

SCIENTIFIC SUMMARY OVERVIEW, COMMENT AND VERIFICATION

Documentation produced by FOSS cc (David Japp), May 2022, and by Robin Carter, Nina Steffani and Pedro Monteiro, Nov 2021 – Mar 2022

**Regarding the Proposed Development of Phosphate Deposits in the
Sandpiper Phosphate Licence Area ML 170 off the
Coast of Namibia**

Prepared for:

Namibian Marine Phosphate (Pty) Ltd

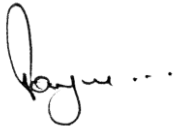
by

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EXPERTISE AND DECLARATION OF INDEPENDENCE

Neither I, Andrew I.L. Payne, nor the company A & B Word Ltd, UK, have any vested interest (financial or personal) in the proposed project or business activity other than remuneration for scientifically based consultative work undertaken on contract for Namibian Marine Phosphate (Pty) Ltd. I am an independent professional marine and fisheries scientist and journal editor, currently a member of and accredited by the Royal Society of Biology of the UK. This evaluation is undertaken without bias and in an entirely neutral capacity.



A & B Word Ltd
31 July 2022

BACKGROUND

Namibian Marine Phosphate (Pty) Ltd (NMP) is required to submit a fresh application for an environmental licence certificate for its Sandpiper Project, to include updates to the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) submitted originally in 2014 and updated in 2016, based on additional work conducted in 2019/2020 and recent relevant research. The author of this overview, comment and summary evaluation was previously involved under contract in October 2016 in leading and participating in a peer (scientific) review workshop convened to assess the outcome of many specialist studies conducted as part of the verification programme for the project, reviewing reports and information that *inter alia* provided input to the EIA and EMP submitted by NMP.

DOCUMENTS CONSIDERED

1. A multitude of reports, directives, documentation and consultation outputs compiled during the decade-plus-long gestation of the project, and notably the more recent public consultation review and outcome of the R.C. Newell report commissioned by and submitted to the Namibian Environmental Commissioner. The latter led the proponent to NMP to conduct further studies and analyses carried out in 2019/2020, and their outcomes were also considered. Also seen was the HR Wallingford “Sandpiper Marine Phosphate Project; Dredging Sediment Plume Dispersion Modelling” produced in 2020.
2. More of relevance to this current report, however, are (a) the recent collation of reports produced by Robin Carter and colleagues (NMP EIA and EMPR Amendments; Environmental Management Plan – Dredge Area Sediment Properties, Benthic Macrofauna Monitoring, and Desktop Assessment of Potential for Ocean CO₂ Emissions), and (b) the comprehensive overview and analysis produced by David Japp of FOSS cc (Environmental Impact Assessment Report – Fisheries, Mammals and Seabirds). It is the science, conclusions and evaluations in the latter two reports that form the basis of this independent review. Note too, that the current review presented in this report does not bring any new information or data, graphic, tabular or written, that is not already in these two above-cited works or their earlier manifestations, nor does it duplicate any of the material provided therein.

1. INITIAL OVERARCHING OBSERVATIONS

Namibian offshore waters contain extensive phosphate deposits along the whole coast, although the greatest concentrations of marine phosphate have been identified in the upper seabed between Walvis Bay and Lüderitz at a water depth of some 200 m. Noting that some of the early work on this project looked at potential issues and effects arising in the Marine Lease Area identified as ML170, originally identified as of primary interest, evaluation focus hereafter has now shifted correctly to the far smaller area within ML170 of initial commercial interest to the project and referred to as Sandpiper 1 or SP1. Such focus naturally affects Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) outcomes, whether considering biotic or abiotic (environmental) issues. Although some environmental effects will naturally spill over into surrounding local areas, SP1, a tiny fraction of the offshore seabed off Namibia, should be, in my opinion, other than for activities related to marine transport, the only area being evaluated for the 20-year extraction period.

