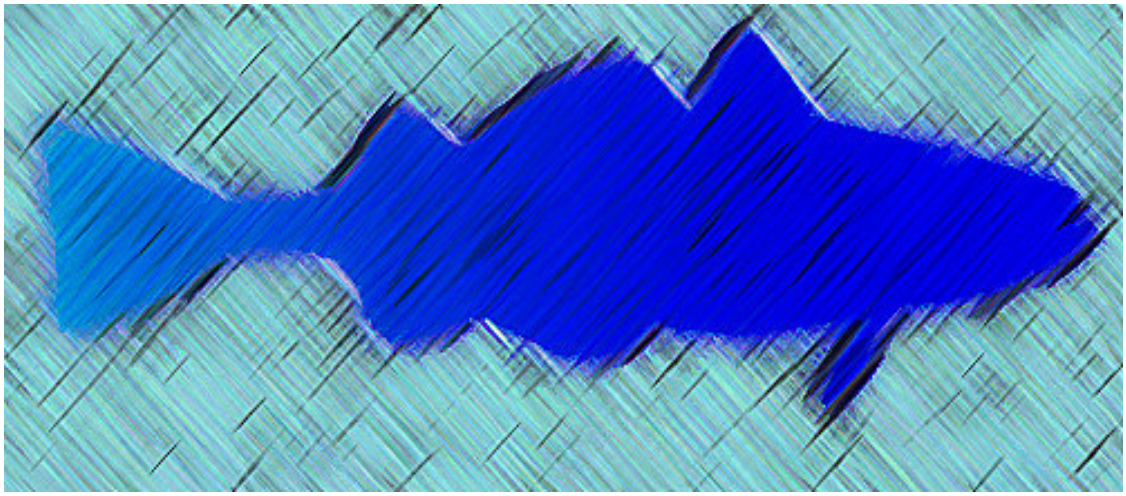
RECOMMENDATIONS ON BENEFICIATION AND COMMERCIALIZATION OF FISHING ACTIVITIES IN THE BCLME REGION

BCLME Project LMR/SE/03/02



PRESENTED TO:

BCLME
Benguela Current Large Marine Ecosystem Programme

BCLME Activity Centre for Living Marine Resources

PRESENTED BY:

ENVIRO-FISH AFRICA

ON BEHALF OF:

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Strategic Fisheries Management Advisors

THE CONSORTIUM

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1. INTRODUCTION

Although the Benguela system contains a relatively small range of commercially exploited species, many of these can be harvested at comparatively low cost. While pure fisheries science focuses on estimating sustainable yield curves, economics asks how to maximise the benefits derived from such harvests. Fish have been commercially caught, processed and sold along this coast for over two hundred years; what this paper asks is: can the annual catches of the major species be processed more profitably and with greater benefits to the communities of the Benguela zone? Related issues will be covered in the micro-economic systems analysis of project BCLME/LMR/SE/03/03.

Beneficiation processes (activities that add value to raw materials) are widely encouraged by governments. The view taken is that when unprocessed raw materials are exported and processed abroad, the profitable (and employment creating) segments of the supply chain are going to lie in the importing country. As an example, iron ore can be exported in its raw form, it can also be exported as pig iron, as mild steel, or as finished steel products. The further along the supply chain the iron goes before being exported, the more jobs it generates and the more income accrues to the exporting country. In the fishing industry, however, this is not always true; indeed, *beneficiation can be unprofitable and inappropriate*. This is particularly true of high value fish such as hake and rock lobster where a premium is paid for top quality fresh (or live) product. As an example, a foreign restaurateur will be willing to pay more for good quality raw (unbeneficiated) fish to which he himself will add value, than he would be willing to pay for the equivalent mass of heavily beneficiated fish-fingers or “boil in the bag” fillets.

The study of beneficiation involves a number of types of analysis; three particularly significant ones are:

- *Supply chains*: These simply describe the inputs and outputs and the processes linking them, from initial raw materials (including the fish itself) to the final product. They are typically determined by the available processing technologies and by any local constraints that might preclude use of them.
- *Value chains*: These trace the addition of *value* in the production process, and identify activities which are particularly worth developing or keeping domestically. These can be deceptive, especially where prices are volatile. With products such as fish that are traded globally, price fluctuations can follow local demand and supply conditions, but more importantly they can be determined by exchange rate fluctuations and supply conditions elsewhere in the world. This instability means that the need to spread risk is an important determinant of the industry’s organisation. This leads to an important caveat: each of the value chains described in this report reflects a situation at the time the research was done. The volatility of costs, exchange rates and market prices means that they will almost certainly be out of date when this report is read. This instability is a common feature of commercial fishing. It explains the emergence of industrial structures that spread risk: seeking rights in a spread of fisheries, diversifying the range of products they produce within a single fishery, or spreading beyond the borders of the industry by becoming subsidiary entities within general food producing conglomerates.
- *Global commodity chains*: these focus on power and information asymmetries in the export market. These asymmetries can make the chains producer-driven or buyer-driven, and can make particular firms ‘industry leaders’, giving them particular abilities to capture value through trade.

The issue of global commodity chains is particularly important for export based industries. The central question is, 'to what extent is the producer a pure price taker?' i.e. do international buyers have the power to dictate prices, terms, quality standards etc. and to force local producers to incur the costs of satisfying them? As an example, the codes of practice such as those put out by the FAO/WHO's Codex Alimentarius Commission, by the USFDA's Hazard Analysis and Critical Control Point (HACCP) system and similar sanitary and phyto-sanitary regulations, may be costly to satisfy. At what point on the supply chain will the burden of these costs be most acutely felt and is a firm's participation an expensive but necessary constraint on profits, or a sought-after means to differentiate the product, that should pay for itself by enhancing the profitability of the local industry?

Two key issues are involved here; on the supply side the ease of entry and exit in the industry, and on the demand side the extent of monopsony power, i.e. how competitive is the production side of the industry, and how much power lies in the hands of the buyers. As an example, international supermarket chains typically dictate quality and product standards to producers. If the producers are in a competitive market, they may be unable to pass these costs forward and will carry the burden of the costs themselves. The supermarket chains also dictate the type of product they want and therefore determine how and to what extent the product will be beneficiated.

The issue of value chains is tied to the value of market information and market access. South Africa, for example, did away with most of its agricultural marketing authorities and boards during the 1980s. These boards were able to accumulate information on prices, market demand, etc. that would have been beyond the reach of an ordinary producer, and were also able to focus on getting their members 'the best possible deal'[1]. In their absence, large firms have a competitive edge over smaller ones that may be sufficient to keep small firms from selling directly into lucrative foreign markets. The possibility of establishing single channel marketing facilities has been mooted, but at national level only. Since even there it appears contentious, it seems implausible that a centralised single channel marketing system could be established to sell fish products from all three BCLME States.

If there are advantages to centralised marketing these will appear through a tendency to increased market concentration in the industry. The function of management is not to maximise current profit, but to maximise the present value of the expected profit stream over time. It also tries to minimise the variance of the revenue stream. It maximises and stabilises profits using economies of large scale production (economies of scale) and economies of scope. Economies of scale refer to declines in average cost as the volume of fish processed rises (big canneries producing at lower cost per tin than small canneries). Economies of scope refer to cost savings associated with producing a mix of products. Although this typically refers to joint products and by-products, it can also refer to the risk-reduction benefits of running a number of related product lines. Wet-fish, for example can be sold domestically or abroad and in different forms: fresh, frozen, or processed. This freedom to switch fish between lines gives the large producer an edge over the small one. The benefits of this are evident in the trend to vertical integration within the industry.

The major firms in South Africa use a vertically integrated structure i.e. they catch, process, distribute and market the product. Some have also integrated horizontally – contractually linking to other firms that catch and process on their behalf. This gives the four main 'vertically integrated' companies extensive pricing power and entrenches relationships with the equally oligopolistic domestic retailers. The vertically integrated structure is also found in

[1] Such boards also operated in the fishing industry, effectively controlling rock lobster, fishmeal and pilchard. While they stabilised returns, it has been argued that they also stultified progress by reducing opportunities for competition.

Namibia, where some firms focus on catching and processing a broad product range. The advantage enjoyed by Pescanova in Namibia is the same in principle as that of I&J, Oceana or Sea Harvest in South Africa. There are also firms moving in this direction in Angola where, for example, the market leading private company, World Wide Internacional has international vertical ties to Inter-Burgo SA, as well as having diversified horizontally across a range of fishing activities and processing methods domestically.

Historically, many major firms in Namibia and South Africa were closely tied. These ties have been steadily weakening, partly through pressures exerted by government, and partly through historic accident. The effect, however, has been to reduce the industry level opportunities to spread risk geographically. In place of these historic relations some of the larger firms have expanded into foreign waters: particularly to South America. Thus the same South African firm may be importing hake from an Argentinean subsidiary, while exporting local hake to Spain. There is clearly room for cooperation between the managers of the fish stocks in the three BCLME States. It makes sense that straddling stocks be managed jointly. As the recent experiences of the hake and pilchard industries in Namibia demonstrate, it also makes sense that planning takes place to ensure that management decisions in one country do not impact negatively on the viability of the industry in another.

2. HAKES

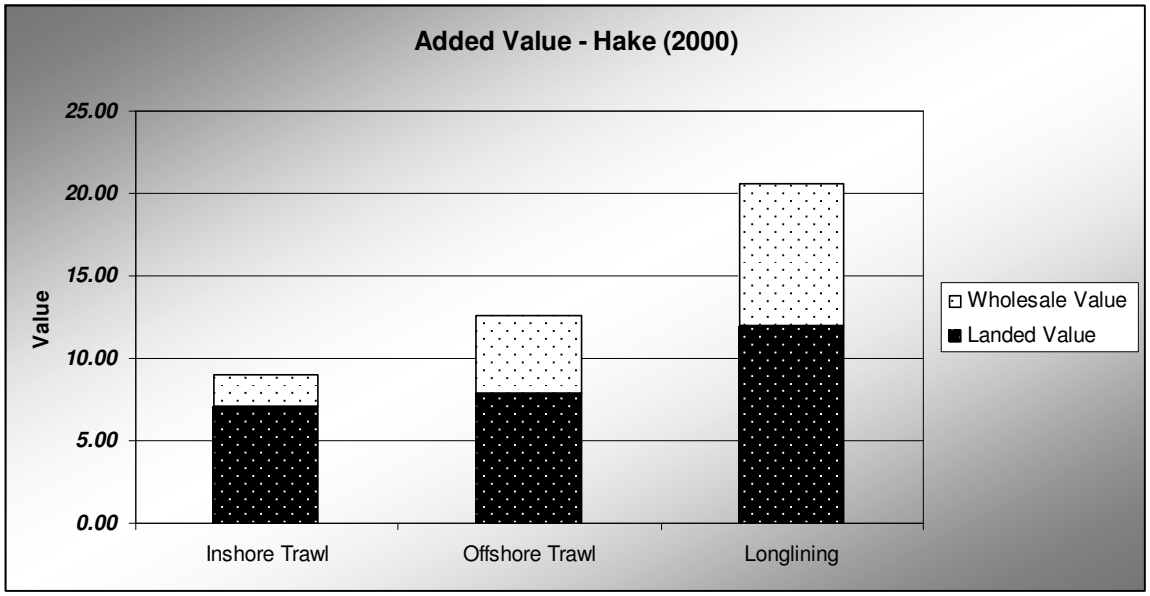
There are three main hake species caught in the Benguela Current ecosystem. The deepwater Cape hake (*Merluccius paradoxus*) and the shallow-water Cape hake (*Merluccius capensis*) are found off the coast of South Africa and Namibia. The Deepwater Benguela Hake (*Merluccius polli*) is only caught off Angola. Although the fishing grounds of southern Namibia and South Africa are adjacent, it is not certain that the South African hakes and those in Namibia north of Luderitz form a true straddling stock.

