



Biodiversity Research and Innovation

Antarctica and the Southern Ocean¹

THAROS ranks 3rd on South Antarctic invention patents' family members

A 2020 paper contributes to mapping the scientific and patent landscape for biodiversity and innovation in Antarctica and the Southern Ocean².

This article reviews 150.401 scientific articles and 29 690 patent families for Antarctic species. The paper identifies the main contours of scientific research in Antarctica³.

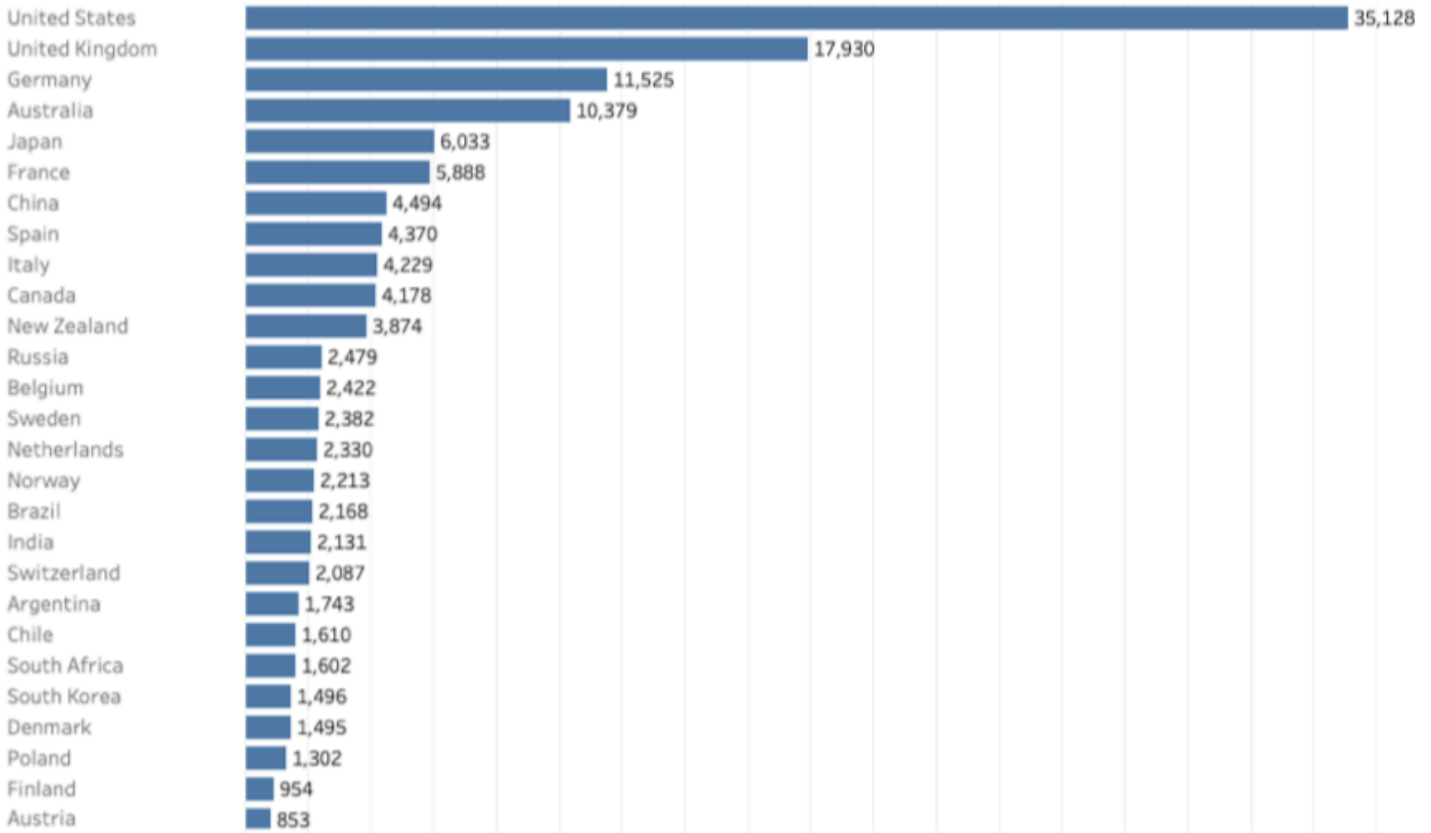
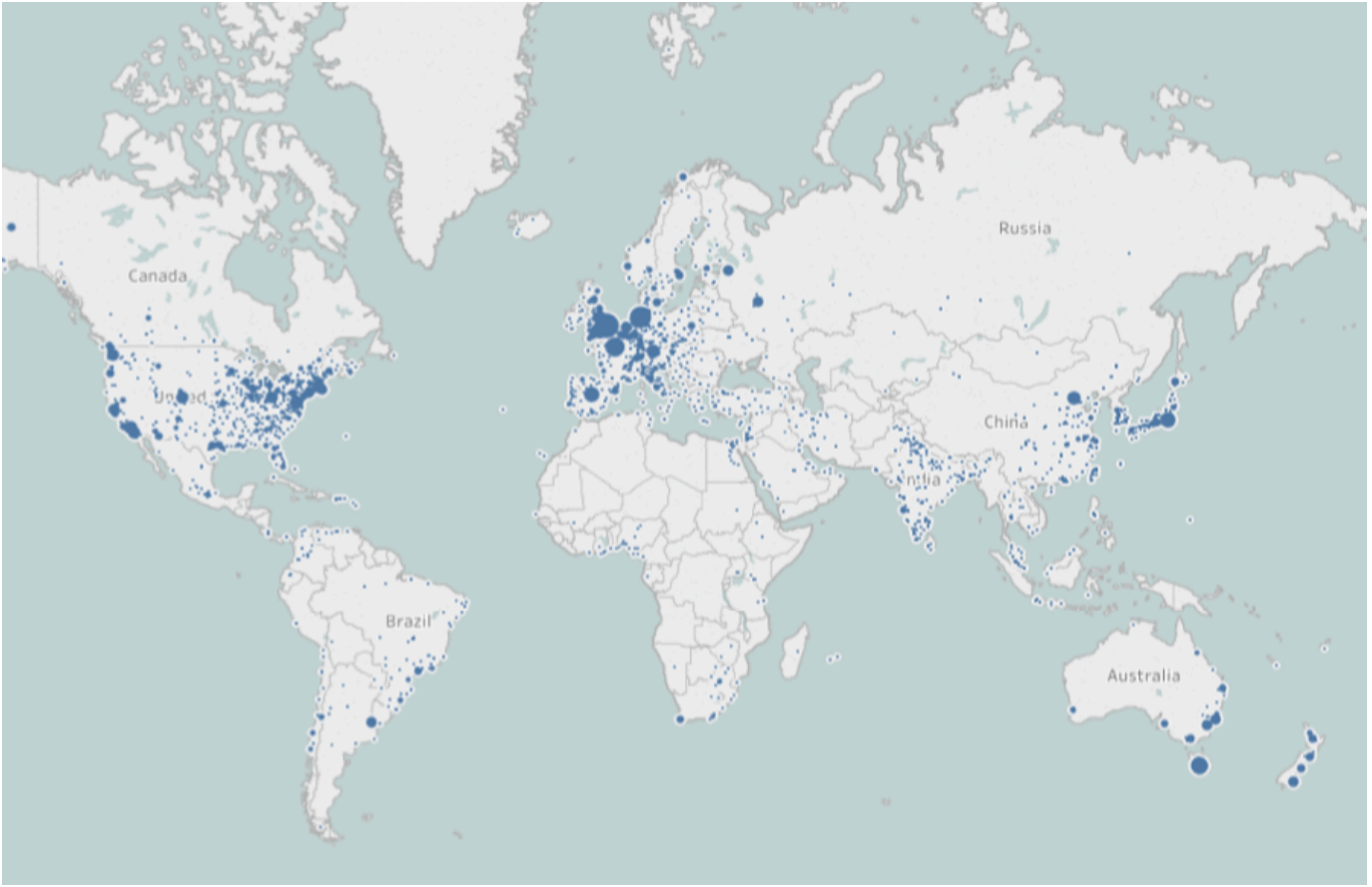
With respect to patent data, at the time of the research it included 116 million patent documents from 64 million families (publications grouped onto the earliest patent filing in a set) from 115 countries.