Another key consideration for any evaluation is understanding that a marine ecosystem changes over time, naturally such as through climate change or in Namibia's case also through anthropogenic activity such as fishing. Therefore, as an example, the system's (biological and perhaps to a lesser extent, environmental) characteristics at the time of the 1960s explosion in pelagic fish catches off Namibia are likely impossible to replicate now. Scientific work, including off Namibia, has shown that the characteristics of many (marine) areas and systems have naturally fluctuated or completely altered for hundreds and even thousands of years. Therefore, to invoke a need in any evaluation of a marine activity such as this to return to its ecosystem/biotic characteristics of the past would be a largely hypothetical exercise. Of course, this statement does not preclude due consideration of whether any (new) activity may be negatively influencing the current system and its various users.

2. SCIENCE-BASED COMMENTARY ON THE WORKS BY ROBIN CARTER AND COLLEAGUES

This useful set of documents clearly outlines current issues and especially those raised by the Newell report and as a consequence of work done both historically/previously and relatively recently, including some commissioned by NMP following receipt of the Newell and HR Wallingford evaluations. In particular, four assessments are made in Carter's lead report, namely on seabed disturbance effects during operational activity, on sediment plume effects at the seabed and at the sea surface during extraction operations, on toxicity risks, and on underwater sound during potential commercial work. I comment briefly on each of these, but note first that Carter and Steffani conclude that any activity conducted during the exploration phase will have very little long-term effect on the area and that recovery from all forms of exploration will be fast. I concur with this judgement.

A number of issues and identification of their possible effects arise during any potential operational phase of the project, and I comment on each of them beneath:

- *Sediment removal* is obviously going to happen operationally and knowledge of the biotic and abiotic benthos at the site is already good. Physical recovery from the suggested rates of extraction is predicted to be longer than the 20-year period of operation forecast, but functional recovery may be achieved earlier, an appropriate expectation. Leaving behind a residual sediment layer of the deposit and ensuring that extraction "lanes" be interspersed with untouched "lanes" is recommended, but a pre-operational dredging survey, focusing on macrofauna, will need to be carried out to ensure that up-to-date information is available for post-operational confirmation. I agree with the authors that given the small area of SP1 relative to the total area potentially containing phosphate deposits of Namibia, the long-term significance of sediment removal during operational mining is not going to be great.

- *Seabed topography* would be altered locally during mining/dredging, potentially affecting the bottom hydrography. Again, the effect will be very local to the small operational area, so is not considered to have a great impact on the offshore Namibian seabed, and will be mitigated against by ensuring that a layer of deposit sediment and untouched dredge “lanes” are left.
- *Surficial organism removal* (and notably of mats of sulphur-oxidising bacteria, crucial to oxidising toxic H₂S) will take place, but studies have shown such organisms not to be very common around and at the SP1 site. The significance rating of this subject to operational activity is not high, but monitoring pre-operation and regularly thereafter is recommended and supported.
- *Release of dissolved nutrients* is another aspect identified, but with a low environmental impact given the small area being targeted and the active water currents known for the area. Immediately pre-operational monitoring should be carried out to ensure the availability of baseline data for subsequent comparison.
- *Any H₂S release during dredging* would have an effect on benthic biota, but it is already known that the seabed of the SP1 target area does not have the characteristics associated with heavy H₂S concentration, so the significance of this issue to future operations will be small.
- A dredge sediment plume could contain *toxins*, but will not be long-term or, given their known life and spread, likely to have a deleterious effect on biota or ecological functionality, so this issue will attract a low significance of impact rating.
- *Proliferation of human health hazardous bacteria* has not been recorded for any southern African fish populations and any potential environmental impact off Namibia, especially in the localized area of SP1, would therefore be negligible.
- *Smothering by seabed plumes created by the dredge head* would not have a significant impact in this case because the biota in the small target area will anyway be removed and the spread of these plumes is very small. Likewise, *hopper overflow plumes* and *dredger overspill plumes* would be of such short duration and so local to the SP1 mining area that potential toxicity and smothering effects on biota generally will be virtually insignificant.
- *Underwater sound effects* of dredging (and other noise-generating) operations on marine biota (seabirds, sea mammals and fish) have been recorded internationally, but they tend to be extremely localised and, except at very high levels, of little influence or impact. That said, the noise-attenuation effects already available need to be checked at various distances from the operation if it starts; for now, however, the environmental effect is considered to be insignificant in the greater scheme of Namibian offshore issues.