Hake in Angola, South Africa and Namibia is caught by freezer trawlers (offshore trawl) or wetfish vessels (both offshore and inshore trawl) and to a lesser extent by longlining. Longline hake is landed wet (on ice) and sold either head on and guts out (HOGO) or head and gutted (H&G). Trawled hake can be sold H&G, HOGO, filleted (skin on or off), and made into value-added fish products. At the same time broken fish, unmarketable by-catch and off-cuts of the processing lines are converted into fishmeal. In addition, hake by-catch can also be headed and gutted and processed for sale. Indeed, certain by-catch species contribute significantly to earnings. Trawled hake can be landed wet (iced) or processed and frozen offshore.

Beneficiation of hake differs from other fish species where value differences occur further down the value chain. With hake the optimal processing path depends on the size and quality of the fish, and on the technology used to catch it. Maximizing the value of a fish requires companies to have economies of scope to be responsive to changing market and biological conditions.

Longliners are labour-intensive and are less damaging to the seabed ecosystem than the capital-intensive trawlers; nonetheless there are concerns about the biological impact of this fishery. Longlining, by its nature catches those hakes that are found closer to the surface of the water where water is generally warmer and attracts the mature female fish. Longline fish is better quality and achieves a higher value than trawled hake by about 50%, but the proportion of large fish in the long-lined catch has been dropping in recent years. The longline market is heavily export-focused, mainly to Europe. The combination of longlining and trawling raises both biophysical and administrative concerns in terms of current management systems. Both industries claim that the other is invading their fishing ground, while declines in the size and catch of long-lined hake in recent seasons may indicate high levels of fishing specifically of female hake in the 'recruitment' stage - a warning that future recruitment may be threatened. The point being stressed here is that present profits and the sustained viability of the industry are interdependent. Present earnings rise when long-lined fish and large fish form a major portion of the TAC, but this can impact on future earnings.

The graph below (from *BCLME/LMR/S/03/02: Market Analysis of Major Fish Product Markets in the BCLME)* shows the value added to the South African Hake industry by processing. Wholesale value is added through skinning, H&G and filleting. The trend in Figure 1 reflects the quality differences in products caught using different techniques.



Source: De Swart (pers.com), 2004

Figure 1. A comparison of hake value per hake fishing sub-sector.

2.1 Namibia

Prior to the collapse of the pilchard fishery in Namibia, Hake represented about 22% of the entire fish catch (Stuttaford, 1998) and was the most important species financially (roughly 65% by value). In 1989 the Namibian hake quota of 52 100 tons had been shared between 15 operators. The total quota was initially cut after independence (in 1990), but increased with the recovery of the stock. By 1991 the TAC had increased to 60 000 tons and by 2001 the hake TAC had almost tripled and was shared between 38 rights holders. In 2003 the TAC was reduced to 180 000 tons, in response to changing catch per unit effort (CPUE) and an increasing proportion of small hake in the demersal catch.

The Namibian levy and quota system is designed to influence industry conduct. It will become clear that in the Namibian hake industry the value and supply chains followed are initially driven by the State's quota policy. Improving the beneficiation of hake requires a review of quota allocations which currently apportions the TAC in favour of wetfish vessels (70%) versus Freezer Trawlers (30%). Furthermore, the incentives and penalties imposed by government to ensure that firms land their entire quota have severe repercussions on both the short term and long term viability of the fishing industry, raising short run costs through penalties or through inducement to expend excessive effort, and through impacts on future fish stocks.

At the margin, the market is willing to pay well above the official quota price, especially for freezer vessel quota. Operators are liable to fines based on the by-catch landed. Doubling the by-catch allowance provides a further incentive to wetfish processing.

In a 2004 study, (Japp and Steenkamp), the Namibian quota apportioning policy was assessed on the basis of resource, economic and sociological indicators.

Table 1. Rent in Namibian Dollars generated from two main fishing techniques.[1]

	WETFISH	FREEZER
Quota[2]	100 (300 if not processed in Namibia)	550
Catching cost	-7740	-8700; Includes catching and processing costs
Processing cost	- 3740	
Mean FOB	8940	9080
Rent per ton	**N$ -2580**	**N$ 380**

1: Data obtained from Japp and Steenkamp, 2004
2. Quota prices are higher for foreign owned vessels

The above data indicates that quota holders who are apportioned wetfish quotas are on average running at a loss of –N$2580 per ton. A policy which *forces* quota holders to use this method lacks viability in the short run and is severely unsustainable in the long term. Only a fall in the cost of fuel and a weakening of the Namibian dollar to the Euro could make the Wetfish method profitable[2]. However both these factors are exogenous. From a policy perspective, deregulation would give rights holders the freedom to choose between vessel types, and allow them to optimize returns by adjusting the wetfish/freezer trawler balance in response to changing market and resource conditions.

It is important to note that deregulation is unlikely to cause a total shift to freezer vessels. The larger companies will maintain both freezer and wetfish vessels. The broader the range of hake sizes and the range of products into which these are processed, the lower the level of market risk faced by a firm. The international market demands a wide and ever-changing range of products and the producer needs the flexibility to adapt to new demands and to meet them at low costs. This requires a large and broad (i.e. wide range of sizes) base load of fish. Importantly, the range of product options is greater with wetfish. Freezer trawlers tend to provide a restricted range of products, make limited use of high value fish and effectively produce a basic standard product – i.e. a commodity rather than a designer product. Freezer trawlers are also more sensitive to the oil price, although their time at sea as a percentage of total time is greater and therefore more efficient; the energy for their entire processing and cooling system has to be generated on board. The catch landed by wetfish trawlers is processed onshore using electricity which is far cheaper.

There is no doubt that at current prices the margins generated in wetfish production are lower, however the greater flexibility in the wetfish supply chain reduces commercial risks in the long run.

Japp and Steenkamp recommend that this deregulation is implemented over a period of four years. Each year an additional amount of the allocated quota is freed up (e.g. 25% per annum) thus in four years there will be no apportionment between the two fishing techniques. A systematic process of deregulation will assist stability in the industry while allowing for greater economic flexibility.

[2] Though this would benefit freezer trawlers even more. All processing aboard freezer trawlers requires energy generated aboard, consequently a tonne of fish caught and processed on a factory trawler uses more oil than the same tonne caught by a wetfish vessel and processed on shore.

There are socio-economic consequences of deregulation. Job losses are to be expected, as the industry would tend towards fewer employees with freezer trawlers (Japp and Steenkamp, 2004). Anecdotal evidence suggests that each ton of fish processed on land is associated with 10 jobs. Furthermore freezer trawlers employ predominantly semi-skilled males whilst wetfish land-based processing employs mainly female unskilled workers. This employment loss is a significant factor for a country with a high unemployment rate. However, coercing firms into maintaining technology it would not otherwise support will lead to an unsustainable fishing industry and the collapse of companies, with related job losses.

While job losses could be compensated through taxing the increased profits of a more efficient fishing industry, this requires that the State be capable of using the rents to create new jobs elsewhere in the economy. Irrespectively, a sustainable long term industry will require deregulation.

Another serious problem is the trend towards decreasing profits as a result of increased effort. This manifests itself in a steadily declining CPUE and trend to smaller fish. Since 2000 there has been growing pressure on firms to fulfil their quota obligations. The system in place penalises quota holders who do not land their allocation both directly, through financial penalties, and indirectly, by threatening future rights. The increased pressure on the hake stock has seen a fall in the size of the fish landed. Since small hake realize markedly lower prices per kilogram than larger ones, vessels not only have to fish harder and longer to fulfil their quota requirements, but also earn lower profits. The cost borne by firms who fish at a loss so as to keep their quotas is both economically unfounded and environmentally absurd.

The value chain is clearly affected by State policies such as those described above. Indeed policies impact on the value chain in a number of ways, and the government can play an important role in maximising the value derived from the annual harvest in several other ways:

- A long term (10-15 year) quota encourages industry to maximize profits over a long term and to make the capital investments necessary to add value to the fish. By providing a basis for co-management it also reduces the risk of over-fishing and encourages sustainable fishing practices.
- In allocating this quota it must be considered that the hake industry realizes value through economies of scale. Spreading quota too widely simply shifts the high risk low margin side of the industry (actually catching the fish) onto those operators least able to spread those risks.
- Any incentives to high grade fish and to expend excessive effort in harvesting need to be removed.
- Industry co-management is beneficial to all parties that have a long term interest in improving the value of the fish population. Industry data could significantly improve the scientific community's ability to set the TAC to the advantage of all stakeholders.

Value is added to the landed hake through processing (filleting, H&G, HOGO). Skinning of hake is not prevalent in Namibia or Angola, whilst in South Africa it is an important means of adding value. This does not mean that these industries are acting irrationally, it is argued that Namibia and Angolan hakes have not followed the 'skin off' trend because fish in the Northern Benguela is softer, breaks more easily and tends to have a layer of dark fat under the skin. Leaving fillets with 'skin on' reduces waste, though it can reduce product shelf-life.

2.2 South Africa

Although proportions of species landed fluctuate, hake tends to constitute roughly 30% of annual landings in South Africa; in 2004 this was a landed nominal mass of approx 140 000 tons.

In South Africa the apportionment incentives are not explicit, as they are in Namibia, but there is a pressure on processors to maintain jobs through their shore-based processing and wetfish fleets, despite the short run financial benefits that would accrue from use of freezer trawlers. Maximising the financial value of the hake catch would require a move towards more freezer trawlers. However as with the Namibian industry it is better to let industry decide the best means given their long term risk profile and specific costs.

Overall, the hake industry is run profitably and the industry is realizing most of its added value. Quota holders are able to maximize the value of the fish through long term quotas (15 years) and flexibility in fishing methods. Once landed, the fish is graded and depending on size it is H&G, HOGO, filleted or made into value added products (fishmeal, etc). In South Africa the hake is firmer and whiter. Value is added by producing 'skin off' fillets, and South African processors are able to benefit from an international market premium paid for this southern Benguela hake.

Because long term quotas exist, stakeholders have the potential to benefit from industry co-management. Combining the data of the big companies with the knowledge of the scientific community will improve the accuracy of setting the TAC to the long term benefit of all involved. Furthermore, industrial co-management allows companies and quota holders to be self-regulating. It is in their best interest to improve the value of their catch in terms of the quantity and the quality/size of fish.

It is recommended that the government gradually and incrementally allow for tradable quotas. One proviso would have to be that any trading transactions would not reduce the Black Economic Empowerment (BEE) profile of the industry, attained through the periodic allocation of quotas by Government.

Although catching fish for sale to large processors can be lucrative, their control over the full length of the supply chain allows them to spread risks. The only insurance open to a small operator is the option of selling his rights if market conditions are difficult. Because of economies of scale and scope that exist in the hake processing industry, small scale quota holders cannot derive the potential value of a caught fish and need the option of being able to trade their quotas. It must be remembered that large scale processors have the option of using Argentine hake as an input if local prices rise sharply so that a lot of the risk facing small rights holders is downside.

