COMPASSION in world farming

ATLANTIC BLUEFIN TUNA

CAUGHT, CAGED, AND UNDER THREAT

A school of Atlantic bluefin tuna swimming inside a sea cage. (© CIWF)

Contents

Aerial footage of Atlantic bluefin tuna farm. (© CIWF)

Atlantic bluefin tuna swimming below the surface inside a farming pen. (© CIWF)

COMPASSION IN WORLD FARMING INTERNATIONAL (CIWF) is the leading international farmed animal welfare charity. It was founded in 1967 by British dairy farmer Peter Roberts and now operates globally, including in the European Union, the USA, Asia and Africa. Our mission is to end factory farming. We work with policymakers, food businesses and civil society to protect animals and the environment, driving shifts to regenerative and sustainable food systems that produce nutritious food, respect animal welfare, and work with nature.

Executive summary

The Mediterranean population of Atlantic bluefin tuna was classified as endangered in 2009, and this species was confirmed as globally endangered in 2011. After decades of overfishing and weak regulatory oversight, the species was pushed to the brink. However, tougher controls on fishing helped the population begin to recover, and by 2021 Atlantic bluefin tuna were no longer considered endangered worldwide.

It should be a conservation success story. Yet, Compassion in World Farming's latest research has identified that many of the warning signs which preceded Atlantic bluefin tuna being classified as endangered in 2011 are reemerging.

Purse seine fishing is at historic levels, oversight remains weak, and the farming industry is expanding rapidly. Aquaculture is often presented as a way to reduce pressure on wild fish populations. However, tuna farming operates against this principle, relying on wild-caught tuna to be fattened in the farms and large quantities of wild fish for feed.

This isn't only a disaster for Atlantic bluefin tuna populations, it has wider ramifications on their welfare, global food security, sustainability and biodiversity.

The situation is most alarming in the Mediterranean, where tuna farming and fishing levels have expanded rapidly, yet the regional population has not been reassessed by the International Union for Conservation of Nature (IUCN) for 17 years, making an update urgently needed.

Atlantic bluefin tuna leaping above the water's surface. (© Ray Harrington / Unsplash)

Key findings

1. Tuna farming is rapidly expanding and there are warning signs that wild populations could once again become at risk.

- Atlantic bluefin tuna farming increased 19-fold from 2003 to 2024. In 2003, up to 55,700 tuna were farmed. By 2024, that had risen to up to one million tuna.
- In 2006, there were 13 licensed farms. In 2026, there are 123 licensed farms.
- Farming depends on capturing live tuna and fattening them. This increases pressure on wild populations – catches of wild Atlantic bluefin tuna were 29% bigger in 2024 than they were in 2008, which is just before they were classified as endangered to protect their numbers.
- A lack of reliable data on Atlantic bluefin tuna catches, aquaculture production, and trade, obscures the true impact and scale of fishing and farming this species. For example, in some cases, producer countries declared exports of Atlantic bluefin tuna to Japan which exceeded Japan's total worldwide imports.

2. Tuna farming is unsustainable, highly inefficient, and undermines food security.

- One farmed tuna could need up to 3,000kg of wild-caught fish as feed – that's the equivalent of up to 33,000 sardines or 166,000 anchovies. This is unsustainable and damages marine life.
- Some fish used for feed are taken from vulnerable, low-income coastal communities who rely on them for food and livelihoods.
- Atlantic bluefin tuna are not farmed as a measure to improve food security. They are produced as a luxury item, largely for the high-income sushi and sashimi market.
- More than €64.9 million of public-related financial support has been spent on Atlantic bluefin tuna farming by the EU and national governments during the past decades. Public funds should only be used to support sustainable farming practices.

3. Animal welfare impacts are severe, and this wild species is totally unsuitable for farming.

- Atlantic bluefin tuna are migratory, fast-swimming, wild animals with high metabolic demands, who must swim continuously to breathe. These characteristics make confinement in farming systems inherently harmful for them.
- Confined in sea cages, they suffer stress, injury, and high mortality rates.
- Current slaughter methods raise serious welfare concerns, including crowding, missed shots, and asphyxiation.
- These sentient animals are exposed to severe welfare risks during capture, transport and slaughter, including crowding, handling, restricted swimming, exhaustion, injuries, and mortality.

Urgent global action is needed to halt this rapid expansion of tuna farming and to protect Atlantic bluefin tuna from exploitation.