Robin Carter (RC) and Nina Steffani (NS) also provide carefully constructed proposals detailing the need for monitoring programmes (some mentioned above) to be developed and planned prior to operationalising/ licensing the project to cover dredge area sediment properties (RC; building on and comparing baseline data and Verification studies completed in 2014) and benthic macrofauna, a group that is likely to be the one most affected by operationalising the project (NS). Monitoring of an anthropologically caused effect is good practice for any activity, but in the marine environment is crucial, to ensure that unexpected and generally unseen effects are swiftly mitigated against. Both documents provide excellent rationale and background, and design, objectives and the approach to be followed. Duration, frequency, gear and procedures (where relevant), and spatial and temporal requirements are all well motivated, and I concur with their recommendations and suggestions; the proposed gears are currently the most appropriate scientific tools available for the monitoring mooted. Confirmation of agreement to fulfil and support these monitoring programmes, including transparent analyses of the results and comparisons with baseline data, should in my opinion reflect positively on an application to commence mining in the SP1 area under consideration.

The final document in the suite provided addresses the internationally highly topical issue of CO₂ emissions and their onward potential influence on climate change. In my opinion it is appropriate

for any anthropogenic activity (past, current or future) to consider this issue, and author Monteiro points out that, although there are few Namibian data or observations on which to base any consideration of the impact of offshore phosphate mining on CO₂ release, there is some information currently being analysed as a baseline against which to work. Succinctly, the effect is not likely to be large in the greater scheme of things for a future dredging activity itself, but Monteiro is right to note that transport (at sea and on land), shore-based handling facility construction and operation, and all the other activities connected with processing ashore cumulatively render the whole project quite a large emitter of CO₂. That finding needs to be weighed against economic development nationally, however.

3. SCIENCE-BASED COMMENTARY ON THE DOCUMENT SUBMITTED BY FOSS cc (DAVE JAPP)

The document provided is useful in terms of background information on Namibian marine fish (with focus on those of commercial interest), the various fisheries being prosecuted there, the sea mammals found (some transiently) off Namibia, and seabirds (also many on a seasonal basis only). The document has been constructed according to a framework applied to the initial assessment of 2011, so is both logically arranged and fairly easy to absorb and to allow comparison with earlier documented information. As with virtually all things related to the marine environment, however, there is uncertainty (e.g. where Japp notes that some regard the catch profile for small pelagic fish and/or for hake as incomplete) relating to statistics and values. Nevertheless and for example based on formally submitted catch data, which tend to be good in the case of fish catches but less so in the case of bycatch (especially historically) and discards, forecasts and survey-based small samples of a large and often transient population, they are as good as can be achieved. FOSS cc have had to rely upon formal statistics kindly provided by designated agencies and the results of various monitoring surveys and information, along with information provided from manifold applied and academic researchers over the years. It is a pity, though, that some of the statistical (catch, TAC, etc) overviews are not as up to date as I would have expected, likely a consequence of an inability to extract latest data from agencies, or perhaps the result of cutting and pasting from previous iterations of this work. By world standards, Namibia is new in recording information on its marine life and fishing, but from personal experience dating back to 1970, when I first arrived in Walvis Bay as a newly qualified young scientist, I cannot fault any of Japp's information.

