2022.11.29
2022年11月29日

Brett Glencross
葛柏峦
Technical Director
技术总监

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THE MARINE INGREDIENTS ORGANISATION

IFFO's Role in the Industry: *Technical Developments*
IFFO在行业中的作用：*技术研究*

Overview 概述

- **Global Marine Ingredients: Where are we now?**
  全球海洋原料：我们的现状如何?
- **Ensuring Quality of Marine Ingredients**
  确保海洋原料的质量
- **Sustainability Underpins Marine Ingredients**
  可持续性保障着海洋原料
- **Emerging Priorities with Marine Ingredients**
  海洋原料的新兴重点工作

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Global Marine Ingredients: Where are we now?
全球海洋原料：我们的现状如何?

Still The Benchmark Ingredients
仍然是基础性原料

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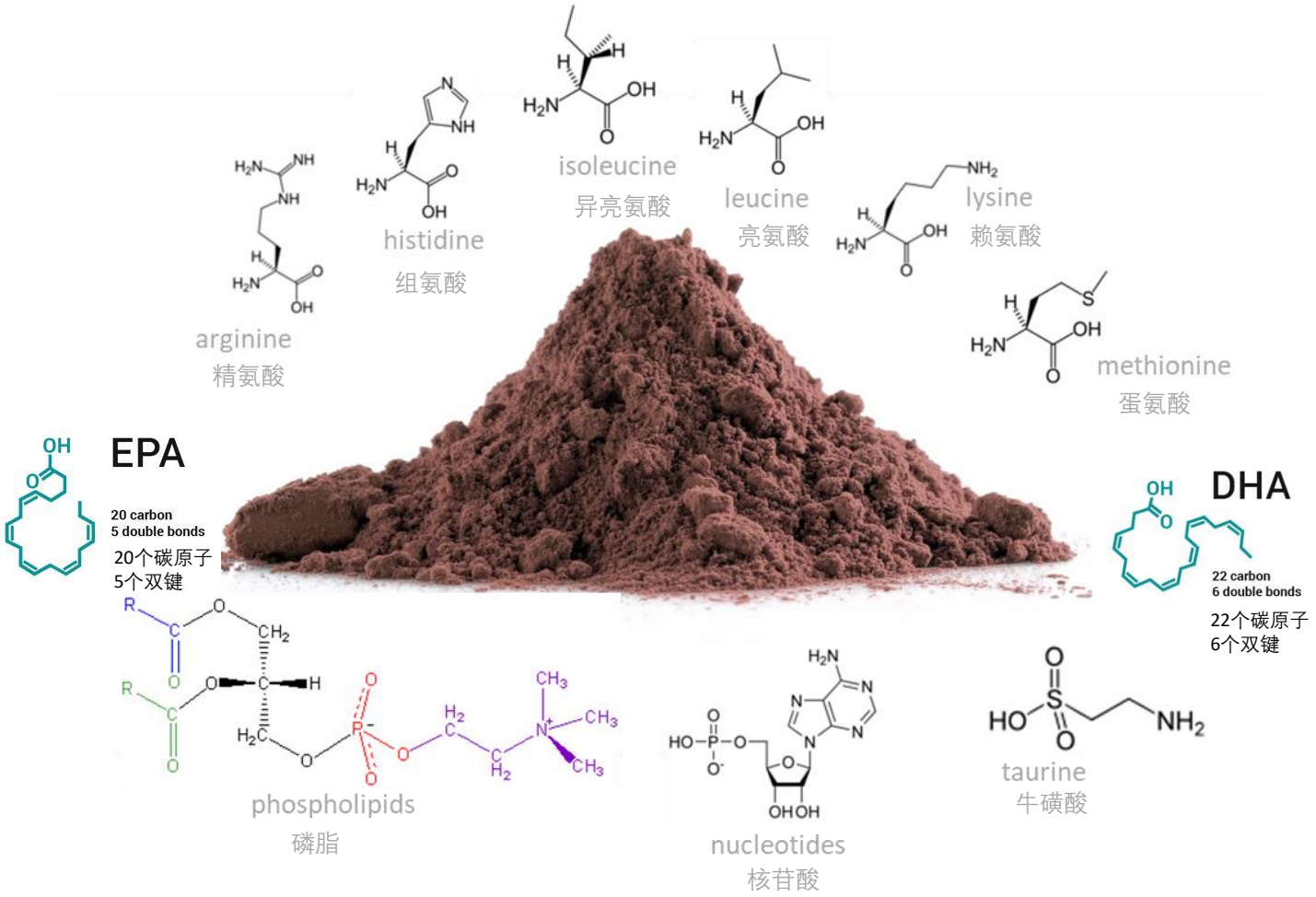
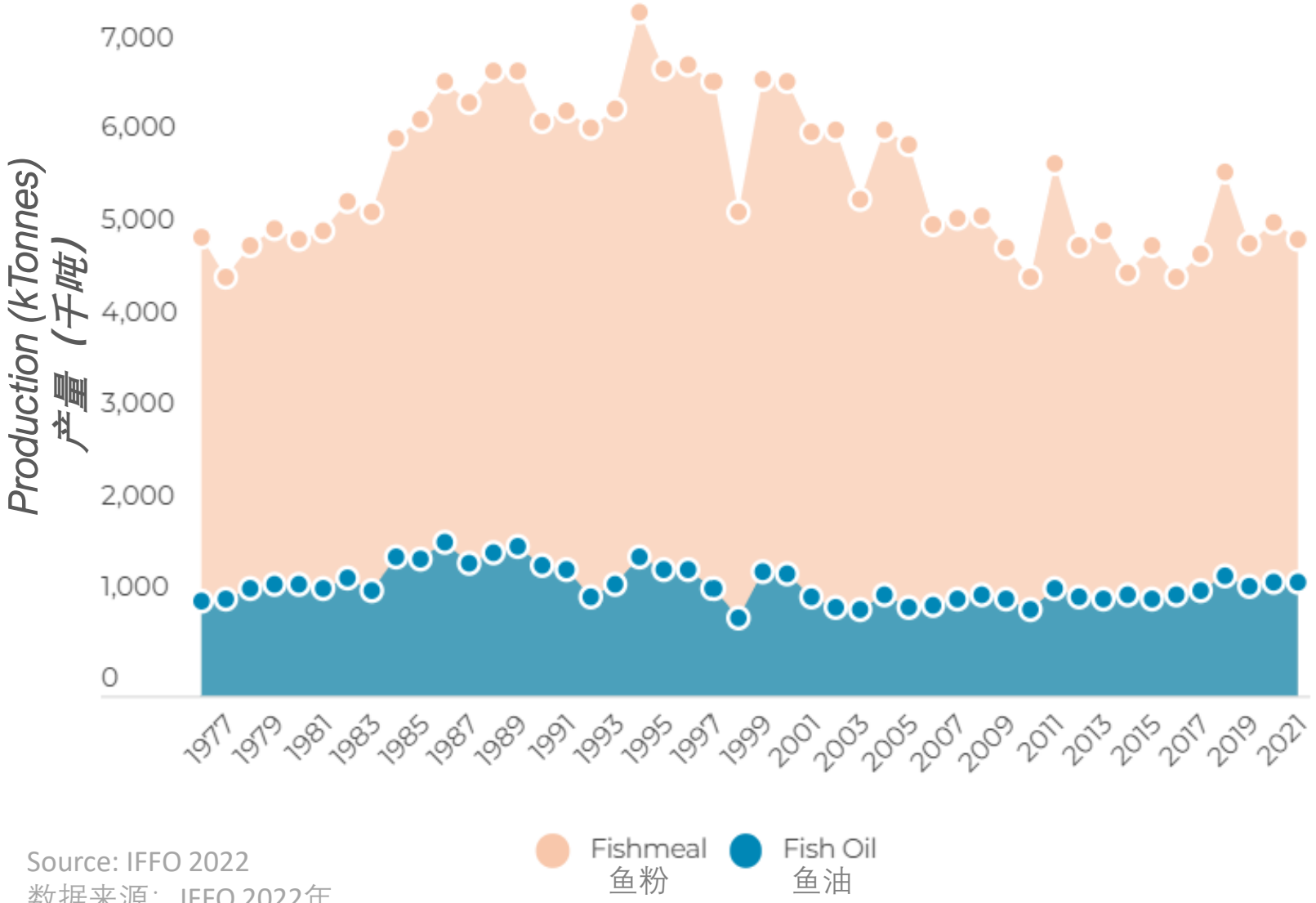
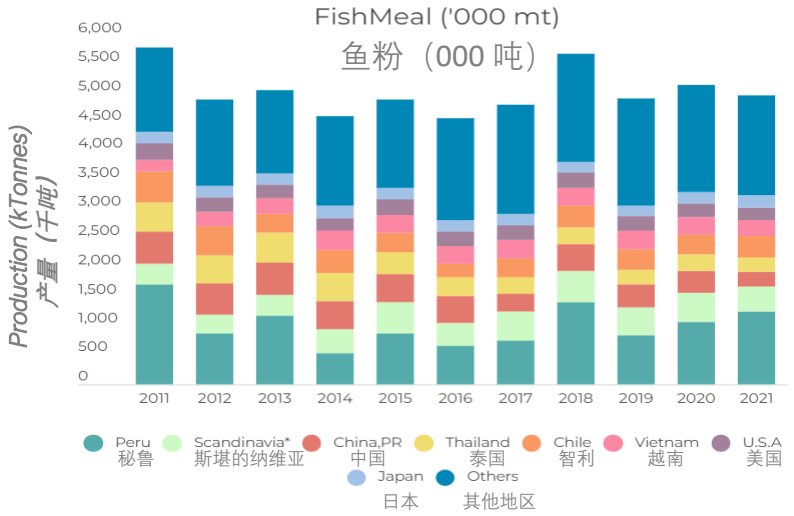
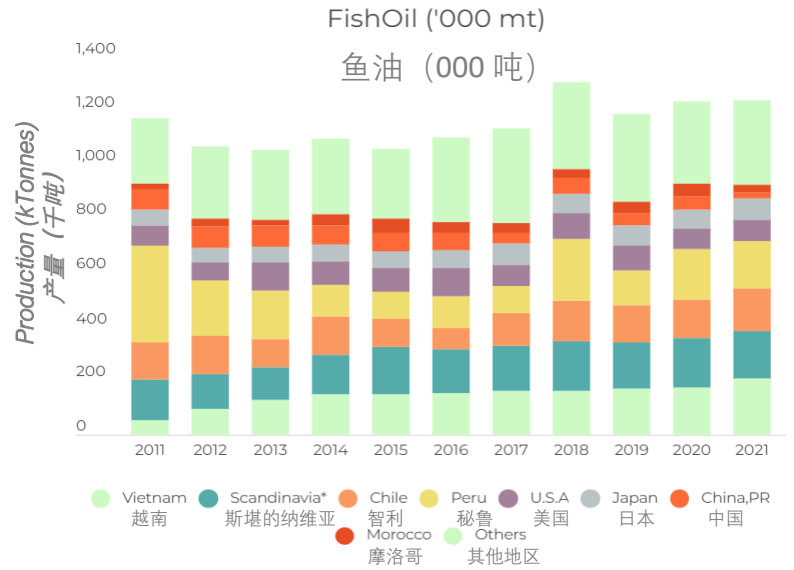