Researchers from 134 countries appeared in the raw publication data relating to the Antarctic, Europe and USA leading the list of invention patents holders.

¹ Paul Oldham and Jasmine Kindness. Convey P, Peck LS. Antarctic environmental change and biological responses. *Science Advances*. 2019;5: 1121 eaaz0888–null. doi:10.1126/sciadv.aaz0888

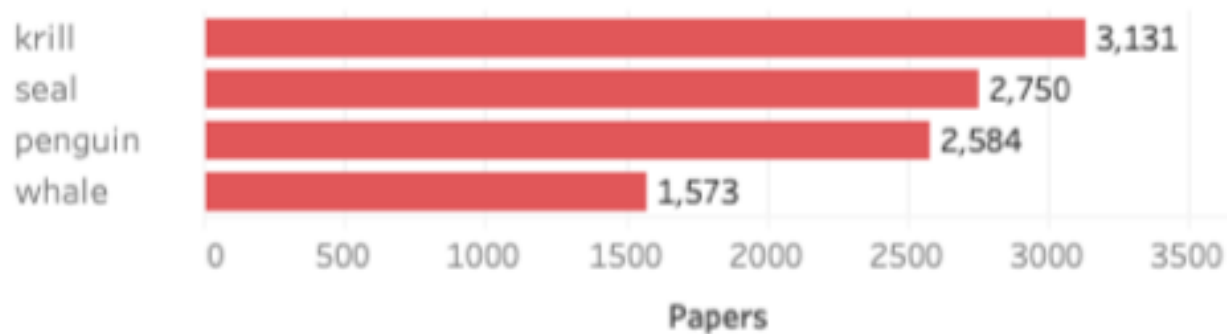
² <https://www.biorxiv.org/content/10.1101/2020.05.03.074849v1>

³ <https://www.biorxiv.org/content/10.1101/2020.05.03.074849v1.full.pdf>



When the data is ranked by species and the number of scientific publications for the 1,819 species, krill leads.

Common Names



In the case of Antarctic krill, we are witnessing a combination of an increasing number of claims to elements of krill, such as krill oil, and the use of krill as an actual or potential ingredient in a claimed invention, such as a foodstuff, animal feed or cosmetic.

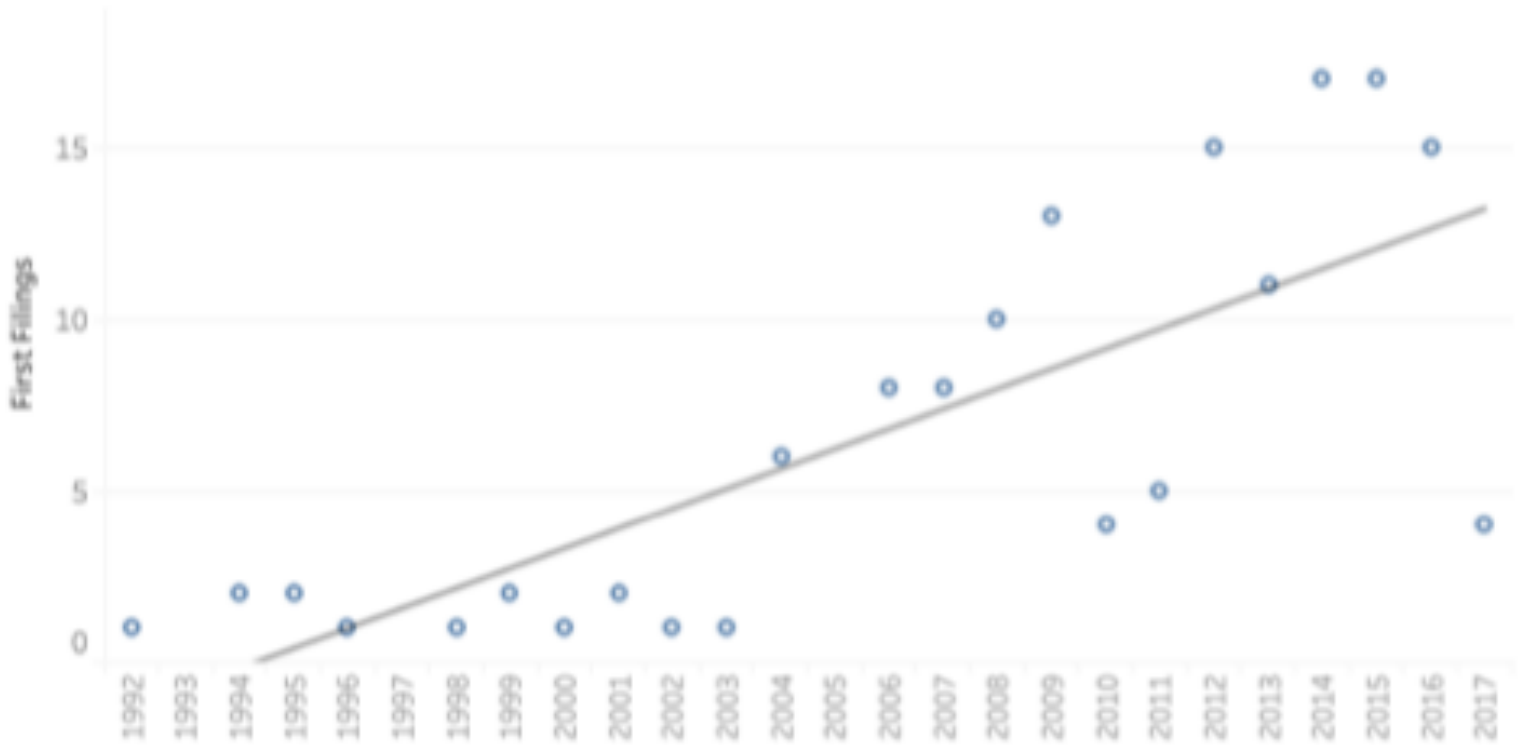
Antarctic krill (*Euphausia superba*) has become an increasing focus for the development of commercial and consumer products involving krill oil and the use of krill in feed for commercial aquaculture.