Not all of the background information is for the same period, but statistics and information (often graphic or tabular) is provided on all the main small pelagic species, namely horse mackerel, sardine, round herring, snoek (which are not so small!), bearded goby and the mesopelagics such as lanternfish, on the main demersal fish species, namely hake (two species), monkfish, sole and orange roughy, on large pelagic fish such as tuna, swordfish and some pelagic sharks, and on other important (to Namibia) exploited species, West Coast rock lobster, deep sea red crab and the two most commonly seen linefish species, steenbras and kob. The present or recent fisheries are also described and quantified in detail, namely the fisheries for hake caught by trawl, hake caught by longline, trawls directed at monk and the deep-water trawl fishery mainly targeted at orange roughy, small pelagic fisheries (midwater for horse mackerel, purse-seine for sardine, and for horse mackerel), crustacean fisheries for West Coast rock lobster and for deep sea red crab, linefisheries for species such as steenbras and kob, and pole and line and longline for tuna and associated large pelagic species. There are also useful sections on the developing mariculture industry, on seabirds, even on turtles, of which only one species has been regularly found off Namibia, and on marine mammals, which include the transient large whales, toothed whales and dolphins, not all of which are transient, and on the often very large population of fur seals, many of which have large colonies along the coast of Namibia and are highly influential in the overall ecosystem. Whales and seals were historically heavily exploited by local and mainly foreign fleets, some species of whale almost to extinction, off Namibia. I note too that other fish species have in the past contributed to large fisheries or bycatches in established trawl or linefisheries, e.g. kingklip (demersal), and anchovy (small pelagic).

Although the background information and statistics are valuable in building up an updated portfolio of knowledge about the larger marine biota and, where relevant, their fisheries, the most important part of the FOSS cc document in terms of the current mining application and its subsequent operationalising is contained in Sections 5 and 6, so on those parts I comment in some detail.

Here it has been correctly emphasized that we are considering a very small part (0.08%) of the original MLA, or just 34 km² during the 20-year dredge plan for SP1 (itself in area just 0.0003% of Namibia's exclusive economic zone). Also, the same methodology used previously in applications has been applied again, and in my opinion is adequate to evaluate for biota at least all zones of influence of the operation, namely:

- the area of assumed direct effects (which would be a slightly moving scale annually);
- the "local" area of indirect and induced effects in the proximity of the area being mined/dredged;
- the area of perceived regional effects;
- the area beyond regional scale or the localized seascape (referred to as "national").

Direct effects would include the exclusion of fishing or the destruction of fishing grounds, the removal or disturbance of habitats utilized by marine fauna, and the possible loss of biodiversity through direct removal in the dredging operation. Indirect effects might include the altering of biota (especially seabirds and mammals) behaviour because of the physical disturbance caused by the dredging operation, and potential upset to the general trophic interactions of the biota and even local ecosystem functioning.

Succinctly, FOSS cc determine (and on the basis of the comprehensive information provided, correctly) that the impact of operationalisation of the activity on commercial fisheries generally would be low, on the biota (notably the fish species) very low and localised, and that any effects on biota and fisheries upstream of the operation through carriage of plumes in the northward current just as minimal if at all. Further, any general impact of future operation on populations of ecologically important demersal and pelagic fish is predicted to be minimal except perhaps for monk (for which there are very few baseline survey data). Likewise, any impact through mining/dredging on future recruitment off Namibia of important commercial fish species, other than monk, is extremely unlikely, noting (also in response to stakeholder inputs – that of Dr J-P Roux addressed in the FOSS cc report) that with many spawning areas of commercial fish unknown or inconsistent, any effect on their spawning products (eggs, larvae and juveniles) cannot be quantified, if indeed they exist, which is questionable. For monk, there is a slight possibility of impact, but as already noted, baseline data on the species are few. Any impact on biodiversity of biota will be small and localised at most, for demersal fish of short duration, for pelagic species to be at most minor, and for surficial (benthic) and in-benthic biota moderate only in the very small area of operation. Finally, in terms of any impact on higher biota, the impact of operationalisation on marine mammals will be little and short term on their behaviour and not negative on wider populations, and although seabirds and the single species of turtle could suffer minor local effects (or negative impacts), the effect on their Namibian or wider ranging populations will be inconsequential.