Global Supply
全球供应情况

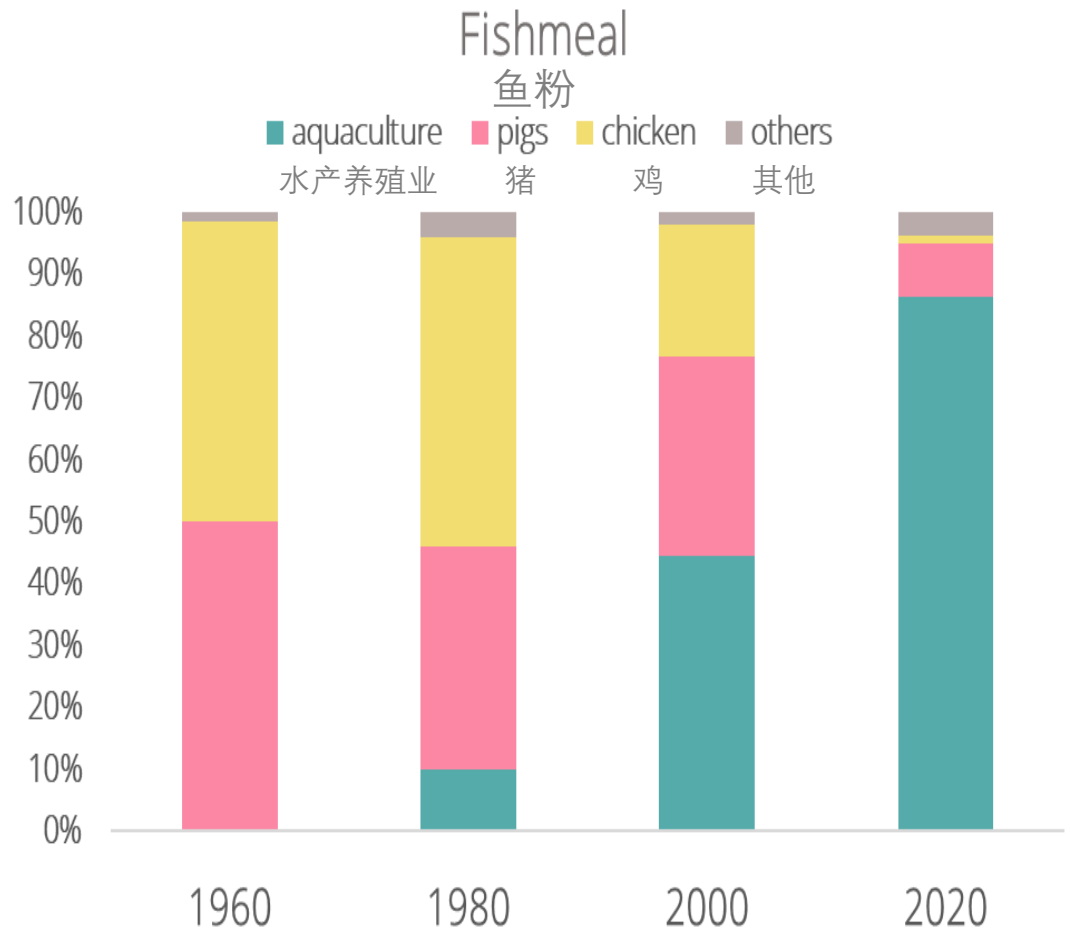


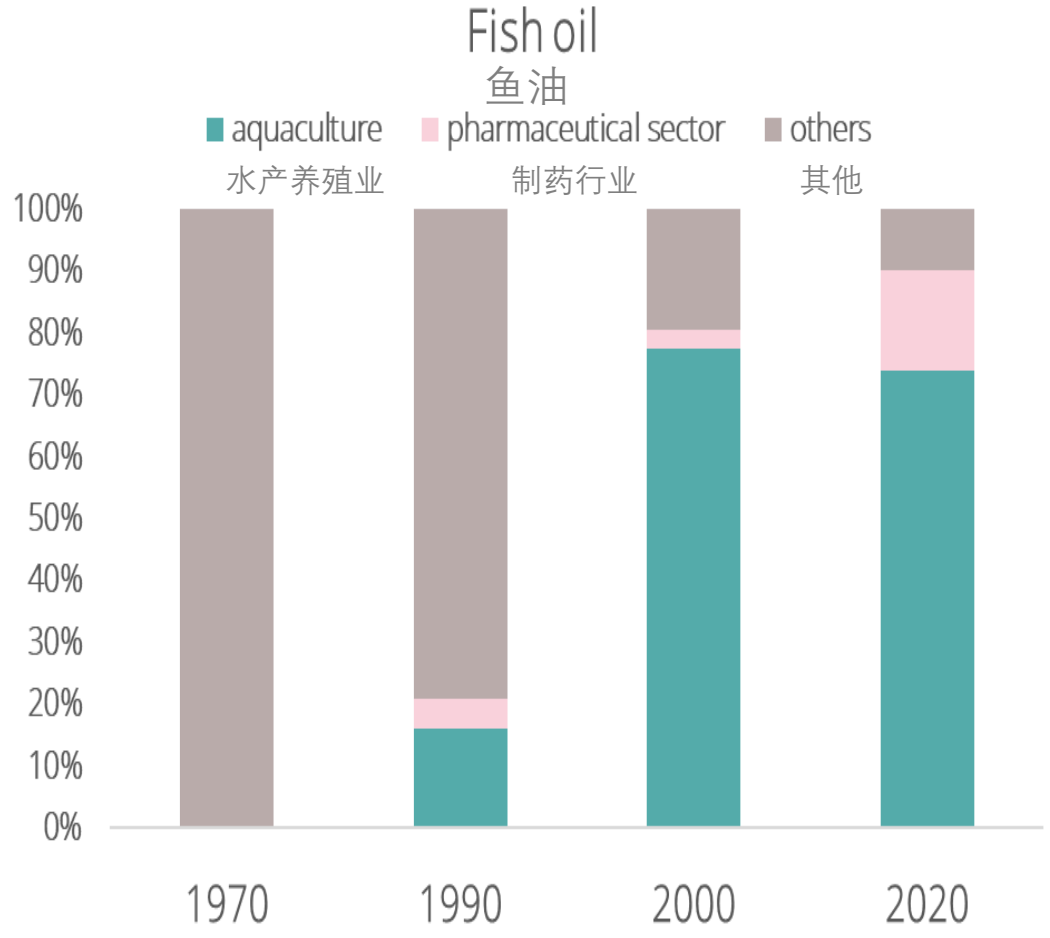




Source: IFFO 2022
数据来源：IFFO 2022年

Historical Application of Fishmeal and Fish Oil
鱼粉和鱼油的历史应用





Source: IFFO 2022
数据来源：IFFO 2022年

A Strategic Ingredient, No Longer Bulk Nutrient Supply
一种战略性原料，不再是营养素的主要供应来源

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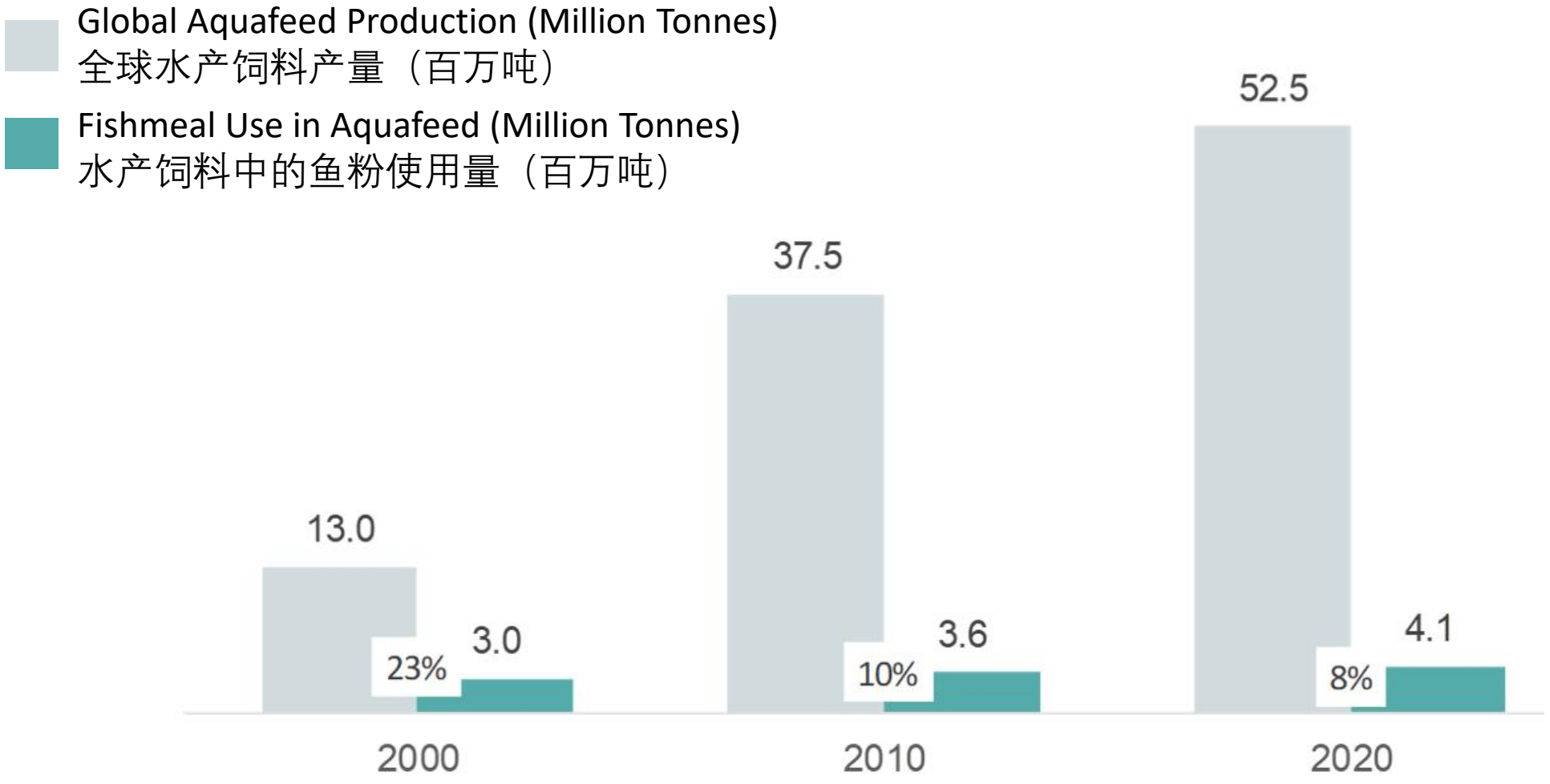

Historical Fishmeal and Fish Oil Prices
鱼粉和鱼油的历史价格

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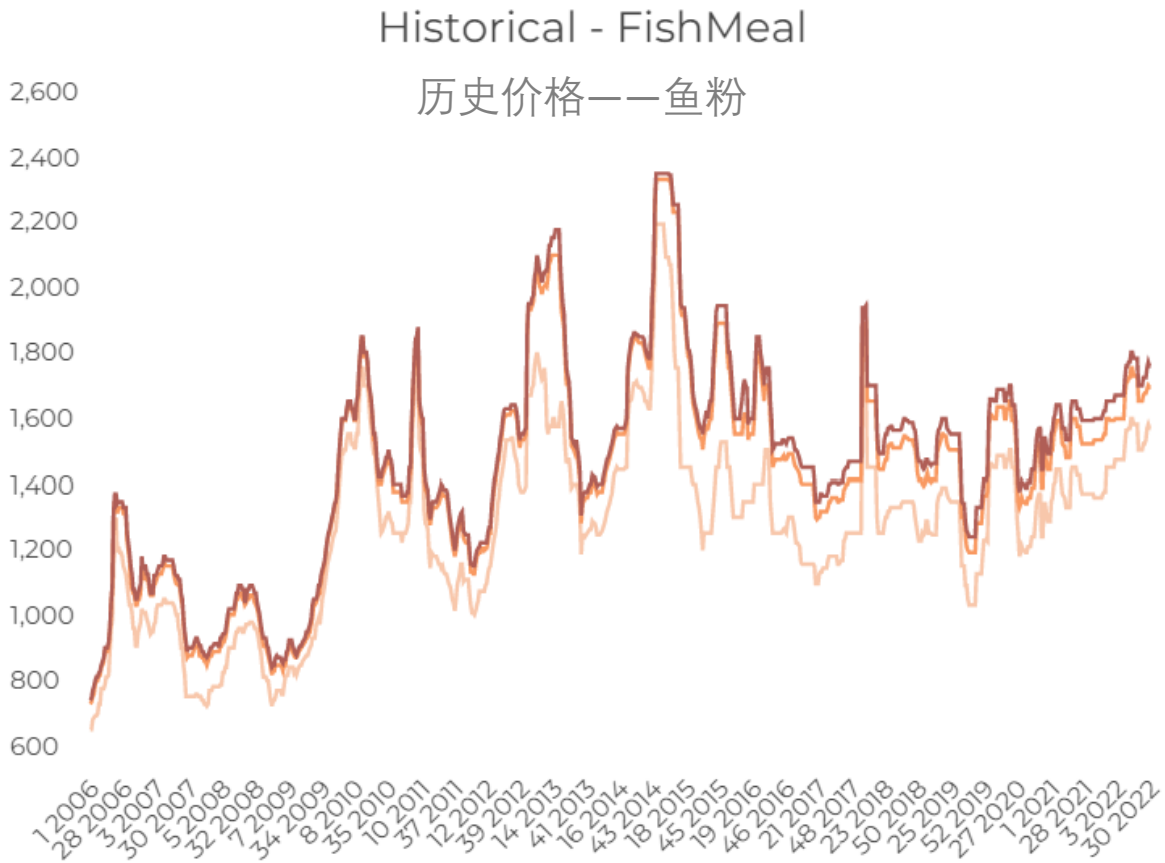

