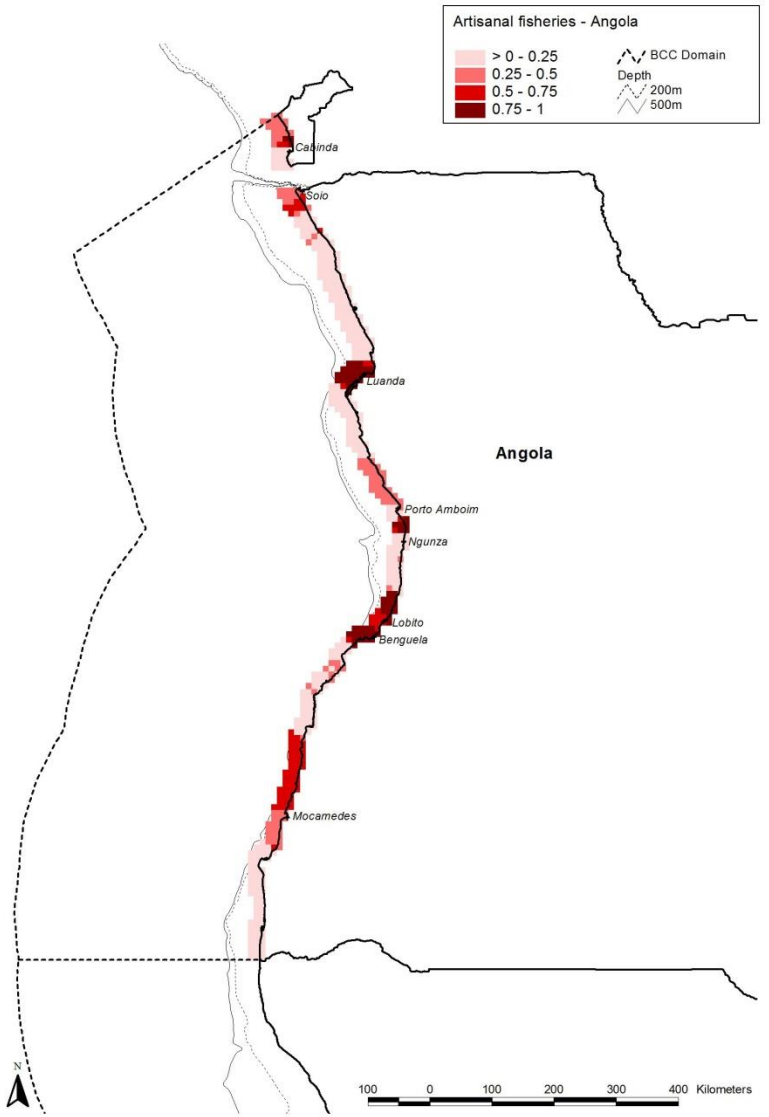

Figure 1: Angola – Artisanal Fisheries.

Angola – Coastal Development

Summary of coastal development pressure.

Base data source:

Coastal land transformation maps that were generated by Vera De Cauwer as part of the BCLME Physical Mapping project [6], were the base data source. The mapping was based on orthophotos, satellite imagery and topographic maps, and gives an indication of any human transformation in the coastal area, e.g. roads, mines and settlements. The layer is now very dated as rapid and uncontrolled urban expansion has occurred over the last few years. In addition, the original data layer was developed using datasets that were already dated and in many cases incomplete.

Methods:

The vector base layer from the BCLME Physical Mapping project was reclassified according to the type of land transformation recorded. Scores used were 1= any type of extensive hard infrastructure, 0.5 = areas with roads, agriculture or forestry, 0 = areas which were identified as being natural. This layer was converted to a raster layer, and an average score was calculated for each 5' grid cell.

Data archiving and GIS data links:

Shapefile: Angola_Pressures_Grids.shp
Field: Ang_coast

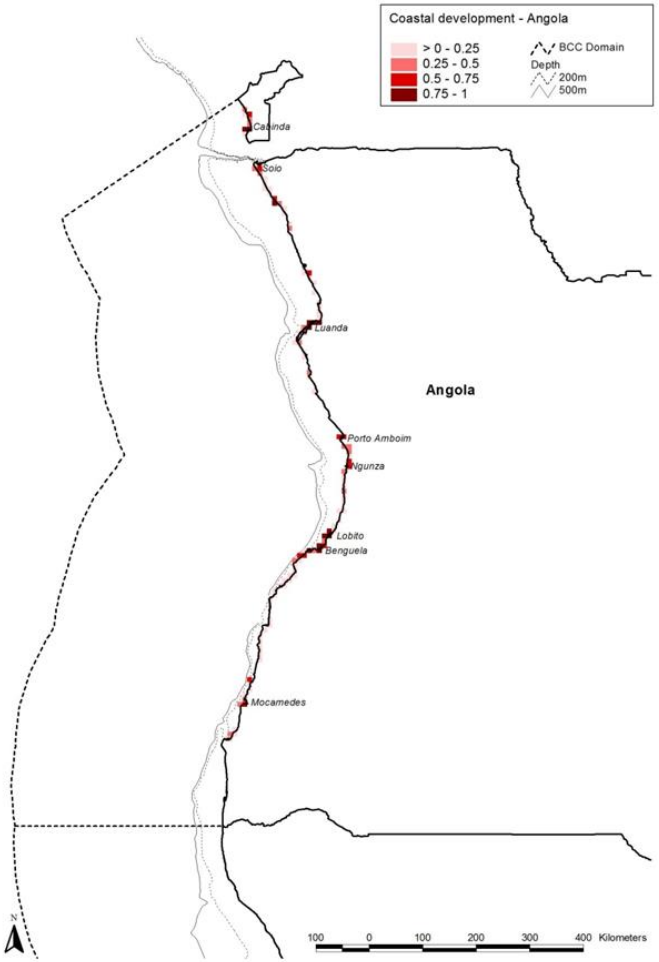

Figure 2: Angola – Coastal Development.

[6] De Cauwer, V. 2007. BEP/BAC/03/02 Mapping of the BCLME Shoreline, Shallow Water & Marine Habitats: Physical mapping project. Project in collaboration with the Benguela Environment Fisheries Interaction & Training Programme (BENEFIT) for the Benguela Current Large Marine Ecosystem (BCLME) Programme.

Angola – Fisheries (International data)

Data on commercial fisheries in Angolan waters are sparse. The project sourced available international data on demersal (destructive; non-destructive low bycatch; and non-destructive high bycatch) and pelagic fisheries (low bycatch and high bycatch) to fill the gaps. The usefulness of these layers in the case of Angolan waters need to be confirmed.

Base data source:

Base data was obtained from Halpern et al 2008 - A global map of human impact on marine ecosystems [7].

Methods:

Fishing intensity was based on the Halpern et al 2008 data. Of these, we only considered the data that corresponded to Angola's EEZ, for which we were mainly interested in the relatively highly impacted areas. . The relevant values were normalized using the d/dmax method (where dmax is the highest value of fishing intensity for a fishery in BCLME), and hence converted to a 0-1 range.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Fields: dem_dm; dem_nd_hbm; dem_ld_lb; pel_hbm; pel_lbm.

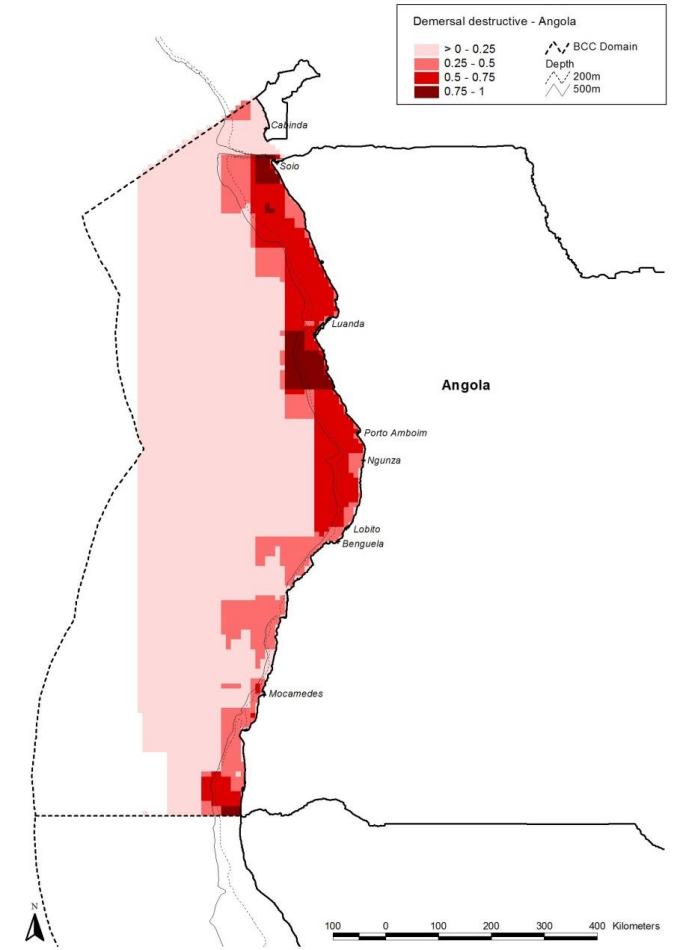

Figure 3: Demersal destructive fisheries from Halpern et al 2008 -A global map of human impact on marine ecosystems.

[7] Halpern BS, Walbridge, S, Selkoe KA, Kappel CV, Micheli F, D'Agrosa C, Bruno JF, Casey KS, Ebert C, Fox HE, Fujita R, Heinemann D, Lenihan HS, Madin EMP, Perry MT, Selig ER, Spalding M, Steneck R, Watson R. 2008. A global map of human impact on marine ecosystems. Science 319: 948-952.

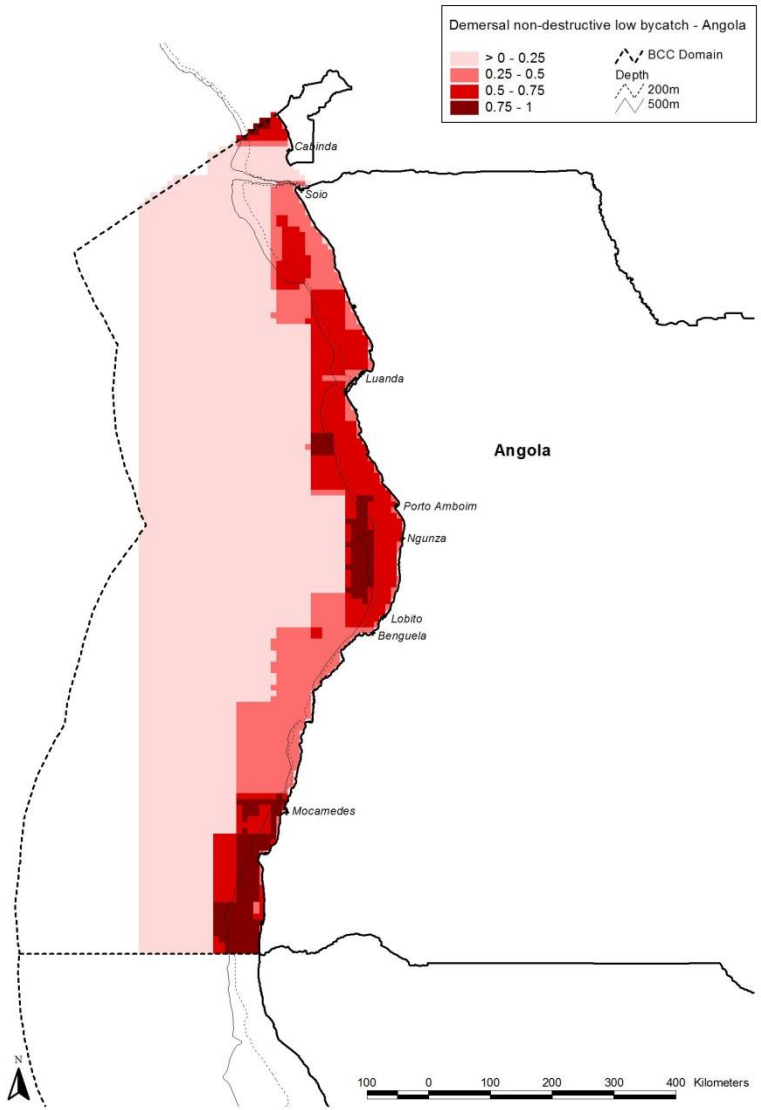

Figure 4: Demersal non-destructive low-bycatch fisheries from Halpern et al 2008 -A global map of human impact on marine ecosystems.

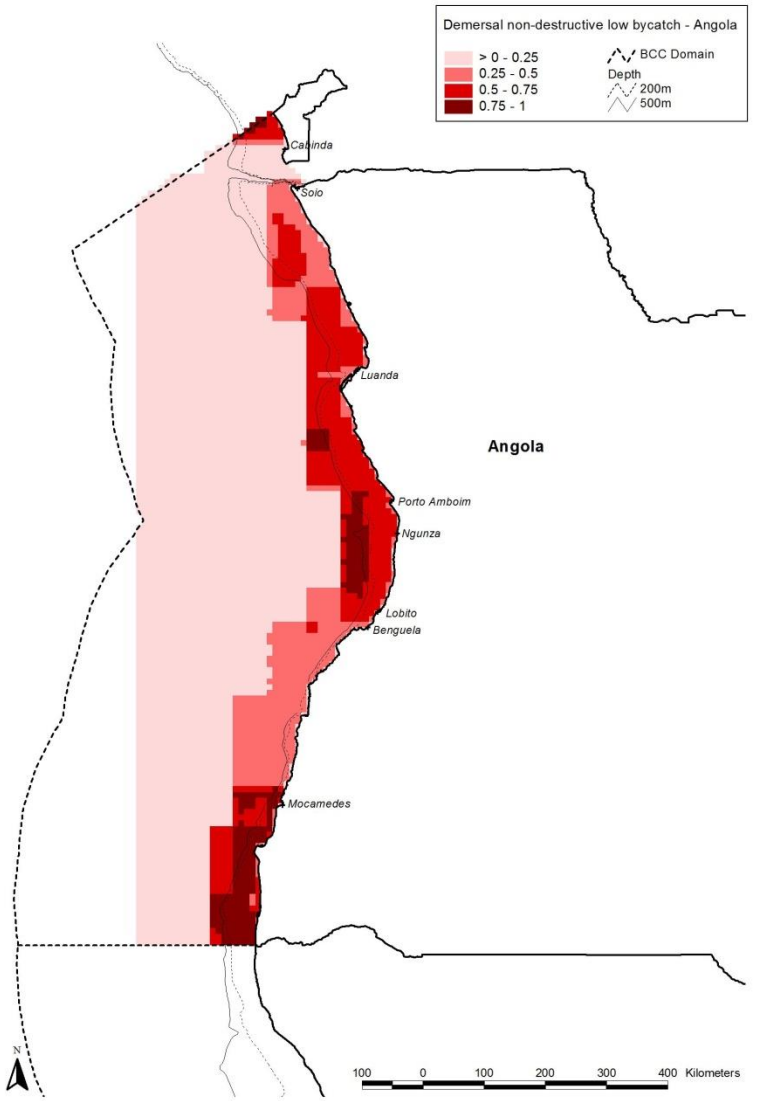

Figure 5: Demersal non-destructive high-bycatch fisheries from Halpern et al 2008 -A global map of human impact on marine ecosystems.

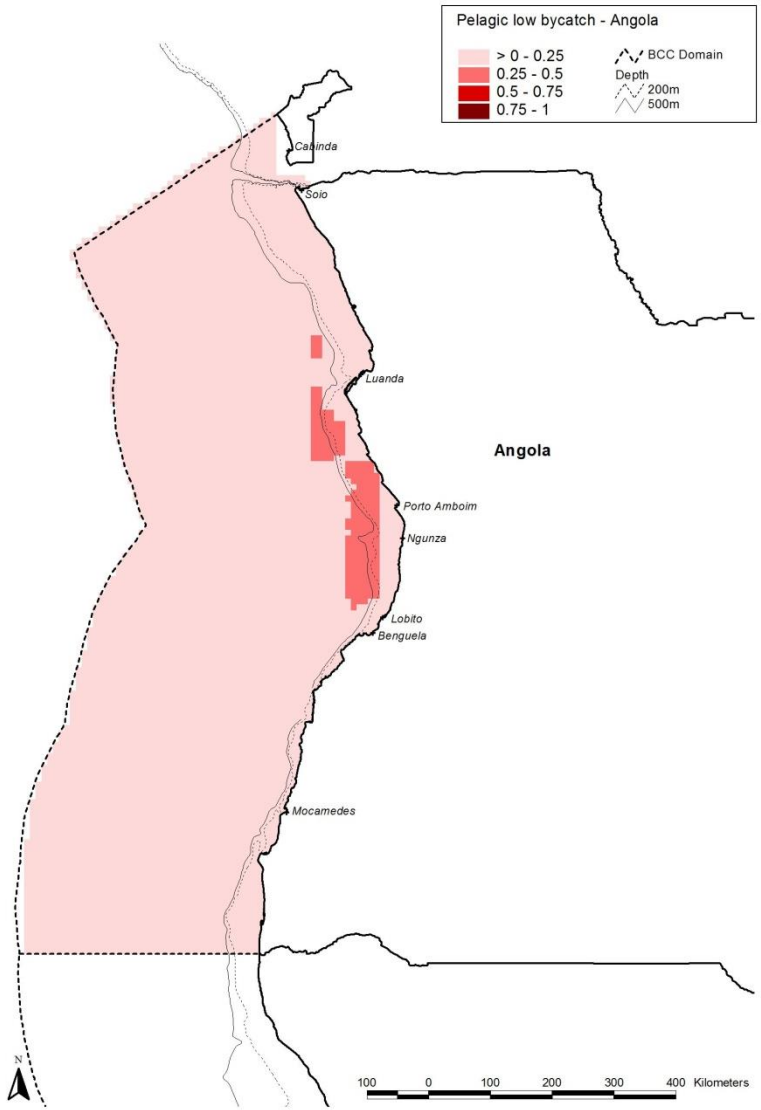

Figure 6: Pelagic low bycatch fisheries from Halpern et al 2008 -A global map of human impact on marine ecosystems.