We are calling for:

- **an immediate, international moratorium** on new or expanded Atlantic bluefin tuna farms, with the aim of ending tuna farming, alongside an urgent assessment under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and IUCN reassessments of its global and Mediterranean conservation status.
- **global, urgent action and guidance from the Convention on Biological Diversity (CBD) to EU member states** to take a precautionary approach on carnivorous aquaculture when delivering their national biodiversity plans.
- **strengthened transparency and monitoring of catches**, farming, production and trade of the tuna, as well as the fish being used as feed.
- **animal welfare assessments** to be required before any new carnivorous aquaculture farm permits are granted.
- **an end to harmful subsidies** by redirecting funds away from tuna farming towards regenerative and sustainable practices such as low-trophic species.

1. The Atlantic bluefin tuna

Atlantic bluefin tuna (*Thunnus thynnus*) (ABFT) is primarily marketed as a high-value product for Japanese sushi and sashimi, distinct from the tuna species typically used in canned products (skipjack, yellowfin, or albacore tuna)[1]. Wild ABFT is distributed across the Atlantic Ocean and the Mediterranean Sea and can grow over three metres long, with some individuals exceeding 700kg[2].

They are fast, powerful swimmers, capable of reaching speeds of up to 45km/h and travelling around 86km to 260km per day[3-5]. ABFT are highly migratory animals[2,6,7] swimming long distances between feeding and spawning areas, with migrations exceeding 8,000km (Figure 1). ABFT are obligate ram ventilators, meaning they must swim continuously to maintain a flow of water over their gills to breathe[2,8]. They also show regional endothermy, allowing them to keep parts of their body warmer than the surrounding water[6]. These adaptations enable ABFT to move across vast ocean areas in short periods, but it also contributes to high metabolic demands[6,9]. In nature, they live for around 20 years[10]. They mature only at four to five years of age and reproduce just once per year within limited warm-water spawning areas[2]. ABFT are a species adapted to extensive movement across oceans, making cage confinement fundamentally incompatible with their natural needs.