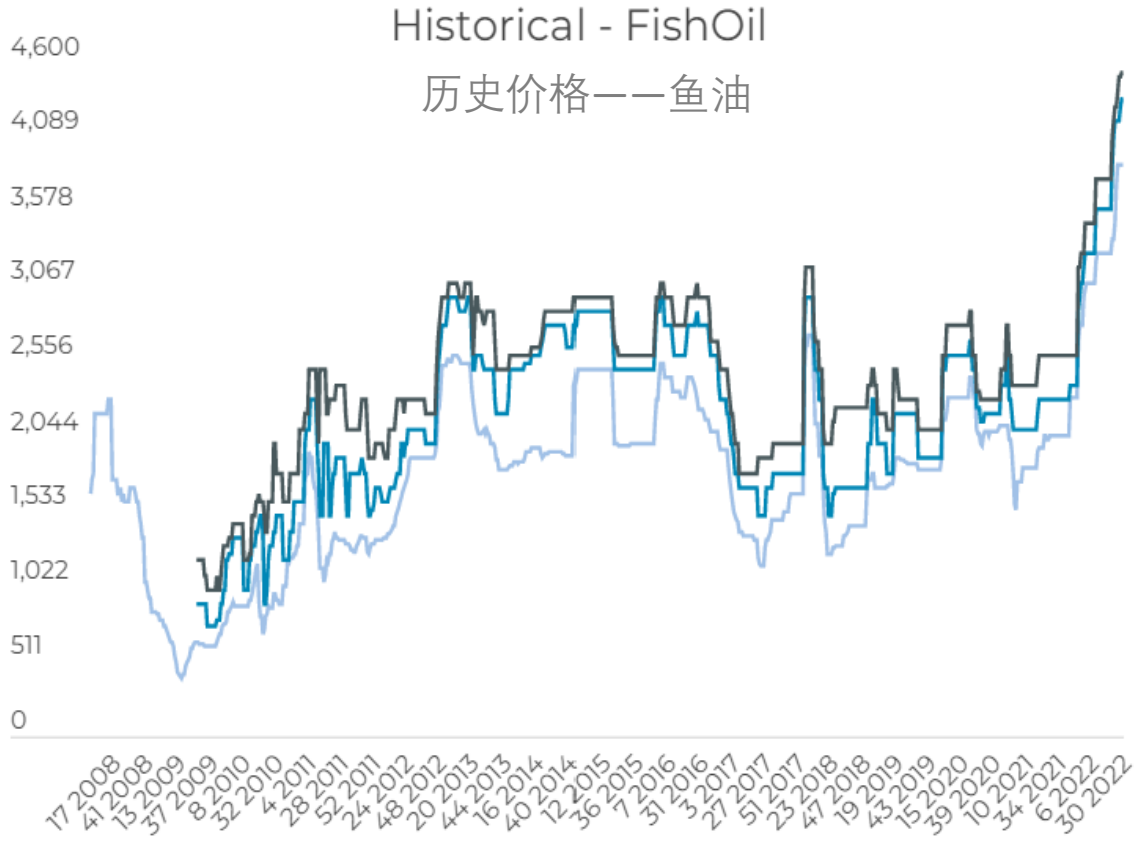

FOB PERUVIAN PRICES*
(US$/metric tonne)
秘鲁离岸价格
（美元/吨）

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Ensuring Quality of Marine Ingredients
确保海洋原料的质量

Quality Criteria of Fishmeals
鱼粉的质量标准

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	产品	蛋白质	脂肪	水分	组胺	挥发性盐基氮	数据来源
	Product	Protein	Fat	Moisture	Histamine	TVN	Data Source
单位	Units	%	%	%	mg/kg	mg/100g	
超高级	SuperPrime	>68	<10	5< X <10	<500	<100	*TASA, Peru*
高级	Prime	>67	<10	5< X <10	<1000	<120	*TASA, Peru*
台湾级	Taiwan	66< X <67	<10	5< X <10	n.r.	<120	*TASA, Peru*
泰国级	Thailand	>67	<10	5< X <10	n.r.	<150	*TASA, Peru*
标准级67	Standard67	>67	n.r.	5< X <10	n.r.	n.r.	*TASA, Peru*
标准级66	Standard66	>66	n.r.	5< X <10	n.r.	n.r.	*TASA, Peru*
标准级65	Standard65	>65	n.r.	5< X <10	n.r.	n.r.	*TASA, Peru*
标准级<65	Standard <65	<65	n.r.	5< X <10	n.r.	n.r.	*TASA, Peru*
	Norse-LT	>68	<13	6< X <10	<500	<180	*Norsildmel, Norway*
	NorSeaMink	~71	<13	5< X <10	<700	<200	*Norsildmel, Norway*
	Scand. Std	~70	<13	5< X <10	n.r.	<250	*Norsildmel, Norway*

TASA

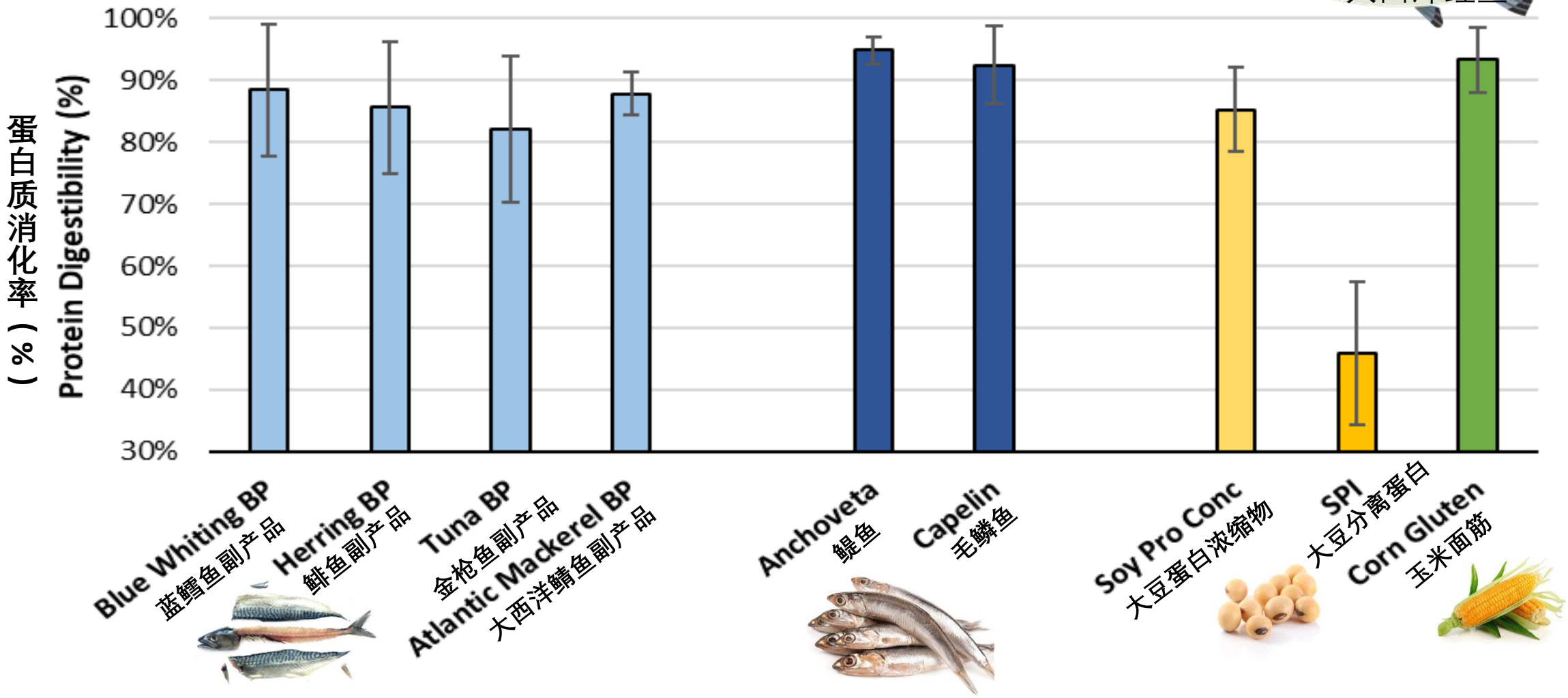
NORSILDMEL

n.r. = no restrictions.
n.r. = 无限制

Protein Digestibility
蛋白质消化率

Data: Glencross & Bachis, 2021. AQUAFEED 13, 21-25.
数据来源：Glencross和Bachis，2021年。《水产饲料》卷13，21-25页

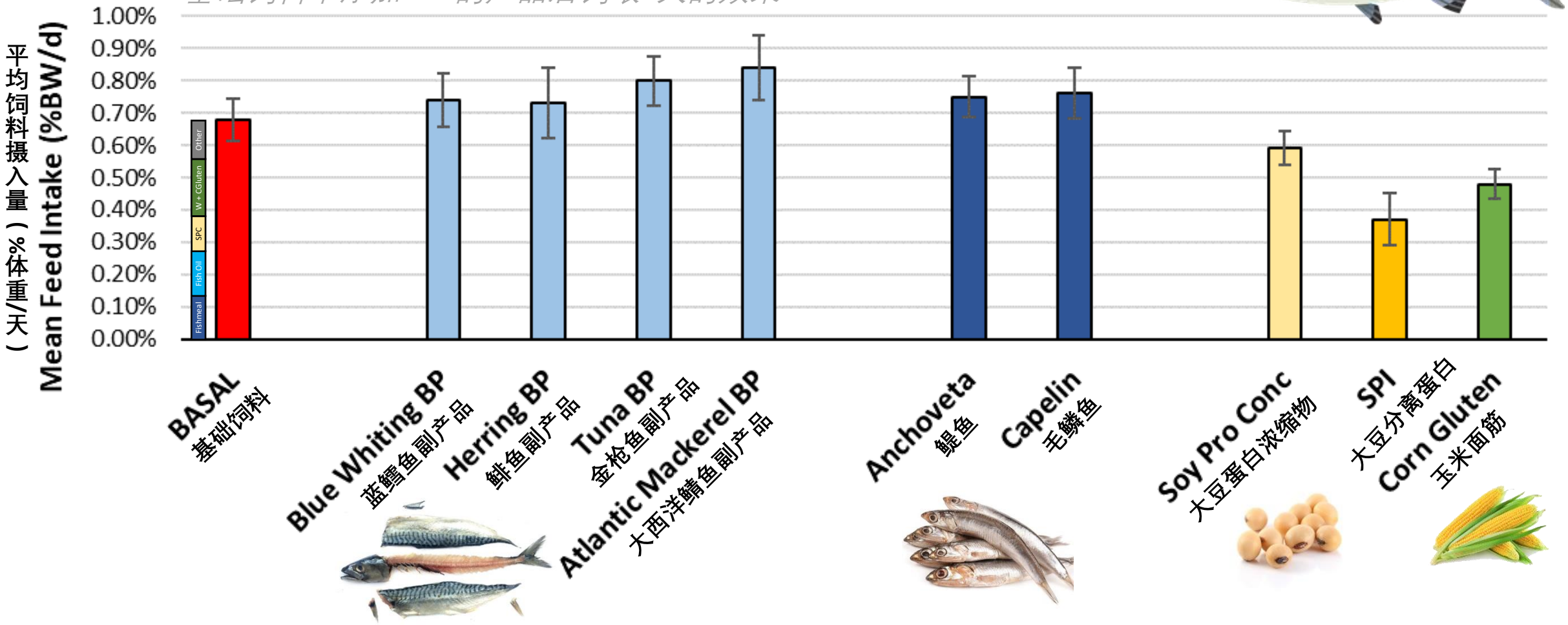
Ingredient Apparent Digestibility/原料表观消化率



Ingredient Palatability…
原料适口性…

Data: Glencross & Bachis, 2021. AQUAFEED 13, 21-25.
数据来源：Glencross和Bachis，2021年。《水产饲料》卷13，21-25页

Effect of 30% addition of Product to Basal Diet over 7-days
基础饲料中添加30%的产品后饲喂7天的效果



Ensuring Quality of Marine Ingredients
确保海洋原料的质量

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- ***Traceability**: Fishmeal and fish oil should be traceable from user (feed compounder) back to the producer (including transportation and storage).*

  ***可追溯性：**鱼粉和鱼油应该具备从用户（饲料配料商）至生产商（包括运输和储存环节）的可追溯性。*

- ***Purity**: Fishmeal and fish oil must be produced in factories that handle only fish or other sea animals such as crustaceans or molluscs. No other type of animals, such as mammals or birds may be processed. Sensitive tests are available to ensure no contamination occurs throughout the handling chain.*

  ***纯净性**：鱼粉和鱼油必须在只加工鱼类或其他海洋动物（如甲壳类或软体动物）的工厂生产。不得加工其他类型的动物，如哺乳动物或鸟类。应进行敏感性试验，以确保整个加工链无污染。*

- ***Safety**: Fishmeal and fish oil must be safe and should meet all legislative requirements for contaminants, purity, free from pathogenic organisms and mycotoxins, without natural toxins.*

  ***安全性**：鱼粉和鱼油必须是安全的，并且应符合所有关于污染物、纯净性、无致病生物和真菌毒素、无天然毒素的法律要求。*

Feed Safety Management of Marine Ingredients
海洋原料的饲料安全管理

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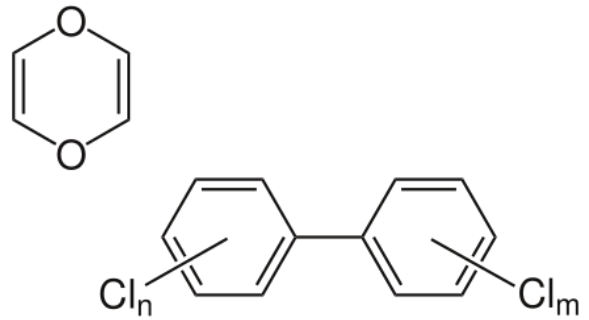
- ***Marine ingredients are subject to a range of regulatory processes providing oversight on feed safety:***
  海洋原料须遵循一系列监管程序，从而保障饲料安全：
  - *CODEX ALIMENTARIUS COMMISSION (Codex)*
    国际食品法典委员会
  - *European Food Safety Authority (EFSA)*
    欧洲食品安全局

CODEX ALIMENTARIUS
WORLD TRADE ORGANIZATION

efsa
European Food Safety Authority

- ***Maximum Levels (MLs) are set by regulators for various contaminants:***
  监管机构设定了各种污染物的最高限量（MLs）：
  - *Dioxins*
    二恶英
  - *Poly Chlorinated Biphenyl's (PCBs)*
    多氯联苯
  - *Heavy metals (As, Cd, Hg, Pb)*
    重金属（砷、镉、汞、铅）
  - *Various others…*
    各种其他污染物…



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Sustainability Underpins Marine Ingredients
可持续性保障着海洋原料

Sustainability Among the Worlds Fisheries
世界渔业的可持续性

- Majority of marine fisheries are operating within accepted sustainability limits.