2.3 Angola

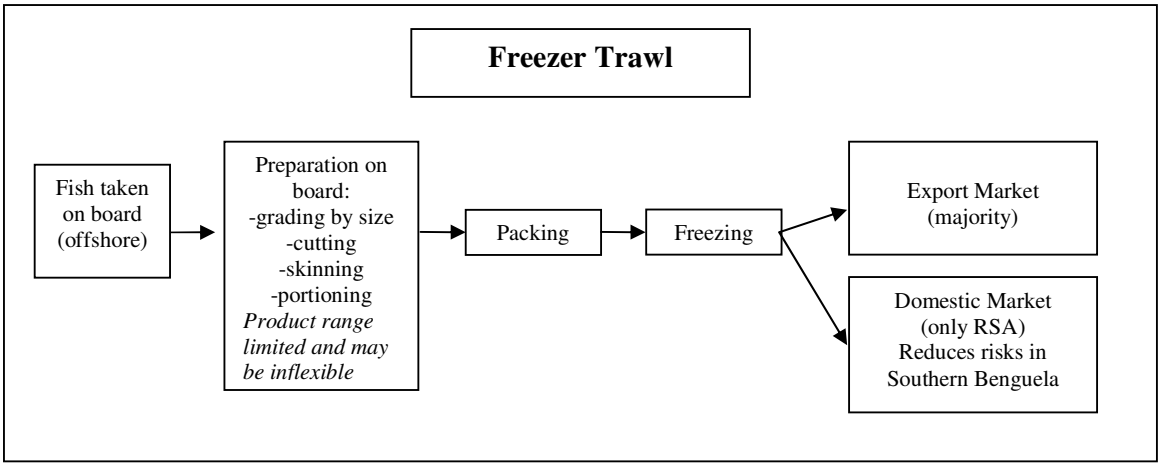
The fishing industry in Angola is generally disadvantaged by the currently poor level of infrastructure on land. Improving the infrastructure viz. roads, electricity and water is the foundation for improvements in the fishing industry's value chain.

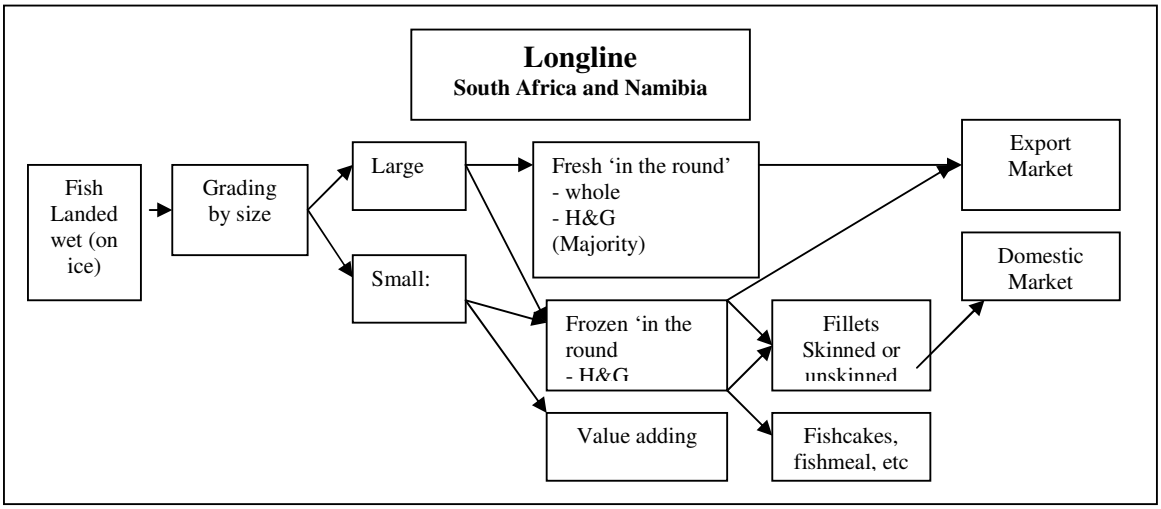
Angola is further disadvantaged in that the hake caught in Northern Benguela has a much lower quality flesh than its counterpart in the south. A consequence is that the market range

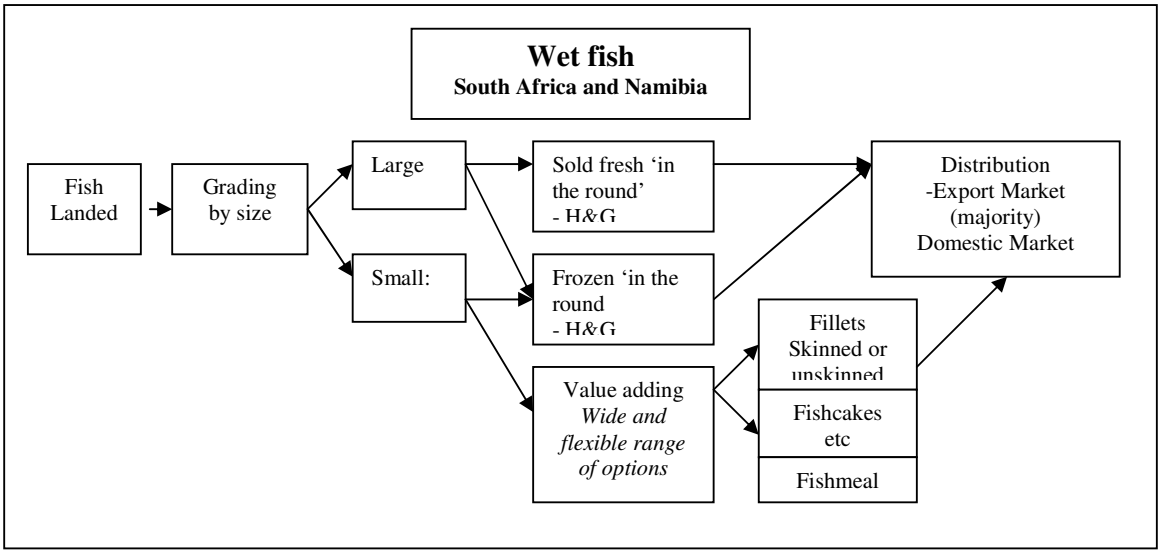
is less (e.g. only 'skin on' fillets are processed). Value needs to be added in the processing but this is only achievable with a stable infrastructural and socio-political environment.

Although most Angolan companies are privately owned, five of the most significant ones remain State owned. A number of private and State owned companies are in joint ventures with foreign companies. Some of these joint ventures have been based on counter-trade deals (i.e. back to back transactions whereby fish is exchanged directly for imported goods). Some of these arrangements have involved direct investment into the fishing fleet; vessels being provided in exchange for a share of the catch. This has merits such as reducing exchange rate risk, etc; but means that the value chain lies largely offshore and such contracts can be open to abuse if poorly monitored. There is a move to establish a local market for hake and its value added products. More research is needed to establish the best means of supplying the domestic market: fresh, tinned, dried and salted, etc.

Viewed from the perspective of global commodity chain analysis, direct foreign involvement in a fishing industry allows processing in line with the standards and requirements of the buyers. The costs of meeting these standards are carried by the buyers in their capacities as direct investors in the process. Both Chinese and Spanish firms have taken on such stakes in the Angolan fishing industry. The downside is that the power relations between the parent company and the Angolan firm may be asymmetric, in addition to which such 'in-house' systems are open to problematic practices such as under-invoicing.







3. PILCHARDS

The stock of pilchard (*Sardinops sagax*) fluctuates cyclically. These shifts can be accentuated locally by over-fishing and by geographic movements of the shoals. In 1999, the Namibian pilchard fishery collapsed leaving numerous crew and processing staff facing retrenchment. Supplies of fish to the main pilchard canning facility in Walvis Bay were insufficient to meet the demand. Canned pilchard exports in 1998 had been 2 050 000 cartons with a value of N$ 320 300 000 or 14.46% of the entire export value for the year. By 2000, this had dropped to 117 300 cartons and only represented 4.14% of total export value (Fishing Industry Handbook, 2004). The factory needed to find a source of pilchards or substitute with another species of fish. The only sources of pilchards were South Africa and Angola while there were several locally available 'substitutes', most notably the abundant horse mackerel.

Namibia decided to temporarily purchase quota from Angola and sent vessels up the coast. In addition, South Africa's pilchard stock was at an unprecedented high level. Though the TAC was not being fully utilised, landings exceeded local canning capacity. For this reason, Minister Iyambo also requested that Namibia be allowed to purchase quota from South African companies. This strategy was used from 2000 to 2003. Both options required trawlers to travel long distances to new fishing grounds, increasing fuel and operating costs significantly. Two questions must be asked:

a) Why was it decided to send vessels up the coast when there was an abundant and apparently feasible substitute in horse mackerel locally?

b) Could a system of cooperation between the three States in the BCLME reduce the risks (and raise the profitability) of adding value to pilchard by allowing movement of unprocessed fish across borders?

The answers to both questions emerge from value chain analysis.

3.1 The Pilchard Value Chain[3]

It is important to note that a can of pilchards is a relatively undifferentiated product and profitability depends on keeping costs down. There is need for large fish, which have a higher percentage yield.

Pilchards are caught by surface seining. Vessel size varies from small GRP vessels of around 16 m to big steel vessels up to 40 m. The small vessels can land about 20 tonnes of pilchard mainly in CSW (chilled seawater) whilst the larger vessels can land up to 250 tonnes in RSW (refrigerated seawater).

The bulk of South Africa's pilchard is canned for the local market; only 142 tonnes with a value of R1 375 544 were exported in 2003. In South Africa it costs approximately R800 per tonne to land pilchard. If the quota holder owns the vessel, the fish is transferred into the cannery at R800 per tonne. If it is an outside quota landing to another company's cannery then the fish will cost R800 + R450 = R1250 per tonne (R800 to the vessel and R450 to the quota holder). If landed on the South Coast the transport costs average R400 per tonne for chilled fresh pilchards from Port Elizabeth to a west coast cannery. Typically the fish price then varies between R1650 and R2000 per tonne.[4]

In Namibia, vessel owners have the majority of quota so the price into the canning factory is negotiated every year and varies with the TAC and market conditions.

The current EDLP (every day low price at retail level) for canned pilchards is R5.99 per can (R14.10/kg) which equates to 24 x R5.99 = R144 per carton. The price for a can of pilchards has changed little over the past 5 years. Retailers purchase cartons for R130 each and have a 10% mark-up per carton. Marketing and transportation costs to the manufacturer amount to approximately R50 per carton. This equates to a R80 factory price. On average, the factory generates R10/15 profit per carton.

[3] The estimates and prices presented in this value chain were obtained in 2005, and reconfirmed in 2006. All price data on pilchards received from Industry Communication.

[4] In recent years the pilchard shoals appear to have moved south and east, leaving the west coast canneries having to truck in fish from the South Coast. All price data on pilchards received from Industry Communication.

The South African market size for pilchards is about 7 million cartons and a good average yield is about 50/55 cartons (540kg per tonne of raw material input = 54% yield). Thus approximately 140 000 tonnes of pilchard is required to satisfy the market. The market is dominated by the Lucky Star label, which enjoys about 72% market share.