Previous work by Foster et. al. 2011⁴ highlighted the proliferation of patent activity across sectors for krill and its implications for predicting trends in krill fishery. Across both scientific and common names for krill, the report identified 150 first filings linked to a total of 1.193 family members worldwide.

⁴ Foster J, Nicol S, Kawaguchi S. The use of patent databases to predict trends in the krill fishery. CCAMLR Science. 2011;18: 135–144. Available: <https://lens.org/060-599-347-188-955>

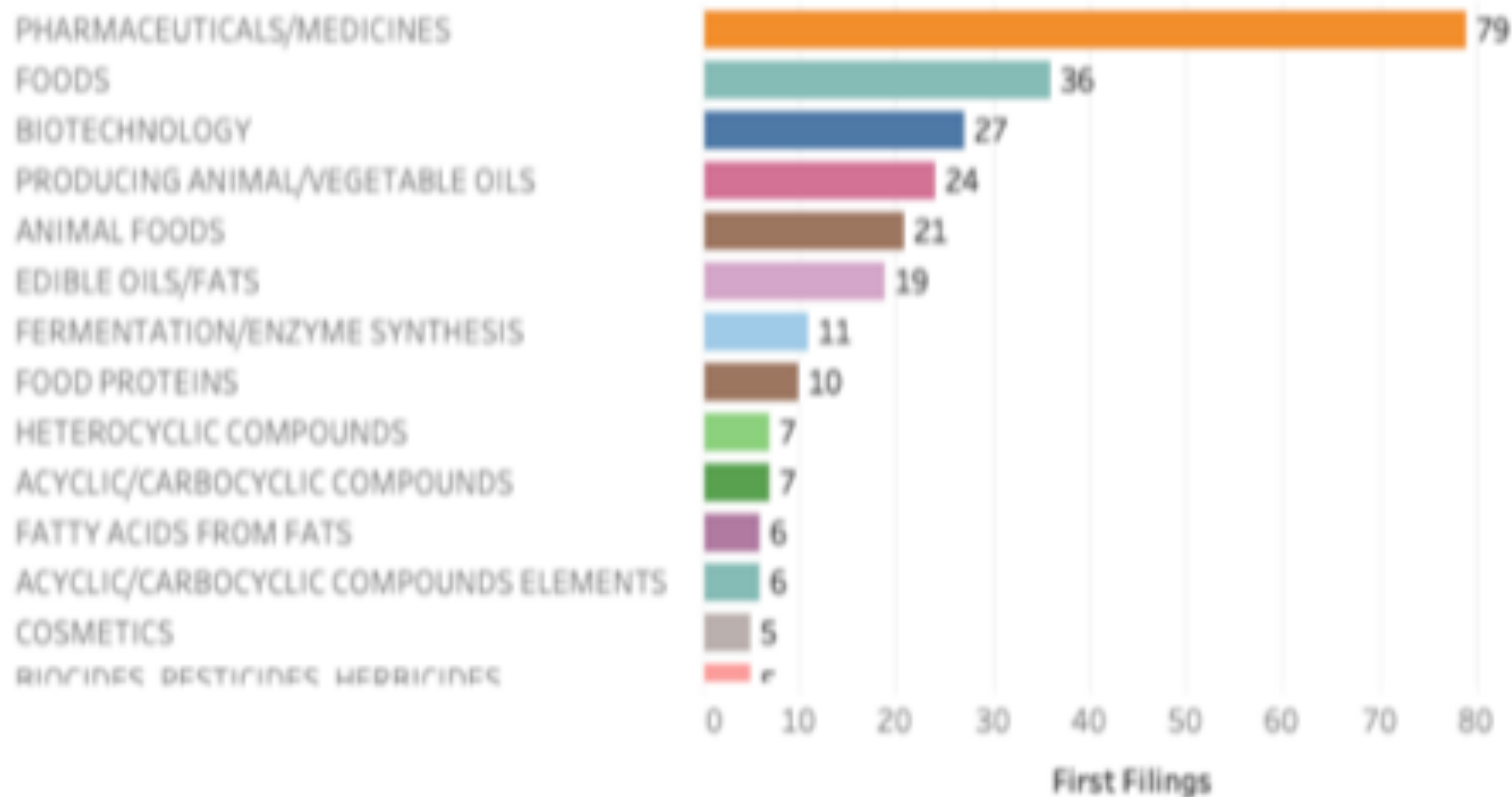
Although first filings in relation to krill are relatively small, there is a distinct rise in filings, reflecting a wider interest in commercial research and development using krill.