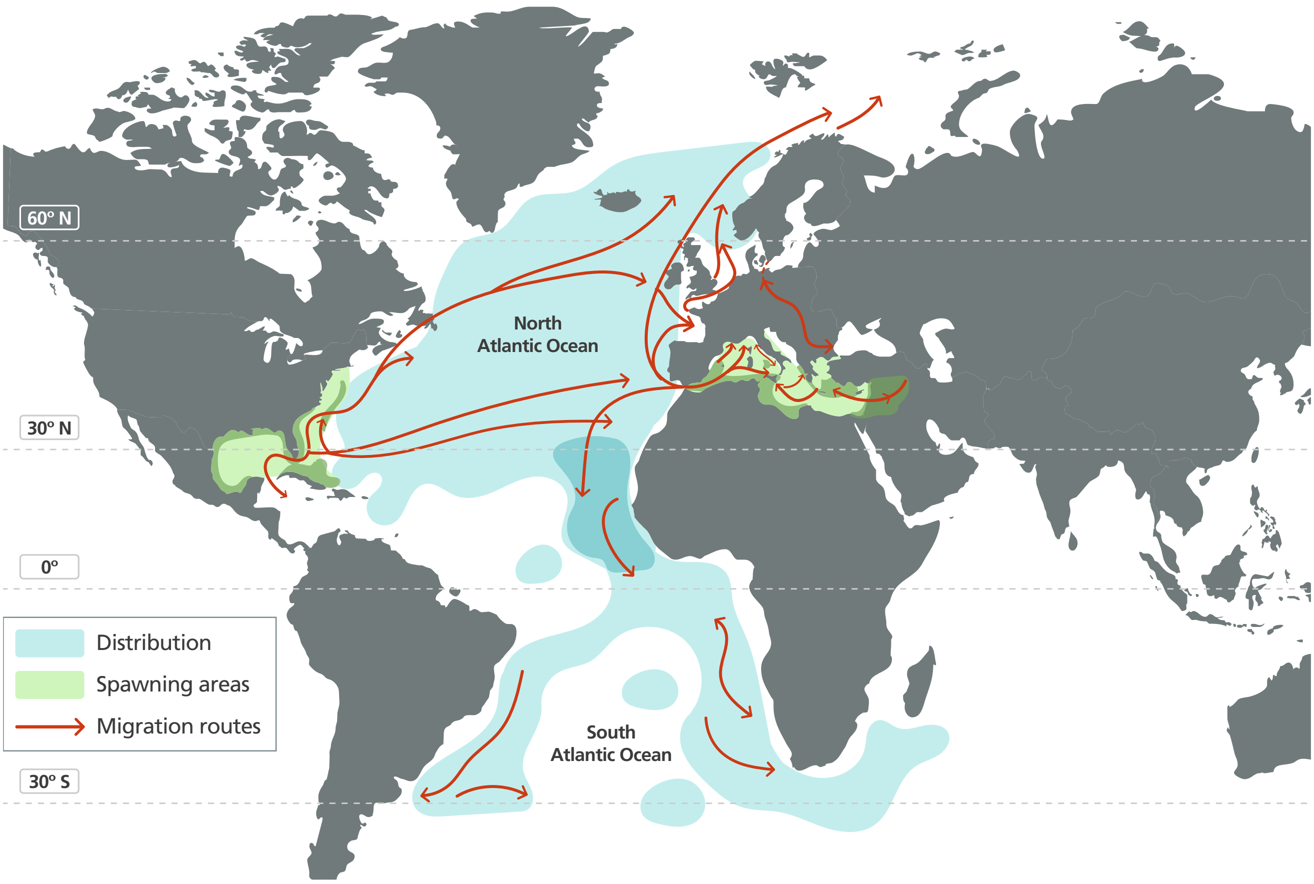


Figure 1. Migration routes, distribution and spawning areas of Atlantic bluefin tuna.
Source: ICES, 2020 (International Council for the Exploration of the Sea).

2. Tuna farming industry and future developments

Current tuna farming industry practices

Despite being widely referred to as 'farming', Atlantic bluefin tuna (ABFT) production is better described as 'fattening' or 'ranching' and is dependent on wild-caught fish. Reproductively adult tuna individuals weighing around 30kg or measuring 115cm are caught with purse seine vessels[a] during the spawning season, transferred to sea cages and intensively fed with small pelagic fish (SPF) for three to ten months until they reach the fat content required by the sushi and sashimi market[2,9,11] (Figure 2).

Croatia is the only exception, holding exclusive legislative rights to farm wild-caught, juvenile tuna weighing between 6.4kg and 8kg or measuring 66cm and 75cm for periods of up to three years[11]. Therefore, the industry remains entirely dependent on wild-caught fish, both for stocking and for feed[11,12].

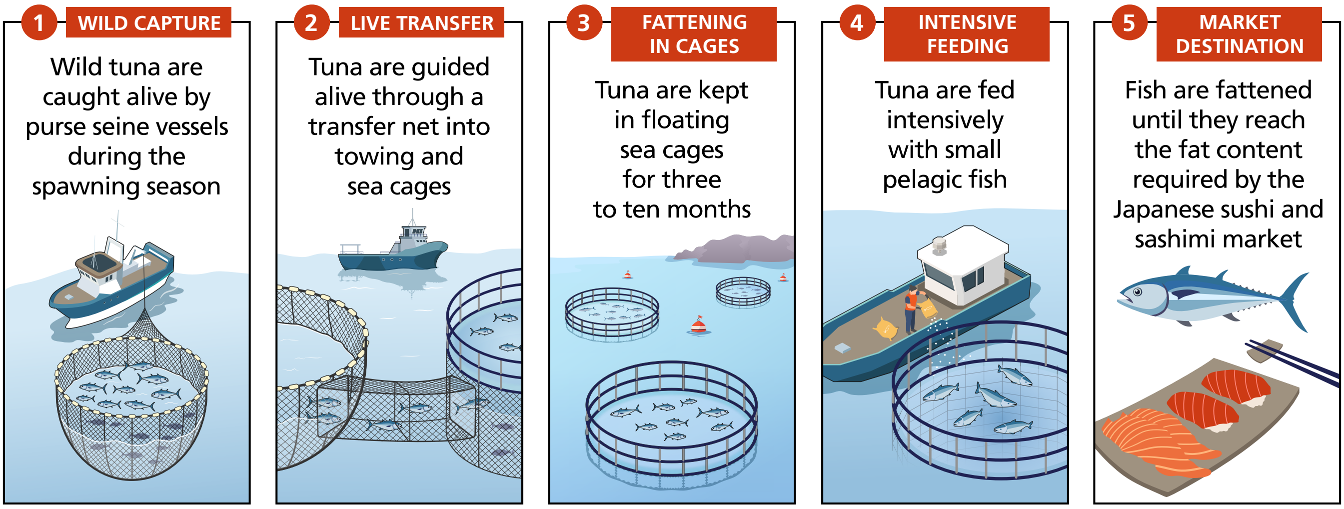


Figure 2. Tuna farming process and practices.