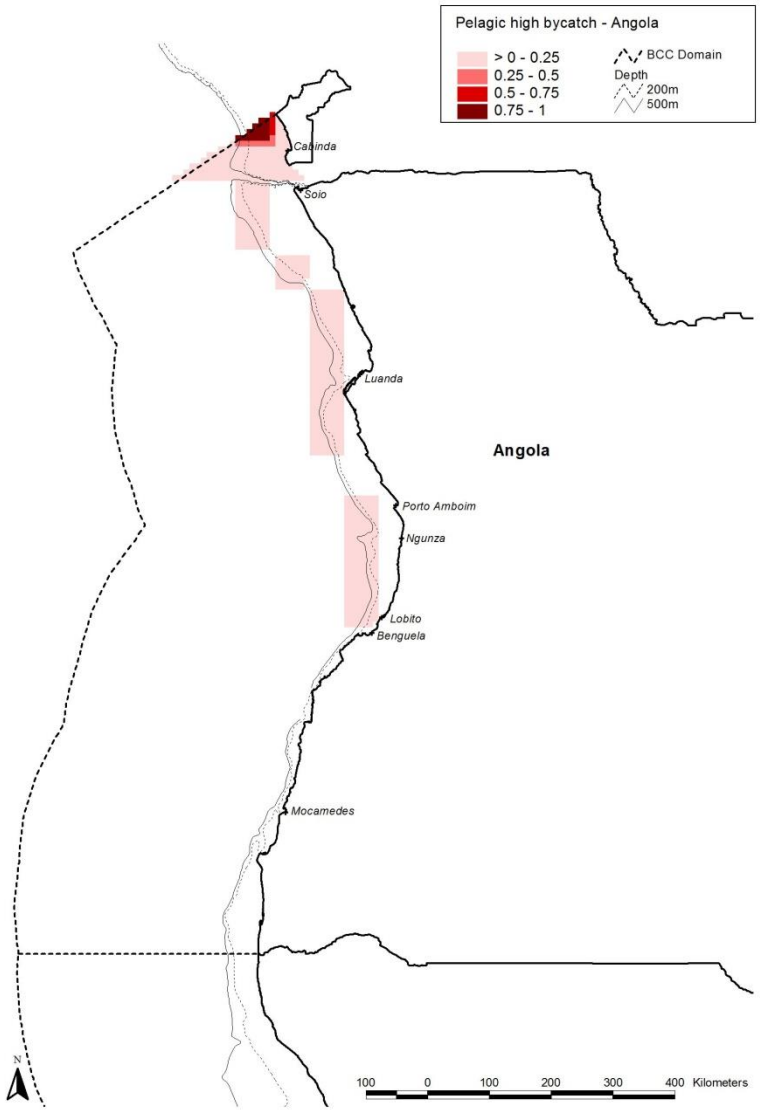

Figure 7: Pelagic high bycatch fisheries from Halpern et al 2008 -A global map of human impact on marine ecosystems.

Angola – Mining

Limited data are available on mining in Angolan coastal areas.

Base data source:

Maps of mining activities were generated by Vera De Cauwer as part of the BCLME Physical mapping project [8] was the base data source. The data include onshore petroleum related activities only.

Methods:

The base layer from the BCLME Physical mapping project was reclassified based on whether mining was recorded. Scores used were 1= mining present, 0 = mining absent. This layer was rasterized, and an average value was calculated per 5' grid cell.

Data archiving and GIS data links:

Shapefile: Angola_Pressures_Grids.shp
Field: Ang_mine

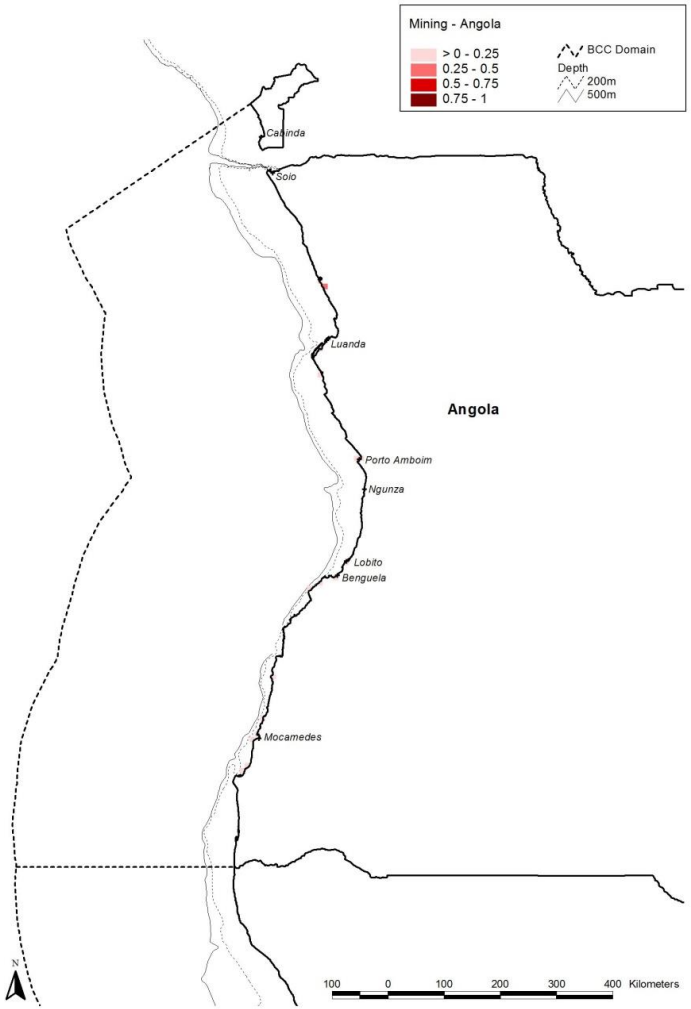

Figure 8: Angola – Mining

[8] De Cauwer, V. 2007. BEP/BAC/03/02 Mapping of the BCLME Shoreline, Shallow Water & Marine Habitats: Physical mapping project. Project in collaboration with the Benguela Environment Fisheries Interaction & Training Programme (BENEFIT) for the Benguela Current Large Marine Ecosystem (BCLME) Programme.

Angola – Oil and Gas

Petroleum prospecting and production is a key economic activity for Angola. Key biodiversity concerns are potential impacts from seismic surveys, risk of spills, and the impacts of exploration and production activities on habitats and species. This assessment focuses only on the impacts of exploration and production activities on habitats and species.

Base data source:

Initial data on wells were collated by Vera De Cauwer as part of the BCLME Physical mapping project [9]. Data were originally provided by Sonangol. Although the patterns of wells have been confirmed in the expert workshop (Luanda - April 2012), the layer is now very dated as rapid expansion of the petroleum industry has occurred over the last few years.

Methods:

Based on expert inputs from Sonangol at the Luanda workshop (March 2012) wells were classified according to their supposed impact into 'high' and 'low' impact wells. This was largely linked to whether the wells were serviced by pipelines or by boat. High impact wells were buffered by 10km and low impact wells by 5km. All 5' grid cells were then scored on the proportion of the cell which was in the buffer. Values were converted to a 0-1 range.

Data archiving and GIS data links:

Shapefile: Angola_Pressures_Grids.shp
Field: An_well

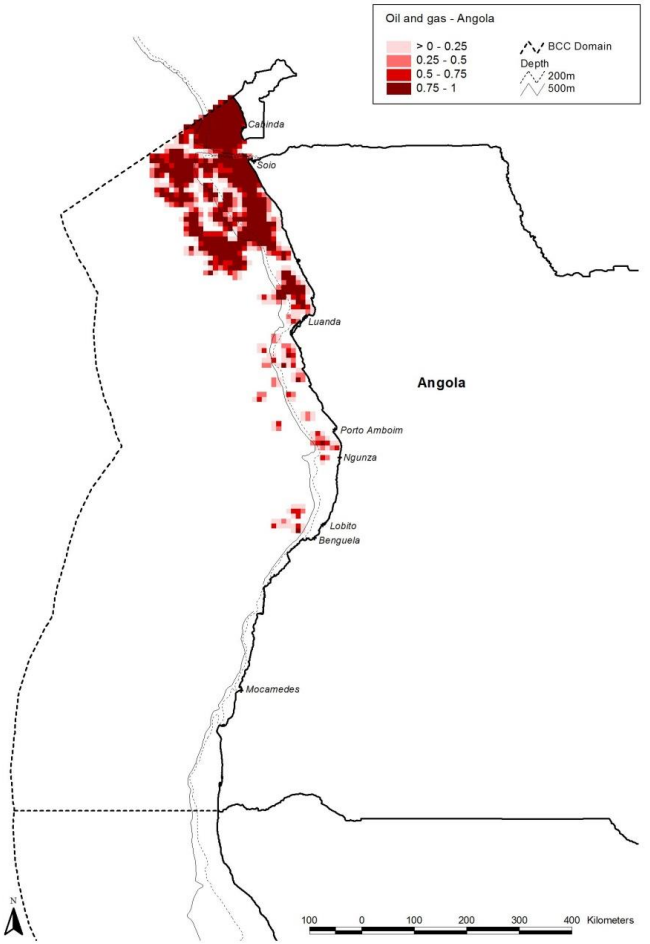

Figure 9: Angola – Oil and Gas.

[9] De Cauwer, V. 2007. BEP/BAC/03/02 Mapping of the BCLME Shoreline, Shallow Water & Marine Habitats: Physical mapping project. Project in collaboration with the Benguela Environment Fisheries Interaction & Training Programme (BENEFIT) for the Benguela Current Large Marine Ecosystem (BCLME) Programme.

Angola – Shipping

Angolan waters have relatively low levels of commercial boat traffic compared with the rest of the BCLME. Potential biodiversity impacts include oil spills, alien species introduced through ballast water and on hulls, dumping of waste, and ship strikes.

Base data source:

Base data were obtained from Halpern et al. 2008 -A global map of human impact on marine ecosystems [10]. This analysis needs to be revised as it is now very dated. Furthermore, the dataset was incomplete in that many smaller vessels were not included.

Methods:

Shipping intensity was based on the Halpern et al 2008 data. These data represented density of vessel tracks. We were interested only in shipping lanes that were heavily used relative to normal levels of vessel traffic in BCLME waters, therefore only the data that corresponded with the BCLME area were considered. Resultant values were normalized using the d/d80 method (d80 =0.41253) and hence converted to a 0-1 range. The bottom 20% of values were re-assigned a 0 value.

Data archiving and GIS data links:

Shapefile: Angola_Pressures_Grids.shp
Field: Ang_ship

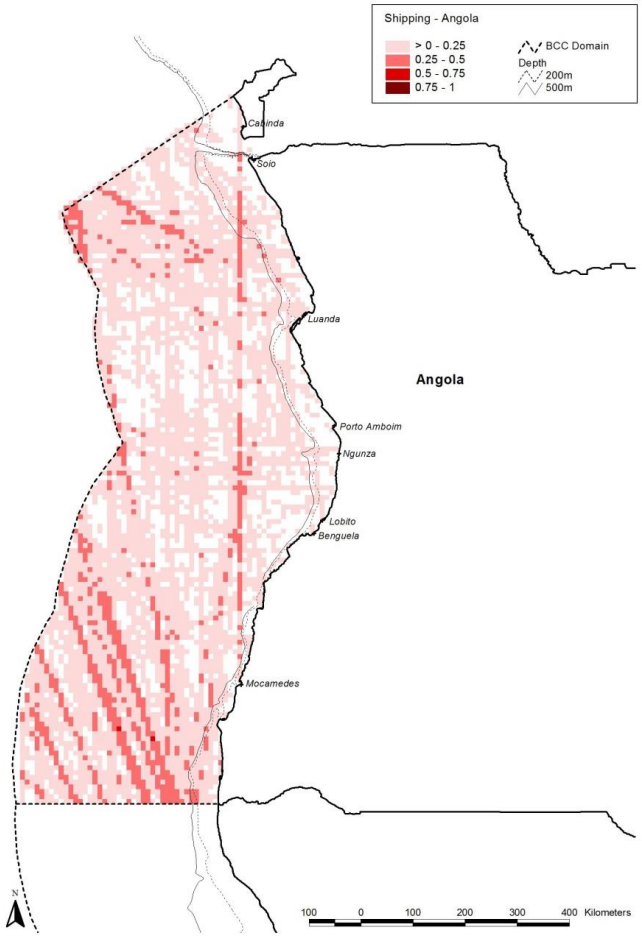

Figure 10: Angola - shipping.

[10] Halpern BS, Walbridge, S, Selkoe KA, Kappel CV, Micheli F, D'Agrosa C, Bruno JF, Casey KS, Ebert C, Fox HE, Fujita R, Heinemann D, Lenihan HS, Madin EMP, Perry MT, Selig ER, Spalding M, Steneck R, Watson R. 2008. A global map of human impact on marine ecosystems. Science 319: 948-952.

Namibia – Coastal Development

Summary of coastal development pressure.

Base data source:

Coastal land transformation maps generated by Vera De Cauwer as part of the BCLME Physical mapping project [11] were the base data. The mapping was based on orthophotos, satellite imagery and topographic maps, and gives an indication of any human transformation in the coastal area, e.g. roads, mines or settlements. The layer is now very dated especially considering that rapid urban expansion has occurred over the last few years in certain areas, such as between Swakopmund and Walvis Bay. In addition, the original data layer was based on datasets that were already dated at the time and in many cases incomplete.

Methods:

The base layer from the BCLME Physical mapping project was reclassified based on the type of transformation recorded. Scores used were 1= any type of extensive hard infrastructure, 0.5 = areas with roads, agriculture or forestry, 0 = areas which were identified as being natural. This layer was converted to a raster, and an average value calculated for each 5' grid cell.

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: Nam_coast

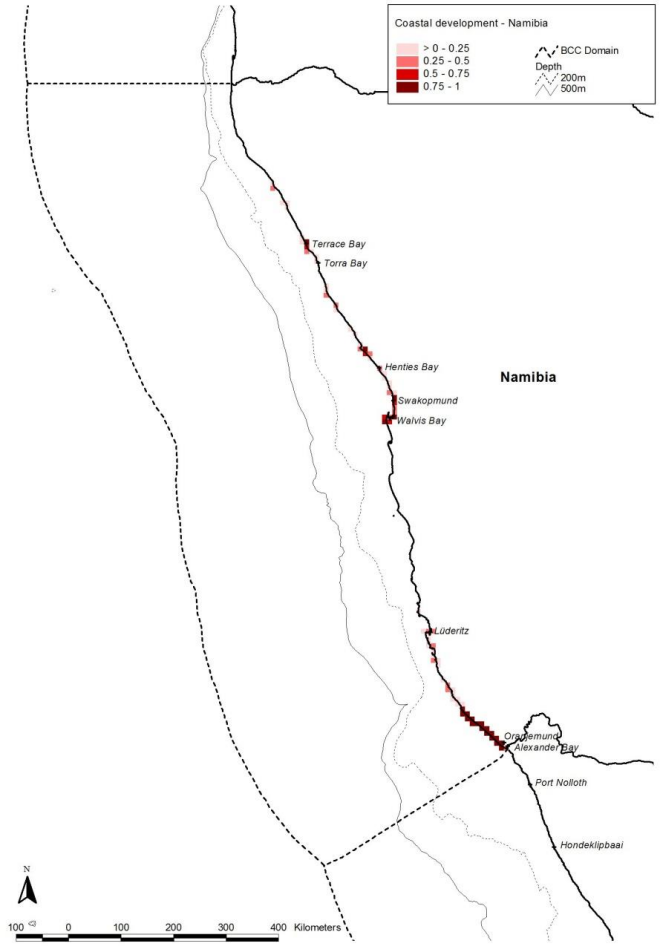

Figure 11: Namibia – Coastal Development.

[11] De Cauwer, V. 2007. BEP/BAC/03/02 Mapping of the BCLME Shoreline, Shallow Water & Marine Habitats: Physical mapping project. Project in collaboration with the Benguela Environment Fisheries Interaction & Training Programme (BENEFIT) for the Benguela Current Large Marine Ecosystem (BCLME) Programme.

Namibia – Deep sea red crab fishery

Commercial industry targeting deep sea red crab using pots.

Base data source:

Data collated by Dr Carola Kirchner as part of the current project, from information held by the National Marine Information and Research Centre (NatMIRC).

Methods:

Data from 2003-2011 are used because co-ordinates are provided for fishing positions in these years. Effort is given as the number of traps set, and catch in terms of mass (kg). Spatial summaries of total effort and catch per 5'grid for the study period were calculated. Resultant values were normalized using the d/d80 method (d80 = 43200 for effort; d80 = 24300 for catch). Both catch and effort summaries were compiled, however we are using effort data only in the final analysis as this data is most comparable with the approaches taken for similar industries. Data from 1998-2002 was not used as specific fishing locations were not captured.

