Update Krill Industry Overview

South Antarctic Krill Derivative Suppliers
Feed Applications

ABSTRACT

V_March 2012
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Abstract

Krill, a term originally applied to “fish fry”, is now taken to refer to euphausiids a group comprising over 80 species most of which are planktonic. They are widespread around all oceans of the world though the Southern Atlantic Ocean is the most important in terms of biomass and commercial interest with its species Euphausia superba, commonly referred as the Antarctic Krill.

Annual average catch has stabilized around 130 000 tons per season for the last six years, showing ups and downs but never close to the 620 000 tons trigger precautionary catch level set by CCAMLR for area 48.

Recently there has been a decisive resurgence on interest in fishing Krill, with the entry of new operators, either working with their own country-of-origin flags or through flags (countries) of convenience. The latter may force to a new growth curve in fishing effort, nonetheless this practice is fading away as a common fishing procedure.

Between the 1980s and 1990s, the three most common South Antarctic Krill end products were feed-grade dried meals and whole raw frozen, plus food-grade peeled Krill meat, which, within the 1990s, their average annual production was approximately 6 000, 58 000 and 2 500 tons, respectively. Within the 2000s, there has been a shift in the type of targeted end-products, in line with a higher demand of aqua-feed proteins, feed-bait grade whole raw frozen and the “wellness” industry claiming for nutraceutical end-products such as Omega 3. The “wellness” route has also firmed demand of whole raw frozen and Krill meal, each used to extract pharma-grade Krill oil.

New target markets has placed a grater effort on nutraceutical-grade and pharma-grade Krill oils, extracted from whole frozen Krill and feed (aox-free)-grade Krill meals, a trend that we expect will be sustained for at least the coming three to five seasons.

As catch and processing efficiencies have seen important changes, so does the catch method, recently focused on the controversial vacuum pump system.
Regarding Krill meal prices, within the 1980s and part of the 1990s, ex-Japanese prices range from US$450 up to US$750 per ton FOB South American port (SA), few qualities reaching US$875 per ton, while Japanese prices were twice as high, or even more. Late 1990s and early 2000s, former USA and Ukrainian operations had their Krill meals match, sometimes surpass, Japanese-quality meals, in the range of US$1 350 to US$1 550 per ton FOB SA. In the past few seasons (2005/2006 onwards) average meal prices have move upwards, above US$1 500 per ton FOB SA, and higher, with some lots reaching prices above the US$2 000 per ton mark (FOB SA).

Tharos’ price predictive model (based on Q1/Q2’12 vegetable and animal raw materials prices) places Krill meal opening price above the US$1 500 per ton FOB SA mark, although lower to current high-priced prevailing prices (Q1 2012). In terms of potential tonnage, Tharos demand matrix shows tonnage above 80 000 tons/year on meals subject several conditions are met. Specific demand and price analysis are addressed on other THAROS’ reports.

In respect to Krill oil, past seasons’ feed-grade (TG-enriched) Krill oil price is found in the vicinity of US$7,5 per kg up to US$30 per kg, or higher, depending on quality, processing condition and final use. Comparatively, pharma-grade oil prices are far higher than this. There are various prices for TG-enriched Krill oils subject to final use. Some marketed oils (OTC) come either from blended products that is not pure Krill oil or very low-quality Krill oil specifications.

Tharos’ pricing model for oil places its price well above the US$5 per kg FOB SA mark (TG- enriched). Price variation depends on TG quality specs, if the oil comes from at sea-operations, or as a by-product from other Krill processes, among other factors. Also, if it is going to be used on feed applications only or as a blend raw material for human-grade Krill oils.

If the use of Krill as a food or feed ingredient for the aquaculture industry was the 1980s and 1990s motivation, Krill outstanding medical properties and it’s immense potential in the lucrative nutraceutical market becomes the 2000s driver. And this is driving the interest of incumbents to expand their operations and insurgents to enter the fishery.
By 2007/2008\(^1\) season, South Antarctic Krill fishing notifications (application to capture Krill) add 754,000 tons. Tharos’ estimate was close to 200,000 tons for a final volume of 125,000 tons\(^2\). Comparatively, notifications and real capture data for season 2010/2011\(^3\) was 401,000 and 179,100, respectively\(^4\).