Krill Trends



A single krill application may lead to multiple applications and grants around the world. Applicants must pay fees at each stage of the application procedure and, where relevant, maintenance fees for patent grants in each country.

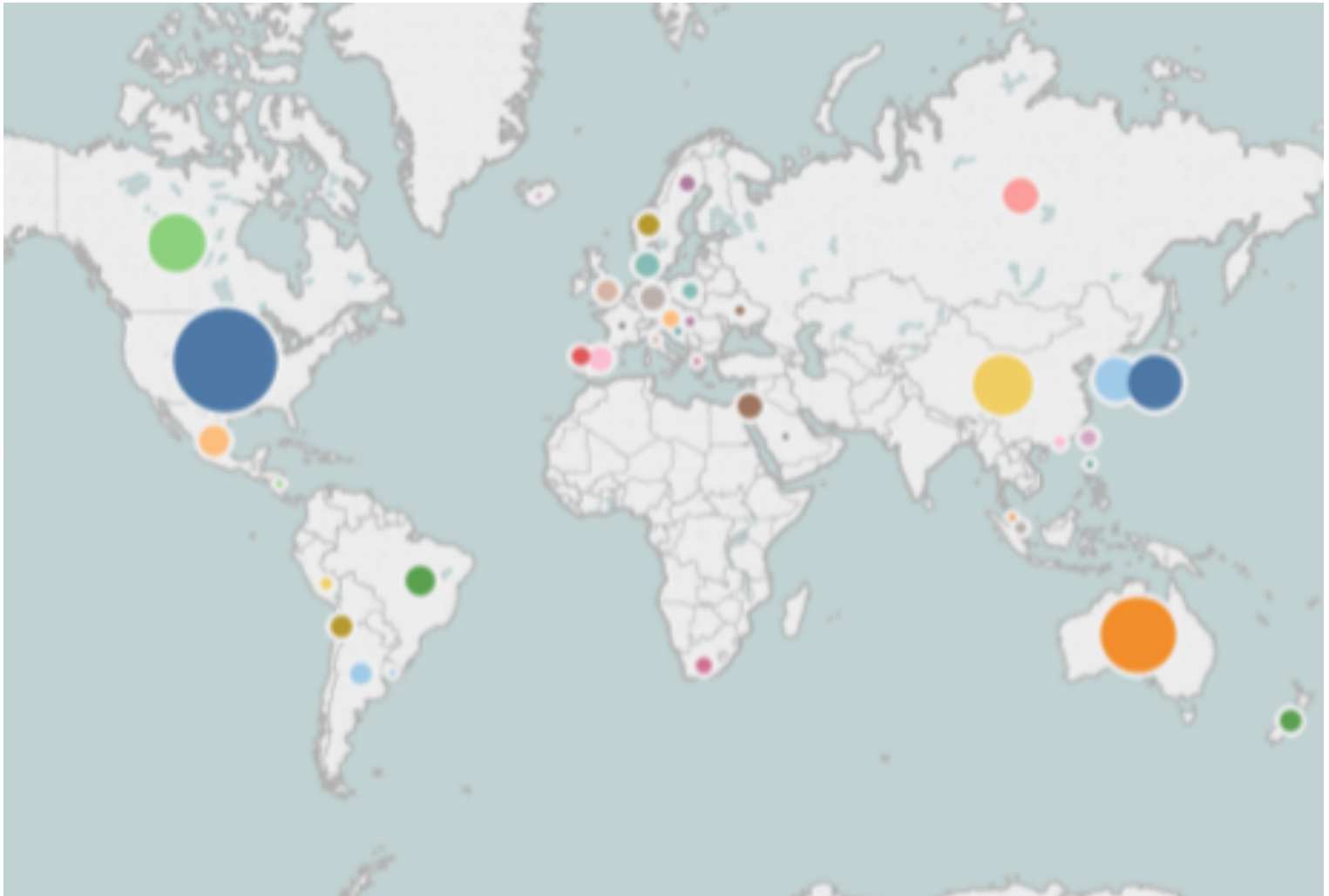
Krill Technology Areas