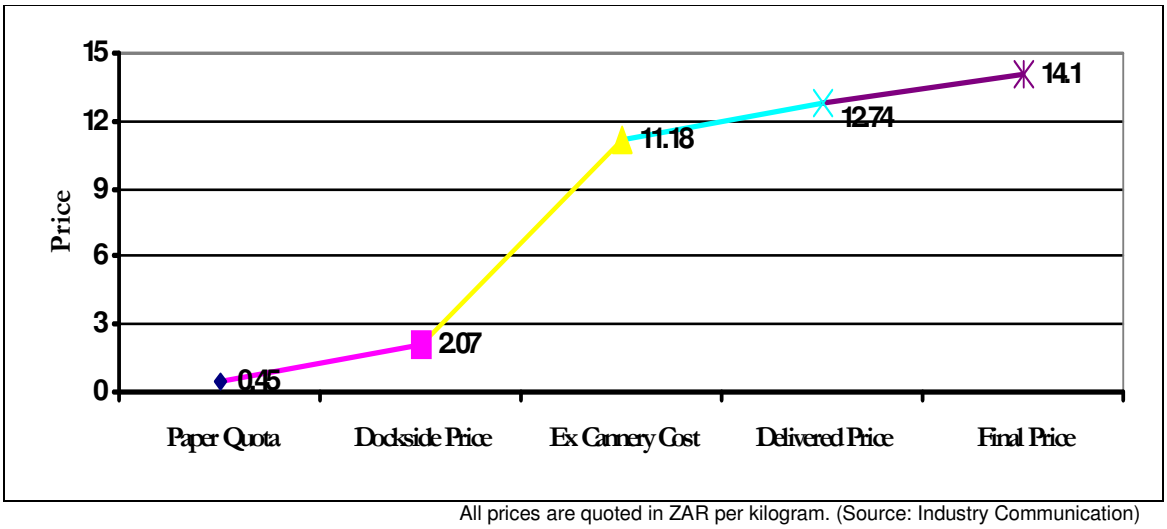
The major linkages in the pilchard value chain are:

Paper Quota	This is in effect a sale of a right to a specific amount of fish which must be removed by the quota holder.
Dockside Price	The price of the landed fish at dockside.
Ex-Cannery Price	The price per kilogram excluding VAT
Delivered Price	The retailers' purchase price from the cannery
Final Price	The price final consumers have to pay from the retailer

The Pilchard value chain shown in Table 2 and represented in Figure 2 shows a R9.11/kg (440%) price difference between the dockside and the ex-cannery price. It must be stressed that in addition to the pilchard actually canned, broken fish, heads, tails and other waste are processed into fishmeal. Where the catch exceeds canning capacity, the remainder is processed into fishmeal. A small 'bait' fishery also exists, but separation of quota was phased out with the latest SA quota allocations.

Table 2. The pilchard value chain.

ITEM	PRICE/COST (ZAR)
Paper Quota	**0.45**
Ex Vessel	1.83
Port Call	0.05
Discharge/Stevedoring	0.19
Dockside Price	**2.07**
Handling	0.04
Transport to Cannery	0.4
Marketing Costs	4.90
Ex Cannery Price	**11.18**
VAT on Selling Price	1.56
Delivered Price	**12.74**
Retailer Mark-up	10%
Final Price	**14.10**



All prices are quoted in ZAR per kilogram. (Source: Industry Communication)

Figure 2. The pilchard value chain represented graphically.

4. HORSE MACKEREL

4.1 The Horse Mackerel Value Chain[5]

The mid-water trawl fishery in Namibia is the source of most of the horse mackerel (*Trachurus trachurus capensis*) caught in the Benguela. The major linkages in the value chain for frozen horse mackerel are:

Paper Quota	This is in effect a sale of a right to a specific amount of fish which must be removed by the quota holder.
Dockside Price	The price of the landed fish at dockside.
Ex-Store Cost	The wholesalers purchase price
Delivered Price	The retailers purchase price from the wholesaler
Final Price	The price final consumers have to pay from the retailer

The Table below shows the price chain for a company that trawls in Namibia. Quotas sell on average for ZAR 0.25 per kilogram. 16+ and 20+ are used to denote the relative size of fish. 16+ are fish that are greater than or equal to 16cm and 20+ are fish greater than or equal to 20cm.

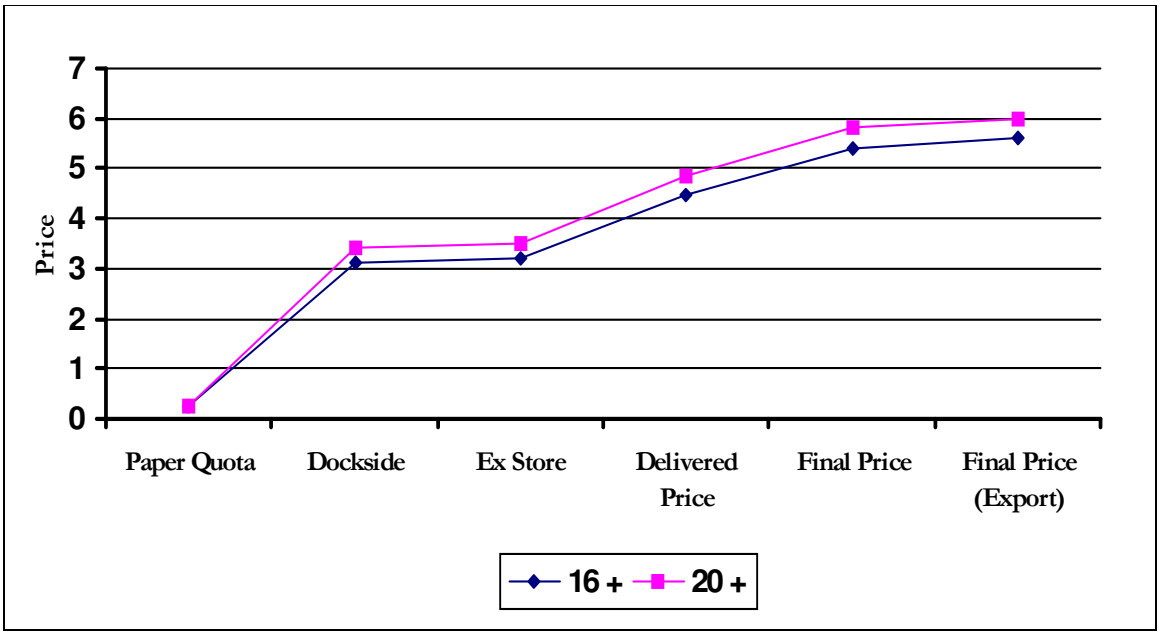
[5] All horse mackerel data supplied by Industry Communication

Table 3. The horse mackerel value chain.

ITEM	PRICE/COST (ZAR)	
Fish Size	**16+**	**20+**
Paper Quota	**0.25**	**0.25**
Ex Vessel	2.86	3.17
Port Call	0.05	0.05
Discharge/Stevedoring	0.19	0.19
Dockside Price	**3.10**	**3.41**
Handling	0.04	0.04
2 Weeks Storage	0.06	0.06
Ex Store Cost	**3.20**	**3.51**
Sale to Wholesaler	3.40	3.60
Transport	0.62	0.62
VAT on Selling Price	0.47	0.61
Delivered Price	**4.49**	**4.83**
Retailer Mark-up	20%	20%
Final Price	**5.39**	**5.80**

All costs are 2005 ZAR per kg live weight

An important note is that in the case of a freezer vessel, processing occurs on board ship, and the dockside price is not a true link in the chain. No horse mackerel caught by the mid-water trawl fleet is sold on the dockside. Its inclusion is a consequence of landings by purse seine vessels which catch horse mackerel as by-catch and sell them at the dockside. The price shown is an estimated dockside price.



All prices are quoted in ZAR per kilogram. (Source: Industry Communication)

Figure 3. The horse mackerel (round) value chain represented graphically.

Retailers on average add a 20% mark-up to the delivered price. The larger 20+ fish commands a higher price per kilogram as a result of consumer preferences and the greater ease of processing. This explains the current concern in Namibia with increasing the average size of fish caught, not only in the hake fishery, but also in the mid-water trawl. There is a large price differential between the quota prices and dockside prices. This is attributable to the high costs of operating a vessel. The scarce resource in this value chain is the quota. There are only 12 quota holders for horse mackerel in the Namibian fishery. Thus allocation of quota provides an opportunity to collect rents. The lack of quota also provides a legal barrier to entry. For this reason, paper quotas command a significant price.

As with consumers in South Africa, Congo (DRC) and West Africa are relatively undifferentiated - they all pay a similar final price. The export product is only slightly higher, reflecting the transport costs involved in exporting. There is little or no margin added by exporting. Export markets do, however, significantly increase the volume of sales.

There is a market for fishmeal both in local Namibian and South African markets as well as in export markets such as Taiwan and Japan. Fishmeal from Namibian horse mackerel trawlers is based on damaged horse mackerel catch and by-catch (ribbonfish, etc.).

The following Tables show the fishmeal price chain for a company engaged in the mid-water trawl fishery in Namibia. The first Table shows the local price chain and the second shows the price chain when the fishmeal is exported to Taiwan and Japan.

Table 4. The horse mackerel (fishmeal) value chain.

FISHMEAL (LOCAL)	ZAR/KG
Paper Quota	**0.25**
Dockside Price	**3.28**
Transport (Windhoek-Cape Town)	0.32
Sale to Food/Feed Processor	**3.60**

FISHMEAL (EXPORT)	ZAR/KG
Paper Quota	**0.25**
Dockside Price	**3.28**
Additional Quality Checks	0.33
Transport (Walvis -Taiwan/Japan)	0.42
Sale to Food/Feed Processor	**4.03**

All prices in ZAR/kg live weight. (Source: Industry Communication, 2005)

Fishmeal processed on board vessels is transported to the marketplace where it is purchased by livestock feed producers. The price differential between local and export final prices is mainly attributable to additional quality checks that have to be performed on the export goods to ensure customer specifications are met. Japanese importers typically demand at least 67% protein content for fishmeal from Namibia.

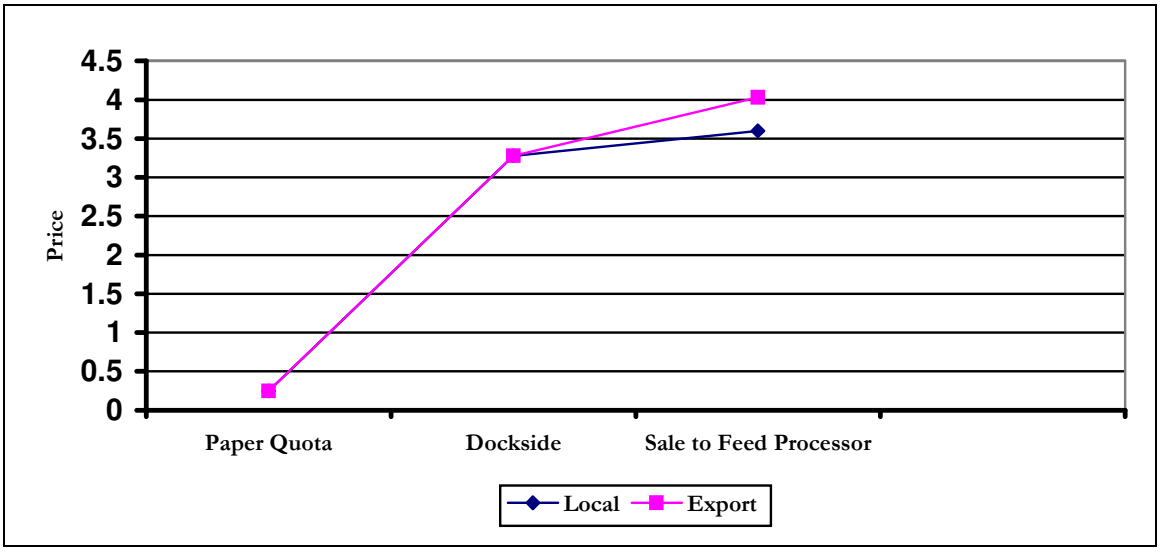


Figure 4. Horse mackerel (fishmeal) value chain.