<table>
<thead>
<tr>
<th>Notifying Country (@ Face value)</th>
<th>Number of Operators (est.)</th>
<th>Notified Tons 2007/2008</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway</td>
<td>3</td>
<td>200,000</td>
<td>26.5</td>
</tr>
<tr>
<td>Cook Island</td>
<td>7</td>
<td>175,000</td>
<td>23.2</td>
</tr>
<tr>
<td>Russia</td>
<td>3</td>
<td>135,000</td>
<td>17.9</td>
</tr>
<tr>
<td>Vanuatu</td>
<td>4</td>
<td>80,000</td>
<td>10.6</td>
</tr>
<tr>
<td>Ukraine</td>
<td>2</td>
<td>65,000</td>
<td>8.6</td>
</tr>
<tr>
<td>Korea</td>
<td>3</td>
<td>48,000</td>
<td>6.4</td>
</tr>
<tr>
<td>Japan</td>
<td>1</td>
<td>30,000</td>
<td>4.0</td>
</tr>
<tr>
<td>Poland</td>
<td>1</td>
<td>20,000</td>
<td>2.7</td>
</tr>
<tr>
<td>Chile</td>
<td>1</td>
<td>1,000</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>25</strong></td>
<td><strong>754,000</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

*Source Tharos based on CCAMLR*

By 2008, Tharos wrongly assumed that based on the strong interest shown at that time by incumbents and insurgents on the Krill fishery, growth pace was strong enough to put annual capture data close to 1.4 Million tons. Tharos estimated that South Antarctic Krill capture was going to surpass 1 Million tons by mid 2010s, leveling off around the season 2013/2014.

---

\(^1\) December 1\(^{st}\) 2007 ~ November 30\(^{th}\) 2008.

\(^2\) Eight vessels from six member countries targeted Krill in 2007/08 in accordance with conservation measures in force.

\(^3\) December 1\(^{st}\) 2010 ~ November 30\(^{th}\) 2011. Notifications for Krill fishing in 2011/12 were received from seven Members and 15 vessels with a notified total predicted catch of 401,000 tons (SC-CAMLR-XXX).

\(^4\) In 2009/10, six Members harvested 211,974 tons of Krill from Subareas 48.1 (153,262 tons), 48.2 (49,999 tons) and 48.3 (8,712 tons) (SC-CAMLR-XXX). In 2010/11 (to 24 September 2011), six Members harvested 179,131 tons of Krill from Subareas 48.1 (9,158 tons), 48.2 (116,552 tons) and 48.3 (53,421 tons) (SC-CAMLR-XXX).
Would that estimate had become real, Krill meal and oil supply would have moved from approximately 30 400 and 730 tons (season 2007/2008) up to 150 000 and 35 000 tons for the season 2011/2012, respectively. On the contrary, Krill meal and oil (triglycerides-enriched) production for seasons 2007/2008 and 2011/2012 was approximately 13 500 and 35 tons, 12 000 and 20 tons, respectively. Meal tonnage data includes meal used for feed application as well as for phospholipids-enriched Krill oil extraction.

The season 2011/2012 will bring approx. 100 ~ 120 000 tons of Krill catch within 8 to 9 vessels. Among these trawlers, Poland quit the fishery (2012). Japanese operation has been downsized and eventually put on hold by 2013.

For the season 2011/2012, six members applied for Krill fishing\(^5\). Notified intentions\(^6\) add 391 000 for 15 vessels. After notifications were received by CCAMLR’s Secretariat, several changes occurred:

1. Chile withdrew its second vessel (only F/T “Betanzos” went fishing).
2. Polish vessel F/T “Dalmor II” was replaced by another vessel although the latter did not reach Krill fishing grounds within 2012.
3. There was a late notification by Ukraine (including the former Russian flagged trawler F/T “Maxim Starostin” which was licensed to Russia in previous years); their notification was for 30,000 tons.

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\(^5\) Chile, China, Japan, Korea, Norway, and Poland
\(^6\) Subareas 48.1, 48.2, 48.3 and 48.4
Krill Fishing Notifications 2011/2012 – How Real Is It ?

Current CCAMLR’s TAC\(^7\) level is 5 610 000 tons per year on sector 48 and 3 085 000 tons on sector 58. There is also a precautionary limit of 620 000 ton limit in area 48 (the so-called “trigger level”) and 452 000 for area 58.4.2. Once this limit is achieved, CCAMLR might close the Krill fishery until a procedure for the division of the overall catch limit into smaller management units.