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: Effort: crab_eff80; Catch: crab_catch80

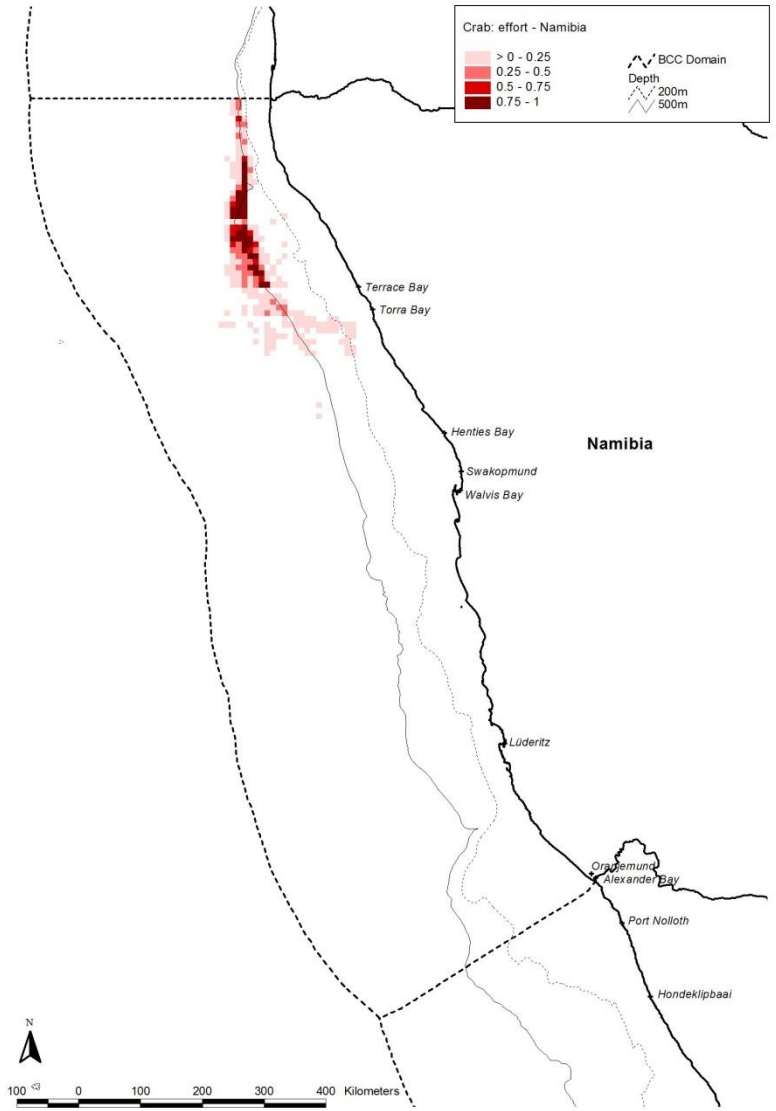

Figure 12: Namibia – Deep sea red crab fishery effort.

Namibia – Hake commercial trawl

Commercial industry targeting hake species.

Base data source:

Data collated by Dr Carola Kirchner as part of the current project from information collected and held by NatMIRC. Dr Paulus Kainge is acknowledged for providing the original underlying data.

Methods:

Commercial data from 1992 to 2010 are available (n=162088 trawls). Positional data using co-ordinates are provided for the first trawl of the day. All records lacking positional data were omitted. For the remaining records, the trawling time and catch (kg) were summed per individual vessel per fishing day. Data for 1997 is minimal.

Spatial summaries of total catch per 5'grid for the study period were calculated. Resultant values were normalized using the d/d80 method (d80 = 12969.89). Initial summaries showed a number of clearly incorrect locations (e.g. in shallow water or on land). Therefore, values below 0.1 were removed as it was likely that many of these were errors. This cleaned up the scatter in the dataset significantly.

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: hake0180

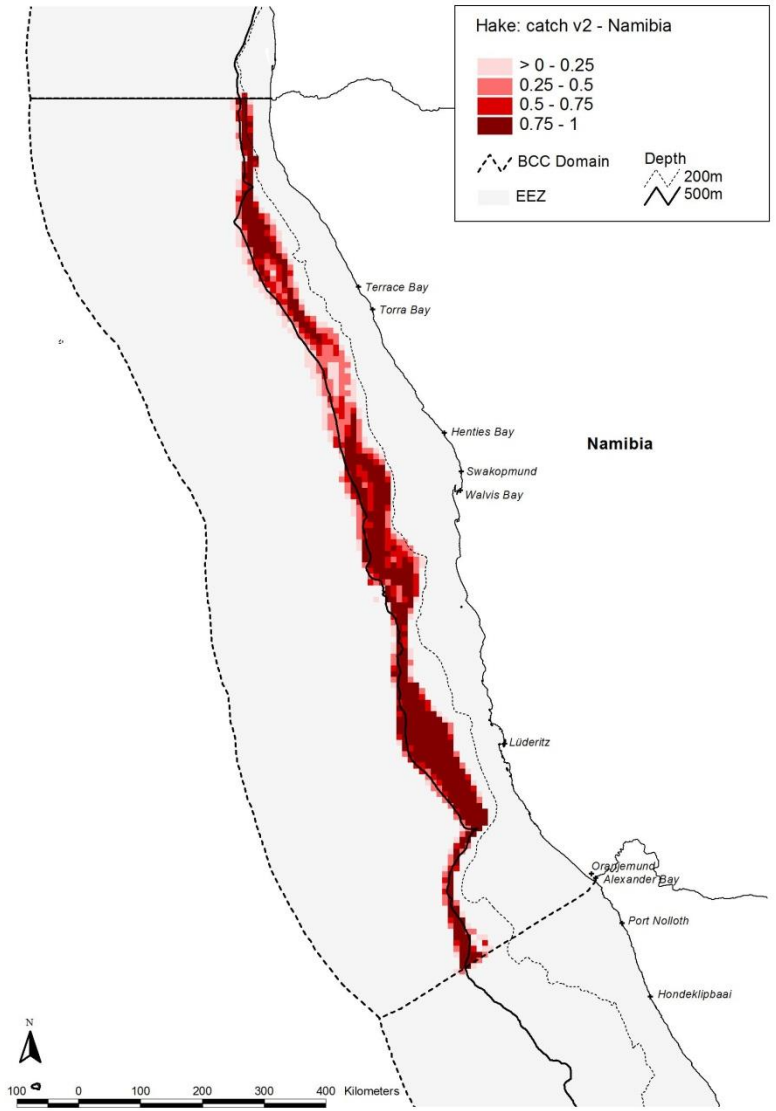

Figure 13: Namibia – Hake fishery catch.

Namibia – Horse mackerel fishery

Commercial industry targeting horse mackerel using mid-water trawl.

Base data source:

Data collated by Dr Carola Kirchner as part of the current project from information held by NatMIRC.

Methods:

Commercial data from 1997 to 2011 are available. Positional data using co-ordinates are provided for the first trawl of the day. All records lacking positional data were omitted. For the remaining records, the trawling time and catch (kg) were summed per individual vessel per fishing day. Spatial summaries of total catch per were calculated for the study period. Resultant values were normalized using the d/d80 method (d80 = 3522).

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: mak8

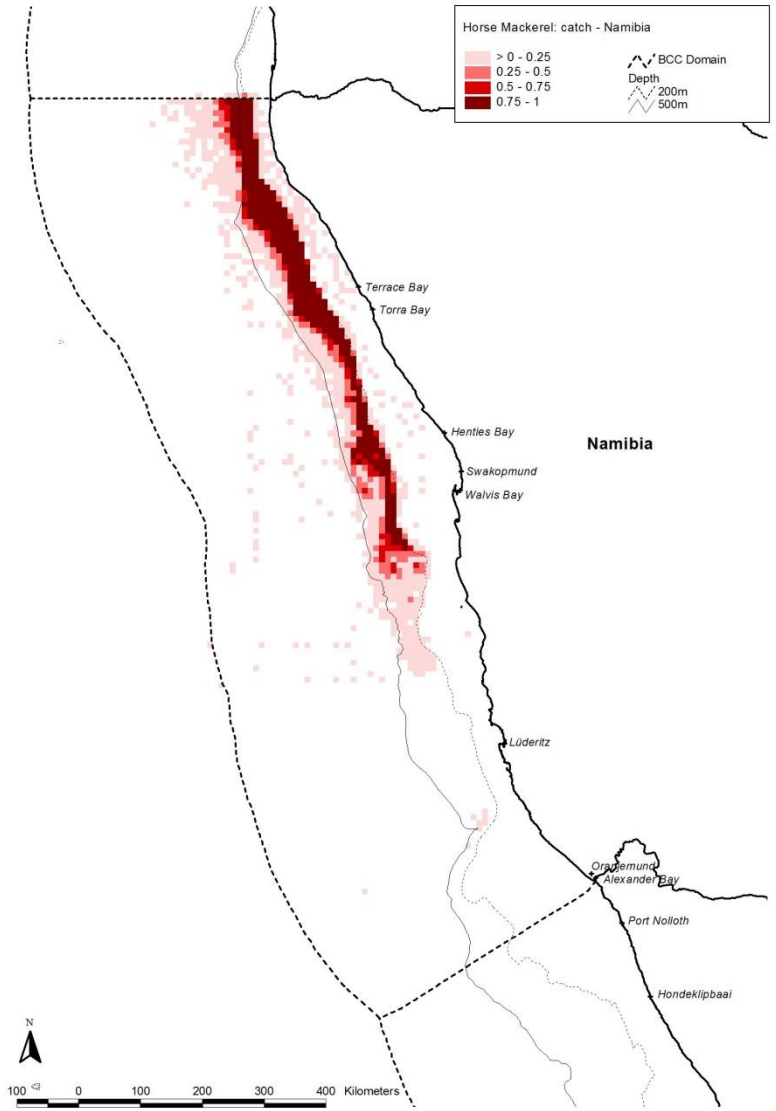

Figure 14: Namibia – Horse mackerel fishery.

Namibia – Large pelagic longline

Commercial longline industry targeting tunas, swordfish, sharks and other large pelagic groups.

Base data source:

Data collated by Dr Carola Kirchner as part of the current project from information collected and held by NatMIRC. Approximately half of the data had to be removed due to inconsistencies and missing information. We are therefore not confident about the underlying data.

Methods:

Commercial data from 2003-2012 are available. Effort is given as the number of hooks set, and catch in terms of mass (kg). Spatial summaries of total effort per 5' grid for the study period were calculated. Resultant values were normalized using the d/d80 method (catch d80 = 3715; effort d80 = 3580). Although both catch and effort were calculated, only effort is shown as this is the layer that we intend using in the analysis as it is most consistent with the approach used for other industries.

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: Catch = longcat8; Effort longeff8

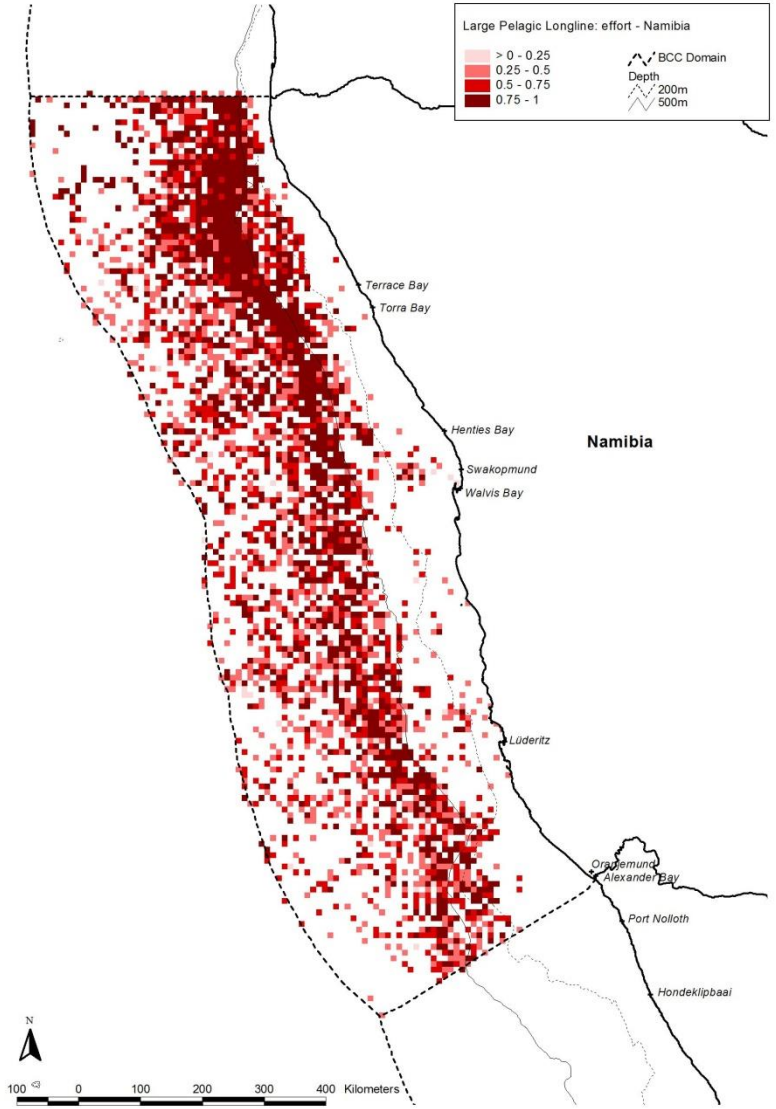

Figure 15: Namibia – Large pelagic longline fishery effort.

Namibia – Large pelagic pole fishery

Commercial pole fishery targeting albacore and yellowfin tuna.

Base data source:

Data collated by Dr Carola Kirchner as part of the current project from information collected and held by NatMIRC.

Methods:

Commercial data from 2003-2012 are availableThe numbers of poles used and hours fished are logged. Catch is given in kg. Effort was calculated by multiplying hours fished by number of poles used. Spatial summaries of total effort and catch per 5' grid were calculated for the study period. Resultant values were normalized using the d/d80 method (catch d80 = 6228; effort d80 = 418). Although both catch and effort were calculated, only effort is shown as this is the layer that we intend using in the analysis.

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: Catch = polecat8; Effort = pole_eff8

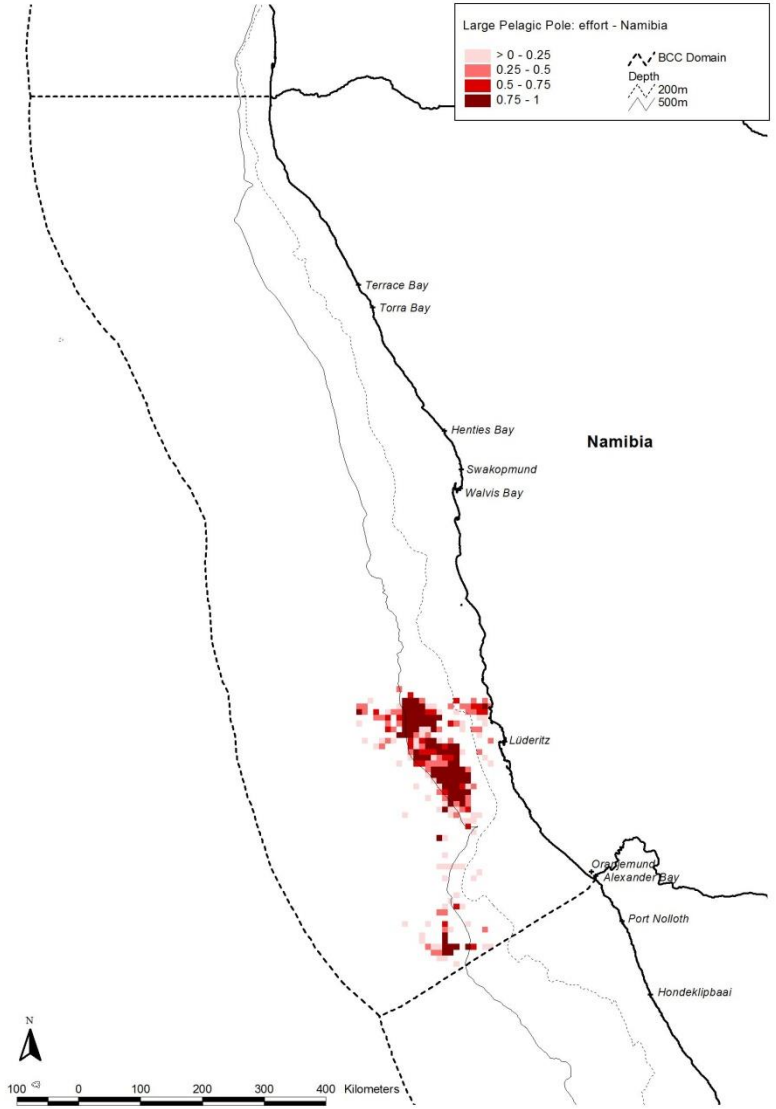

Figure 16: Namibia – Large pelagic pole fishery effort.

Namibia – Linefish

Recreational shore based fishery sector targeting kob, steenbras, galjoen and blacktail.

Base data source:

Data collated by Dr Carola Kirchner as part of the current project from information collected and held by NatMIRC.

Methods:

Linefish data are available for the period 1995 to 2012. Daily catch statistics for the four linefish species are given by fishing area and season. The total number of fish caught per fishing area for the study period was calculated. Intensity of fishing was approximated by dividing the total number of fish caught by the length of the fishing area in kilometres. Values for the fishing intensity were normalized using the d/dmax method (dmax = 1315.95). This line was rasterized and a mean value per 5' grid was calculated.

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: linefish10

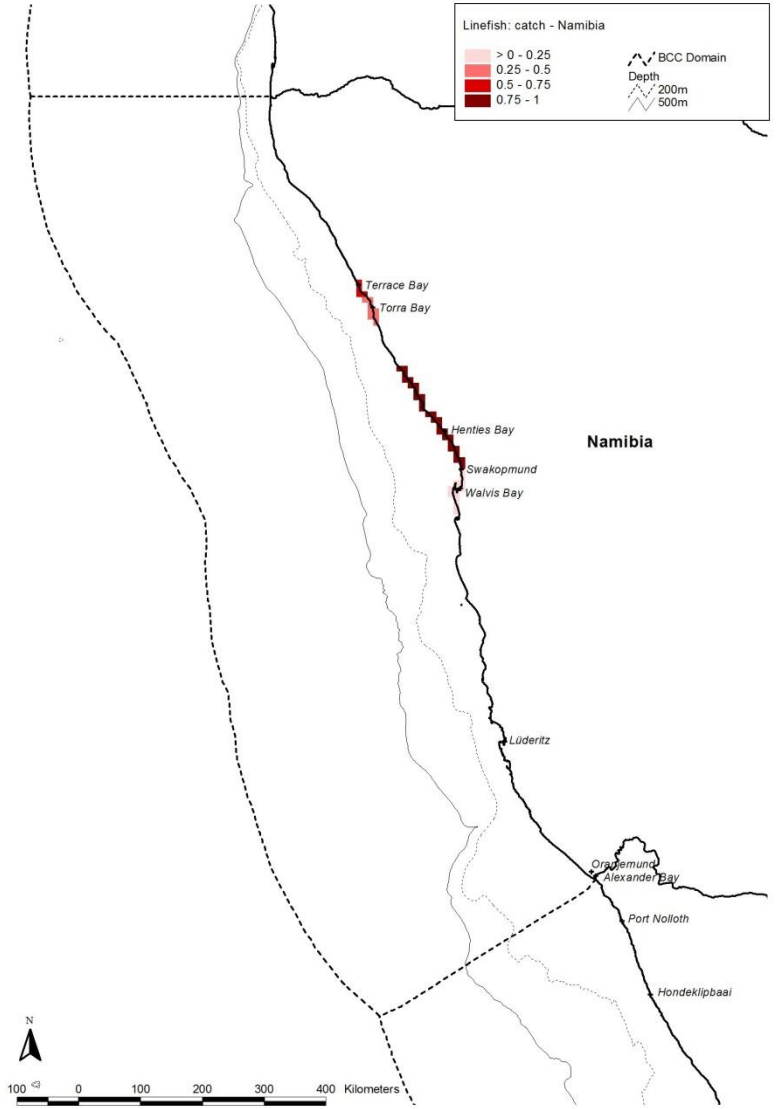

Figure 17: Namibia – linefish catch.