Mackerel intended for fishmeal realise lower prices on the dockside and on sale to the processor than do mackerel that will be kept in the round. The major reason for this is that juvenile horse mackerel have little value except as input into fishmeal and therefore lower the

average value. The subsequent beneficiation of fishmeal into animal feed is not represented in the figure above.

The beneficiation of horse mackerel, whether frozen round or into fishmeal, centres on cost minimisation and is heavily dependent on scale economies. From a policy perspective this means that spreading quota too thinly would impact on the viability of the industry.

4.2 Pilchard and Horse Mackerel: Value Chains Compared

The dockside price of pilchard recently stood at R2.07, while the dockside price of horse mackerel was R3.10. This means that horse mackerel in the round commands almost a 50% higher price. By the end of the value chain the opposite holds true. The price of horse mackerel shows an average increase of R2.29 per kilogram (16+ fish) whereas the final price of pilchard increases by R12.03 per kilogram on average. While horse mackerel have appreciated by 74% over their dockside price, pilchards have appreciated by 581%! The final comparison is that canned pilchards sell at a price 147% higher than horse mackerel. The steepness of the pilchard value chain explains why the Namibian fisheries decided to purchase quota from Angola and South Africa instead of closing their canneries.

This leads to the second of the two questions raised earlier: why not can horse mackerel when there is a temporary shortfall in pilchard supplies?

4.3 The Feasibility of Canning Horse Mackerel

Investigations into horse mackerel canning suggest that such a venture would not be profitable. There have been unsuccessful small scale experiments in South Africa and Namibia. Namsov, the largest Namibian horse mackerel producer, experimented with canning horse mackerel (at substantial costs) but claimed that market resistance to the product forced them to abandon the project. The experiments with mackerel canning in both countries encountered the following problems:

- Size: the mid-water trawl in the northern Benguela typically yields a mackerel smaller than the Chilean fish. It averages 16 to 25cm though it can reach 35cm. Mid-water fisheries policy requires vessels to trawl at a depth of 200 – 400 m in an attempt to remedy this problem by avoiding small fish which shoal closer inshore. The fish found on the South African southern coast are typically bigger than those caught in Namibia, but even these did not do well in canning experiments.
- Location: the fish targeted are far offshore (30 – 100 km). This distance makes trawling with a freezer vessel the only economically feasible option. Unlike Chilean mackerel the resource is beyond the range of purse-seine vessels. None of the freezer vessels used has onboard canning facilities. Freezing horse mackerel and returning them to shore for canning is possible, but far less efficient (due to additional freezing/packaging costs & fuel costs) than purse seining. Freshness is the key to production of a quality product. Previously frozen fish provide a lower quality canned product than do fresh fish.
- Although the inshore purse-seine vessels catch horse mackerel, these are largely juveniles averaging approximately 17cm in length. These juveniles are found shoaling with pilchards and are most often a by-catch of pilchard catches. Targeting juvenile horse mackerel is discouraged. A report discussing the impact of juvenile catches by purse seine vessels in South Africa indicated that even small pelagic catches would have a substantially negative impact on future mid-water trawl catches. (Source: Industry Communication)

- Physiology: Namibian horse mackerel have a large and bony scute which protrudes from the mid-section through to the tail. In the cooking process this scute does not soften appreciably. The tinned product also tends to have a slightly "bitter" taste. The tomato sauce in which it is cooked tends to darken after the cooking process. Both features suggest consumer resistance against the product, especially since tinned pilchards suffer neither of these blemishes[6].

These features explain the non-emergence of the Namibian horse mackerel cannery despite the emergence of a significant mackerel canning industry in Chile. The policy question that follows is whether changes in mesh size and quota policy could increase the mean size of fish caught, and whether this would be sufficient to make canning feasible. Before debating this one needs to assess the possible benefits. The best the industry can aspire to is to replicate the Chilean process; hence the upper limit on the benefits from a mackerel cannery is shown by the value chain of Chilean mackerel.

4.4 The Chilean Mackerel Value Chain[7]

Jack Mackerel, *Trachurus picturatus murphyi,* is a migratory pelagic species that is very similar to the Namibian horse mackerel. Its size at maturity is approximately 31cm. In normal years most shoals of fish are found in the 10 to 80 metre depth range. This means that the shoals can be harvested by small purse seine vessels and returned to shore for processing. Unlike in Namibia where juvenile fish are caught close to shore and mature fish are further out (and beyond the range of purse seine vessels) in Chile mature mackerel are found very close to shore.

Chile supplies a canned form of jack mackerel that directly competes with local Namibian and South African canned pilchards. They also produce fresh/frozen fish and fishmeal.

Over the years, Chile has gradually moved away from fishmeal production. The reason for this is that there is more profit to be gained from further value adding. To illustrate:

Four tons of fish can be converted to one ton of fishmeal that sells at US$600 a ton. This would generate revenue of US$600.

Alternatively, the fish can be frozen and sold without head and tail. This results in 2.8 tons of frozen fish that retails at US$1540, and about 0.3 tons of fishmeal. The revenue generated is calculated to be US$4492.

Finally, the fish can be filleted and sold for US$2400 a ton. Only 1.7 tons of fillets are produced from 4 tons, but combined with the remaining 0.7 tons of fishmeal, revenue is US$4500. (Source: Industry Communication)

It must be stressed that the analysis above focuses on revenues rather than profits. Value adding also means addition of costs and need not result in greater profits. This is a major concern in assessing policy for the Namibian mid-water trawl fishery.

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[6] Interestingly, the tinned Chilean Horse Mackerel did not have this bitter taste. There has been speculation as to the reason for this. A theory is that the stomach enzymes of the horse mackerel cause this bitterness to occur. The Chilean process cuts the tail-section so as to exclude the stomach. This could explain why there is no bitterness. The stomach of the Namibian was not removed in the experiments.

[7] Data on Chile supplied by Industry Communication and evaluated using mid 2005 prices

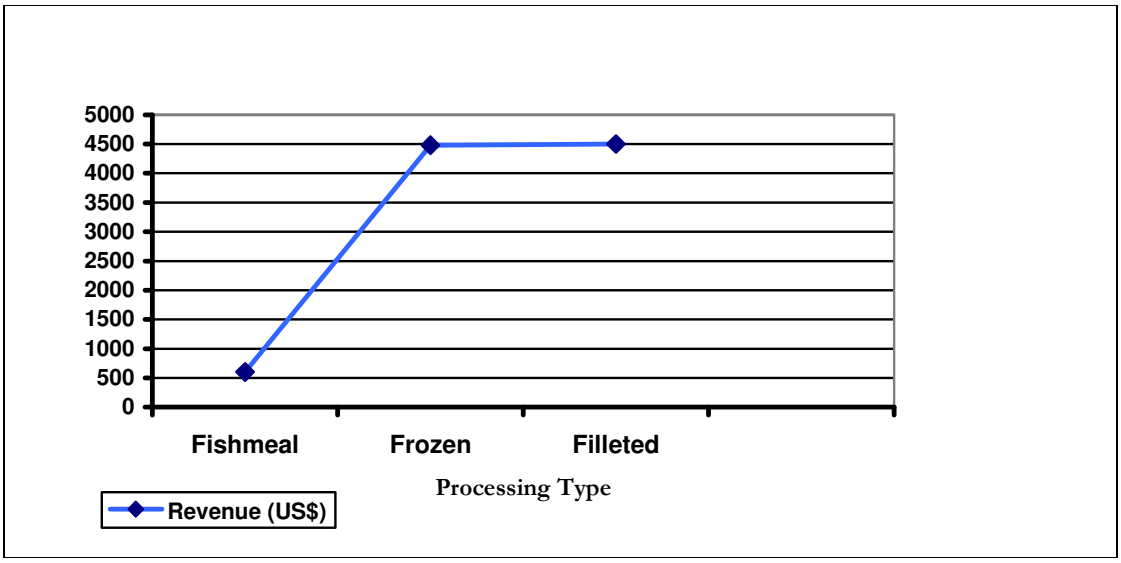

Figure 5. Revenue generated from four tons of Chilean horse mackerel.

Demand for Chilean canned Jack mackerel has been increasing and in 2002 there was substantial excess demand. This resulted in a price increase in 2003. Clearly good quality canned mackerel is a popular product. For the period January 2001 to December 2002, canned jack mackerel reached US$ 52 million. This is far below the 1998 value of canned pilchard in Namibia (US$ 492 million), but far above the 2000/2001 value of US$ 2.8 million following the collapse of Namibia's pilchard stock.

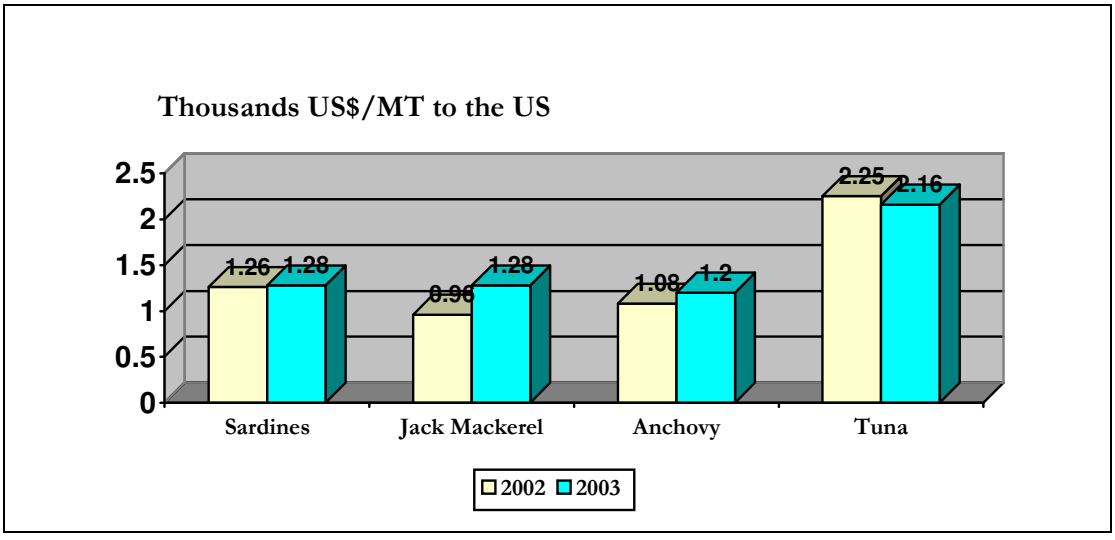

Figure 6. Export price for canned fish (Jan-May 2003).

4.5 Canning

Most canning in Chile takes place in land-based canning factories. The horse mackerel resource is found close to shore and is targeted by purse seine vessels that land the fish "wet", i.e. it is refrigerated onboard and returned to shore in a short space of time. The average Chilean canned mackerel in its whole form is roughly 30 cm long. This is substantially larger than the Namibian mean of 17.1 cm and suggests the importance of raising the average size of the mackerel landed in Namibia.