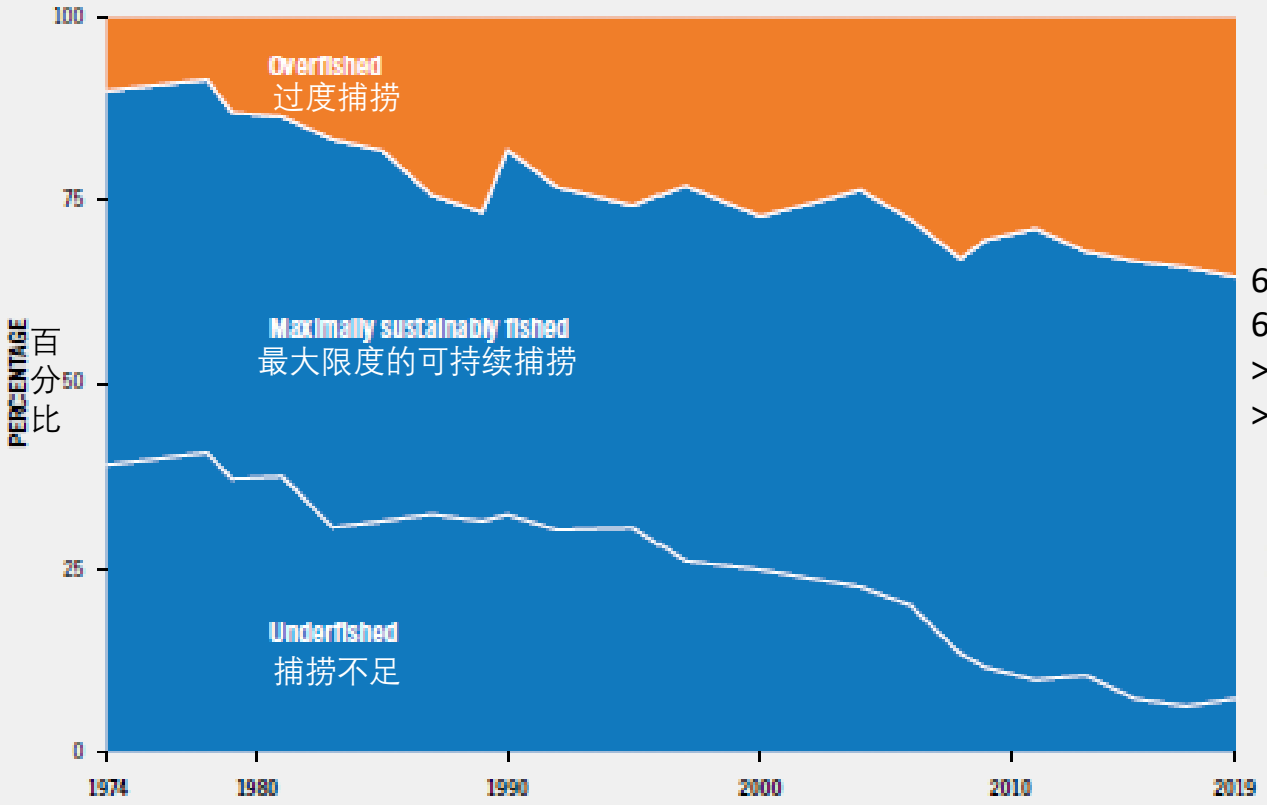
  大多数海洋渔业都在公认的可持续性限度内作业。

- Most overfished sectors are high-value food fish (high-risk : high-return).

  大多数过度捕捞的行业都是高价值的食用鱼行业（高风险：高回报）。

FIGURE 23 GLOBAL TRENDS IN THE STATE OF THE WORLD'S MARINE FISHERY STOCKS, 1974–2019

图23　1974年-2019年世界海洋渔业种群状况的全球趋势



Source: FAO SOFIA Report 2022

资料来源：联合国粮农组织《2022年世界渔业和水产养殖业现状》报告

Globally, Well Managed Fisheries are Rebuilding
管理良好的渔业正在全球范围内恢复重建中

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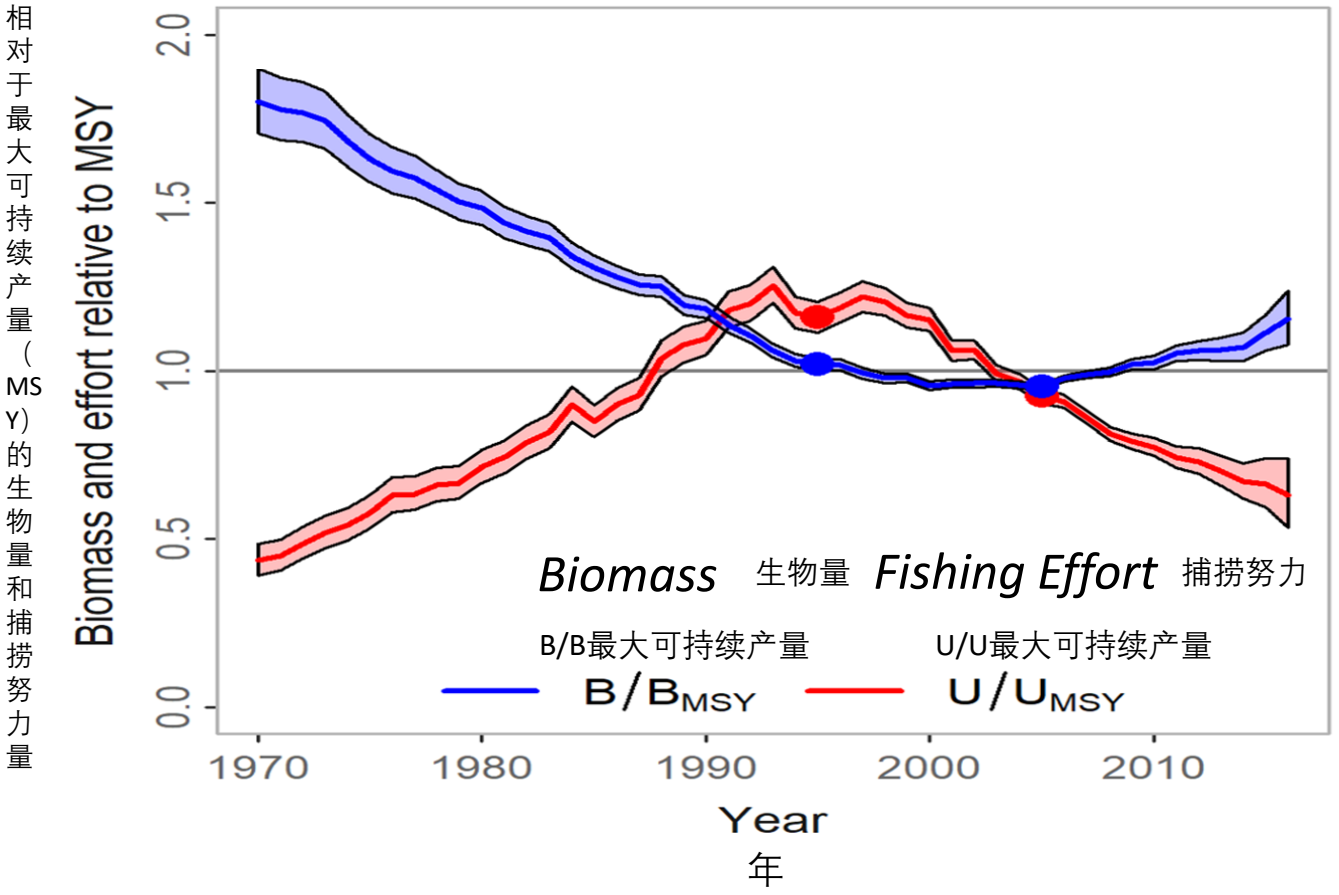
Trend in abundance and harvest rate
丰度和捕获率的趋势



Effective fisheries management instrumental in improving fish stock status
有效的渔业管理有助于改善鱼类资源状况

Ray Hilborn[a,1], Ricardo Oscar Amoroso[a], Christopher M. Anderson[a], Julia K. Baum[b], Trevor A. Branch[a], Christopher Costello[c], Carryn L. de Moor[d], Abdelmalek Faraj[e], Daniel Hively[a], Olaf P. Jensen[f], Hiroyuki Kurota[g], L. Richard Little[h], Pamela Mace[i], Tim McClanahan[j], Michael C. Melnychuk[a], Cóilín Minto[k], Giacomo Chato Osio[l,m], Ana M. Parma[n], Maite Pons[a], Susana Segurado[o], Cody S. Szuwalski[c], Jono R. Wilson[c,p], and Yimin Ye[q]

2218–2224 | PNAS | January 28, 2020 | vol. 117 | no. 4
2020年1月28日
www.pnas.org/cgi/doi/10.1073/pnas.1909726116

Small Pelagic Fisheries Are Considered Well Managed
小型中上层渔业被认为管理良好

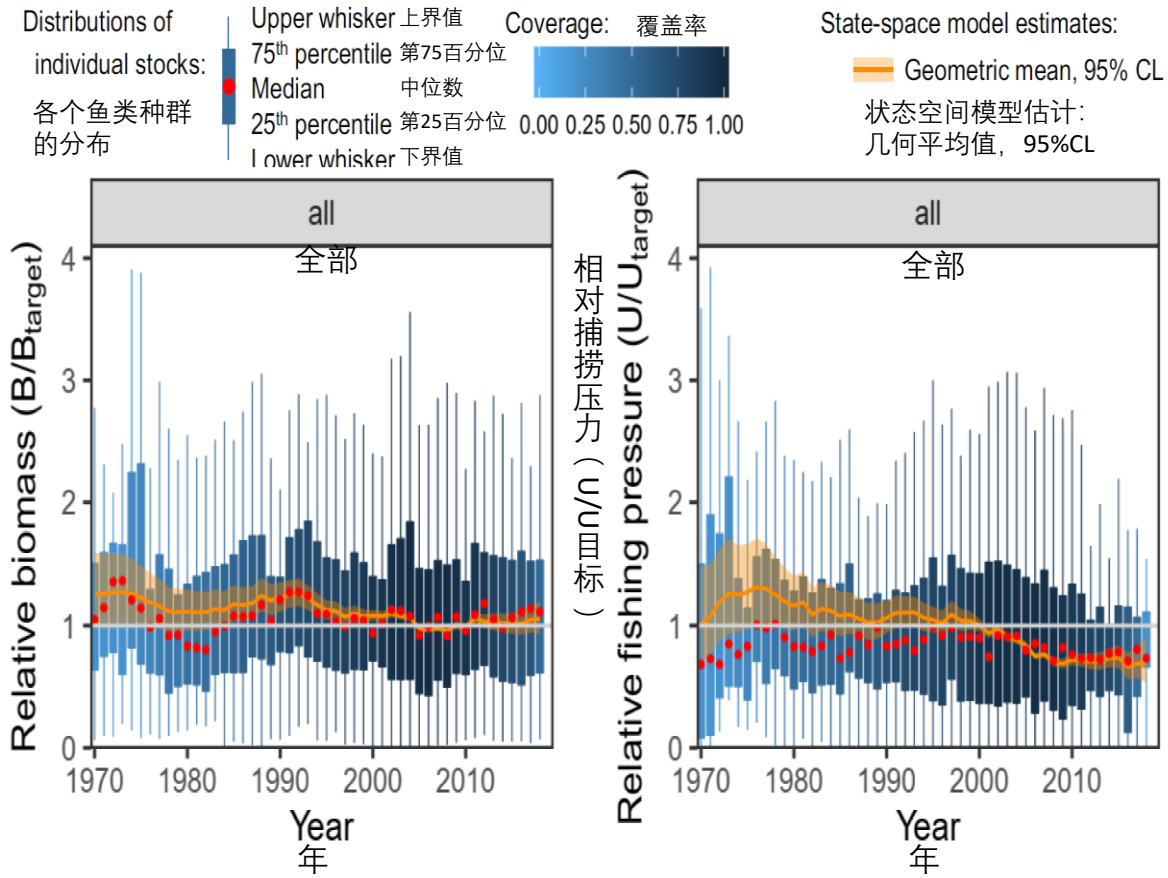


FIGURE 4 Trends in small pelagic fish global estimates from RAMLDB of: (a) relative abundance, B/B_{targ}; and (b) fishing pressure, U/U_{targ}, relative to MSY-based or other target reference points from 1970–2018. Geometric mean trend is re-scaled to the median in years of >90% coverage. Shaded bands around mean denote 95% finite population-corrected confidence bounds (applicable to all years with <100% coverage). Red dots show the median of all stocks assessed in that year. Boxplots show distributions of individual stocks in each year, with shading reflecting the fraction of stocks with assessments covering that year. Stocks are equally weighted