Namibia – Mining and salt production

The Namibian coastal mining industry is largely focussed on diamond mining in the south of the country. Salt production areas are also included in this layer.

Base data source:

Maps of mining activities generated by Vera De Cauwer as part of the BCLME Physical mapping project [12] was the base data source.

Methods:

The base layer from the BCLME Physical mapping project was reclassified based on whether mining or salt production was recorded. Scores used were 1= mining present, 0 = mining absent. This layer was rasterized, and an average value was calculated per 5' grid cell.

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: nam_mine

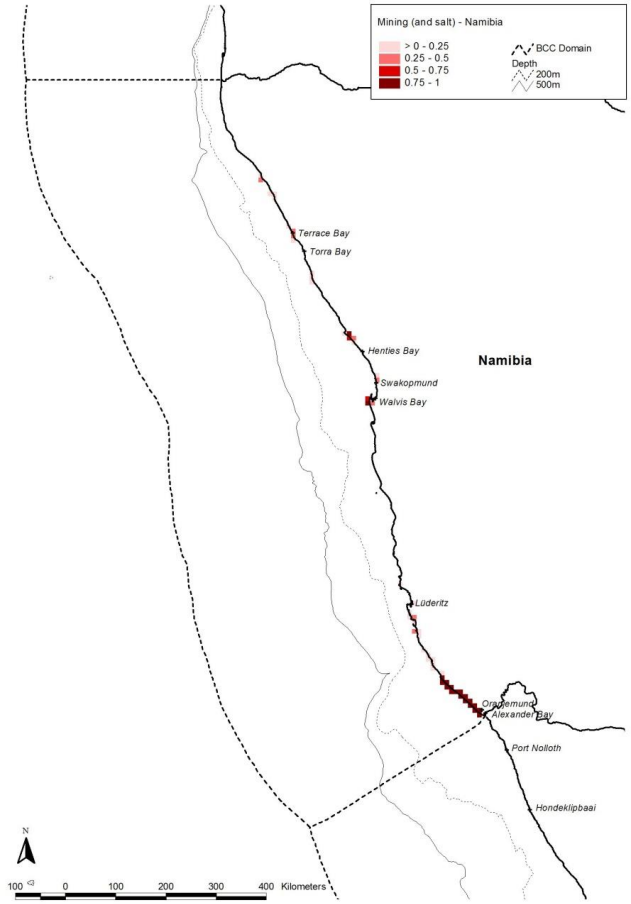

Figure 18: Namibia mining (and salt).

[12] De Cauwer, V. 2007. BEP/BAC/03/02 Mapping of the BCLME Shoreline, Shallow Water & Marine Habitats: Physical mapping project. Project in collaboration with the Benguela Environment Fisheries Interaction & Training Programme (BENEFIT) for the Benguela Current Large Marine Ecosystem (BCLME) Programme.

Namibia – Monkfish

Commercial trawl industry targeting monkfish.

Base data source:

Data collated by Dr Carola Kirchner as part of the current project from information collected and held by NatMIRC.

Methods:

Commercial data from 2005 to 2010 are available. Positional data using co-ordinates are provided for the first trawl of the day. The trawling time and catch (kg) were summed per individual vessel per fishing day. Spatial summaries of total catch per 5'grid were calculated for the study period. Resultant values were normalized using the d/d80 method (d80 = 161670).

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: monk8

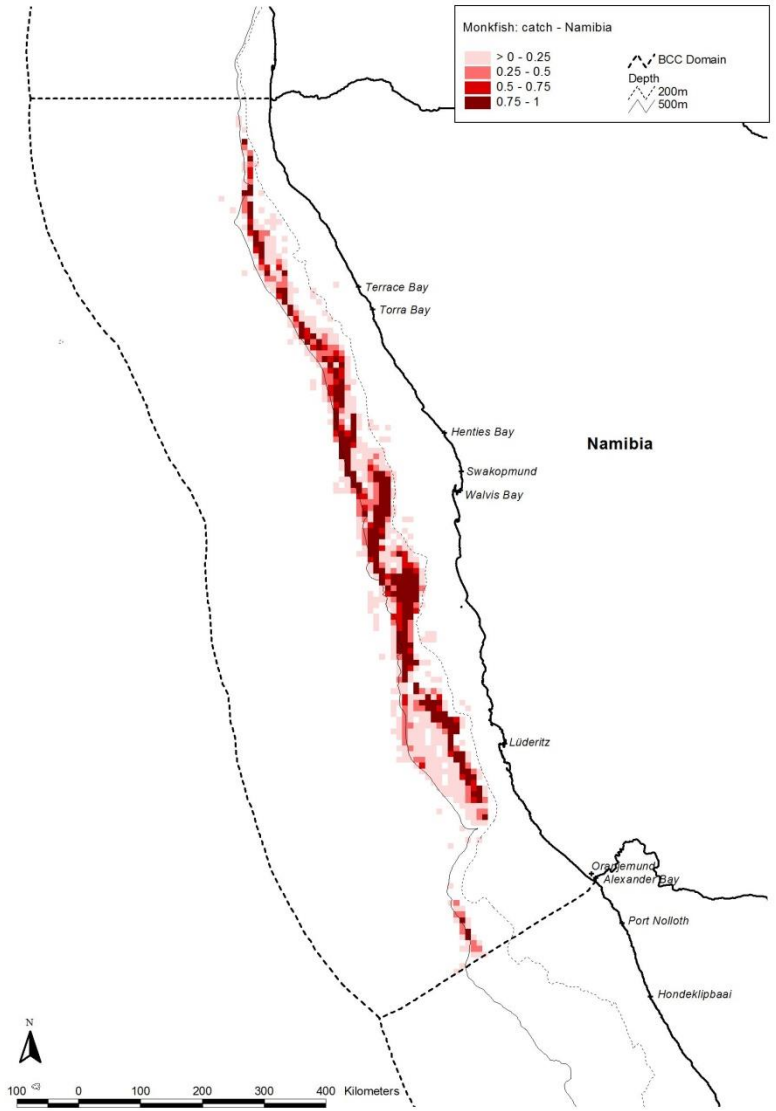

Figure 19: Namibia – Monkfish.

Namibia – Mariculture and Guano production

This layer summarizes of mariculture (e.g. mussel and oyster production) and similar industries (e.g. guano production platforms).

Base data source:

Initial data on points where organic marine products are farmed or collected (aquaculture, guano) were mapped by Vera De Cauwer as part of the BCLME Physical mapping project [13]. The points were digitised based on information gathered from stakeholders and literature.

Methods:

All points where natural resources are produced or collected were buffered by 2km. Any 5' grid cell which overlapped with this buffered layer was allocated a score of 1. All other cells had a 0 score.

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: Nam_mari

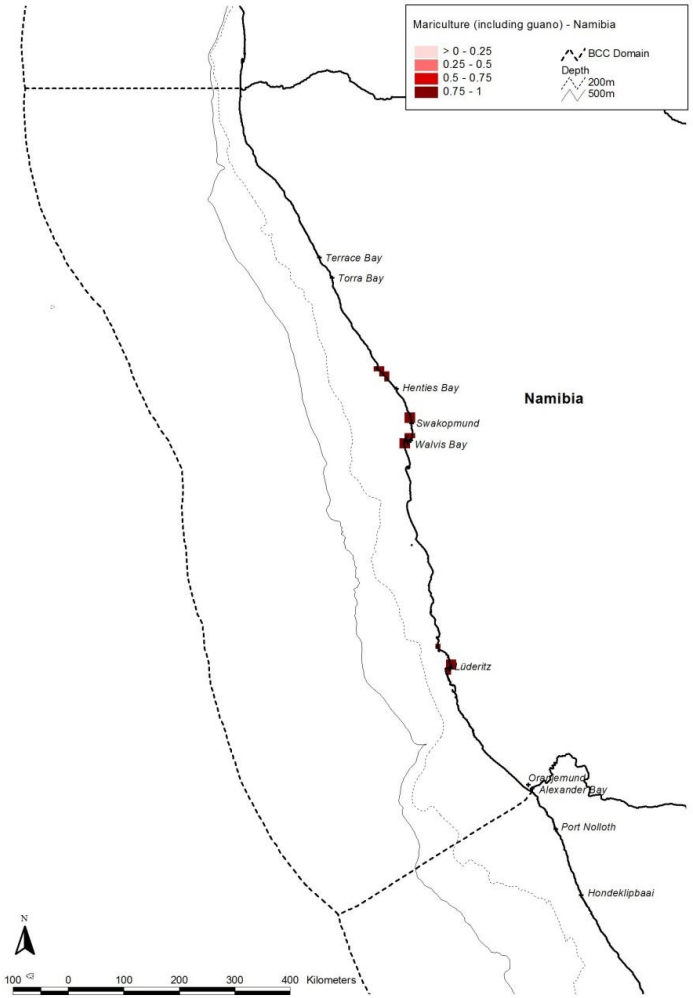

Figure 20: Namibia – Mariculture and Guano Production

[13] De Cauwer, V. 2007. BEP/BAC/03/02 Mapping of the BCLME Shoreline, Shallow Water & Marine Habitats: Physical mapping project. Project in collaboration with the Benguela Environment Fisheries Interaction & Training Programme (BENEFIT) for the Benguela Current Large Marine Ecosystem (BCLME) Programme.

Namibia – Oil and Gas

Petroleum prospecting and production is an emerging key economic activity for Namibia. Production is currently centred on the Kudu Gas Field in the south. Key biodiversity concerns are potential impacts from seismic surveys, risk of spills, and the impacts of exploration and production activities on habitats and species. This assessment focuses only on the impacts of exploration and production activities on habitats and species.

Base data source:

Initial data on four wells was collated by Vera De Cauwer as part of the BCLME Physical mapping project [14]. This layer is certainly incomplete as it only includes four known wells, and it appears likely that significant wells would have been drilled for exploration.

Methods:

The base layer from the BCLME Physical mapping project was reclassified based on whether an oil well was recorded. Scores used were 1= well present, 0 = well absent.

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: nam_gas

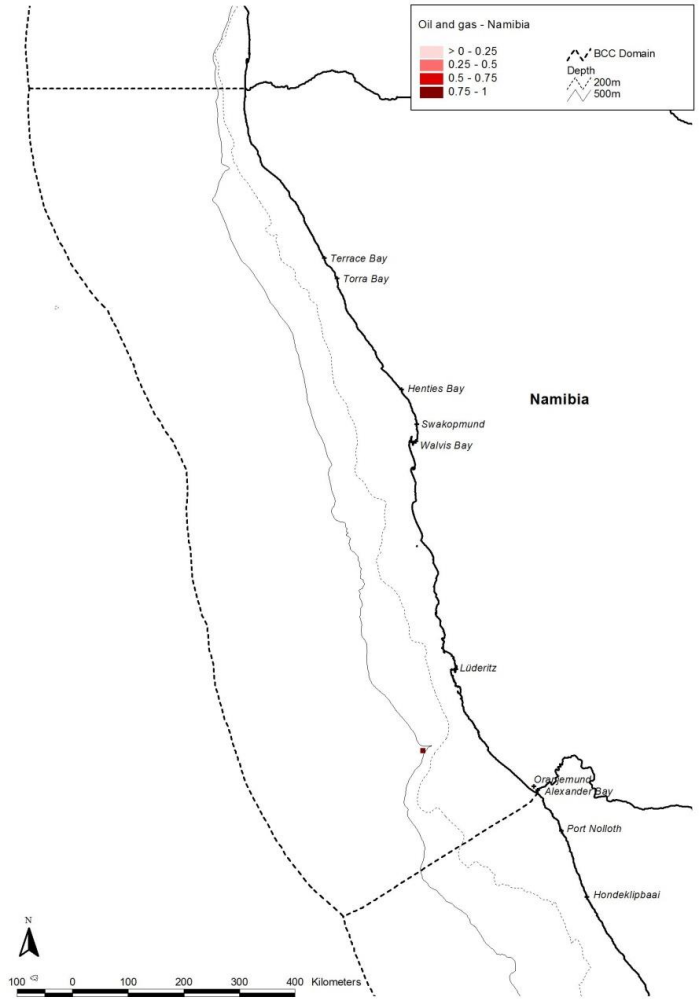

Figure 21: Namibia – Oil and Gas.

[14] De Cauwer, V. 2007. BEP/BAC/03/02 Mapping of the BCLME Shoreline, Shallow Water & Marine Habitats: Physical mapping project. Project in collaboration with the Benguela Environment Fisheries Interaction & Training Programme (BENEFIT) for the Benguela Current Large Marine Ecosystem (BCLME) Programme.

Namibia – Orange Roughy

This data reflects the commercial trawl industry targeting Orange Roughy. Due to collapse of the fishery, the industry has been closed since 2007.

Base data source:

Data were collated by Dr Carola Kirchner as part of the current project from information collected and held by NatMIRC.

Methods:

Commercial data from 1994 to 2007 when the industry was closed is available. All trawls made by the individual vessels on one day are summed on fish caught in kg. Positional data using co-ordinates are provided for the first trawl of the day. Spatial summaries of total catch per 5'grid for the study period were calculated. Resultant values were normalized using the d/d80 method (d80 =7900).

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: rough80

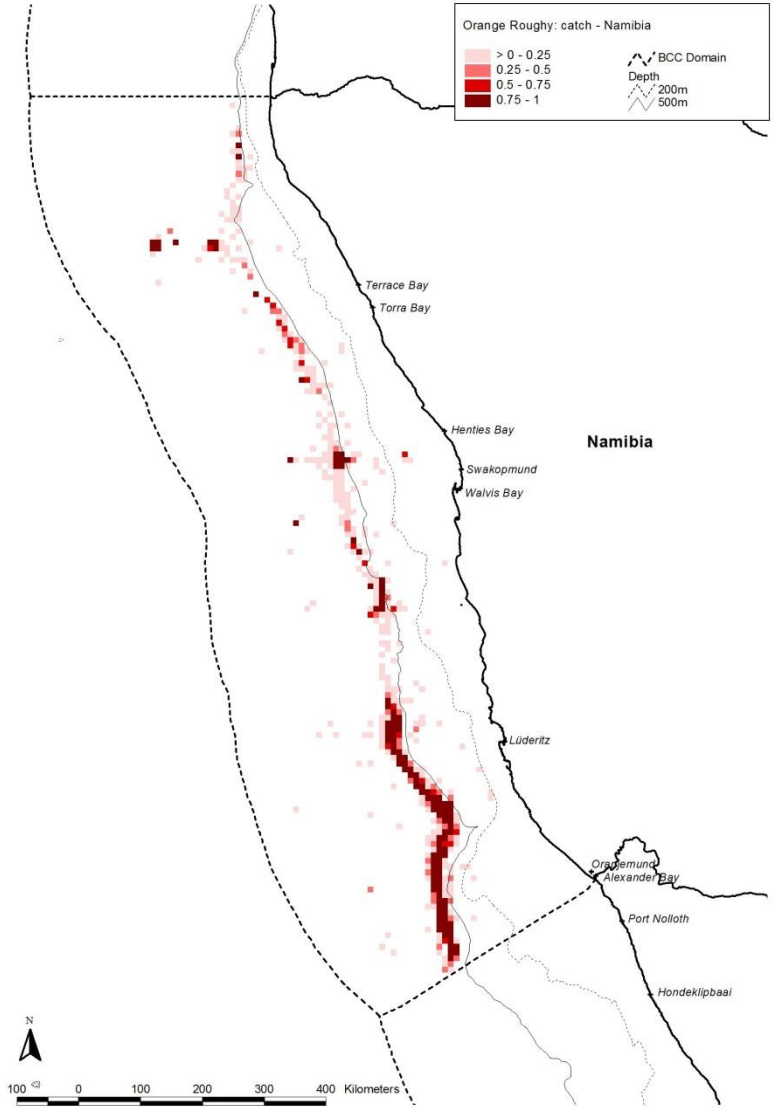

Figure 22: Namibia – Orange roughy catch.

Namibia – Seal harvesting

Summary of colonies where fur seals bulls and pups are harvested.

Base data source:

Data were collated by Dr Carola Kirchner as part of the current project from information collected and held by NatMIRC.

Methods:

Seal harvest data from 2007 to 2011 were collated. All harvest took place at either Cape Cross or Atlas Bay/Wolf Bay. Approximately equal total numbers were harvested from each of these locations. The 5' grid cells which overlapped with the harvested colonies were allocated a score of 1. All other cells had a 0 score.