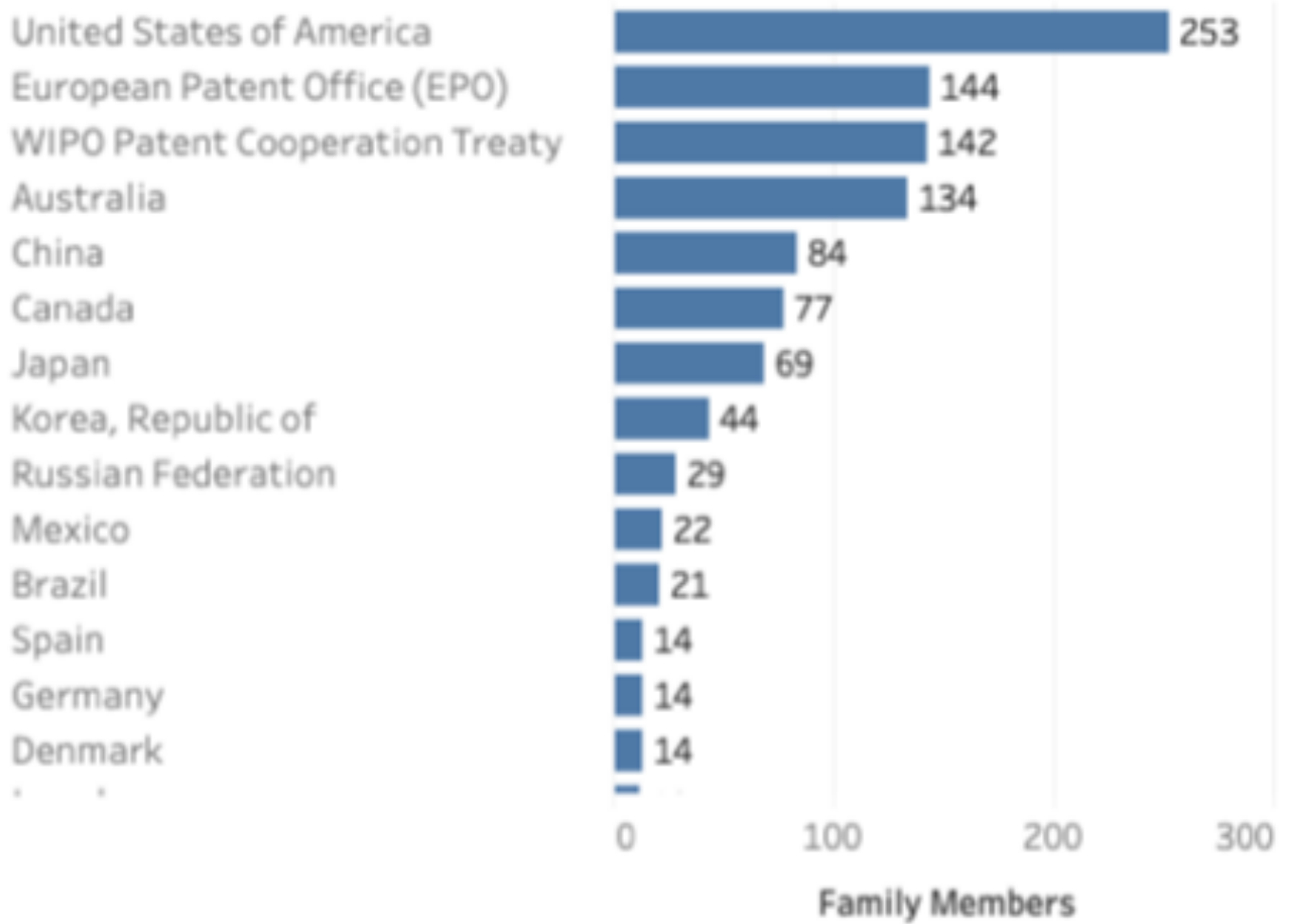
Following filings, it reflects the importance of the claimed inventions to the applicants in specific markets. This data also demonstrates that a relatively small number of filings can have a wider global impact as applicants seek to protect and commercialize their claimed inventions in multiple markets.