\(^7\) Total Allowable Catch
If the growth shown by fishing permits is an indication on how healthy a fishery is, certainly the South Antarctic Krill fishery is one of them. Since the 90s, fishing allowance to capture Krill, granted by CCAMLR, has not seen other route than growth. Alongside this trend, CCAMLR has put more effort defining new conservation areas and increasing MPA’s\(^8\).

### Historical CCAMLR TAC levels (000 Tons)

<table>
<thead>
<tr>
<th></th>
<th>48.1</th>
<th>48.2</th>
<th>48.3</th>
<th>48.4</th>
<th>Total 48 (4)</th>
<th>58.4.1</th>
<th>58.4.2</th>
<th>Total 58</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999/2000(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 500</td>
<td>775</td>
<td>450</td>
<td>1 225</td>
</tr>
<tr>
<td>2000/2001(2)</td>
<td>1 008</td>
<td>1 104</td>
<td>1 056</td>
<td>832</td>
<td>4 000</td>
<td>440</td>
<td>450</td>
<td>890</td>
</tr>
<tr>
<td>2001/2002(3)</td>
<td>1 008</td>
<td>1 104</td>
<td>1 056</td>
<td>832</td>
<td>4 000</td>
<td>440</td>
<td>450</td>
<td>890</td>
</tr>
<tr>
<td>2003/2004(3)</td>
<td>1 008</td>
<td>1 104</td>
<td>1 056</td>
<td>832</td>
<td>4 000</td>
<td>440</td>
<td>450</td>
<td>890</td>
</tr>
<tr>
<td>2004/2005(3)</td>
<td>1 008</td>
<td>1 104</td>
<td>1 056</td>
<td>832</td>
<td>4 000</td>
<td>440</td>
<td>450</td>
<td>890</td>
</tr>
<tr>
<td>2005/2006(3)</td>
<td>1 008</td>
<td>1 104</td>
<td>1 056</td>
<td>832</td>
<td>4 000</td>
<td>440</td>
<td>450</td>
<td>890</td>
</tr>
<tr>
<td>2006/2007(3)</td>
<td>1 008</td>
<td>1 104</td>
<td>1 056</td>
<td>832</td>
<td>4 000</td>
<td>440</td>
<td>450</td>
<td>890</td>
</tr>
<tr>
<td>2007/2008(3)~11/12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 610</td>
<td>440</td>
<td>2 645</td>
<td>3 085 (5)</td>
</tr>
<tr>
<td>2011/2012 (3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 085 (5)</td>
</tr>
</tbody>
</table>

(1) July 1\textsuperscript{st} – June 30\textsuperscript{th}
(2) July 1\textsuperscript{st} – June 30\textsuperscript{th}
(3) December 1\textsuperscript{st} – November 30\textsuperscript{th}
(4) Precautionary catch limit 620 000
(5) Precautionary catch limit 452 000

This trend indicates CCAMLR’s confidence that this TAC increase do not negatively affect the web-food chain and is in accordance to fisheries interests.

It also shows that there are strong political movements within the CCAMLR community. It should be expected a greater Krill fishing effort within the coming seasons.

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\(^8\) **Marine Protected Area**
The “trigger level” was adopted to prevent local depletion of Krill, in the event of a rapid expansion of the fishery. CCAMLR might implement the FAO code of conduct for responsible fisheries, in which case, fishing restrictions will be stronger, on an actual scenario where approximately 40% of the annual Krill catch is fully utilized and approx. 67% of captured volume targets low-end aqua-feed grade products, away from higher-value added products.
In the non-achievable and fully hypothetical scenario that the entire 8.7 Million TAC quota (areas 48 & 58) is processed as dried meal and oil only, using current average processing yields, it means approximately 1,450,000 tons of meal and 40,000 tons of feed-grade Krill oil supply per season. Comparatively, annual pelagic (brown & white) fishmeal and fish oil production is close to 5,500,000 and 840,000 tons, respectively.

Unless CCAMLR changes its regulatory policy, or it finds new data about a greater biomass, or it succumbs to the actual pressure applied by fishing corporations through government agencies, production volume caps 100 ~ 140,000 tons per year of dried meal and 1,750 ~ 3,300 feed-grade and high-quality Krill oil, plus whole frozen and food-grade meats. Krill oil is considered here as a final product not coming as a re-processed product either from whole (frozen) raw Krill or dried meal.

Pricing is another factor that precludes Krill meal to become an affordable and competitive feed ingredient. Krill oil is a sort of new product, so there is not yet a well-known established price trend from where convenient price matrix can be built.