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: nam_seal

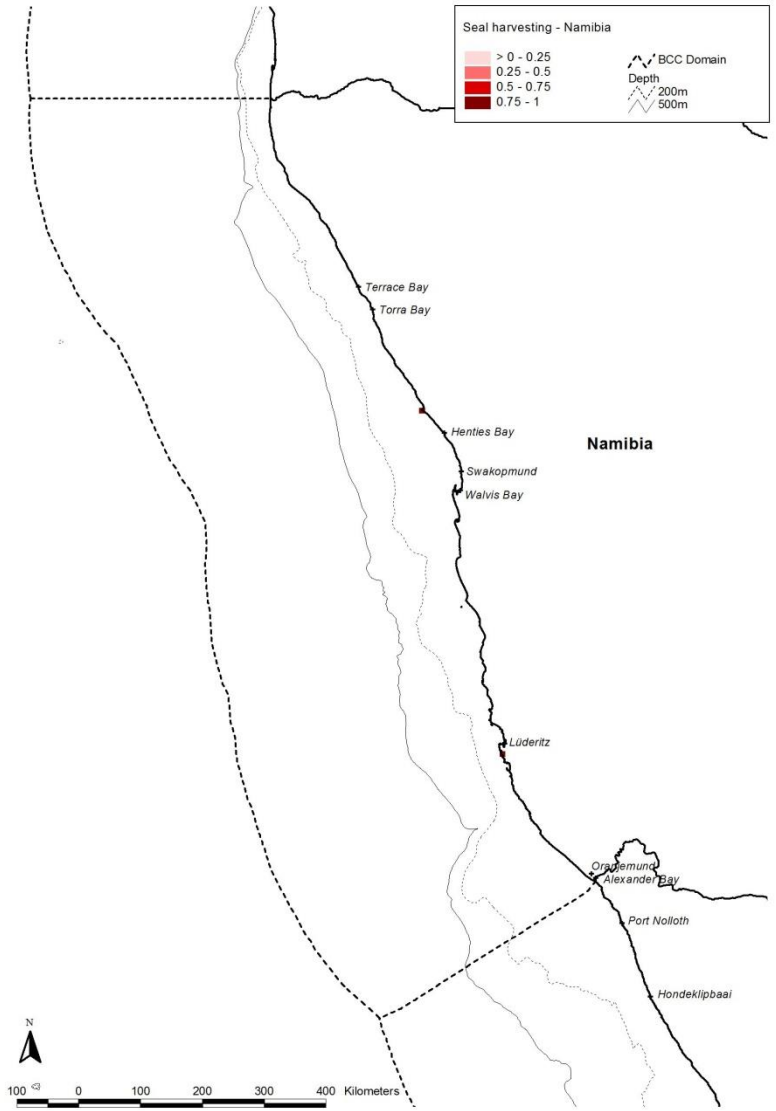

Figure 23: Namibia – seal harvest.

Namibia – Shipping

Namibian waters have relatively high levels of commercial boat traffic compared with the rest of the BCLME domain. Biodiversity impacts are associated with oil spills, alien species introduced through ballast water and on hulls, dumping of waste, and through ship strikes.

Base data source:

Base data were obtained from Halpern et al 2008 -A global map of human impact on marine ecosystems [15]. Many smaller vessels were not included in this international dataset. Furthermore, there are also clearly some errors in the dataset as indicated by false tracks.

Methods:

Shipping intensity was based on the Halpern et al 2008 data. This data represented density of vessel tracks. We were interested in heavily used shipping lanes relative to normal BCLME vessel traffic levels only, therefore the international data were sub-sampled to the BCLME area. Resultant values were normalized using the d/d80 method (d80 =0.41253), and hence converted to a 0-1 range. The bottom 20% of values (approximately equivalent to values below 0.069845) were re-assigned a 0 value.

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: nam_ship

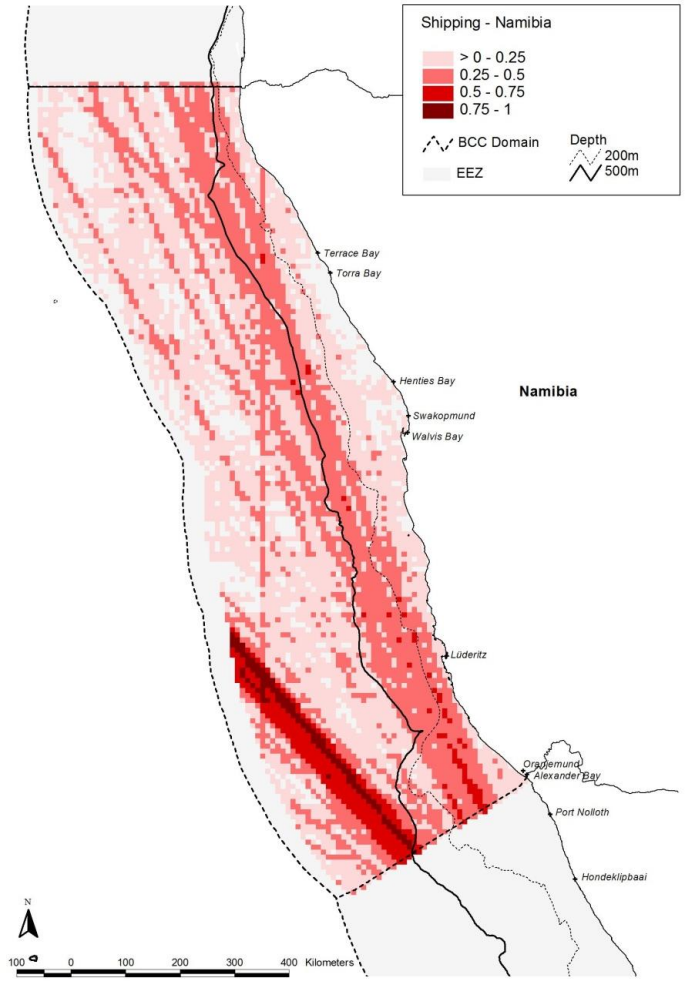

Figure 24: Namibia - shipping.

[15] Halpern BS, Walbridge, S, Selkoe KA, Kappel CV, Micheli F, D'Agrosa C, Bruno JF, Casey KS, Ebert C, Fox HE, Fujita R, Heinemann D, Lenihan HS, Madin EMP, Perry MT, Selig ER, Spalding M, Steneck R, Watson R. 2008. A global map of human impact on marine ecosystems. Science 319: 948-952.

Namibia – Small pelagics

Commercial industry targeting sardine, anchovy and redeye.

Base data source:

Data were collated by Dr Carola Kirchner as part of the current project from information collected and held by NatMIRC.

Methods:

Commercial data from 1996 to 2011 is available. All trawls made by the individual vessels on one day are summed for fish caught. Positional data using co-ordinates are provided for the first trawl of the day.

Spatial summaries of total catch per 5'grid for the study period were calculated. Resultant values were normalized using the d/d80 method (d80 = 1120). Initial summaries showed a number of clearly incorrect locations (e.g. in very shallow water or on land). Therefore, after discussion with NatMirc, values below 0.2 were removed as it was likely that many of these were errors. This significantly cleaned up the scatter in the dataset.

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: s_pel_8002

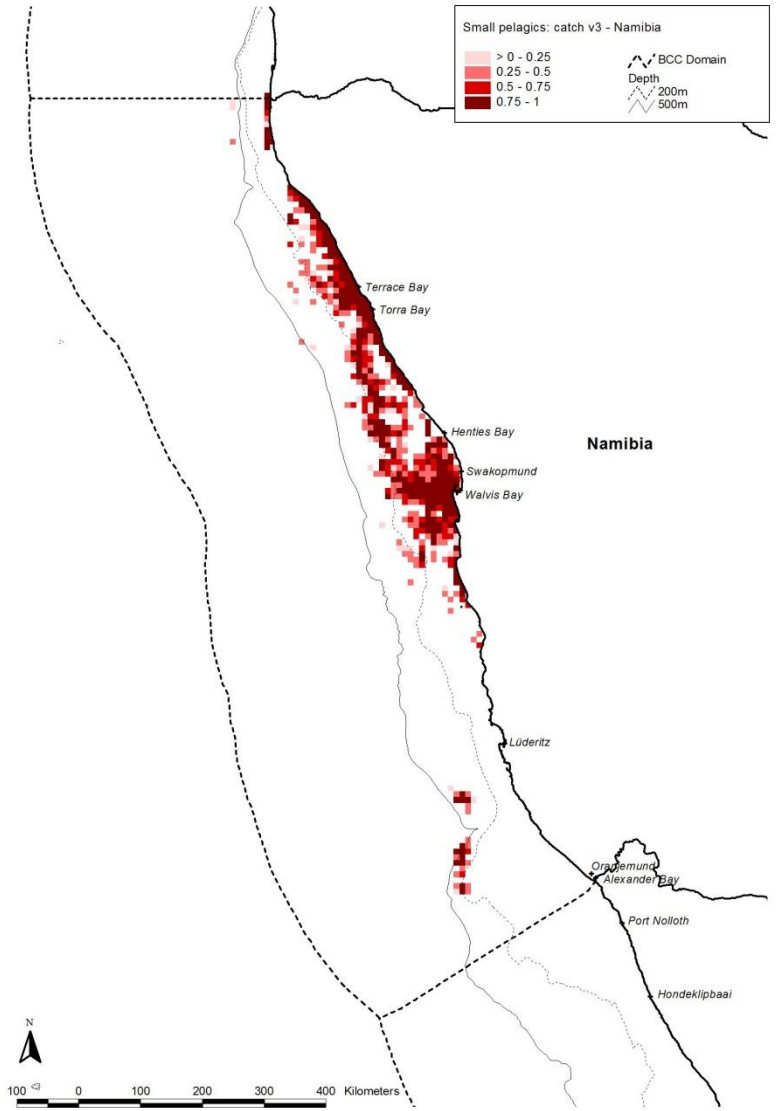

Figure 25: Namibia – Small pelagics.

Namibia – Rock lobster

The rock lobster fishery targets the temperate, cold water, spiny lobster species *Jasus lalandii*. Key biodiversity are related to stock status concerns.

Base data source:

Data were collated by Dr Carola Kirchner as part of the current project from information held by NatMIRC.

Methods:

Commercial data from 1999 to 2011 are available, with the exception of 2003. Only 5 areas are fished extensively. Catch and effort data are provided per area only.
Number of traps per fishing area for the study period were calculated and a trapping intensity per km of coastline was estimated for each fishing area. Values for the fishing intensity were converted to a 0-1 range using d/dmax method (dmax = highest intensity in any fishing area). This line was rasterized and a mean value per 5' grid was calculated.

Data archiving and GIS data links:

Shapefile: Namibia_Pressures_Grids.shp
Field: lobster

.

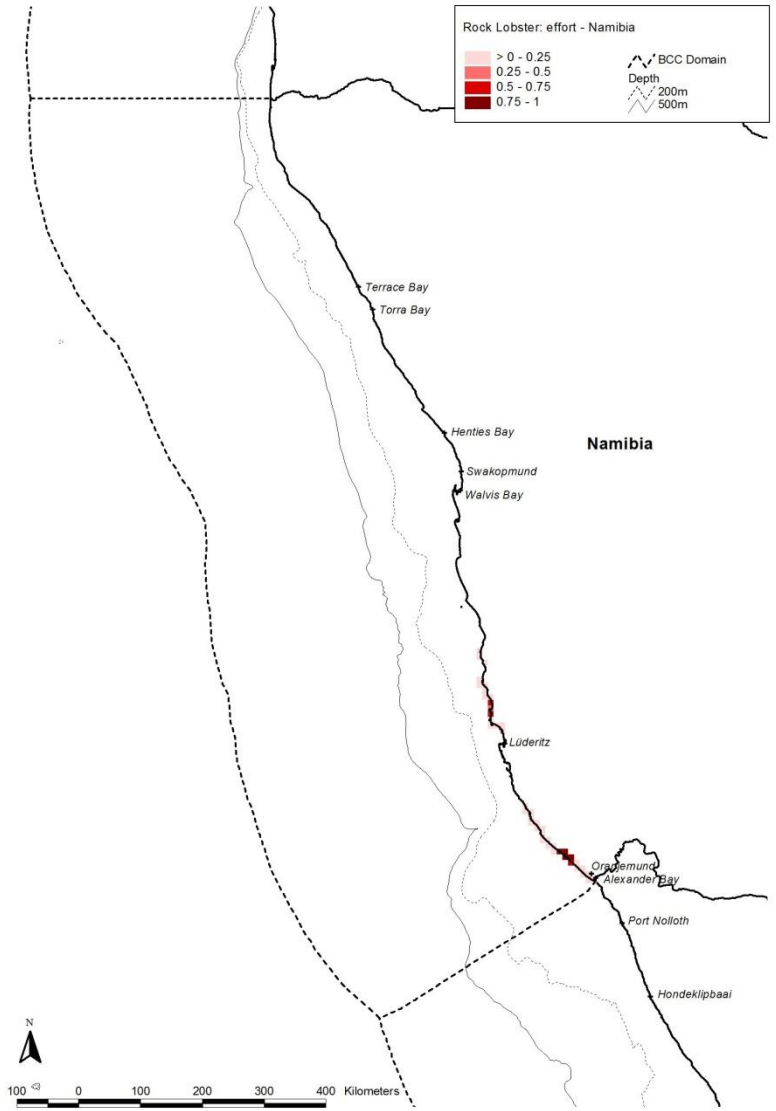

Figure 26: Namibia – Rock lobster effort.

South Africa - Alien Invasive Species

Summary of key alien invasive species which have the potential to transform habitats or to significantly modify ecosystem function.

Base data source:

Data were initially summarised as part of the South African National Biodiversity Assessment 2011 [16].

Methods:

Point and linear data on the distribution of alien invasives were analysed for the presence of key invasive species within a 5' block. Blocks with both *Mytilus galloprovincialis* and *Carinus maenas* received a value of 1, while areas with *Mytilus galloprovincialis* only were allocated a value of 0.9. Spatial data on distributions are relatively broad. Consequently all South African coastal areas within the BCLME domain have received the same score.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: Alien

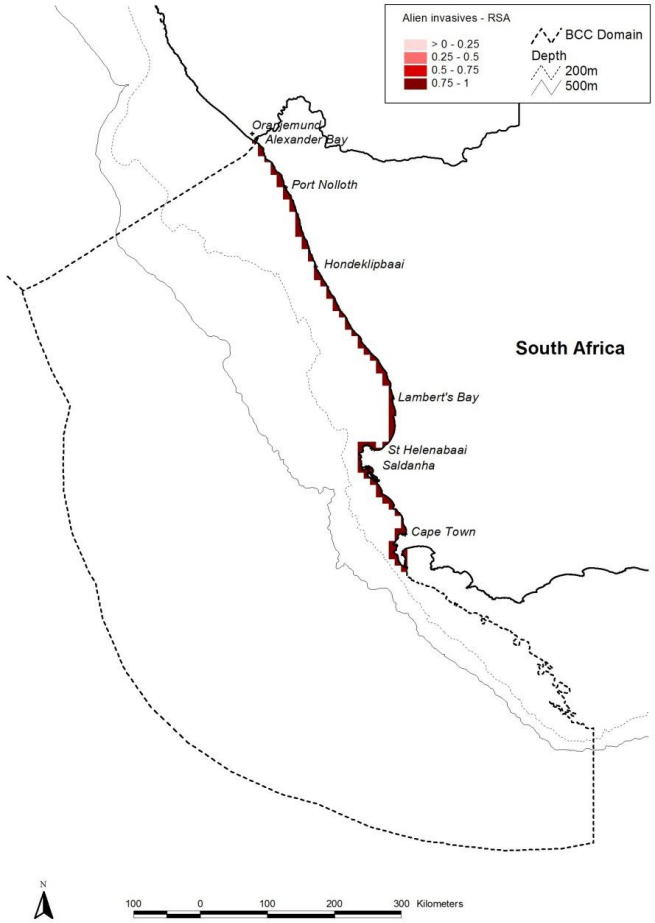

Figure 27: South Africa – alien invasives.

[16] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa - Coastal development

Summary of coastal development pressure.

Base data source:

Initial data were compiled by Dr Linda Harris as part of the South African National Biodiversity Assessment 2011 [17]. The Surveyor General property parcel layer was converted into a layer of all coastal buildings, after verifying and modifying (as necessary) each property parcel against Google Earth, and manually digitizing any additional development. This was combined with development-related landcover types extracted from the National Land Cover 2000 map.

Methods:

This base data layer developed by Linda Harris was used to calculate the percentage of the terrestrial area within 1 km of the coastline area that was under urban landcover types, i.e. for each 5' block within a 1 km buffer of the coast, the percentage land area that was covered by urban development (residential, commercial or industrial) was calculated and used as a proxy for coastal development pressure. Values were linearly converted to a 0-1 range with 0 being completely undeveloped and 1 being completely developed.

In comparison with other layers this is a very accurate dataset, nevertheless there are inherent and inevitable inaccuracies in any landcover map. Further, in areas with rapid development, the layer will rapidly become dated.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: DEV_DM

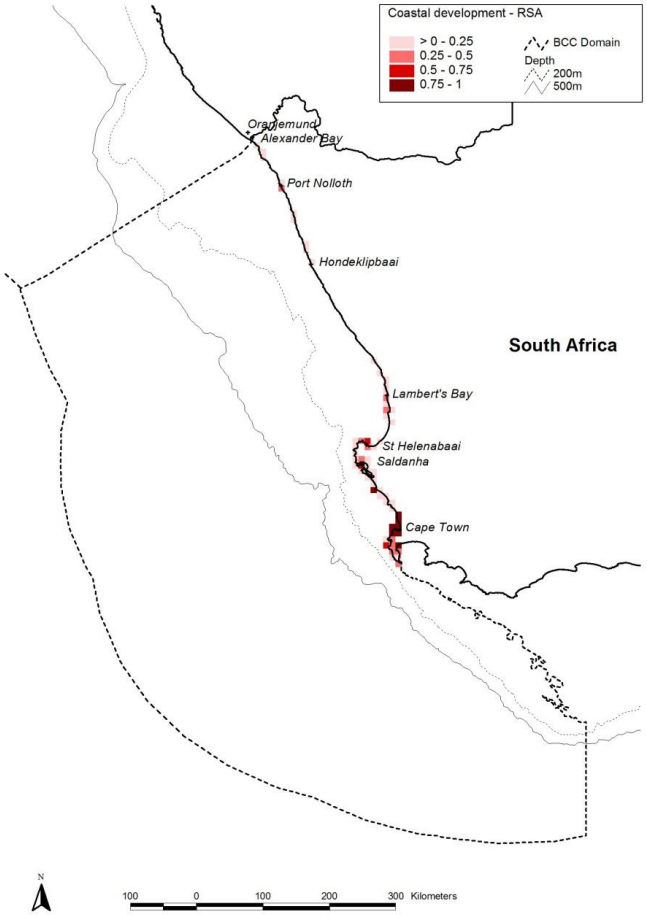

Figure 28: South Africa – coastal development.