Antarctic Krill Patent Family Members

Krill Family Members Map



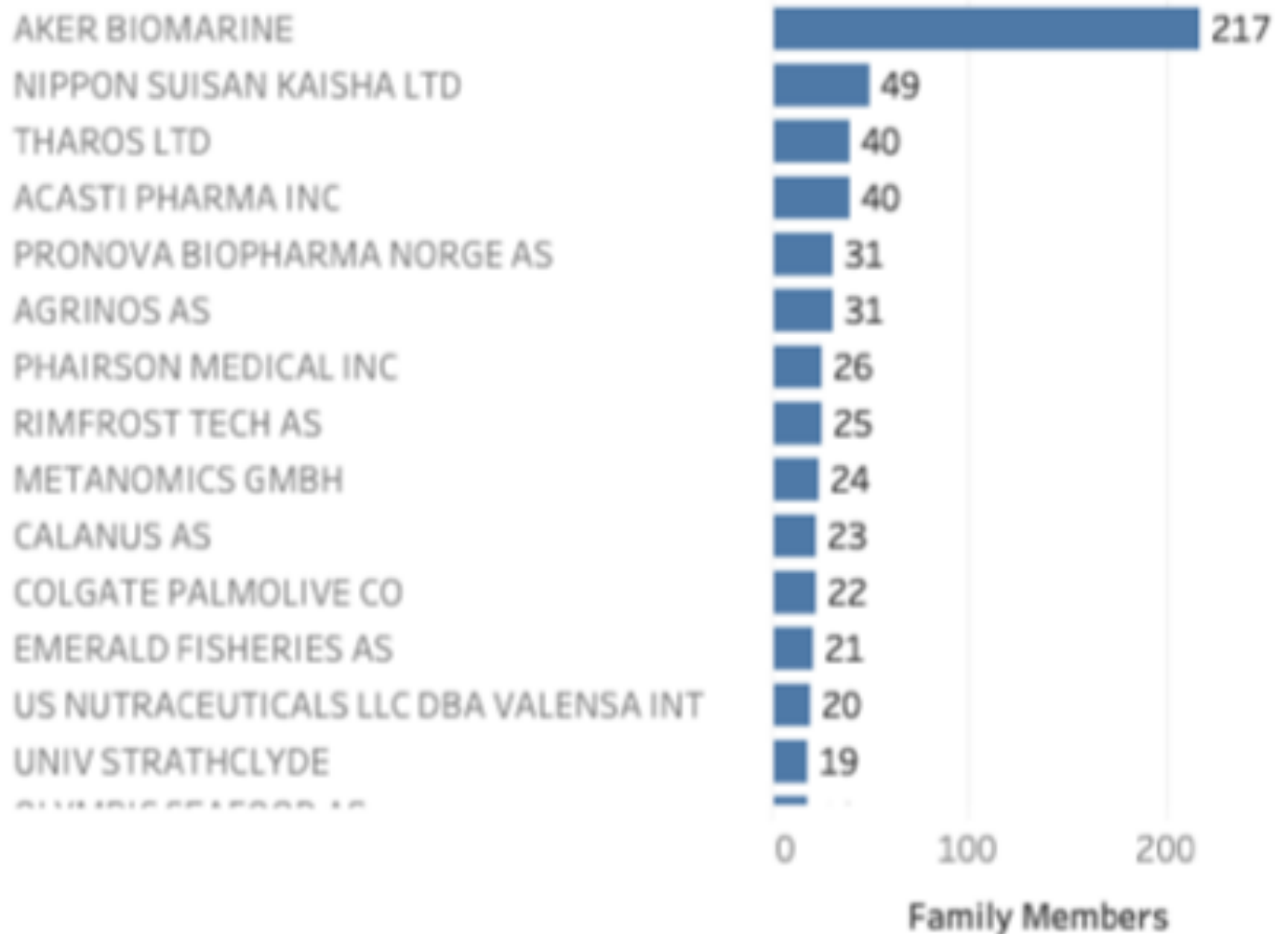
Krill Family Countries



Krill Member Trends



Krill Member Applicants



There is also a steeply rising trend the numbers are not dramatic relative to activity in the wider patent system.

In practice, filings relating to Antarctic krill can be traced back to the 1980s and the scientific literature on krill has played a significant role in promoting commercial research and development.