Processing is relatively simple. The head and tail sections are removed and processed into fishmeal. The mid-section is put into a can with tomato sauce and spices. The canned product is then put through a cooking process. The cooking process cooks the fish and softens the bones as in typical pilchard canning. This makes the final product immediately edible by the consumer.

4.6 Implications for the Industry

Analysing the problems mentioned above, it is clear there are several requirements for an economically viable mackerel canning industry in the Northern Benguela:-

A larger fish is needed in order to allow a sizeable tail-section cut that excludes the stomach. More experiments need to be done in order to ascertain whether it is the stomach that is the cause of the bitterness. There are indications that a solution to the discolouration has been found. However, South African canners using the individually larger 'South Coast' horse mackerel have confirmed that they too had problems with bitterness and discolouration. Despite the larger size of the fish, they abandoned their canning experiment and reverted to sale of the catch fresh or frozen.

For Namibia specifically, the most practical solution would be to install canning facilities on the mid-water trawlers. The inshore horse mackerel are juveniles, inappropriate for canning, and the larger offshore stock is too distant and too deep to be exploited by small wetfish vessels. In consequence land-based canning of Namibian horse mackerel seems unfeasible. There appears to be only scope for factory ship processing; the fish, even if a larger size could be guaranteed, is unlikely to replace pilchard as a basic input in land based canneries.

Installation of canning facilities onboard would require substantial investment: given the negative aspects of tinned horse mackerel mentioned above, it may not be an attractive option, especially while pilchards are available. However, given solutions to the bitterness and colouration problems, there could be substantial scope for vessel-based canning.

4.7 Alternative Means of Adding Value to Horse Mackerel

Five possible final horse mackerel products are mentioned below. Each of these has an economic substitute that is based on either price or quality.

4.7.1 Round Form

There are several substitutes for fresh horse mackerel. Fleets catching in the North Sea, Mauritania, Morocco and high seas supplies caught off Chile by Russian and Chinese trawl fleets also target Namibia's West African markets and provide a very similar product. All these catch areas have their own species of horse mackerel (although from the same family, there are differences in fat content, size and taste). As mentioned, Mauritanian horse mackerel commands a premium above the Namibian fish.

Demand for horse mackerel is highly price elastic due to the low average income per capita of its consumers. If the Namibian price were to increase relative to the Mauritanian, consumers would not find it difficult to shift consumption towards the relatively cheaper product. Consumers can shift demand to tripe, fatty cuts of meat, chicken, beans or simply eat no protein. Thus in order to maintain demand in West Africa, it is important to keep the price as low as possible with respect to the competition.

4.7.2 Fishmeal

World fishmeal production has not increased significantly since the mid eighties and is not likely to increase substantially in the near future. On the supply side there has been a shortage of fish, while on the demand side a structural break has occurred over the last two decades in the substitution possibilities between fishmeal and soya bean meal. This is a high volume, low mark-up activity and only feasible as a means of ensuring full use of off-cuts, low value by-catch and juvenile fish landed as by-catch in the inshore small pelagic trawl.

4.7.3 Filleted Form

Filleted horse mackerel is an important value-adding step not yet implemented by any of the major Namibian producers. Between 1970 and 1980 Russian fishing companies operating in the Pacific produced frozen blocks of horse mackerel fillet. Experiments have been conducted and market research has shown that there is not a large enough market in West Africa to warrant large-scale production of horse mackerel fillets. This is because horse mackerel involve such high processing costs that they effectively price themselves out of the market.

Substitutes include the dominant hake market. Experiments filleting horse mackerel have shown that the cost per kilogram of machine filleted horse mackerel is similar to that of hake, despite horse mackerel's landed value being much lower. There has been investigation into an automated filleting machine for horse mackerel that would lower the processing costs.

4.7.4 Salted and Dried

Commercial salting and drying of horse mackerel was done till recently in all three BCLME States, but became unfeasible due to the higher processing costs involved (packaging had to be waxed to retain freshness). In addition, West African importers began to salt and dry the fish themselves. As a result importers only demanded the cheaper frozen form and were unwilling to pay a premium for dried fish. An artisanal drying industry still exists in Angola, but its market is largely internal. In South Africa the drying industry was in decline but a new plant recently opened. Operators are buying mackerel and other fish landed as by-catch, as well as shark landed by longliners.

4.7.5 Tinned

Tinned horse mackerel has only been experimented on and currently there is no large- scale production of tinned Namibian horse mackerel. If horse mackerel were canned, substitutes would include tinned horse mackerel from Chile and tinned pilchards. Tinned pilchards have by far the largest market share (over 98%) in the West African, Namibian and South African tinned fish markets.

4.8 Industry Structure and Economic Risk

Several sources of risk confront investors in the Benguela Horse Mackerel fishery.

- **Availability of future quota:** Quota allocation may become related to political patronage or curbed by declining stocks. Namibia issues relatively short-term rights (7 years on average). In South Africa the catch is regulated using the precautionary principle. Greater effort will have to be put into stock assessment if the industry is to expand.
- **Catch rates in winter:** Namibia has a low winter catch rate.
- **Size of fish:** Small fish have lower value per tonne.
- **Currency exchange rates:** The Namibian Dollar (N$) is pegged to the South African Rand (ZAR), thus a strong Rand is detrimental to Namibian exporters.
- **Operating Costs:** High fuel prices are a particular problem as fuel is a larger share of total costs for off-shore mid-water trawlers than for the inshore seine (pilchard and anchovy) trawlers with whom they are effectively competing.
- **Product prices fluctuations** Mackerel is sold as a standardised commodity rather than a luxury good. As such its price is likely to be cyclical.

These risk factors affect profitability and price in several ways and have resulted in the decline of horse mackerel prices over the last few years:

- **Excess vessels during summer:** A greater number of vessels tend to fish in Namibia between October and April when the fishing is at its best. This results in most fish being landed during that period. The increased supply puts downward pressure on prices.
- **ZAR/US$ Fluctuations:** About 70% of the TAC is transhipped onto reefers that take the product to West Africa. The main importers are the DRC, Ghana and Mozambique. If the US Dollar is strong, it is much more profitable to tranship than to land the product domestically.
- **External Fish Supplies:** The primary export markets in West Africa are also target markets for fish from the North Sea and North Africa (Mauritania and Morocco) and more recently South America (in high seas off Chile). The North African supply on average tends to consist of bigger fish. This means that Namibian fish has to be cheaper to maintain its market share.
- **Operating Costs:** Average production costs vary for various reasons, mainly fluctuating fuel prices and catches. Companies typically have a breakeven catch rate per day (normally around 60 metric tons per day) for each of their vessels. If catches drop below this level, it becomes unprofitable to continue the operation. This explains why many vessels move out of Namibian waters during the winter months when poor catches are experienced. The oil price plays a major role in the operating costs. Fuel related commodities constitute approximately 55% of the total operating costs. Oil prices rose by approximately 45% during 2005 and have continued rising in 2006.

Risk resides on both cost and market sides. Quota holders have two options available. They can purchase a trawler and fish for themselves or charter a vessel to catch on their behalf. Typically in a charter approximately 86% of all profits go to the vessel owner and the remaining about 14% to the quota holder. Vessels are a capital-intensive commodity. The

cost of a 2nd hand Russian mid-water trawling vessel is approximately R70 million. The newer Dutch trawlers cost in the region of US$ 40 million (approximately R250 million).

At a policy level the Namibian government has control over several risk factors. It determines quota allocation and is responsible for the stipulation that full quota must be caught. The Namibian dollar is kept pegged to the South African Rand. This means that South African exchange rate policy affects Namibian competitiveness in export markets. The government also has the opportunity to subsidise fuel for vessels.

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5. ANCHOVY

The anchovy (*Engraulis capensis*) catch in the Benguela ecosystem is entirely used for fishmeal production, a by-product of which is a yield of fish-oil (a commodity whose price has varied sharply with local demand). In this use as a livestock feed, it differs from the Mediterranean anchovy (*Engraulis encrasicolus*) which has a long history of use as a human food product. The FAO advises that *E. capensis* northern limit on the Atlantic coast of Africa is arbitrary and that there may be no distributional break from the European anchovy (*E. encrasicolus*). In economic terms, however, the fish is only significant in South Africa and Southern Namibia. Populations have fallen sharply in the Northern Benguela, both in absolute terms and relative to other small pelagics (*Trachurus* and *Sardinops*). The prospects for the development of anchovy based fisheries in this area seem consequently limited. Accordingly this analysis will focus on processing in the Southern Benguela.

The fish are caught by small unrefrigerated surface seiners using 12.7mm mesh nets. In consequence anchovy vessels may have a by-catch of more valuable species (e.g. pilchard) while vessels targeting pilchard (with a larger mesh size nets) will not have a by-catch of anchovy. Coming off unrefrigerated vessels, these fish are generally unsuited for human consumption (vessels targeting pilchard typically store their catch in refrigerated or chilled seawater, while horse mackerel are often processed and frozen immediately on board the vessel).

The use of the Benguela anchovy resource as a foodstuff for human consumption has been mooted; this would probably first require a move towards the use of more sophisticated vessels.

Anchovy are a naturally oily fish. While high oil content is an asset for larger fish such as horse mackerel, it can be a liability when trying to process small fish such as anchovy for human consumption. Fish have to be split, the entrails removed and the fish salted and dried. The process takes place under pressure so as to express oil and reduce the risk of the product tasting rancid. While such a process may be feasible for large fish, at current prices it would be prohibitively expensive for smaller ones if the intention was to provide a cheap source of protein for human consumption. Experiments have been run to see if small volumes of salt anchovy fillets (aimed at a more affluent consumer group) could be prepared using the traditional Mediterranean salting/drying technique. While the resulting product was acceptable in quality, the small domestic market kept the industry from investing in such activities. The process is extremely labour intensive, and while a small family operation could be set up to satisfy the local market, the high marketing and distributional costs might preclude its viability.

By contrast, fishmeal production from anchovy is a capital intensive shore-based activity.[8] The entire fish is used and there is no waste. The market is global and is effectively a sub-section of that for agricultural protein. Although oil-seed residues such as cotton seed cake act as subsidiary competitors, the product leader in this market sector is soya meal (imported soya meal is typically approx. 47% protein). Consequently the market price is driven by the soya-meal price. Although anchovy-based fishmeal producers typically aim for 63%-65% protein in their product the local price realised tends to be roughly 180% of the international soya meal price with a premium paid for a superior product such as the 67% protein, sanitised meal, intended for sale abroad. On the international market the price of fishmeal has typically been between 2 and 2.5 times that of soya, allowing for a slight lag[9]. There have, however, been structural breaks in this relationship in recent years, and the relative prices at the time of writing (April 2006) showed a fishmeal price set at 350% to 400% of that of soya. These prices reflect the view that the positive characteristics of fishmeal extend beyond its absolute protein content. The FAO comments that, "Special types of fish meal have proved beneficial for feeding ruminants and as a whole, there is little doubt that in future a wider differentiation in the products of the fishmeal industry will take place, subsequently diminishing the influence of competition from soya"[10].

Being price takers, manufacturers can only maintain their profitability by controlling costs, though they can reduce market risk by engaging in cross-commodity futures hedging with soya. This implies a relatively sophisticated marketing approach which would not ordinarily be available to small scale producers without the assistance of the industry association. It should be noted that both soya and fish meals are globally traded. In consequence exchange rates as well as global supply conditions in both markets contribute to price volatility. The global spot price of fish meal therefore varies considerably. Maintaining the viability of the industry is a challenge to both marketing and production.