图4 根据RAMLDB对小型中上层鱼类全球趋势的估计，相对于1970年-2018年最大可持续产量或其他目标参考值的（a）相对丰度，B/B目标；和（b）捕捞压力，U/U目标。几何平均趋势在覆盖率>90%的年份重新调整至中位数。平均值周围的阴影带表示95%的有限生物种群校正置信区间（适用于覆盖率<100%的所有年份）。红点表示该年份评估的所有种群的中位数。箱形图显示了每年的各个种群分布，阴影反映了当年评估的各个种群的比例。各个种群的权重相等。

Received: 13 September 2021 | Revised: 31 May 2022 | Accepted: 1 June 2022
DOI: 10.1111/faf.12690

ORIGINAL ARTICLE

FISH and FISHERIES WILEY

Recent trends in abundance and fishing pressure of agency-assessed small pelagic fish stocks

机构评估的小型中上层鱼类种群的丰度和捕捞压力的最新趋势

Ray Hilborn[1] | Claudio C. Buratti[2] | Erich Díaz Acuña[3] | Daniel Hively[1] | Jeppe Kolding[4] | Hiroyuki Kurota[5] | Nicole Baker[1] | Pamela M. Mace[6] | Carryn L. de Moor[7] | Soyoka Muko[5] | Giacomo Chato Osio[8,9] | Ana M. Parma[10] | Juan-Carlos Quiroz[11] | Michael C. Melnychuk[1]

- Global small pelagic fisheries (anchoveta, sardine, herring, etc) are sustaining their biomasses at expected levels.
  全球小型中上层渔业（鳀鱼、沙丁鱼、鲱鱼等）的生物量维持在预期水平。

- A reduction in fishing pressure has been central to that success.
  减少捕捞压力是这项工作成功的关键。

- Small pelagics are among the MOST sustainable of all fisheries.
  小型中上层渔业是所有渔业中最可持续的。

Mostly Well Managed, But Still Room for Improvement
大部分管理良好，但仍有改善空间

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用于鱼粉和鱼油的渔业：**2021**年可持续渔业伙伴组织渔业可持续性概述

*REDUCTION FISHERIES: SFP Fisheries Sustainability Overview **2021***

表3：当前鱼类资源得分（管理质量和种群健康），可持续渔业伙伴组织可持续性类别（A、B1、B2、DD、C），以及该概述中评估的用于鱼粉和鱼油生产的24种主要鱼类种群的最新渔获量（千吨）数据。渔获量指2019年的数据，单位为千吨。

Table 3. Current FishSource scores (Management quality and Stock health), SFP sustainability category (A, B1, B2, DD, C), and latest catch ('000 t) data for the 24 main stocks used for reduction purposes and assessed in this overview (as of June 2021). Catches refer to 2019 and are in thousand tonnes.

Stock / nested jurisdiction (when applicable) [1, 2]	Management quality scores			Stock status scores		Sustainability category	Latest catch	% of total	Changes from last year
	Management strategy	Managers' compliance	Fishers' compliance	Current health	Future health				
Antarctic krill - Atlantic Southern Ocean	≥ 8	10	10	≥ 8	≥ 8	A	390.2	4%	-
Chilean jack mackerel - Southeast Pacific [3]	≥ 6	10	10	10.0	9.8	B1	631.5	6%	-
European sprat - Baltic Sea	≥ 6	10.0	9.1	10	8.4	B1	314.2	3%	-
Norway pout - North Sea	≥ 6	10.0	10	10	≥ 8	B1	97.7	1%	-
Atlantic menhaden - NW Atlantic	≥ 8	≥ 6	10	9.2	9.7	B1	214.0	2%	-
Anchoveta - Chile Valparaíso (V) - Los Lagos (X)	≥ 6	10	10	≥ 8	≥ 8	B1	161.3	2%	-
Anchoveta - Chile Atacama (III) -Coquimbo (IV)	≥ 6	10	10	≥ 8	≥ 8	B1	70.3	1%	-
Anchoveta - Southern Peru/Northern Chile	≥ 6	≥ 6 - ≥ 8	≥ 8	10	10	B1	719.9	7%	B2 to B1
Gulf menhaden - Gulf of Mexico	≥ 6	≥ 8	≥ 6	10	9.5	B1	487.0	5%	-
Sandeels nei - Central Eastern North sea	≥ 6	10.0	10	10	≥ 6	B1	136.9	1%	-
European sprat - North Sea, Skagerrak and Kattegat	≥ 6	≥ 8	10	9	≥ 6	B1	136.8	1%	-
European pilchard - NW Africa central [3]	≥ 6	≥ 6	≥ 6	≥ 8	≥ 8	B1	444.9	4%	-
European pilchard - NW Africa southern (Morocco)	≥ 6	≥ 6	≥ 6	≥ 8	≥ 6	B1	588.7	6%	B2 to B1
Anchoveta - Peruvian Northern-Central	≥ 6	≥ 8	≥ 8	≥ 6	≥ 6	B2	3,140.0	32%	NS to B2
Araucanian herring - Central-South Chile	≥ 6	10	10	≥ 6	≥ 6	B2	340.5	3%	-
Capelin - Icelandic	≥ 6	9.9	9.9	≥ 6	≥ 6	B2	0.0	0%	C to B2
Blue whiting - NE Atlantic	9.4	5.6	10.0	9.8	6.5	C	1,512.0	15%	-
Falkland sprat - Los Lagos Region	< 6	≥ 6	< 6	9.2	8.7	C	11.3	0%	-
European pilchard - NW Africa southern (Mauritania)	≥ 6	≥ 6	< 6	≥ 8	≥ 6	C	381.0	4%	-
Falkland sprat - Aysén Region	< 6	≥ 6	10	7.6	8.7	C	1.3	0%	-
Pacific chub mackerel - Ecuador	≥ 6	≥ 8	< 6	7	8	C	14.0	0%	B2 to C
Sandeels nei - Dogger Bank area	≥ 6	10	10	7.0	< 6	C	86.7	1%	-
Frigate and bullet tunas - Ecuador	≥ 6	≥ 8	< 6	7.8	3.9	C	20.7	0%	B2 to C
Bali sardinella - Southern Java to Western of Timor Sea	< 6	≥ 6	≥ 6	DD	DD	C	34.1	0%	-
Capelin - Barents Sea	≥ 8	10	10	4.7	< 6	C	0.0	0%	-

79% of Volume

94% of Volume

21% of Volume

6% of Volume

Notes: (1) Shading in stock name: Nebula means no change from 2020; light green means rise in sustainability category; light orange means a drop in the sustainability category; dark blue means new fishery added to the 2021 overview. (2) Stocks are ordered according to the SFP sustainability category, from A (the highest) to C (the lowest). The Criteria for the five sustainability categories used in this 2021 reduction fisheries overview are presented in **Table 2** above. [3] Chilean jack mackerel is a transboundary stock, with five different jurisdictions and management performance per each of these jurisdictions. The current scores displayed reflect the management and stock status at the stock level (SPRFMO). For the specific management quality scores for each of the specific nested jurisdictions please consult the respective fishery pages in FishSource.

2022 quotas set for Northeast Atlantic pelagic fisheries, but no agreement on shares

By Jason Holland
October 28, 2021

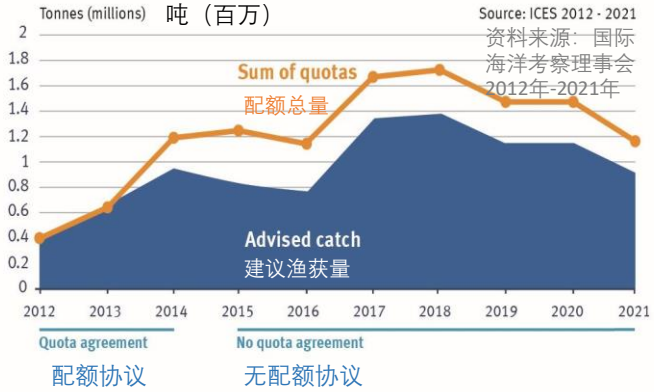
SHARE

2022年针对大西洋东北中上层渔业设定的配额，但未就份额达成协议

Northeast Atlantic coastal states have reached agreements on the total 2022 catches for mackerel, herring, and blue whiting that follow the advice given by the International Council for the Exploration of the Sea (ICES). However, there is still no accord on how these quotas should be divided up between the fishing nations.

In a statement issued on 28 October, 2021, the Norwegian Ministry of of Fisheries and Maritime Affairs confirmed that alongside the European Union, the Faroe Islands, Greenland, Iceland, and the United Kingdom, it had signed an agreement on a total quota of 794,920 metric tons (MT) of mackerel for 2022. This is in line with ICES recommendation and entails a reduction from the quota for 2021, which was 852,284 MT, it said.