Thus, a 1986 article on “*Supercritical carbon dioxide extraction of oils from antarctic krill*” by researchers from Japan has been cited in the patent literature over 55 times⁵.

Claimed inventions and R&D pipeline include:

1. Lipid Composition of Oil Extracted from Wasted Norway Lobster Heads and Comparison with Oil Extracted from Antarctic Krill⁶
2. Production of fish oils⁷
3. Krill oils and marine oils⁸
4. The extraction of polar lipids and phospholipids from krill⁹
5. New krill oil composition useful as an anti-inflammatory, as an antioxidant and for improving insulin resistances and blood lipid profiles¹⁰
6. Krill extract aimed at treating thrombosis¹¹
7. Krill oil to treat risk factors for cardiovascular, metabolic and inflammatory disorders¹²
8. Therapeutic phospholipid compositions to treat or prevent a wide range of diseases; e.g. cardiovascular and neurodegenerative¹³

⁵ Yamaguchi K, Murakami M, Nakano H, Konosu S, Kokura T, Yamamoto H, et al. Supercritical carbon dioxide extraction of oils from antarctic krill. *Journal of Agricultural and Food Chemistry*. 1986;34: 904–907. doi:10.1021/jf00071a034

⁶ <https://www.mdpi.com/1660-3397/14/12/219/htm>

⁷ . P. Bimbo, Production of Fish Oil, in Ref. 26, pp. 181–225.

⁸ Marine Oils - Bailey's Chapter - 2-20 7th edition.pdf

⁹ Finn M, Nils H, Håvard T. Phospholipid compositions and their preparation [Internet]. US 9867856 B2, 2018. Available: <https://lens.org/011-348-907-388-821>

¹⁰ Inge B, Mikko G, Snorre T, Sebastiano B, Jeffrey C, Daniele M. Bioeffective krill oil compositions [Internet]. WO 2008/117062 A1, 2008. Available: <https://lens.org/121-122-631-692-465>

¹¹ Mose LP, John FS. Thrombosis preventing krill extract [Internet]. WO 2007/080515 A1, 2007. Available: <https://lens.org/093-453-817-763-64X>

¹² Inge B, Snorre T, Jeffery C, Mikko G, Daniele M, Nils H, et al. Methods of using krill oil to treat risk factors for cardiovascular, metabolic, and inflammatory disorders [Internet]. US 8697138 B2, 2014. Available: <https://lens.org/148-076-064-464-591>

¹³ Fotini S, Henri H. Concentrated therapeutic phospholipid compositions [Internet]. US 8586567 B2, 2013. Available: <https://lens.org/015-218-496-395-882>

9. Krill meal as a significant focus of commercial research and development such as krill meal products¹⁴
10. Industrial Oil and Fat Products¹⁵
11. Methods for making krill meal¹⁶
12. Krill meal as a supplement^{17 18}
13. Applications seeking to tackle oxidized LDL cholesterol¹⁹
14. Krill products to provide new nutritional supplements²⁰
15. Krill products to provide new type of lipids²¹

¹⁴ Snorre T, Nils H. Phospholipid and protein tablets [Internet]. US 8372812 B2, 2013. Available: <https://lens.org/146-794-117-594-239>

¹⁵

file:///Users/dimitri/Downloads/Article_BAILEY%E2%80%99S%20INDUSTRIAL%20OIL%20AND%20FAT%20PRODUCTS%202005.pdf

¹⁶ Snorre T, Øistein H. Method for making krill meal [Internet]. US 2015/0050403 A1, 2015. Available: <https://lens.org/196-498-262-945-493>

¹⁷ Inge B, Mikko G, Rune RS. Compositions and methods for nutritional supplementation [Internet]. US 2012/0231087 A1, 2012. Available: <https://lens.org/048-513-968-558-360>

¹⁸ M KW, Leo N, Alex O. Feed additive [Internet]. EP 3456205 A1, 2019. Available: <https://lens.org/064-509-646-853-285>

¹⁹ A MJ, Stephen HW, E MR. Therapeutic astaxanthin and phospholipid composition and associated method [Internet]. US 9763897 B2, 2017. Available: <https://lens.org/154-620-924-659-65X>

²⁰ Oskar RW. A primarily anhydrous composition, in particular for use as nutritional supplements [Internet]. EP 3473240 A1, 2019. Available: <https://lens.org/107-222-989-181-812>

²¹ Junichi O, Tomomi Y, Koretaro T, Takeya Y. Lipid composition and method for producing same [Internet]. US 10246663 B2, 2019. Available: <https://lens.org/181-471-030-132-253>