Industry efforts to put Atlantic bluefin tuna in tanks

One of the sustainability challenges of ABFT capture-based aquaculture is the complete dependence on wild-caught juveniles. This dependence has driven significant research investment into closing the biological cycle in captivity, to produce juveniles in hatcheries rather than catching them from the wild. While Pacific bluefin tuna (*Thunnus orientalis*) was bred in captivity in Japan in 2002[11,12], ABFT reproduction in captivity remains largely experimental, despite Spanish and European Union investment[12]. The Spanish Institute of Oceanography (IEO) reported production of hatchery-reared juveniles in the 2010s, the first successful closed-cycle ABFT aquaculture project[11]. However, commercial production is constrained by high larval and juvenile mortality, egg shortages, environmental sensitivity, cannibalism, and high costs of research and infrastructure for large species[11].

More recently, land-based recirculating aquaculture systems (RAS) have been proposed as a more sustainable alternative for the grow-out (fattening) stage, where ABFT are reared to market size under controlled conditions. However, the species' physiological demands, including continuous high-speed swimming, very high oxygen consumption, and constant thermoregulation[10], make them energy-intensive, technically challenging, and raise serious welfare concerns[12]. Rather than resolving the fundamental ecological and welfare constraints of farming a high-trophic species, land-based systems intensify these problems by worsening the well-being of these animals and requiring much higher energy, water, and feed inputs.

a. Purse seine vessels use a large net to encircle schools of fish and close it at the bottom, trapping them inside. It is a widely-used fishing method to capture pelagic species such as tuna, mackerel, sardines, or anchovies.

3. The rise of Atlantic bluefin tuna farming and its impact on wild populations

Expansion of tuna farming

Atlantic bluefin tuna (ABFT) shifted from a low value species, once used for pet food, to a global luxury commodity as Japan's post-war economic boom expanded demand for sushi and sashimi[1,10]. By the 1990s, rising consumption of these so-called 'luxury foods' in Europe and the United States pushed prices sharply upward[1,10]. The development of industrial fishing, refrigeration, and air freight enabled ABFT to be caught and shipped worldwide while maintaining premium quality, and today, more than 90% is exported to Japan[1,10].

Growing market demand for sushi and sashimi puts pressure on wild stocks, driving the rise of capture-based aquaculture, commonly known as tuna farming[10]. The UN's Food and Agriculture Organization (FAO) data show that farmed ABFT production was almost absent before the 1990s but expanded rapidly from the early 2000s onwards (Figure 3). Farmed production increased from 1,896 tonnes in 2003 to 36,855 tonnes in 2024, a nearly 19-fold increase. Since 2008, farmed production has also more than doubled, rising from 14,880 tonnes to 36,855 tonnes in 2024.

By 2024, **farmed ABFT production was almost equal to reported wild capture**, with **36,855 tonnes of farmed ABFT** compared with **39,589 tonnes from wild capture** (Figure 3). However, this is not a move away from wild capture because most farmed ABFT are caught alive from the wild, adding further demand for wild-caught tuna.

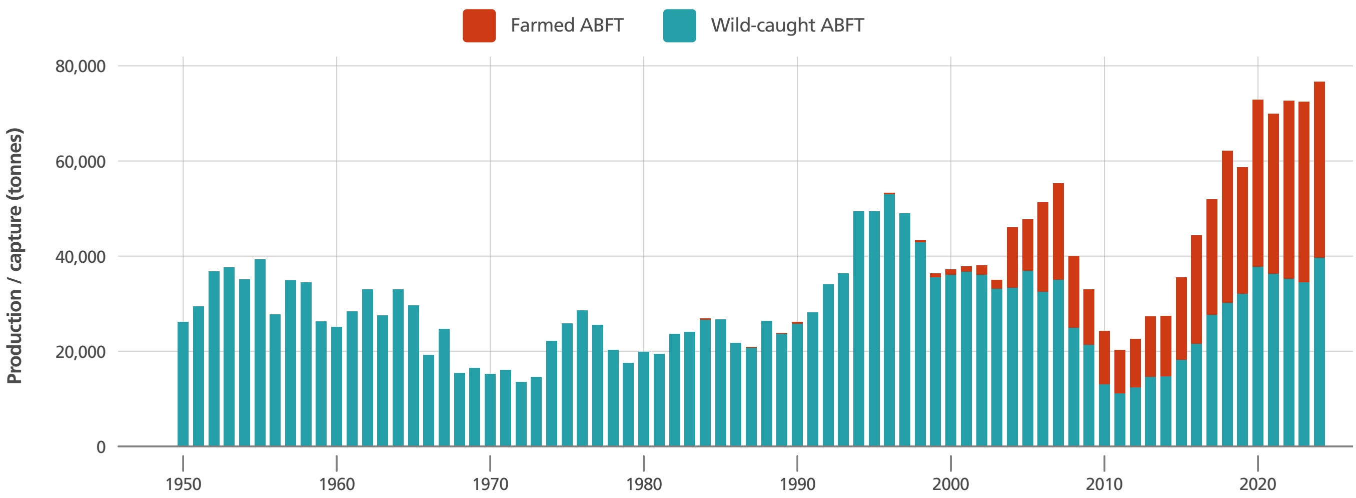


Figure 3. ABFT wild capture vs ABFT farming production from 1950 to 2024. Source: FAO FishStatJ, 2026.