In summary, I see no scientific reason from the information provided to disagree with FOSS cc in terms of the conclusions, which in summary are:

- That the impact of the dredging/mining operation on Namibian fisheries will vary depending on the fishery sector, with operations LOCAL to the fisheries (and there is little fishing activity there anyway) affected only slightly. Overall, though, the significance of any impact will be negative or very low, with really only the monk-directed trawl fishery

possibly slightly impacted. Other fisheries take place too distant from the potential operation to be affected at all.

- That the potential impact on commercial fish stocks (i.e. on their biomass) is also very low owing to the small area of potential operation and in most cases long distance from main population distributions.
- That the impact on recruitment to the main fisheries, primarily because of the reduced scale of the dredging, will be neutral and insignificant.
- That there is no evidence to suggest that mining/dredging will result in a loss of biodiversity, so the effect on the broader ecosystem off Namibia will be negligible, even if slightly higher in the area of operation.
- That mining will displace fish resources such as monk, gobies and hake and change the essential habitat occupied by them in the immediate area of mining. However, unless the area of operation is expanded subsequently, such a local effect will not have far-reaching and potentially major effects on Namibia's offshore marine ecosystem.
- That there will be only a very limited and localised impact on the biodiversity of demersal and pelagic fish species.
- That there will be an impact on local habitat that may not be reversible in the long-term.
- That for seabirds, turtles and marine mammals at a local level, modification in behaviour might be expected (some may be temporarily attracted, others more likely to avoid the area), but overall and broader impact on these animals' populations will be unaffected.

FOSS cc conclude that careful monitoring of the biotic/faunal environment should be part of any future plans in order to be able to evaluate any unlikely long-term non-local effects and to allow future managers, decision-makers and scientific experts to be better placed to evaluate any future similar or other industrial applications in the general area. Such would be common sense.

4. OTHER SCIENCE-BASED COMMENTARY

Commentary on other environmental impact assessment documentation and analyses did not form part of my brief for this task, but I have seen much written work targeted along those lines, and been part of joint remotely held joint discussions on the subject during the past few months. Although I cannot provide direct commentary, I will say that the lines of analysis being proposed make perfect sense scientifically, so I would expect the final impact assessment document to be reasoned and fully justified.

5. CONCLUDING REMARKS

From many years of participation in southern African marine science-based advice and research, and also as a consequence of my participation in 2014's Peer Review Workshop of verification studies behind this Namibian Marine Phosphate project along with access to a huge suite of documentation/ advice/written inputs to/on the process over the years, I believe I am both qualified and well-placed to conduct this overview. Further, I record that, in my opinion:

- Despite the well-known difficulty and high cost of obtaining information in the marine environment, all the most relevant data and information have been sourced, collected, synthesised and summarised for the task in hand;
- All the topics and subject material appropriate to the application have been covered in the documents provided for my evaluation;

- Experienced and well-accredited southern African local and international expertise has been assembled for the various stages of the process.

APPENDIX

Curriculum vitae: Andrew I. L. Payne

Name of Firm: A & B Word Ltd (left South African Government Department, April 2000, and retired from Cefas, UK, September 2013, thereafter Associate)

Name: Andrew I.L. Payne

Profession: Director, International Fisheries Consultant and English grammatical editor

Year of Birth: 1946

Nationalities: British and South African

Years with Firm/Entity: 11 (with Cefas full-time for >13 years)

Membership of Professional Societies:

- Zoological Society of Southern Africa
- Royal Society of Biology (London)
- Marine Biological Association of the UK