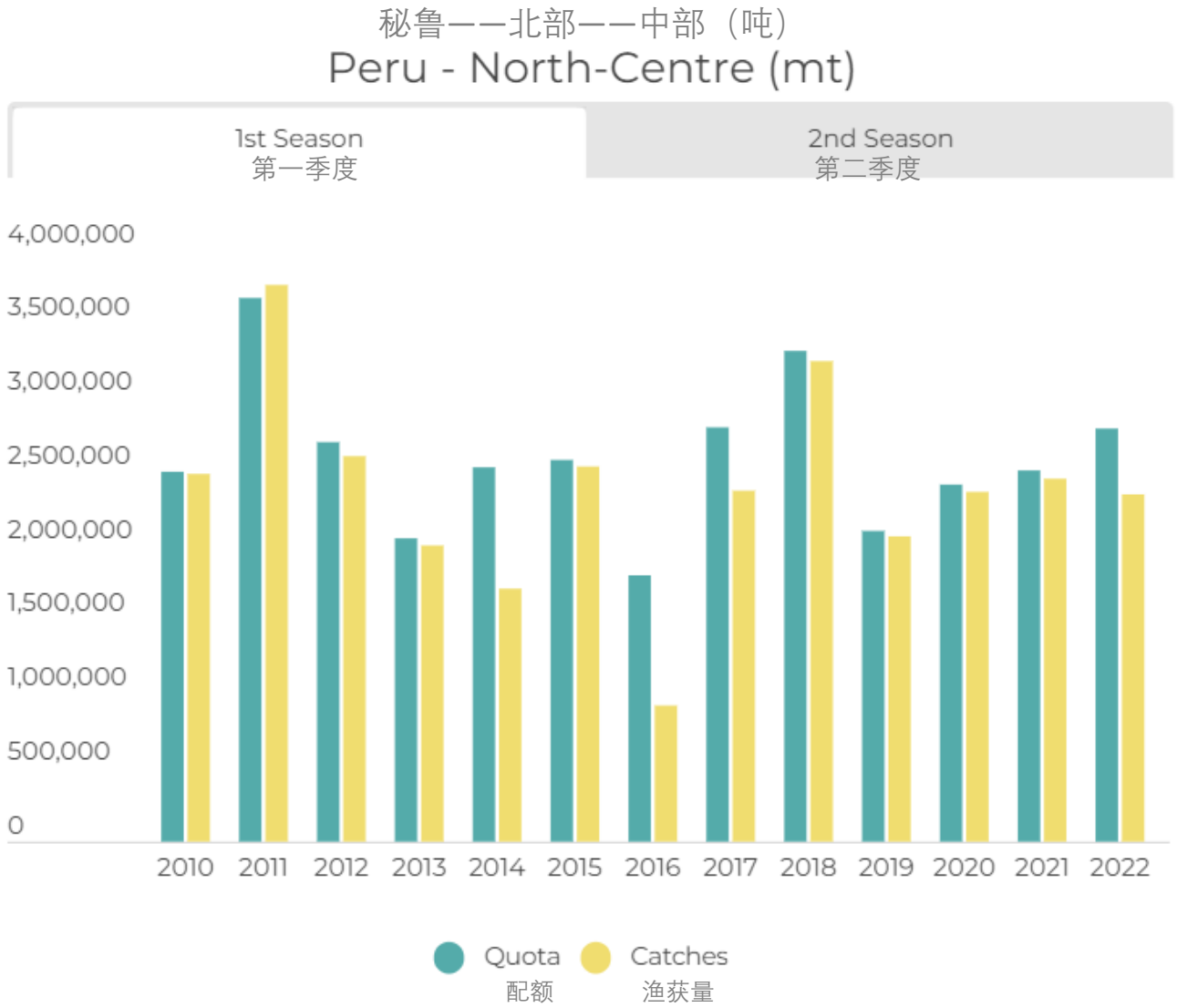
Blue whiting　蓝鳕鱼



Sustainable Fisheries PARTNERSHIP

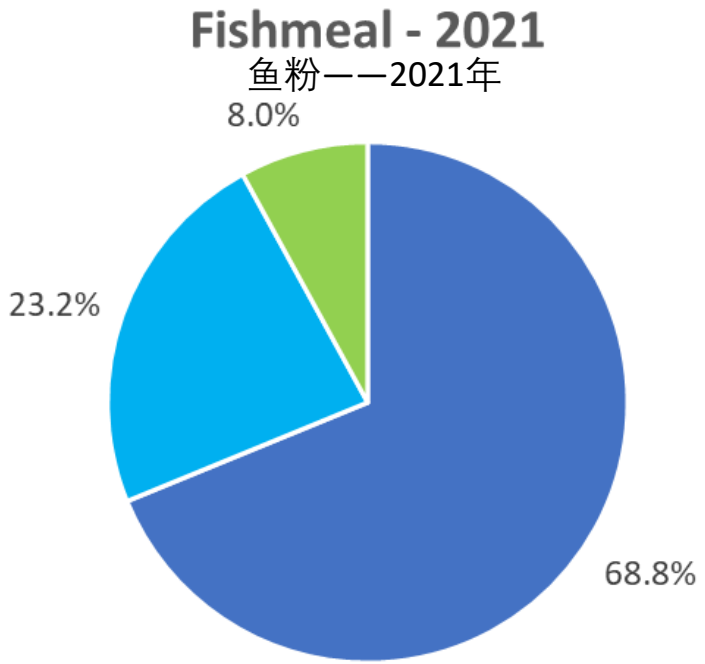
Sustainability Maintains The Future
可持续性保障着我们的未来

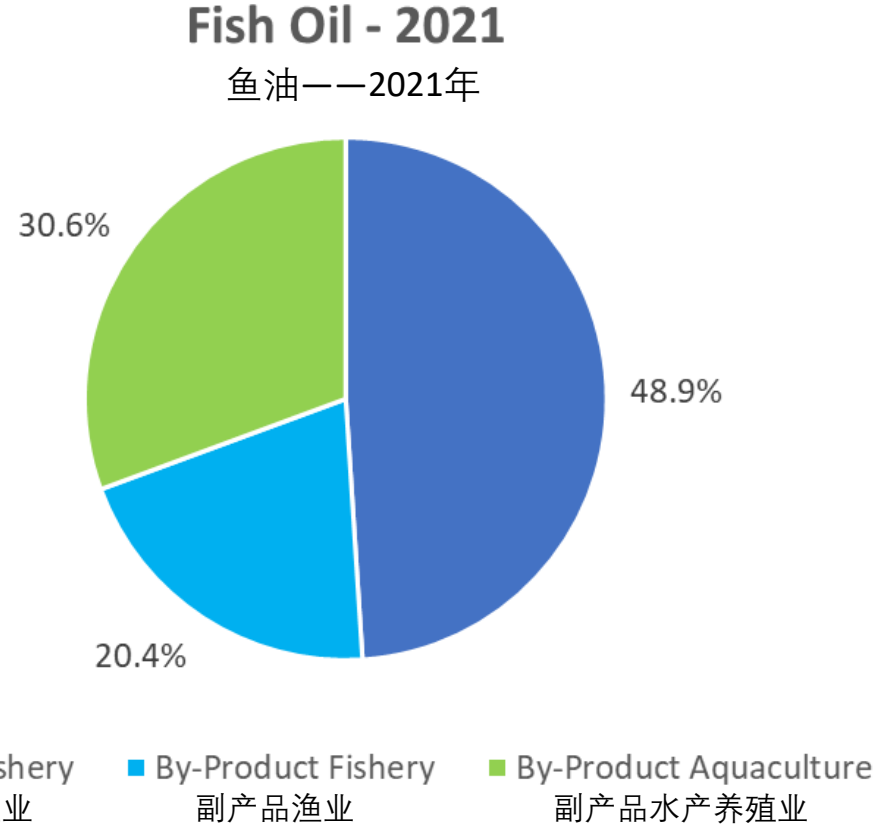
- Most fisheries in developed nations of the world are now managed by independently set quotas.
  世界发达国家的大多数渔业管理目前都遵循独立设定的配额制度。
- Modern fishers are regulated to operate within those quota systems.
  在配额制度中，现代渔民在监管下进行捕鱼作业。
- There has been a BIG shift in fisheries management over the past 20 years.
  在过去20年中，渔业管理经历了重大变革。



Source: Instituto del Mar del Peru (IMARPE).no/en
资料来源：秘鲁海洋研究院 (IMARPE)

By-Products Increasingly Important
副产品日益重要





- By-products resources currently supply about 32% of all FMO ~2.0Mtonnes:
  副产品资源目前供应200万吨鱼粉和鱼油总产量的约32%。
  - Aqua: 770 ktonnes
    水产养殖业：77万吨
  - Fishery: 1242 ktonnes
    渔业：124.2万吨

Marine Ingredient Supply Is Growing From By-Products
来自副产品的海洋原料供应量正在不断增长

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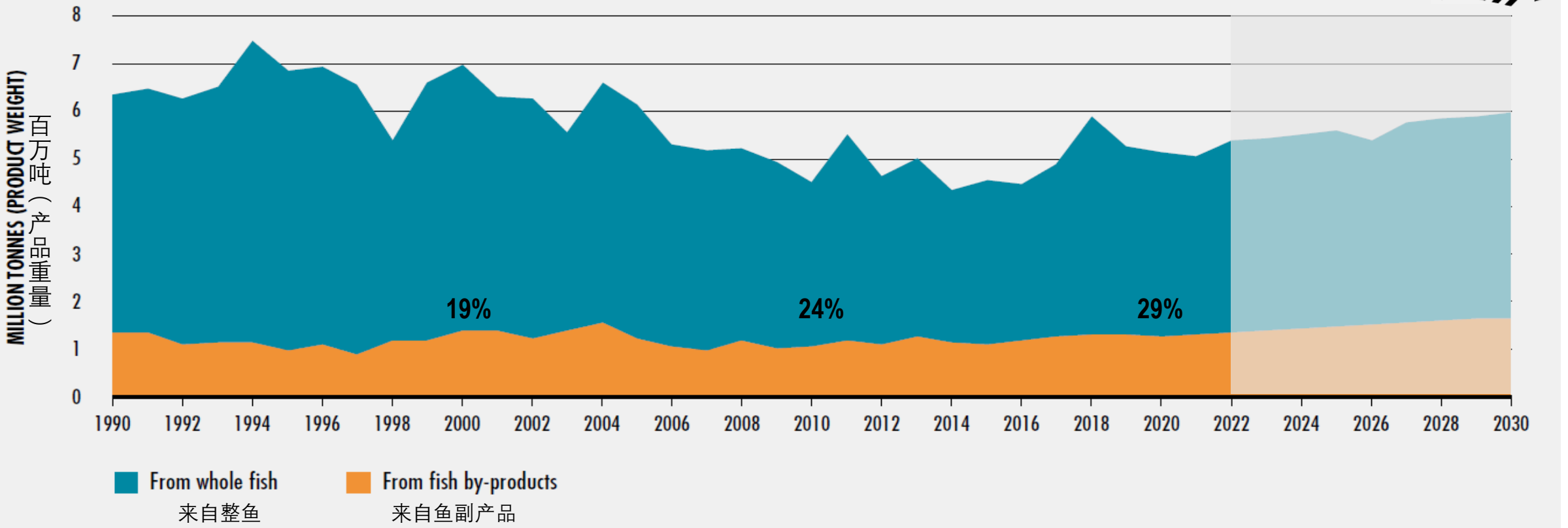
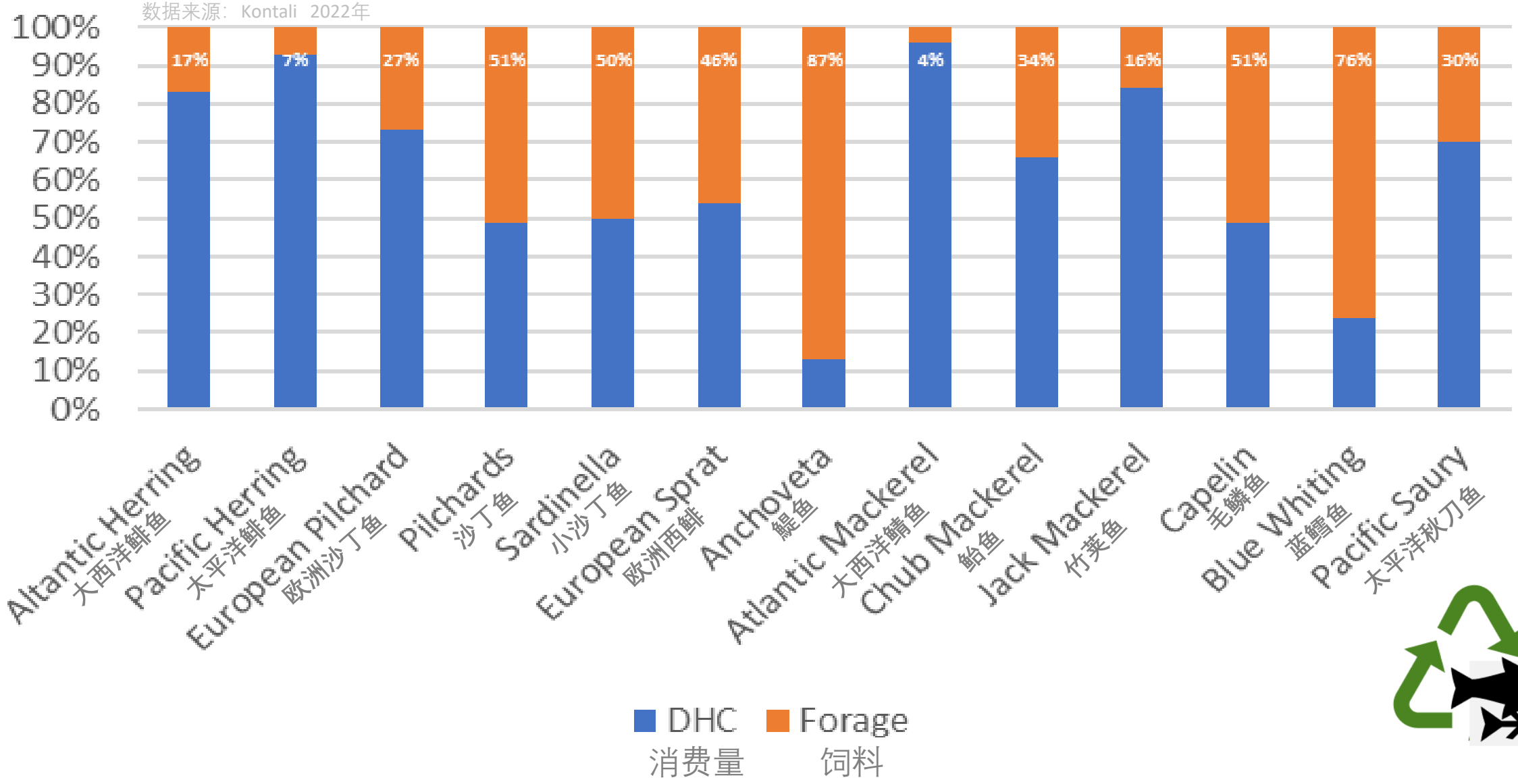
FIGURE 55
WORLD FISHMEAL PRODUCTION, 1990–2030
图55 1990年—2030年世界鱼粉产量



SOURCE: FAO SOFIA 2020
资料来源：联合国粮农组织《2020年世界渔业和水产养殖业现状》报告

Consumption (DHC) vs Forage
消费（人类直接消费）与饲料

Data source: Kontali 2022
数据来源： Kontali 2022年



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Emerging Priorities with Marine Ingredients
海洋原料的新兴重点工作