[17] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa – Disturbance of coastal areas

Potential coastal disturbance impacts associated with human use of the coast (e.g. shorebird disturbance and trampling of dunes and intertidal fauna).

Base data source:

Initial data were compiled by Dr Linda Harris for the National Biodiversity Assessment 2011 [18]. The two base layers (vehicle access points and recreational beaches) were obtained from the Department of Environmental Affairs project "National Re-evaluation of the Beach Driving Decision Support Tool" (Anchor Environmental and International Ocean Institute, with input from Dr Ronel Nel and Dr Linda Harris).

Methods:

Coastal access was mapped by creating a 1 km buffer around all vehicle-based access points to the coast. In addition the national recreational beaches layer was used to identify the coastal area associated with highest levels of human disturbance. Within each 5' grid cell that overlapped with the coastline, the total percentage of recreational beaches or beaches within 1 km of an access point were expressed as a proportion of the total coastline length. These percentages were linearly scaled to a 0-1 range.

This is a coarse proxy for disturbance and does not take beach or beach use characteristics into account. It may also underestimate impacts on rocky shores.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: Tramp_dm

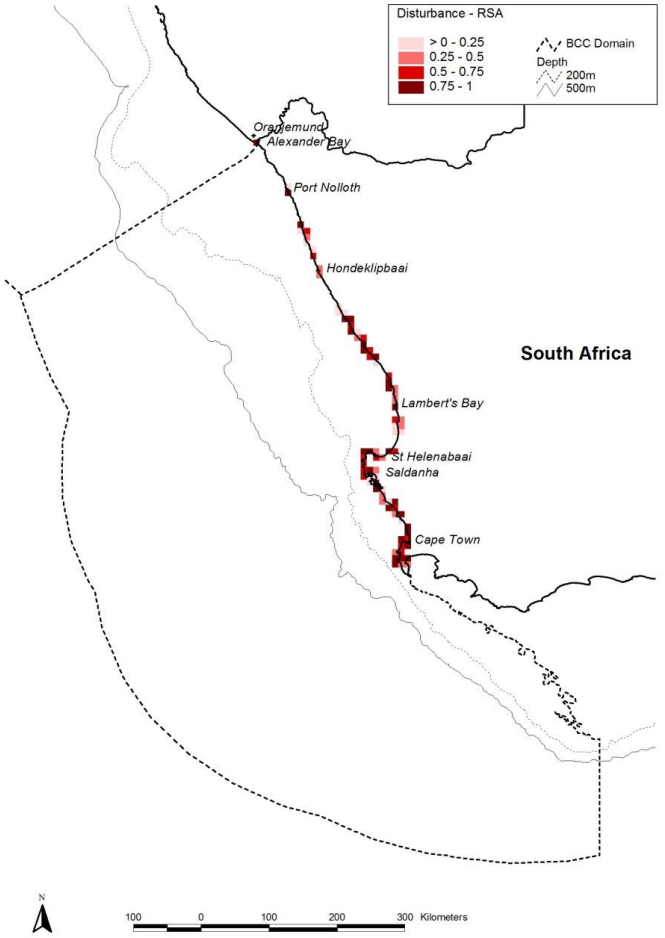

Figure 29: South Africa – coastal disturbance.

[18] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa – Demersal longline fishery

A commercial industry targeting mainly deep-water hake. Key issues include substantial bycatch of other species, direct impacts on benthic communities and vulnerable marine ecosystems, status of target species, and impacts on seabirds.

Base data source:

Data were initially collated as part of the Offshore Marine Protected Area project [19]. The current intensity layer was developed for the South African National Biodiversity Assessment 2011 . Data collection for this layer is based on a 20' grid, which is very coarse for this sort of analysis. The record is also relatively short.

Methods:

Based on the commercial effort data of the offshore trawl fishery for the period 2000 to 2008, average annual effort in hours per block of the demersal 20' x 20' trawl grid was converted to intensity for 5' blocks. The values were normalized using the d/d80 method.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: HL_TE_DM

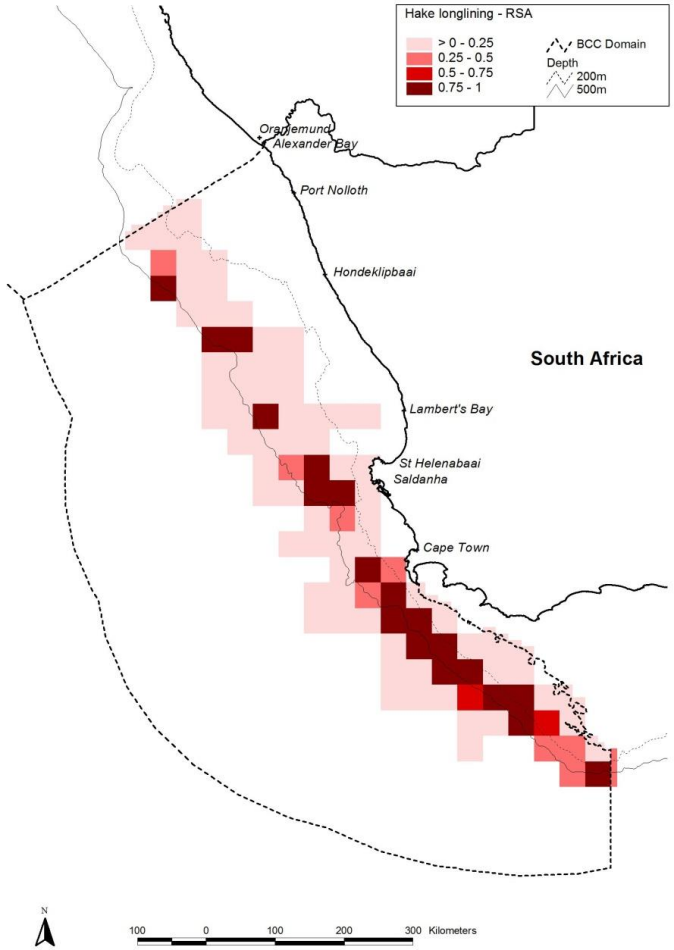

Figure 30: South Africa – demersal longline fishery.

[19] Sink KJ, Attwood CG, Lombard AT, Grantham H, Leslie R, Samaai T, Kerwath S, Majiedt P, Fairweather T, Hutchings L, van der Lingen C, Atkinson LJ, Wilkinson S, Holness S, Wolf T. 2011. Spatial planning to identify focus areas for offshore biodiversity protection in South Africa. Unpublished Report. Cape Town: South African National Biodiversity Institute.

South Africa – Offshore demersal trawl fishery

Commercial industry targeting deep-water hake, with significant and valuable bycatch species which may in some cases be deliberately targeted. Key issues include direct impacts on benthic communities and vulnerable marine ecosystems, status of target species, and bird bycatch.

Base data source:

Data were initially collated as part of the Offshore Marine Protected Area project [20]. Data collection for this layer is based on a 20' grid, which is very coarse for this sort of analysis. The record is also relatively short.

Methods:

Commercial effort data for the offshore trawl fishery. Average annual effort in hours for the period 2000 to 2008 for the demersal 20' x 20' trawl grid, was converted to intensity for 5' blocks. The values were normalized using the d/d80 method.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: OT_TE_DM

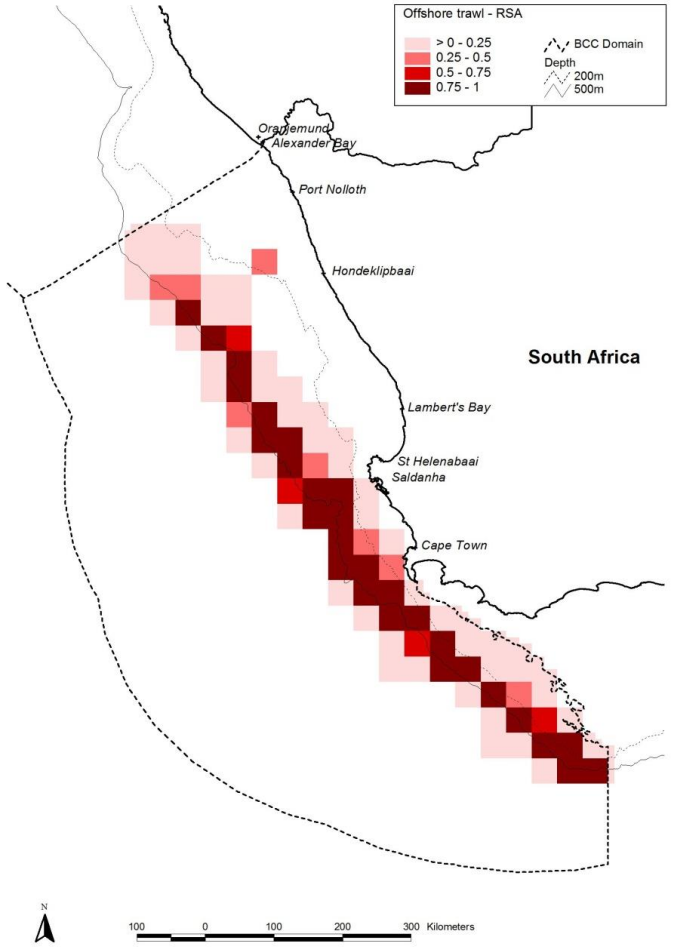

Figure 31: South Africa – offshore trawl.

[20] Sink KJ, Attwood CG, Lombard AT, Grantham H, Leslie R, Samaai T, Kerwath S, Majiedt P, Fairweather T, Hutchings L, van der Lingen C, Atkinson LJ, Wilkinson S, Holness S, Wolf T. 2011. Spatial planning to identify focus areas for offshore biodiversity protection in South Africa. Unpublished Report. Cape Town: South African National Biodiversity Institute.

South Africa – Kelp harvest

Kelp harvesting includes the harvesting of fresh kelp from live stocks as well as the removal of kelp that has washed up on beaches (beach-cast kelp).

Base data source:

Data were initially summarised as part of the South African National Biodiversity Assessment 2011 [21]. Data on harvesting concessions and harvest from Rob Anderson, collated by Cloverly Lawrence (SANBI). The harvesting of red algae was not mapped and therefore the potential impact of this activity was not included in this study.

Methods:

A kelp harvesting layer was developed based on the total annual kelp harvest data for each concession from 2000-2009. Harvesting intensity was calculated by dividing the total harvest for that section by the coast length in kilometres. These values were then scaled using the d/d80 method.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: Kel_TH_DM

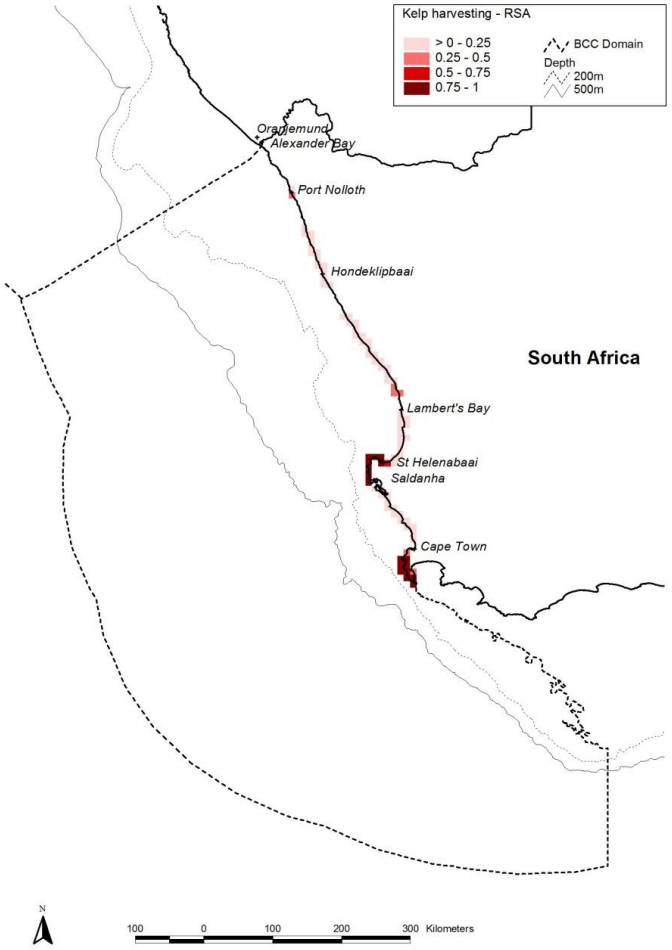

Figure 32: South Africa – kelp harvesting.

[21] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa – Large pelagics

A commercial pelagic fishery targeting various tuna and swordfish species using longlining. Issues include the status of swordfish, and bycatch of sharks and seabirds.

Base data source:

Data were initially collated as part of the Offshore Marine Protected Area project [22]. The current intensity layer was developed for the South African National Biodiversity Assessment 2011 [23].

Methods:

Effort was calculated based on the annual average number of hooks set per 10 x 10 minute grid for the period November 1997 to January 2008. The data included all foreign and local-flagged vessels fishing under a South African license. The values were normalized using the d/d80 method.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: LP_TE_DM

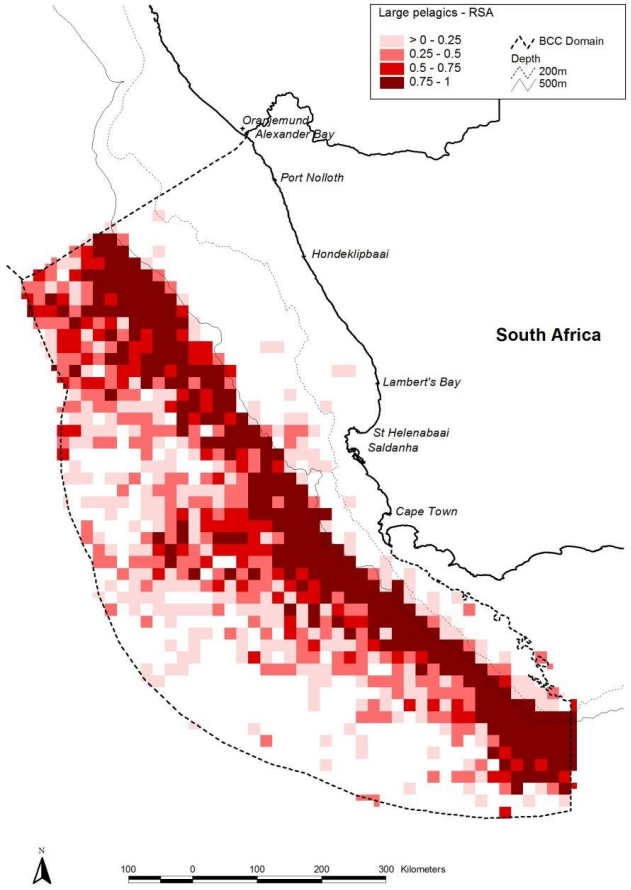

Figure 33: South Africa – large pelagic effort.

[22] Sink KJ, Attwood CG, Lombard AT, Grantham H, Leslie R, Samaai T, Kerwath S, Majiedt P, Fairweather T, Hutchings L, van der Lingen C, Atkinson LJ, Wilkinson S, Holness S, Wolf T. 2011. Spatial planning to identify focus areas for offshore biodiversity protection in South Africa. Unpublished Report. Cape Town: South African National Biodiversity Institute.

[23] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa – Commercial linefishing

The commercial linefishery is a multispecies fishery largely targeting 35 species. Biodiversity concerns are centred on the poor stock status of many linefish species and the potential impact of reduced linefish populations on marine ecosystems.

Base data source:

Data were initially collated as part of the Offshore Marine Protected Area project [24]. The current intensity layer was developed for the South African National Biodiversity Assessment 2011 [25]. There are some data quality issues as detailed inspection of the dataset indicates some false reporting of actual fishing sites (i.e. there appears to be use of dummy reporting blocks often situated just outside harbours).

Methods:

Total linefish effort per 5' grid for the period 2003 - 2007 (which represents the period since medium term fishing rights were allocated) was used as the measure of linefishing intensity. The values were normalized using the d/d80 method.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: LF_TE_DM

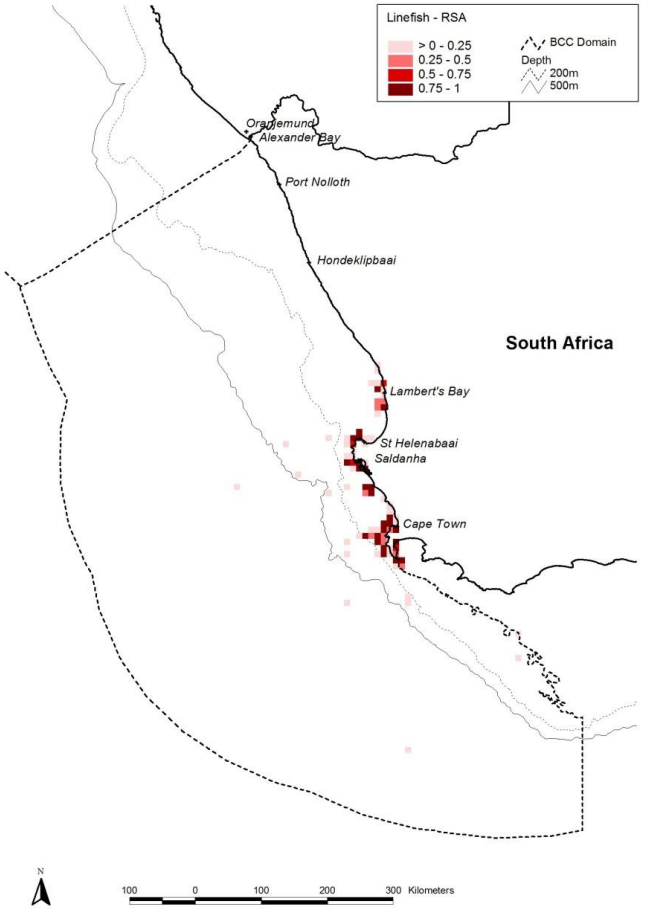

Figure 34: South Africa – linefishing effort.