Dr Payne is a graduate of the University of London and completed post-graduate degrees at the Universities of Stellenbosch (MSc; on age and growth of kingklip) and Port Elizabeth (PhD; on aspects of the demersal fishery on South Africa's south coast) in South Africa. He worked in Namibia for five years, South Africa for 25 years (eventually leaving as Director of the Sea Fisheries Research Institute), and retired in 2013 from the Centre for Environment, Fisheries and Aquaculture Science (Cefas), UK, where he was first Science Area Head for Fisheries and then "roving" international fisheries consultant in which role he *inter alia* managed a large commercial contract evaluating sites for future nuclear power stations to be built in the UK, and the Fisheries Science Partnership, an initiative bringing scientists and fishers together in a common aim to produce information of use to those charged with managing Europe's fish stocks. Most of his research work was conducted in South Africa, and he has published widely in the scientific literature, mainly about fisheries management and on demersal fish in particular, being involved over the years in all facets from basic biological research through to the stock assessment process and subsequent advice to management. He was scientifically and administratively active in the Benguela Ecology Programme, was involved in drafting South Africa's first democratic fisheries policy (which later became enshrined as the Marine Living Resources Act), and was a leading player in the establishment of the Benguela Current Large Marine Ecosystem project and the Benguela Environment, Fisheries, Interaction, and Training (BENEFIT) project, the latter two concentrating on three countries, Angola, Namibia and South Africa. From 2003 to 2011, he was Editor-in-Chief (and from 2000 to 2003 editor) of the ICES Journal of Marine Science, was the founding editor/editor-in-chief (and now international panel member) of the (South) African Journal of Marine Science, and is Series editor of the Springer book series *Humanity and the Seas*. He has also conducted peer expert review of fisheries in Argentina, South Africa and the USA, and was involved in the EU's TACIS project on Sustainable Management of Caspian Fisheries, among several other EU projects. He has led or been involved in certification reviews for the Marine Stewardship Council, notably for Antarctic krill, Cornish hake and Russian pollock, has acted as an expert peer reviewer of reports on, among others, the US Limited Entry Groundfish Trawl fishery and the SA deep-sea hake trawl fishery, and has led or participated in surveillance audits for different fisheries worldwide. He was also part of an international (independent) team that formally evaluated the ICCAT Bluefin tuna research programme. Finally, he has personally written/edited one book – "Oceans of Life off Southern Africa", and lead-edited and contributed to two more – "Management of Shared Fish Stocks", and "Advances in Fisheries Science; 50 years on from Beverton and Holt", the last two both for Cefas, and provides editorial services (including editorship and formal instruction courses in scientific writing) and peer review for a variety of clients and scientific journals.

Summarized highlights

- More than 50 years of fisheries science, management advice, strategy and policy development in southern Africa and/or the UK
- Many years of scientific leadership and mentorship in South Africa and the UK
- 25 years of advising on infrastructural needs relating to all aspects of fisheries and the marine environment
- More than 20 years (in small periods of a month at a time) of expert advisory reviewing and chairing of expert scientific meetings in the USA, and of leading a Cefas initiative in this aspect corporately
- Several years of participating in and leading a Regional Research and Training Project and a strategic “Large Marine Ecosystem” project in southern Africa (South Africa, Namibia and Angola)
- Expert external reviewer of the technicalities of bottom fisheries management in Argentina
- Experience as an Expert in Regional Fisheries Management for the EU’s 2-year TACIS project “Sustainable Management of Caspian Fisheries”, 2004-2006 (visiting and interacting with/advising scientists and managers in Azerbaijan, Kazakhstan, Iran and Russia)
- Evaluator of Fisheries Management Systems for fisheries requiring maintenance of Marine Stewardship Council accreditation
- Regular participant (sometimes lead) member of MSC certification and surveillance audit panels for various fisheries worldwide (noting that MSC certification requires environmental as well as fisheries and biological expertise)
- Book and journal editor and provider of editorial services and courses in scientific writing