The production process entails heating to break down fats and coagulate proteins, grinding, draining and drying. The yield of dry meal to wet fish is approximately 1:4.2, i.e. 4.2 tonnes of fish yield 1 tonne of meal, plus a by-product of roughly 3% oil, i.e. approximately 0.1 to 0.2 tonnes. In financial terms using April 2006 prices, R1686 of fish yield R3650 of meal plus R460 of oil.

The manufacturing process is simple and relatively standardised, leading to a simple supply chain. However, while for pilchard or horse mackerel processing into fishmeal is a choice that can be selected, or that is intended to reduce waste by making use of off-cuts, in the anchovy industry fishmeal production uses the entire catch. It is the primary aim of the fishery. As mentioned, the price of the final product is volatile; hence the chain described below should not be regarded as stable.

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[8] A detailed description of the production process is available in FAO Fisheries technical paper 142 *The production of fishmeal and oil*. Rome, 1986 on the FAO website:
http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/003/X6899E/X6899E04.htm

[9] See Table 4 in Kristofersson and Anderson, *Structural Breaks in the fishmeal-soyabean meal price relationship*. http://www.nlh.no/institutt/ios/Seminar/2004/s-02-06.pdf. Note that although the global soya price is now roughly US$180/tonne, it has been approximately twice that at times in the past two years.

[10] http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/003/X6899E/X6899E10.htm

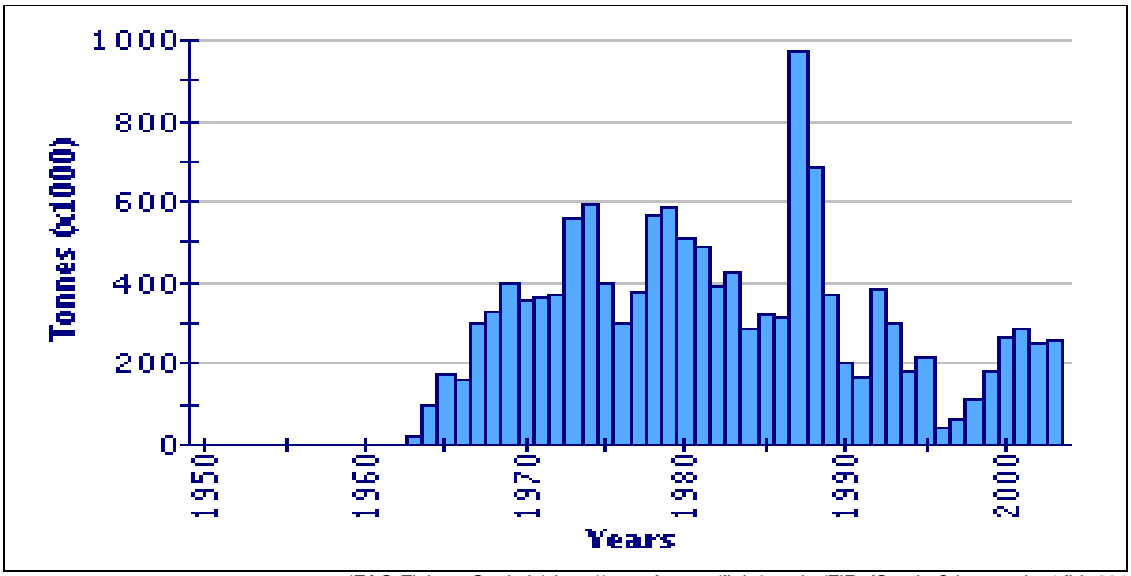
Table 5. The anchovy (fishmeal) value chain.

FISHMEAL (LOCAL)	ZAR/TONNE
Paper Quota	**73**
Dockside Price	**400**
Yield @ 4.2:1 => 1 ton fish yields 0.238 ton meal Normal processing => 63% protein	
Sale to Food/Feed Processor @ R3650/ton	**870**
Fish-oil approx 3% recovery @ R2300/ton	**80 to 110**
Total value @ R3650/toone	**980**
Total value @ R4250/tonne (spot price 04/2006)	**1100**

Table 6. The anchovy (export) value chain.

FISHMEAL (EXPORT)	ZAR/TONNE
Paper Quota/tonne	**73**
Dockside Price/tonne	**400**
Steam processing (=> 67% protein) Additional Quality Checks Transport (to E.U. or Far East)	 33 42
Sale to Food/Feed Processor @ R4400/tonne	**1040**
Fish-oil approx 3%-4% recovery @ R2300/ton	**80 to 110**
Total value	**1140**

The anchovy catch is almost entirely processed into fishmeal. An idea of the variability of supply and hence the likely supply based volatility of prices, can be gleaned from the diagram below.



(FAO Fishery Statistic) http://www.fao.org/figis/servlet/FiRefServlet?ds=species&fid=2919

Figure 7: Global Capture production for *Engraulis capensis.*

6. TUNA

A variety of tuna species are caught in the South Atlantic; however, catches are uncertain and there is no history of large scale sustained harvesting in BCLME waters. Canning of Tuna in Walvis Bay took place between 1993 and 1997 but was then discontinued - Namibian pole tuna is now canned abroad. A small tuna cannery exists in South Africa. In Angola joint venture companies such as World Wide International / Inter-Burgo SA have established themselves to exploit the tuna resource, using longliners to catch fish for export to Japan and Europe. There is a proposal that a cannery be opened as the second phase of an international joint venture. Labour is a major component of the tuna canning industry's costs, hence its movement from the USA to Central America and then to Thailand and the Philippines. Currently tuna is caught globally and the can-able sections are sent frozen to Thailand for sorting, steaming and canning, as this is the cheapest alternative. Only the sections (and tuna types such as albacore) that are not can-able as 'solid flesh' tuna are likely to remain for local processing. These are suited for production of tuna flakes, a product less demanded globally and selling at a discount, but nonetheless popular locally. Canning 'flake' tuna is a more automated process and uses less labour. This makes it better suited to southern African conditions.

Namibia has underutilised pilchard canneries and some of this plant is being adapted to meet tuna canning needs. The initial costs are already sunk; so such enterprises would only have to cover their variable costs!

As mentioned, the tendency to export unprocessed tuna from the Benguela, and to import canned tuna to the region, is partly a result of uneven supplies; large pelagics are uncertain migrants. In addition, it is influenced by the structure of the local fishery, which restricts itself to regional waters - globally, fleets can spread their overheads by following large pelagics as they migrate, whereas the local fleet waits for their arrival. It is also a consequence of historic factors such as differential freight costs on frozen and tinned products, and the USA's historically high levels of protection against imported tinned tuna. Tuna caught in the

Benguela region could be exported frozen to American processors, but high tariffs and lack of access to North American distribution channels precluded export of tinned tuna to that market. South Atlantic tuna is still sought after by foreign canners, but consumers of tuna locally, having adapted their tastes, now seem content with the internationally less preferred and cheaper Skipjack (*K. pelamis*), an Indian Ocean species from canneries in Thailand and the Philippines.

The viability of the local fishery has been aided by the presence of swordfish and blue shark, but the catch rates of the latter have been excessive and it is uncertain how much longer the South Atlantic shark fishery (and shark by-catch) can survive.

7. ROCK LOBSTER

Rock Lobsters (*Jasus lalandii*) are effectively confined to South Africa and Namibia. Capture is with traps (offshore) and hoop-nets (inshore). The industry can accommodate a wide range of technologies, from labour intensive artisanal enterprises, to more capital intensive commercial operators.

The commercial lobster industry in southern Africa has been geared towards exports since its inception. Freezing replaced canning in the years after the Second World War, and today rock lobster is exported in a range of forms. According to market preference these include: whole cooked frozen, whole raw frozen, frozen tail, and live. This range of options helps reduce market risk and provides apparent economies of scope. Unlike the hake industry, however, this has not lead to market concentration and vertical integration, but to the emergence of specialist processing intermediaries who offer a range of services to small operators, and to cooperative processing and marketing enterprises that small quota holders can join.

Location and depth of capture can affect the colour and appearance of lobster, typically those caught in traps being lighter than those caught in hoop-nets. While individual markets exhibit preferences for lighter or darker specimens or lobster that are relatively larger or smaller, the markets' tastes vary enough to ensure that the general price per kg is not significantly sensitive to the size or colour of the lobster caught.

In Namibia lobster is landed at Luderitz for onshore processing. Lobster caught in the Luderitz area tend to be slightly smaller than those caught in South African waters, quantities are also lower and catch per unit effort generally higher. Distance and low volumes effectively preclude Namibian producers from participating in the more lucrative market for live lobster. Existing factories are big enough to process further increases in allocated quota. The industry produces three products: whole cooked lobster, frozen whole raw lobster and frozen lobster tails. Lobsters are exported mainly to Japan (FAO, 2001d).

The West Coast rock lobster catch has remained relatively constant over the analysis period at just under 1,800 tons, but Figure 8 shows that the proportions of products produced have changed significantly. The total mass of products produced is less than the total catch because the yield on a frozen lobster tail is approximately 14%-17%.

In South African waters the bulk of lobster is kept alive, held in tanks while being purged, and then sold live into markets in the Far East (Hong Kong and Japan) and Europe. There is a premium for live rock lobster, especially when in good condition. As a result only seriously damaged lobsters, or those involved in cannibalism while in the tanks, are likely to be tailed.

There are occasional gluts in the market for live lobster, in which case they can be processed: either steam cooked and frozen, or frozen raw.

There is effectively no market for quota and costs of harvesting lobster vary considerably with both location and weather conditions. Catch per unit effort is typically far lower in the north than it is south of Dassen Island (2006 industry estimates vary between R50/kg at Lamberts Bay to R20 - R25 between Dassen Island and Cape Town. Large producers catch and process for themselves, small operators may either sell their catch or have it handled on their behalf. Packaging and marketing involve additional further expenses.

The economic viability of the West Coast rock lobster fishery and associated processing industry seems tied to four key variables:

i. **Catch per unit effort** – in the long run driven by stock abundance, but also influenced in the short run by water and weather conditions.

ii. **The exchange rate** – the Rand and Namibian Dollar are tied: when the Rand is weak on international currency markets, exporters in both South Africa and Namibia benefit through higher prices. Product sold into the local market also rises in price. The recent strength of the Rand against the US Dollar has reduced margins in the Far Eastern markets which are Dollar denominated. The Rand has not risen as strongly against the Euro, consequently margins on exports to Europe have not been as strongly affected.

iii. **Market conditions** – on the supply side, cost and availability of air-freight have fluctuated over the past decade (e.g. the number of planes flying routes dropped following the destruction of the World Trade Centre and also the outbreak of the SARS virus in the Far East). Market demand is also variable; there is a seasonal fluctuation that normally causes prices to rise at the end of the season (August) as producers in Australia and New Zealand drop out of the market.

iv. **The allocation date of quota to fishermen** – late allocation of quota reduces margins: on the supply side, if the quota is spread over the entire season there is the capacity to hold the catch in purging tanks. If the harvesting period is shortened by late allocation of quota, shortage of capacity in the tanks may force producers to freeze more of the catch than would otherwise be ideal. On the demand side there is a greater risk that the live lobster market will be glutted if the catching season is shortened.