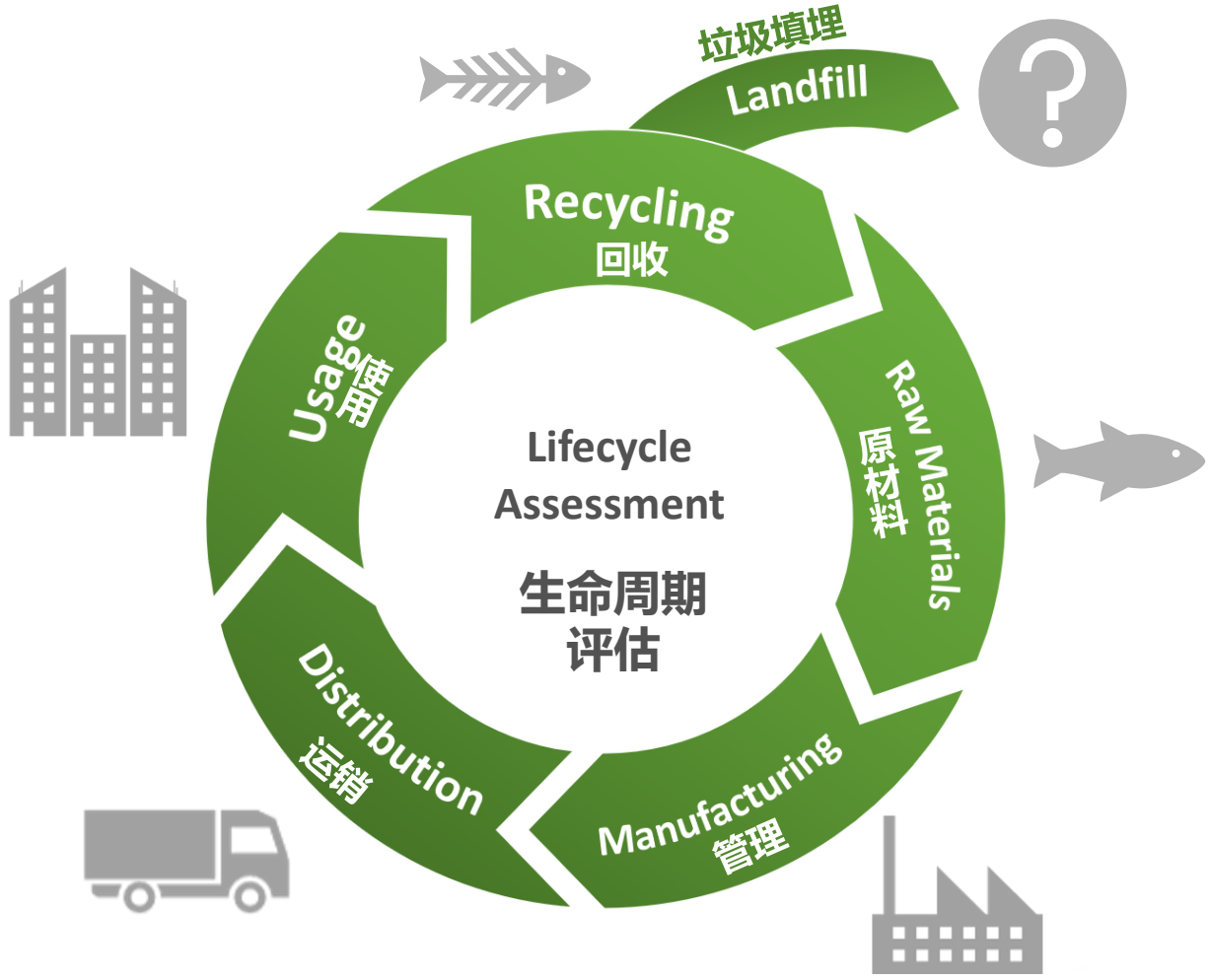
Understanding and Manging Our Impacts
了解和管理我们的影响

- Environmental impacts do not just occur on the production unit:

  环境影响不仅仅发生在生产单位中：
  - Feed ingredients/饲料原料
  - Feed processing/饲料加工
  - On farm production/养殖场生产
  - Processing/加工
  - Distribution/运销
  - Consumption/消费
  - Waste disposal/废物处理
- All require land, water, raw materials and energy, and can lead to harmful emissions.

  所有这些都需要土地、水、原材料和能源，并可能导致有害排放。
- Using a Lifecycle Assessment (LCA) approach we can better understand our full impact on sustainability.

  使用生命周期评估 (LCA) 方法，我们可以更好地了解我们对可持续性的全面影响。



Life Cycle Assessment Approach to Impact Analysis
关于影响分析的生命周期评估方法

- Life Cycle Assessment (LCA) aims to compare the full range of environmental effects assignable to products and services by quantifying all inputs and outputs of material flows and assessing how these material flows affect the environment.

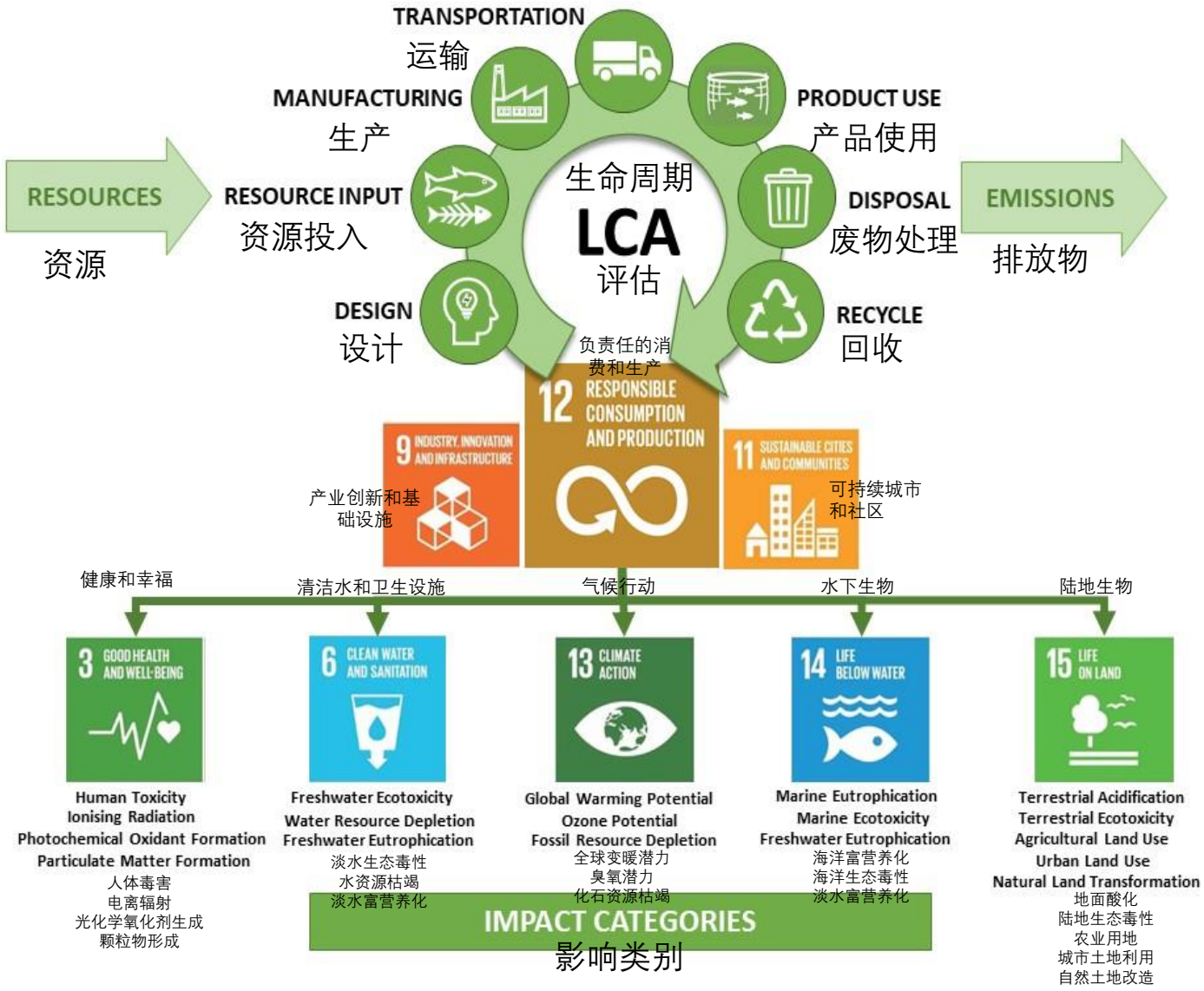
  生命周期评估（LCA）旨在通过量化材料流的所有输入和输出，并评估这些材料流对于环境的影响，从而对于产品和服务的所有环境影响进行比较。

- Based on compiling an inventory of relevant energy and material inputs and environmental releases

  基于对相关能源和材料投入以及环境排放清单的编制

- Increasingly seen as the “mainstream” way to establish environmental credentials.

  日益被视为进行环境认证的“主流”方式。



Sustainability Only Has Meaning if Standardised
可持续性只有实现标准化才有意义

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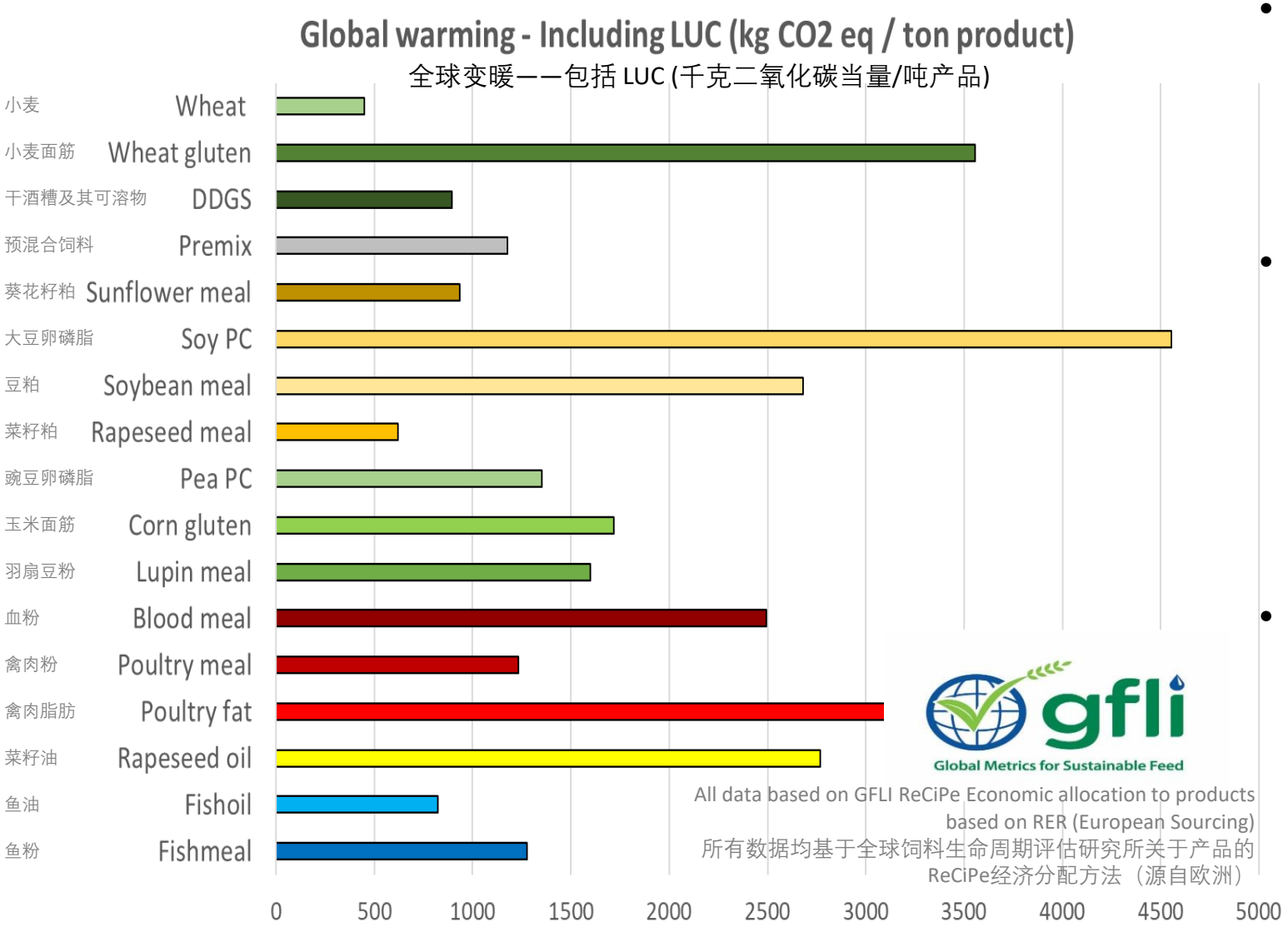
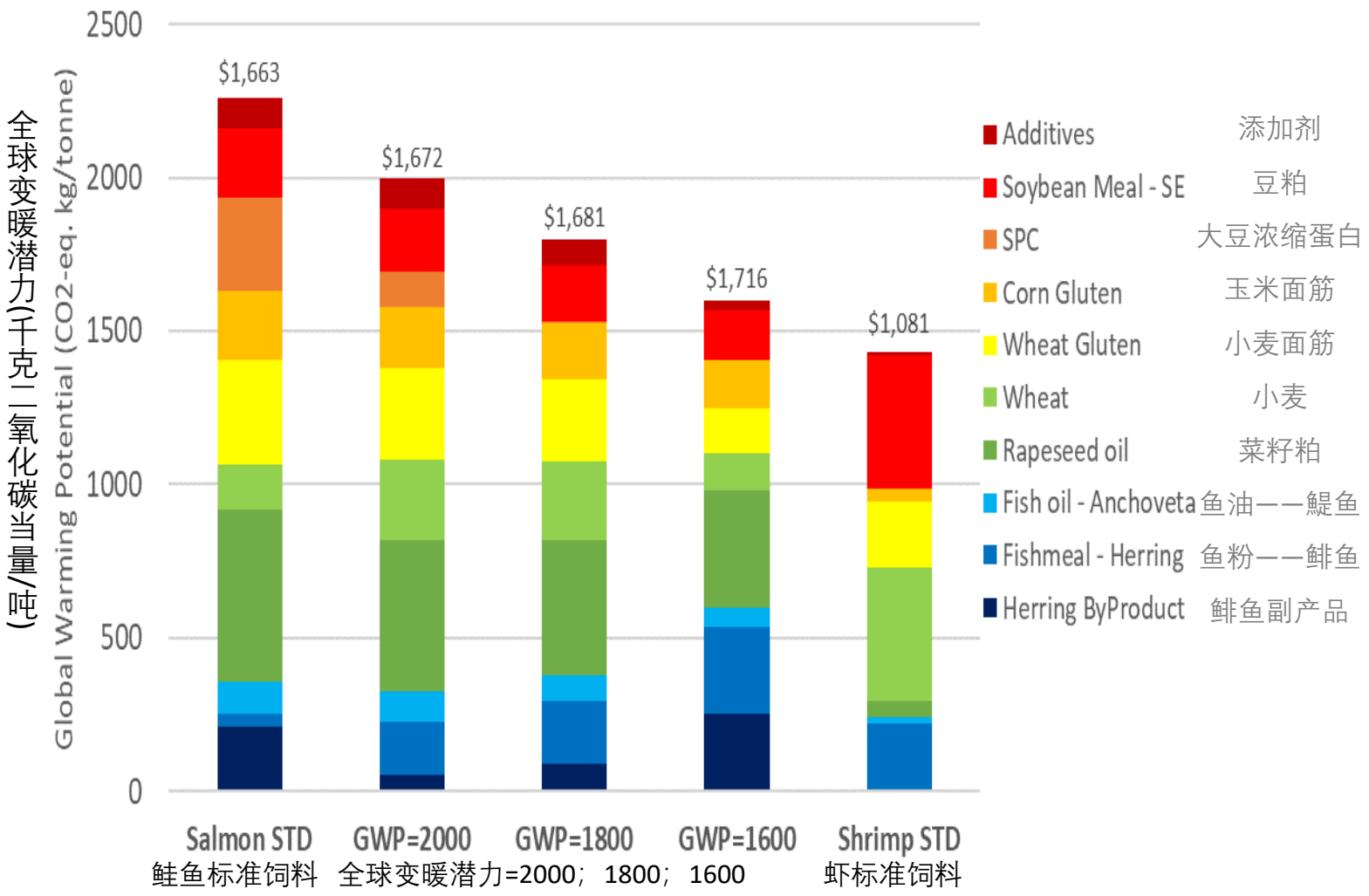