Education:

Institution	Date(s)	Degree(s) or Diploma(s) obtained
University of Port Elizabeth, South Africa	1983–1986	PhD Zoology
University of Stellenbosch, South Africa	1973–1974	MSc Zoology
University of London, UK	1965–1968	BSc (Hons) Zoology

Employment Record:

Date from - Date to	Location	Company	Position	Description
2013 – date	UK	A&B Word Ltd, UK (and formal Associate of Cefas)	Director (and Associate)	Marine Research consultant and provider of editorial services. This includes independent evaluation of environmental assessments, Expert Advisory work for EU projects (EcoFishMan and MareFrame) and ICCAT (the Atlantic tuna commission), MSC certification, surveillance and peer review work, various other small consultancies in different research and advisory projects, including one relating to environmental impacts of offshore mining for phosphate off Namibia, plus editorship and editorial consultation and provision of formal scientific writing courses, internationally

2005 – 2013	UK	Cefas	International Fisheries Consultant	<p>Direct work and manage contract staff, including delegation responsibility, to ensure delivery of all activities conducted within contracts, manage delivery of a large contract for the UK Government with the Fishing Industry, manage an even larger commercial contract with EDF Energy investigating issues and impacts relating to new nuclear build, involvement in several EU projects on the technical side, and bring in, and sometimes deliver, relevant international business advice.</p> <p>Selected Projects:</p> <ul style="list-style-type: none"> • Caspian Sea, 2004–2006, Expert in Regional Fisheries Management for the EU’s 2-year TACIS project “Sustainable Management of Caspian Fisheries” (visiting and interacting with/advising scientists and managers in Azerbaijan, Kazakhstan, Iran and Russia • UK, 2008-2013, project-manage a large contract with EDF Energy looking at water dynamics and quality, resource issues, etc, around potential new nuclear power station sites • UK, 2005-2013, Delivery manager for the Fisheries Science Partnership project (UK Government). Ensured quality of delivery of all projects from idea through to presentation of results. • USA, 2002-2010, In small periods of a month at a time, reviewed and/or chaired meetings in the USA (Centre for Independent Experts). After 2007, led the Cefas review team for that work on a corporate basis. • MSC-associated accreditation work.
2000 – 2005	UK	Cefas	Head of Fisheries Management Science Area	Direct work and manage staff, including delegation responsibility, to ensure delivery of all activities conducted within the Science Area, and bring in, and sometimes deliver, relevant international business

1986 – 2000	Cape Town, South Africa	Sea Fisheries Research Institute	Assistant Director, then Deputy Director, then Director	<p>Lead research, develop strategy for marine research back-up to advice, ensure adequacy of infrastructure for delivery, and advise Government</p> <p>Selected Projects:</p> <ul style="list-style-type: none"> • Southern Africa, 1970–2000 <ul style="list-style-type: none"> ○ 30 years of fisheries science, management advice, strategy and policy development in South Africa and Namibia (SA Government) ○ 20+ years of scientific leadership and mentorship in South Africa (SA Government) ○ 20+ years of advising on infrastructural needs relating to all aspects of fisheries and the ecosystems in which they are found (SA Government) ○ Several years (1996–2000) of participating in and leading a Regional Research and Training Project and a strategic “Large Marine Ecosystem” project in southern Africa (SA Government, NORAD Norway, GTZ Germany) • Argentina 1997 Expert external reviewer of the technicalities of hake fisheries management in Argentina
1974 – 1986	Cape Town, South Africa	Sea Fisheries Research Institute	Senior Scientist	Involved in research on the hake fishery and the ecosystem in which the species lives
1970 – 1974	Walvis Bay, Namibia	Sea Fisheries Research Institute	Demersal Research Scientist	Set up demersal research unit and carry out initial research underpinning the management regime

Full CV including complete publication record available on request