[24] Sink KJ, Attwood CG, Lombard AT, Grantham H, Leslie R, Samaai T, Kerwath S, Majiedt P, Fairweather T, Hutchings L, van der Lingen C, Atkinson LJ, Wilkinson S, Holness S, Wolf T. 2011. Spatial planning to identify focus areas for offshore biodiversity protection in South Africa. Unpublished Report. Cape Town: South African National Biodiversity Institute.

[25] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa – Mariculture

Mariculture operations include in-situ marine operations (e.g. rafts, racks or cages suspended directly in the sea) and terrestrial operations that abstract sea water, pass it through the culture facility, and then return it to the sea. Key issues include pollution and water quality issues, as well as the introduction of alien species, microbes and pathogens.

Base data source:

Data from Department of Agriculture, Forestry and Fisheries were collated by SANBI as part of the South African National Biodiversity Assessment 2011 [26].

Methods:

All active aquaculture sites which were connected to, or located in, the sea were buffered by 2km. The 5' grid cells which overlapped these areas were allocated a value of 1, all other cells were given a 0 value.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: maricultur

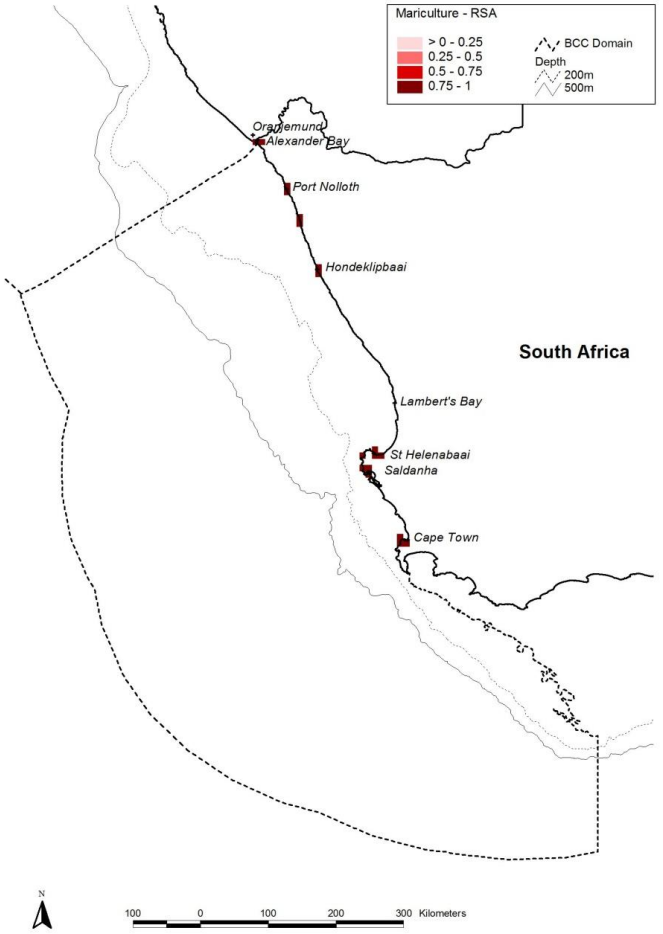

Figure 35: South Africa - mariculture.

[26] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa – Mining

Mining in South African marine and coastal habitats focuses on diamonds and heavy minerals. Greatest impacts are associated with diamond mining using bulldozers in coastal areas, divers or ship-based methods.

Base data source:

Initial data were summarised as part of the South African National Biodiversity Assessment 2011 [27]. Data on mining and prospecting sites from Lesley Roos (De Beers), were verified by Cloverley Lawrence (SANBI) and edited by Trevor Wolf. Mining landcover types were extracted from the National Landcover 2000 (NLC). The current intensity layer was developed for the South African National Biodiversity Assessment 2011.

Methods:

All 5' grids containing mined sites (or overlapping areas with a mined landcover category) were allocated a score of 1. Grid cells which had only been prospected were allocated a value of 0.2, and all other cells were given a value of 0.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: Mining_DM

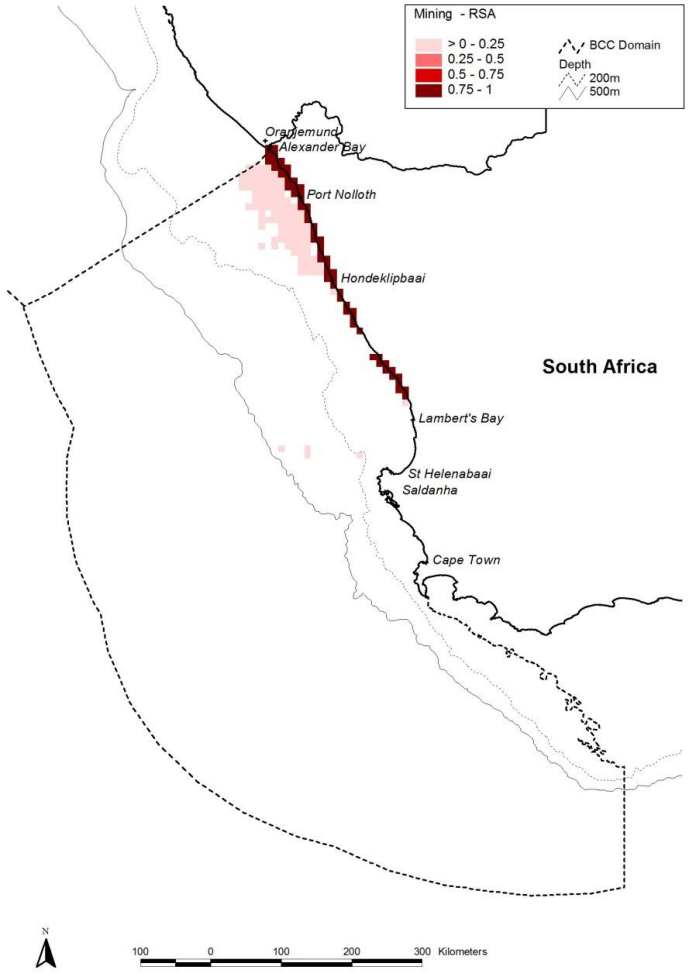

Figure 36: South Africa - mining.

[27] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa – Oil and Gas

Oil and gas prospecting and production have a long history in South African waters, and more than 300 offshore wells have been drilled. Most of these are however not within the BCLME domain. Key biodiversity concerns are potential impacts from seismic surveys, risk of spills, and the impacts of exploration and production activities on habitats and species. This assessment focuses only on the impacts of exploration and production activities on habitats and species.

Base data source:

Data on active and suspended wellheads data are from Lara Atkinson. The current intensity layer was developed for the South African National Biodiversity Assessment 2011 [28].

Methods:

All 5' grid cells which contained production wells, suspended well heads or abandoned well heads were allocated a score of 1. Early versions differentiated between the well categories, but these distinctions were removed following expert input.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: Oil_DM

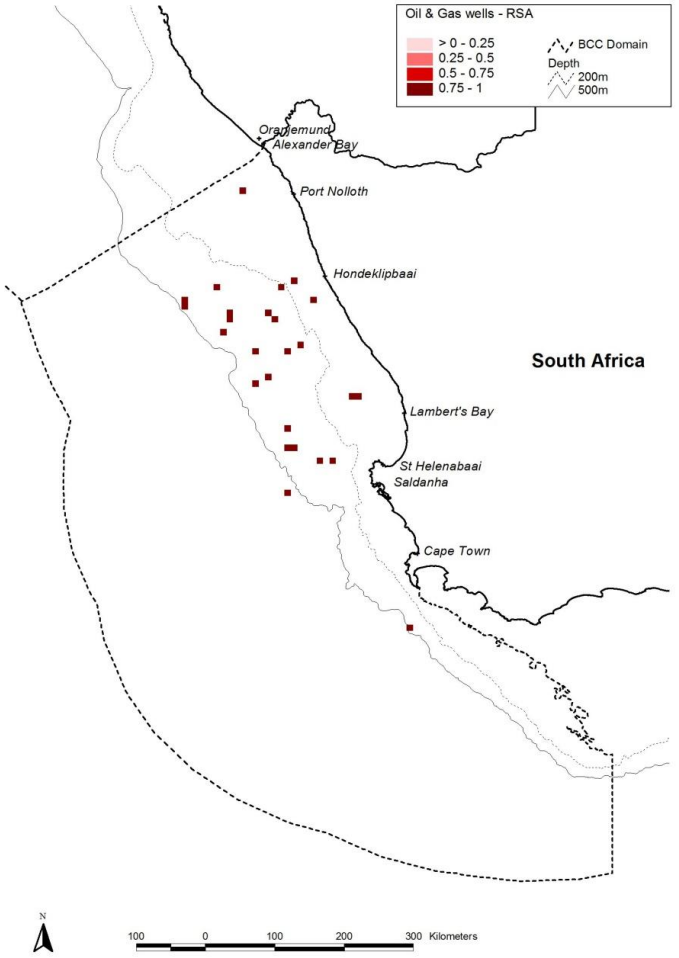

Figure 37: South Africa – oil and gas.

[28] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa – Pole tuna

The tuna pole fishery targets albacore and yellowfin tuna. The industry has near zero bycatch but there are some concerns regarding the stocks.

Base data source:

Data were initially collated as part of the Offshore Marine Protected Area project [29], while the current intensity layer was developed for the National Biodiversity Assessment 2011 [30].

Methods:

During the OMPA process high, medium and low value areas were identified for albacore and yellowfin based on expert identification of important tuna areas. For the current analysis, grids for each species were scored on a 1-3 scale, and a combined score was calculated by adding these values. Combined scores were normalized to the 0-1 range using a modified d/d80 method, where the value of 5 was used in place of d80. Resulting values greater than 1 were reduced to 1.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: PT_DM

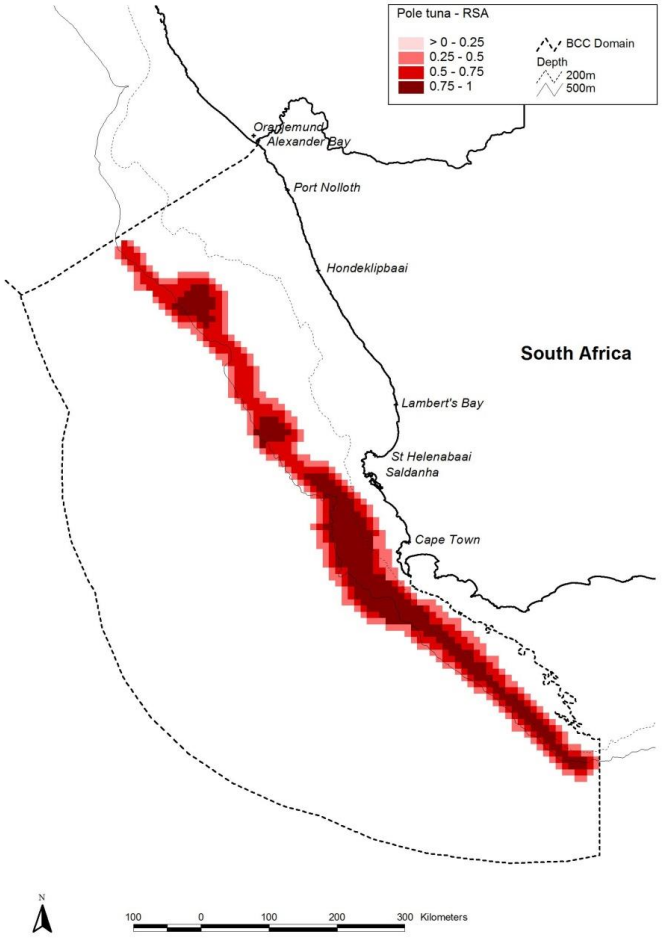

Figure 38: South Africa – pole tuna.

[29] Sink KJ, Attwood CG, Lombard AT, Grantham H, Leslie R, Samaai T, Kerwath S, Majiedt P, Fairweather T, Hutchings L, van der Lingen C, Atkinson LJ, Wilkinson S, Holness S, Wolf T. 2011. Spatial planning to identify focus areas for offshore biodiversity protection in South Africa. Unpublished Report. Cape Town: South African National Biodiversity Institute.

[30] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa – Recreational Boat Fishing

Boat based recreational linefishing targets many of the same species as the commercial fishery, but mostly at much lower intensities. Biodiversity concerns associated with this activity are the poor stocks and poor conservation status of many target species.

Base data source:

Data were initially summarised as part of the South African National Biodiversity Assessment 2011 [31]. Boat launch sites data are from the SANBI Marine Program and Linda Harris.

Methods:

A modelled fishing intensity base layer was developed based on the inverse Euclidean distance to boat launch sites. A maximum distance of 30km was used to align with cut-offs used in the KZN Seaplan process. No-take MPAs and No-Take MPA Zones were excluded. An average intensity per 5' grid was calculated using an area weighted mean. These values were then normalized using the d/d80 method.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: REC_B_DM

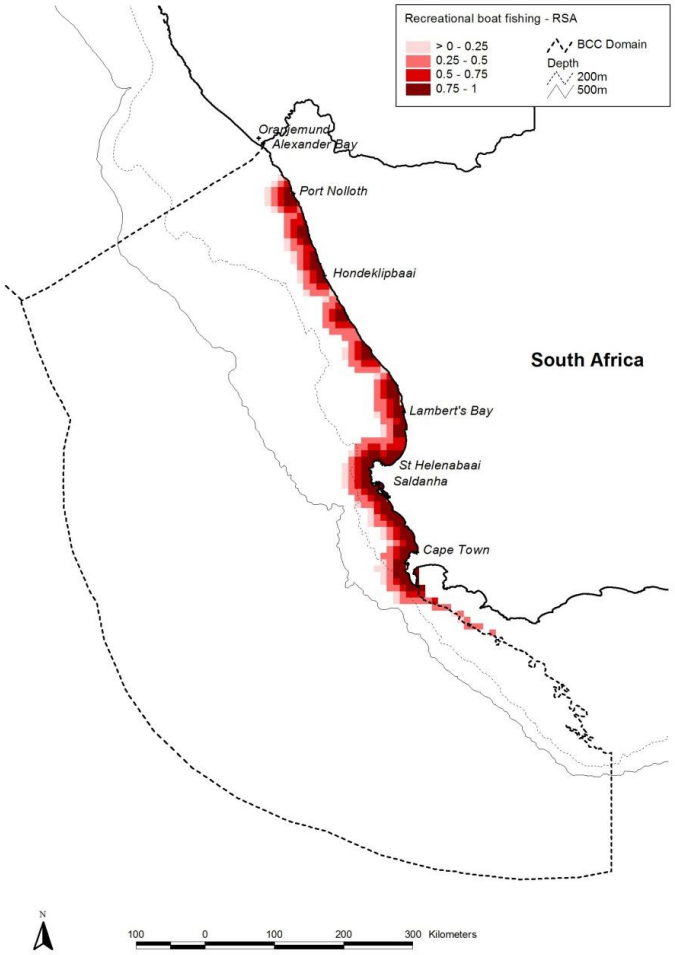

Figure 39: South Africa – recreational boat fishing.

[31] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa – Recreational Shore Fishing

Recreational fishers target a range of species, some of conservation concern.

Base data source:

Data were initially summarised as part of the South African National Biodiversity Assessment 2011 [32]. Coast access points and recreational beaches were obtained from Linda Harris / Anchor Environmental - GIS layer as part of the National Beach Driving Decision Support System. Angler days were from existing published studies [33, 34].

Methods:

The recreational and high access beaches used in the "Disturbance of coastal areas " layer were used as the basis to identify accessible shores. No-take MPA areas were excluded. Base intensity of fishing along the coast was calculated by dividing angler days by the length in km of accessible coast where fishing is allowed. An area weighted mean of the angling intensity was then calculated per 5' grid. The values were normalized to a 0-1 range.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: Rec_sh_dm

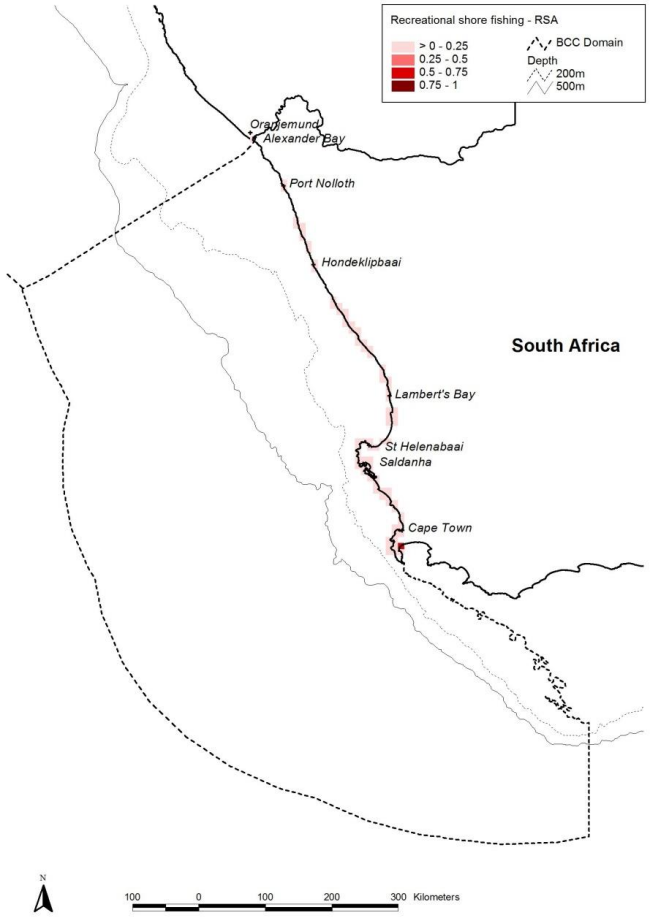

Figure 40: South Africa – recreational shore fishing.

[32] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

33 Brouwer, S.L., Mann, B.Q., Lamberth, S.J., Sauer, W.H.H., Erasmus, C. 1997. A survey of the South African shore-angling fishery. South African Journal of Marine Science. 18, 165-177)
34 Transkei = 170457 as per Mann, B.Q., McDonald, A.M., Sauer, W.H.H., Hecht, T. 2003. Evaluation of participation in and management of the Transkei Shore Linefishery. African Journal of Marine Science. 25, 79-97

South Africa – Shark fishery

The commercial industry targets both pelagic and demersal sharks. Biodiversity concerns are centred on the status and vulnerability of target species and the ecosystem impacts from loss of top predators.