To reduce the volatility of earnings in the industry and maximise the value generated by a given quota it is imperative that quota be allocated as early as possible, and that the existing cartelised nature of marketing in the industry be maintained: the ability to hedge on foreign exchange markets, to market the product over a range of separate markets, and to freeze and store product in the short run, are all contingent on the existence of large operators. Since at least one of these operates as a *de facto* cooperative, small operators need not incur a lower return on their capital. A variety of service industries exist to support small operators: live lobster tanks can be leased while a catch is being purged graded and held prior to export; the export process can also be contracted out. An informed small rights holder need not be excluded from any stage of the product supply chain!

The following describes the basic value chain in April 2006 (Tables 6, 7 & 8):

Table 6. The rock lobster (live) value chain.

LIVE	ZAR/KG
live @ dockside varied directly with rand exchange rate: has fallen from a high of approx. R220/Kg when the Rand exchange rate stood at R12/$1 to R110/Kg with the exchange rate at R6.5/$1. Dockside prices also tend to fall with oversupply of live lobster in tanks.	**110 – 220**
Price Collect, grade, purge + holding + packaging	21
Marketing	
Air Freight	**30**
Final landed (@R6.5:1US$ & inc. agent's fees)	**120 - 190**
Net after weight loss and over packing @ approx 7%	**110 - 177**

Table 7. The rock lobster (raw frozen) value chain.

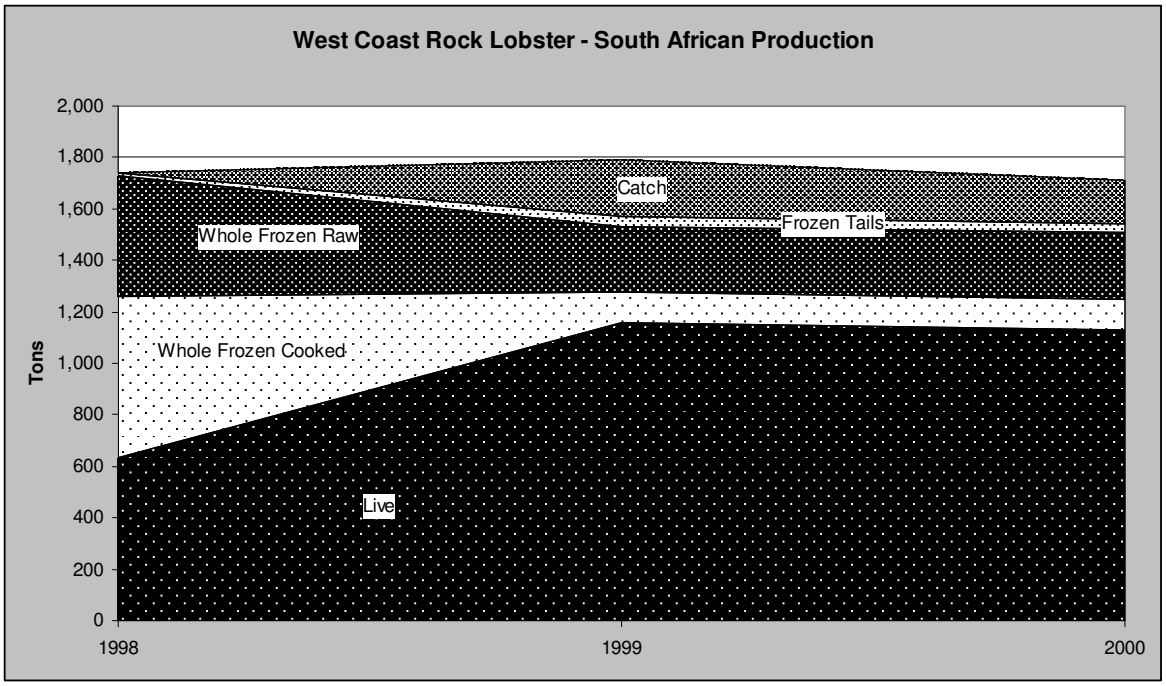
RAW FROZEN	ZAR/KG
Dockside: varies with exchange rate, currently R110	**110**
Cold storage + handling [1 week]	0.10
Packaging: variable	
Shipping: (sea)	**6**
Final sale: 16 – 21 US dollars/kg	**104 - 136**

Table 8. The rock lobster (cooked frozen) value chain.

COOKED FROZEN	ZAR/KG
Dockside: varies with exchange rate, currently R110	**110**
Cooking cost: minimal	
Cold storage + handling [1 week]	0.10
Packaging: variable	
Shipping: (sea)	**6**
Final sale: 16 – 21 US dollars/kg	**104 - 136**

There is no marked weight loss or over-packing loss when exporting raw frozen or cooked frozen rock lobster.

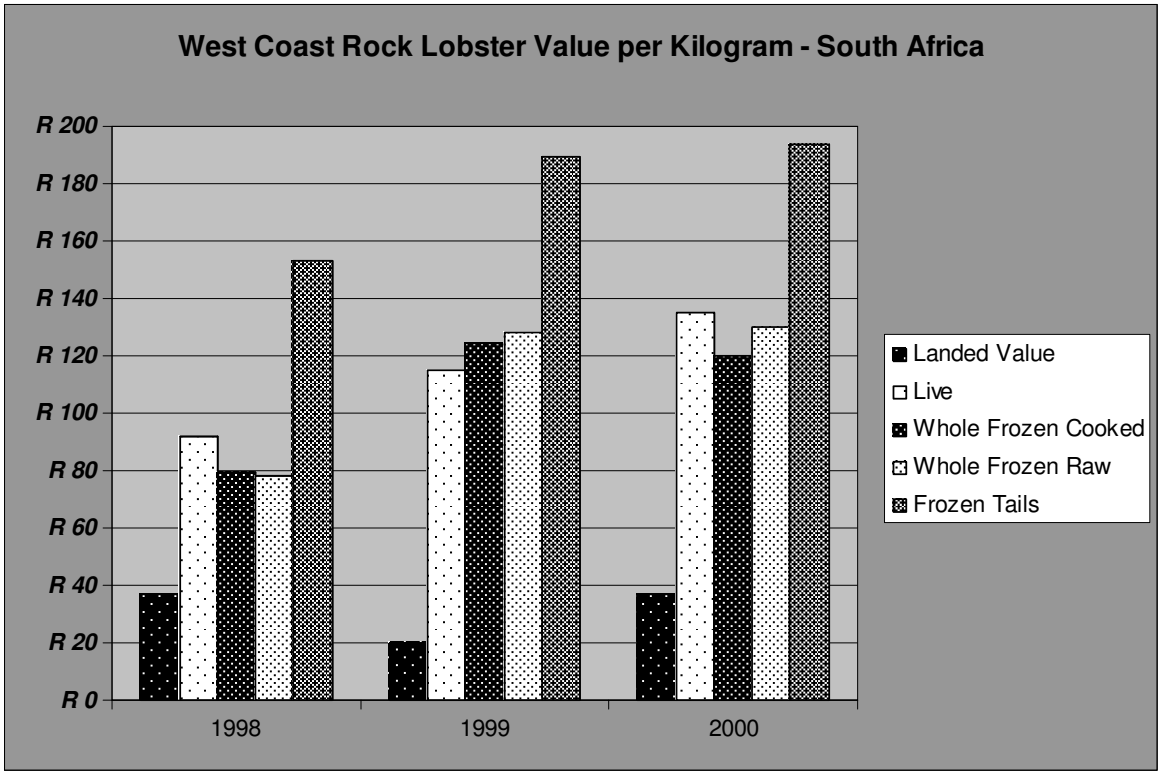
It is clear that with the strong rand the margins in the industry have been seriously affected, however, the profitability of live lobster export, even with the greater costs involved, still far exceeds that of frozen products.



Source: De Swart (pers.com), 2004

Figure 8. A comparison of the volume of the difference types of rock lobster product in South Africa, 1998 – 2000.

Figure 9 shows that the landed value dipped from its equilibrium value of around R37/kg to R20/kg in 1999. The value of the various wholesale products continued on an upward trend despite this dip in landed value.



Source: De Swart (pers.com), 2004

Figure 9. The value of the various rock lobster products, compared from 1998 – 2000.

8. DEEP SEA RED CRABS

These crustaceans (*Chaceon maritae*) are caught in a stock that straddles the Namibian/Angolan border. Although harvesting is performed by Angolan registered companies, the holding firms are largely tied to the same Far Eastern parent. Crabs caught legally in Angolan waters are landed for inspection. Crab from both sides of the border are frozen and sent immediately to China for packaging followed by export to the Japanese market. There have been suggestions that illegal operators have been fishing for crab in Angolan waters, but this is not confirmed. Virtually no value is added in local waters, and the quota holding vessels involved are currently Japanese, though it is reported that Russian vessels are also fishing in Angolan waters. The fishery suffers extensive rent seeking and the process of quota allocation seems to lend itself to this problem. Operators in the industry report that average sizes and catches per unit effort are lower in Angolan waters. While this may reflect natural conditions, it may also be an outcome of over-fishing in Angolan waters - Namibia has based its TAC on a reported steady rise in stocks since 1997.

9. CONCLUSION

This report focussed on the potential for fish caught in the BCLME to be beneficiated, i.e. to add value to fish by processing it rather than selling it as a raw commodity. Conventional thinking is that the greater the extent of beneficiation, the greater the contribution the fishing industry will make to the economy. The report ascertained the extent and manner of

beneficiation currently practiced in the region. The terms of reference suggested a subsidiary aim for the report; to use a value chain analysis to identify the potential for more widespread and extensive beneficiation, particularly in the under-developed fisheries of Angola. The study found that the value chains in the industry are extremely unstable. The values of paper quota, fish at dockside and fish processed in various forms, all fluctuate with exogenous shocks such as changes in the oil price, the exchange rate and the international price of the fish concerned. This instability means that there is no simple rule that can be imposed on the industry to force it to maximise value added.

Two points follow from this. Firstly, fishing companies operate in a risky industry and much of their activity is devoted to spreading the risks they face. Spreading can be achieved by diversifying product range, targeting a range of species, and keeping the supply chain flexible so that fish can be diverted into the most profitable line at any point in time. The State can assist in this process by allowing multiple rights to be held by a single company, allowing full use of capital. As an example, a vessel licensed for hake longlining can also serve for tuna pole fishing. If it is licensed to do so when conditions for longlining are poor, the return on capital is improved and the efficiency of the industry is enhanced.

Secondly, beneficiation is not always financially sensible. As examples, the most valuable hake per kilogram is often the least beneficiated, i.e. good quality fresh fish sold in the round. The same is seen in the rock lobster fishery when live lobster exports are typically more profitable that exports of more heavily beneficiated cooked/frozen lobster.

What should the State do? State controlled marketing boards have poor records of success. Attempts to regulate value adding directly have also shown little benefit. Industrialists can react to changing market conditions faster than a State bureaucracy can, and in an ideal system they should have the flexibility to do so. It makes little sense to undertake joint marketing between the 3 BCLME countries, nor for Governments to be involved in decisions about how to maximise product beneficiation on the value chain, as this will vary widely – from location to location, time to time, species to species and market to market. It will also be affected by fluctuating exchange rates and government imposed trade barriers. In general then, decisions about maximisation of product value should generally be left outside the domain of the state. That said, where intergovernmental cooperation can help sustain an industry through a temporary/localised downturn in catches, it makes sense that there be a commitment to do so. International Law prescribes that underutilised fish stocks should first be offered to the fishing industries of neighbouring states. It would be simple for the authorities of the three BCLME states to commit voluntarily to such mutual assistance without recourse to the Law of the Sea Convention. Not only might this benefit the local industry, it would also be an additional argument in state efforts to keep foreign fleets out of BCLME waters.

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