- The environmental footprint of feed ingredients becoming increasingly of importance.
  饲料原料的环境足迹变得越来越重要。

- The Global Feed Lifecyle-Assessment Institute (GFLI) acts as an independent database on close to 1000 ingredients.
  全球饲料生命周期评估研究所（GFLI）建立了一个涵盖近1000种原料的独立数据库。

- Examination of the Global Warming Potential (Carbon footprint) shows that marine ingredients compare very favourably.
  对全球变暖潜力（碳足迹）的研究表明，海洋原料相比之下非常具备优势。

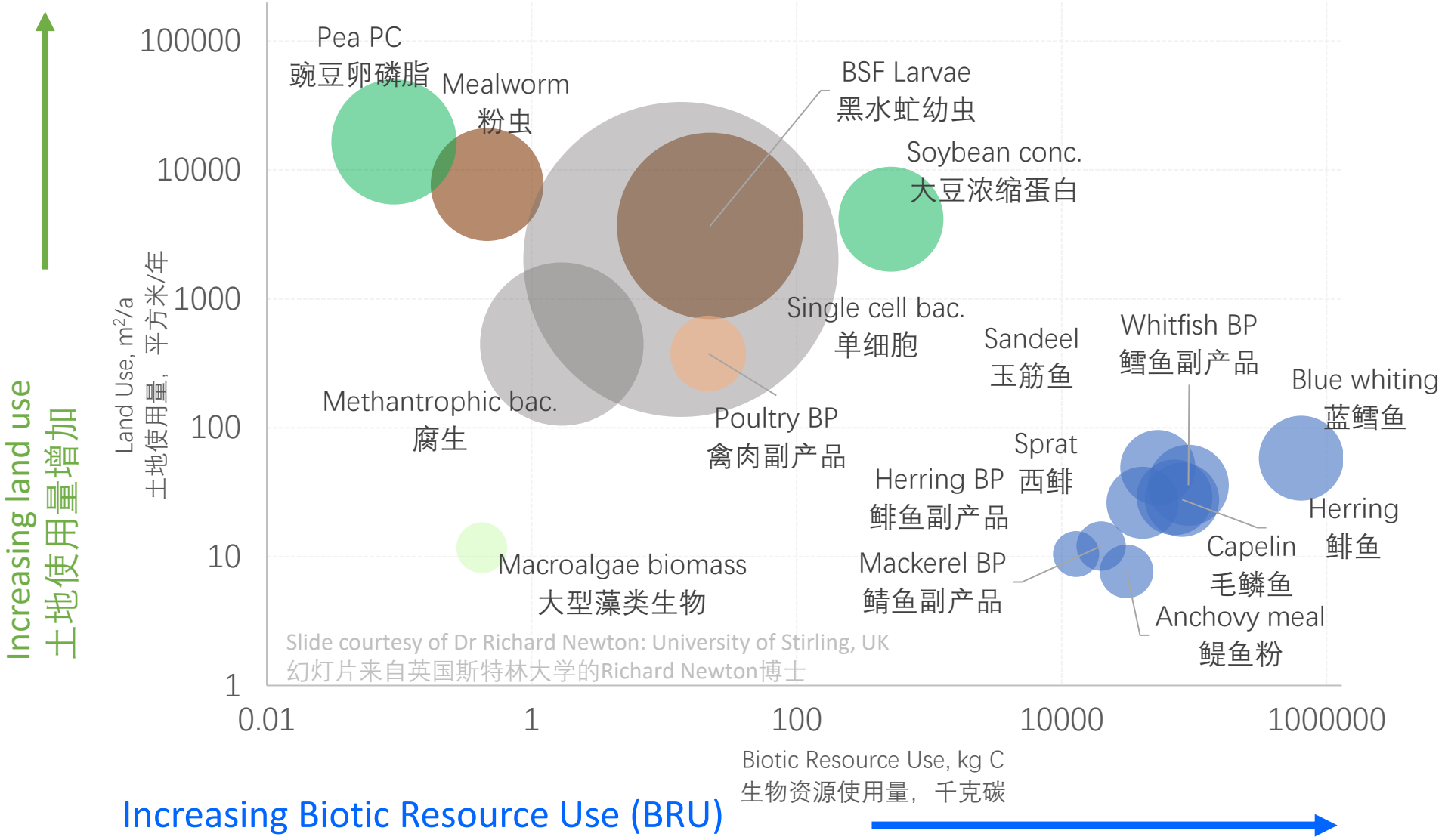
Sustainability Will Increasingly Become a Formulation Constraint
可持续性将日益成为配方饲料的一项限制条件



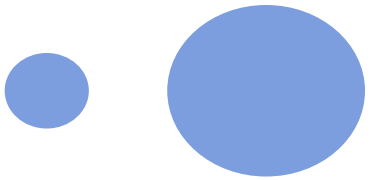
Proportional color indicates the proportional inclusion in the formulation.
比例彩块表示其在饲料配方中的比例含量。

- Using databases like that of the Global Feed Lifecyle-Assessment Institute (GFLI) it becomes possible to obtain independent and standardised LCA data.
  通过使用全球饲料生命周期评估研究所（GFLI）数据库这类资源，可以获得独立和标准化的生命周期评估数据。
- A simple examination of the Global Warming Potential (GWP: Carbon footprint) shows that it is very easy to formulate on GWP and that marine ingredients become keystone ingredients in achieving this.
  对全球变暖潜力（GWP：碳足迹）的简单研究表明，规范全球变暖潜力非常容易，而海洋原料则成为实现这一目标的关键原料。

All Ingredients Have Issues…
所有原料都存在一定的问题…



Bubble size: increasing carbon footprint
气泡大小：碳足迹增加



Summary
总结

- **Where are we Now?** 我们的现状如何?
  - Marine ingredients remain reliable and cost effective sources of important nutrients.
    海洋原料仍然是可靠且成本效益高的重要营养素来源。
  - Increasingly targeted by aquaculture and DHC markets.
    日益成为水产养殖业和人类直接食用（DHC）市场瞄准的目标。
  - Now seen as “strategic” ingredients, no longer a bulk supply of nutrients.
    目前被视为“战略性”原料，而不再是营养素的主要供应来源。
- **Ensuring Quality of Marine Ingredients** 确保海洋原料的质量
  - There is a growing range of qualities focussing on specialist markets.
    针对专业市场设定的质量要求越来越多。
  - High digestibility and palatability remain key advantages of marine ingredients.
    高消化率和适口性仍然是海洋原料的重要优势。
  - Traceability, Purity and Safety are priorities to the sector.
    可追溯性、纯净性和安全性是该行业的重点要求。
- **Sustainability Underpins Marine Ingredients** 可持续性保障着海洋原料
  - Good fisheries management is leading to improved biomass of stocks.
    良好的渔业管理将导致种群生物量提高。
  - Major stocks of small pelagics considered amongst best managed of all fisheries.
    主要的小型中上层鱼类种群被认为是所有渔业中管理最好的。
  - ByProducts are beginning to be a major contributor to production.
    副产品将开始贡献大部分产量。
- **Emerging Priorities with Marine Ingredients** 海洋原料的新兴重点工作
  - Sustainability metrics are moving to more holistic measures like LCA.
    可持续性指标将转向生命周期评估等更全面的衡量标准。
  - Importance of environmental footprint is growing
    环境足迹的重要性与日俱增
  - ALL ingredients have issues
    所有原料都存在一定的问题

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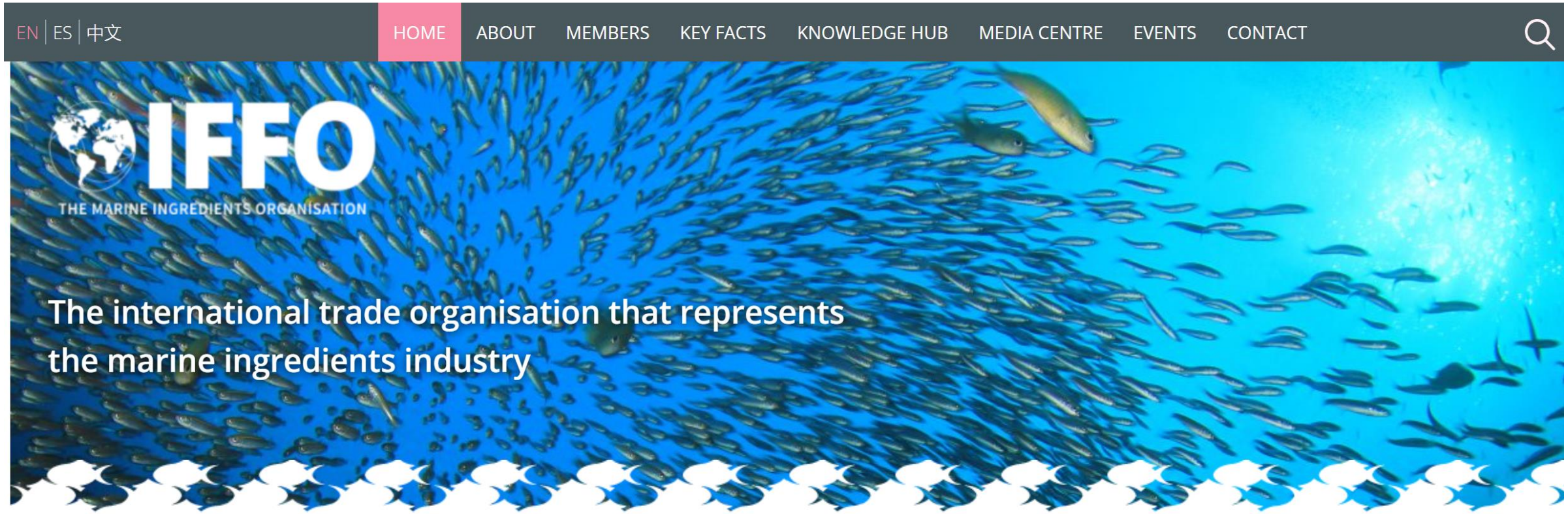

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