Base data source:

Data were initially collated as part of the Offshore Marine Protected Area project [35], while the current intensity layer was developed for the NBA 2011 [36]

Methods:

Intensity of effort was based on the average total number of hooks set by the pelagic and demersal-directed shark longline industry per year for the period 2003 to 2008. The 10' grid used for reporting by this industry was resampled to a 5' grid. The grids were converted to the standard 5' grid. These values were then normalized using the d/d80 method.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: SH_TE_DM

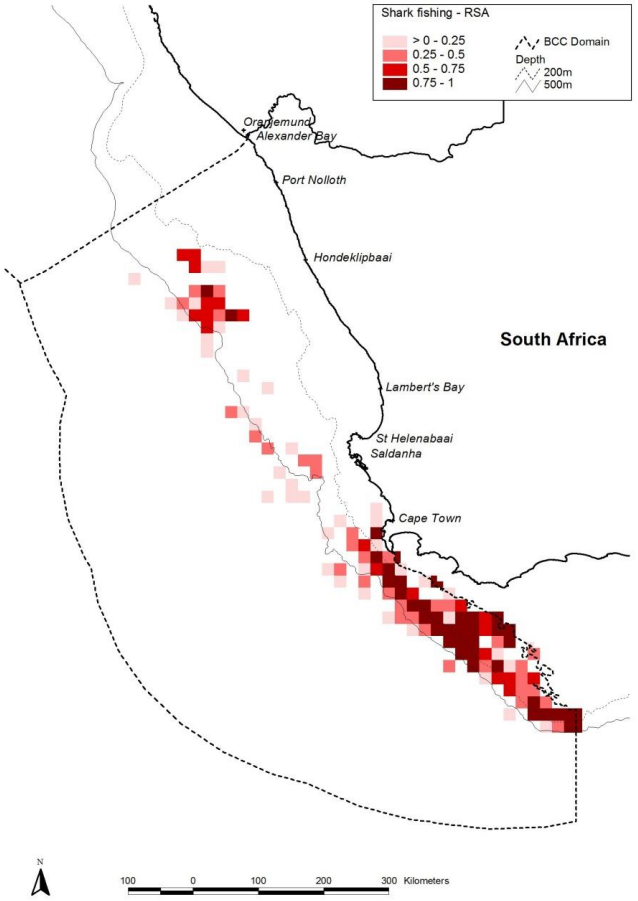

Figure 41: South Africa – shark fishing.

[35] Sink KJ, Attwood CG, Lombard AT, Grantham H, Leslie R, Samaai T, Kerwath S, Majiedt P, Fairweather T, Hutchings L, van der Lingen C, Atkinson LJ, Wilkinson S, Holness S, Wolf T. 2011. Spatial planning to identify focus areas for offshore biodiversity protection in South Africa. Unpublished Report. Cape Town: South African National Biodiversity Institute.

[36] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa – Shipping

South African waters have relatively high levels of commercial boat traffic. Biodiversity impacts are associated with oil spills, alien species introduced through ballast water and on hulls, dumping of waste, and through ship strikes.

Base data source:

Base data were obtained from Halpern et al 2008 -A global map of human impact on marine ecosystems [37]. The current intensity layer was developed for the NBA[38]. Note that many smaller vessels are not included in this dataset.

Methods:

Shipping intensity was based on the Halpern et al 2008 data. This data represented density of vessel tracks. We were interested in heavily used shipping lanes relative to normal SA vessel traffic levels only, therefore the international data were sub-sampled to the SA EEZ before thevalues were normalized to a 0-1 range. Thebottom 20% of values were re-assigned a 0 value.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: SHIP_DM

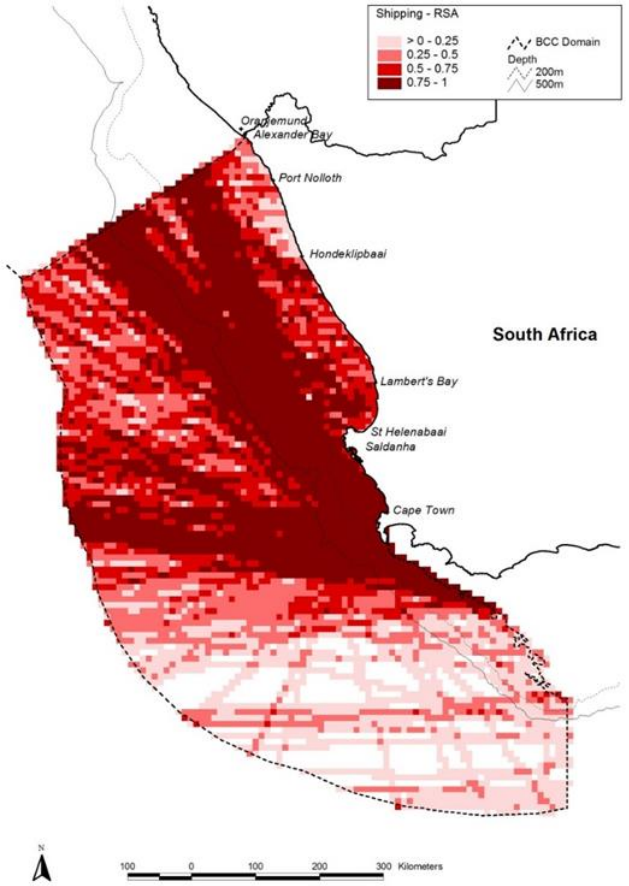

Figure 42: South Africa – shipping intensity.

[37] Halpern BS, Walbridge, S, Selkoe KA, Kappel CV, Micheli F, D'Agrosa C, Bruno JF, Casey KS, Ebert C, Fox HE, Fujita R, Heinemann D, Lenihan HS, Madin EMP, Perry MT, Selig ER, Spalding M, Steneck R, Watson R. 2008. A global map of human impact on marine ecosystems. Science 319: 948-952.

[38] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa – Squid

The chokka squid industry in South Africa in largely focussed on the south coast but limited fishing also takes place in the BCLME area. Biodiversity concerns include potential impacts on squid predator populations, plastic pollution from squid boats, and impacts associated with the use of bright lights at night.

Base data source:

Data were initially collated as part of the Offshore Marine Protected Area project [39] , while the current intensity layer was developed for the NBA[40].

Methods:

Squid fishing effort data per 5' grid for the period 1986-2007 were used as the basis for calculating intensity of effort. Values were normalized using the d/d80 method.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: SQ_TC_DM

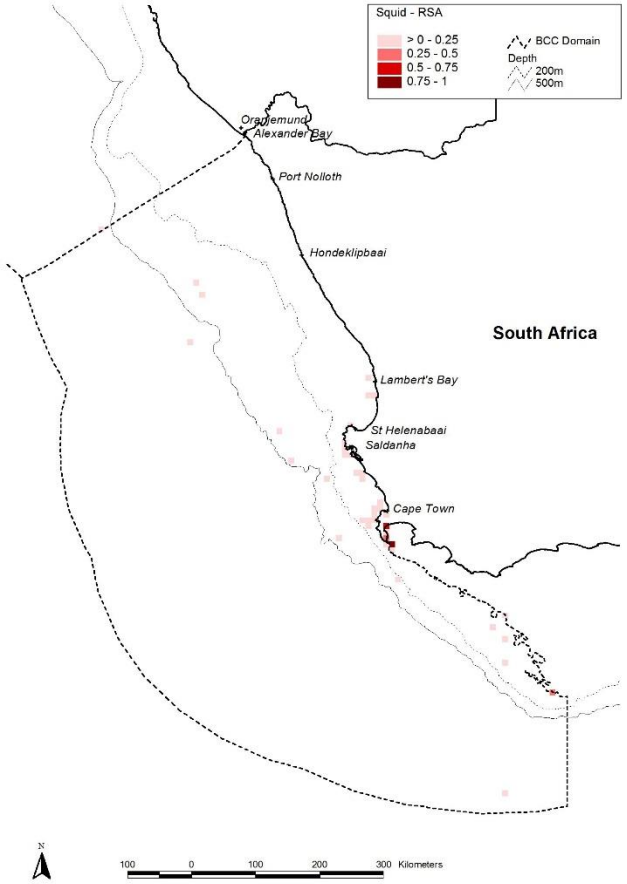

Figure 43: South Africa squid fishing.

[39] Sink KJ, Attwood CG, Lombard AT, Grantham H, Leslie R, Samaai T, Kerwath S, Majiedt P, Fairweather T, Hutchings L, van der Lingen C, Atkinson LJ, Wilkinson S, Holness S, Wolf T. 2011. Spatial planning to identify focus areas for offshore biodiversity protection in South Africa. Unpublished Report. Cape Town: South African National Biodiversity Institute.

[40] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa – Subsistence shore fishing and bait collection

The subsistence fishery uses various fishing and harvesting methods to target more than 30 species from a range of habitats. Key biodiversity concerns relate to overexploitation of intertidal resources.

Base data source:

Data were initially summarised as part of the South African National Biodiversity Assessment 2011 [41] based on published data[42]

Methods:

Intensity of harvesting was based on the number of subsistence fishers per km of coastline outside of no-take MPAs. An area weighted mean was calculated per 5' grid cell of fishing intensity. These values were normalized using the d/d80 method.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: SUBHAR_DM

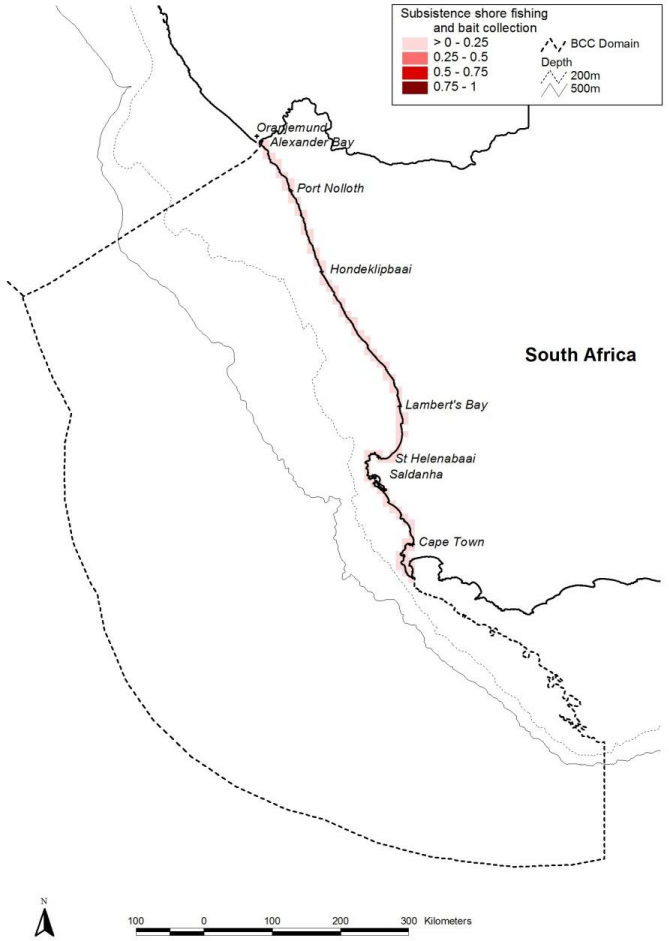

Figure 44: South Africa – subsistence shore fishing and bait collection.

[41] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

42 Clarke, B.M. et al. 2002. Identification of subsistence fishers, fishing areas, resource use and activities along the South African coast. South African Journal of Marine Science, 24: 425-437

South Africa – Waste water discharge

South Africa has numerous point sources where wastewater is discharged offshore, into the surf zone or into estuaries, though relatively few are in the BCLME domain. These wastewater discharges comprise municipal wastewater, effluent from fish processing, or wastewater from chemical works, desalination plants, refineries and other industries, as well as cooling water.

Base data source:

Data were initially summarised as part of the South African National Biodiversity Assessment 2011 [43].

Methods:

The coastline was divided into segments of uniform length, those segments where point sources of wastewater discharge were present were allocated a score of 1, with the remaining segments given a score of 0. The percentage of 5' grid blocks corresponding with the coastline that overlapped with one or more segments with a score of 1 was then calculated , and the resultant values normalized using the d/d80 method.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: CoastP_DM

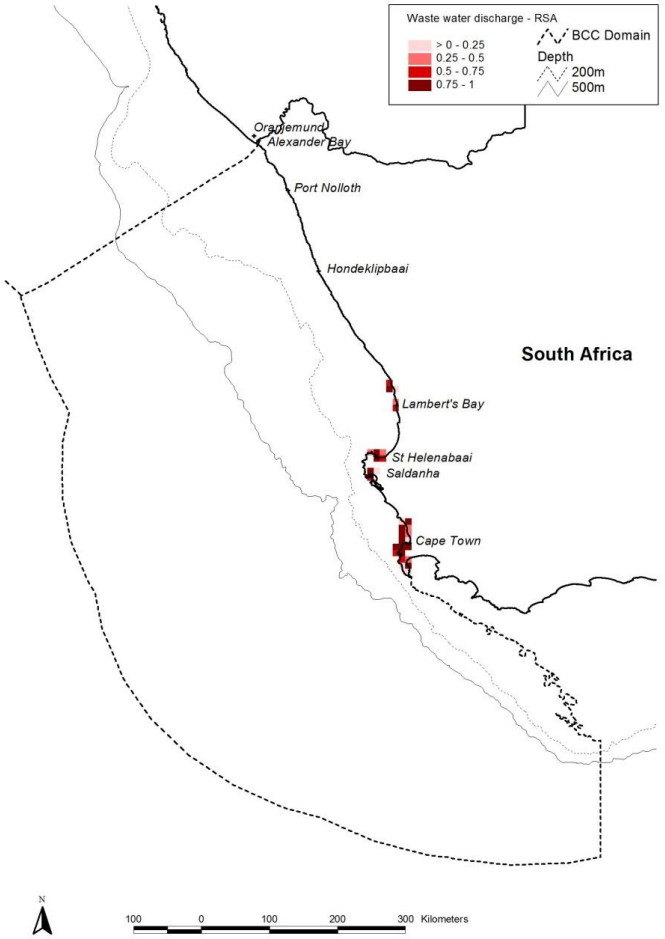

Figure 45: South Africa – waste water discharge.

[43] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.

South Africa – West Coast Rock Lobster

The West Coast rock lobster fishery targets the temperate, cold water, spiny lobster species *Jasus lalandii*. The key biodiversity concern is related to stock status.

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Base data source:

Data were initially collated as part of the Offshore Marine Protected Area project [44], while the current intensity layer was developed for the NBA[45].

Methods:

Intensity of effort was based on the total annual traps set during the period 2000-2007 in different harvest units. Intensity of effort in each harvesting unit was calculated as the number of traps set per year per area (km2) of the harvesting unit. An area weighted mean per 5' grid was then calculated, and the resultant values normalized using the d/d80 method.

Data archiving and GIS data links:

Shapefile: SA_BCC_combined_pressures_grid_wgs84.shp
Field: WCRL_TE_DM

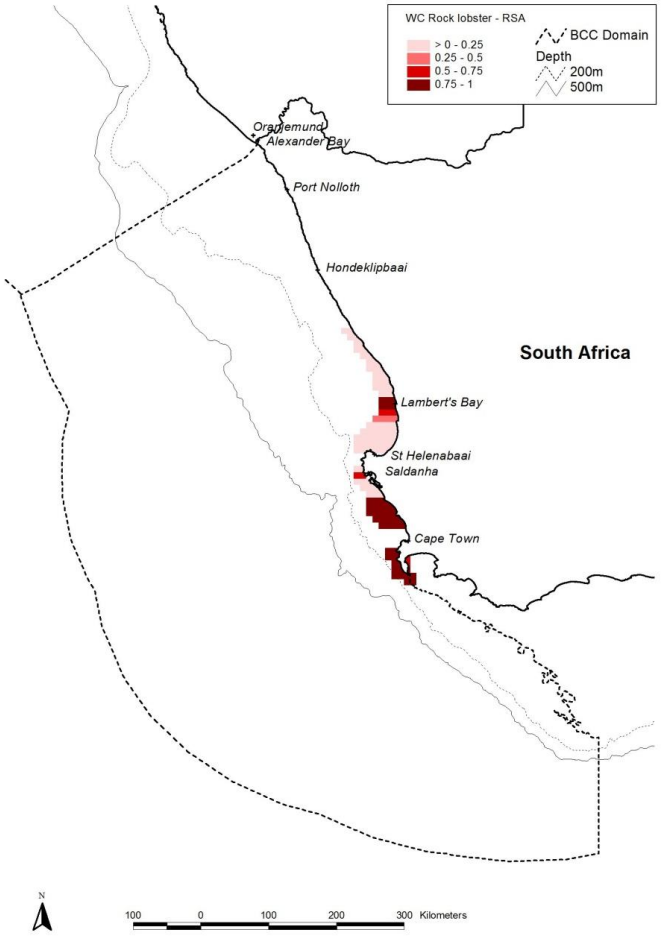

Figure 46: South Africa – west coast rock lobster.

[44] Sink KJ, Attwood CG, Lombard AT, Grantham H, Leslie R, Samaai T, Kerwath S, Majiedt P, Fairweather T, Hutchings L, van der Lingen C, Atkinson LJ, Wilkinson S, Holness S, Wolf T. 2011. Spatial planning to identify focus areas for offshore biodiversity protection in South Africa. Unpublished Report. Cape Town: South African National Biodiversity Institute.

[45] Sink, K.J, Holness, S., Harris, L., Majiedt, P.A., Atkinson, L., Robinson, T., Kirkman, S., Hutchings, L., Leslie, R., Lamberth, S., Kerwath, S., von der Heyden, S., Lombard, A.T., Attwood, C., Branch, G., Fairweather, T., Taljaard, S., Weerts, S., Cowley, P., Awad, A., Halpern, B., Grantham, H. & Wolf, T. 2012. National Biodiversity Assessment 2011: Technical Report. Volume 4: Marine and Coastal Component. South African National Biodiversity Institute, Pretoria.