Eurostat data were used to identify the main countries involved in farmed ABFT expansion (Figure 4). Data show that tuna farming is concentrated in a small number of countries, in particular Malta, Spain, and Türkiye, with Croatia, Italy, Cyprus contributing lower volumes over the period analysed (Figure 4). The figure also shows that rising production volumes were accompanied by an increase in total production value, highlighting the growing economic importance of tuna farming.

Atlantic bluefin tuna aquaculture facility. (© CIWF)

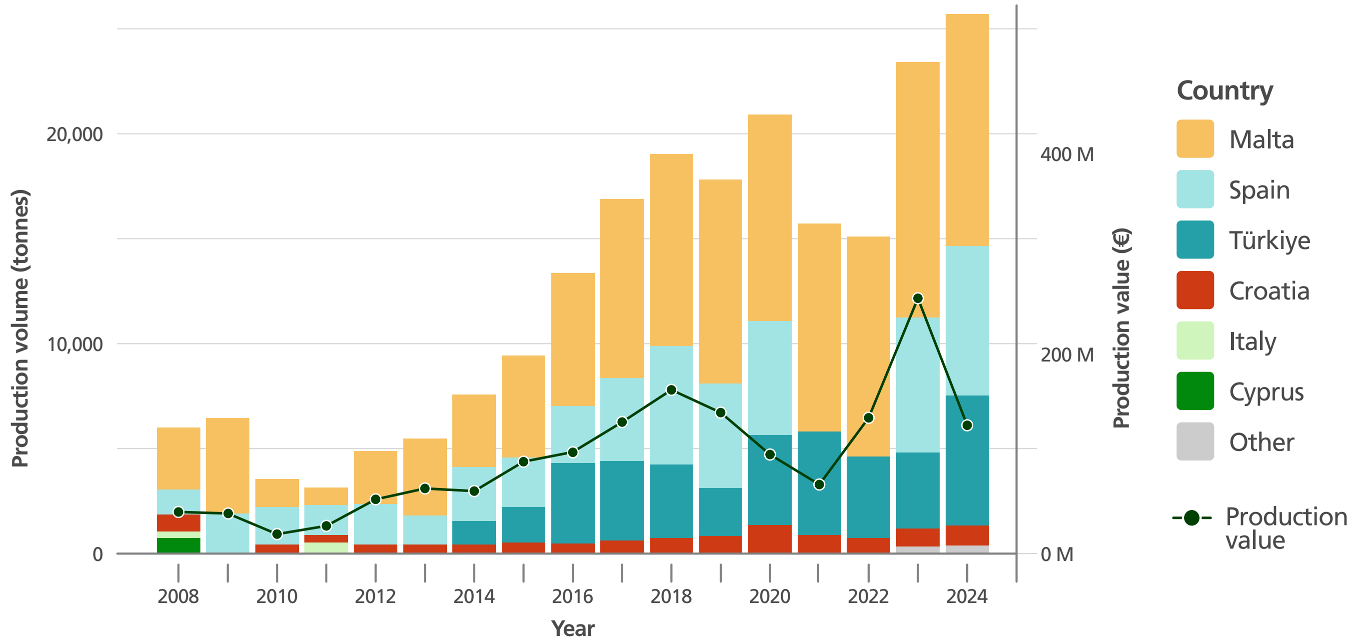


Figure 4. Production volume and value of farmed ABFT in Mediterranean producer countries from 2008 to 2024. Bars show annual production volume in tonnes by producing countries. The line shows the estimated total production value in million EUR. Source: Eurostat.

This expansion is also reflected in the increase in the number of licences for tuna farms during the last decades, approved by the International Commission for the Conservation of Atlantic Tunas (ICCAT), the international body responsible for managing ABFT fisheries (Figure 5). The cumulative number of ABFT farming facilities increased substantially during the 2000s, rising from 13 facilities in 2006 to 123 in 2026. Growth was driven mainly by Spain, Croatia, Italy, Malta, and Türkiye (Figure 5).

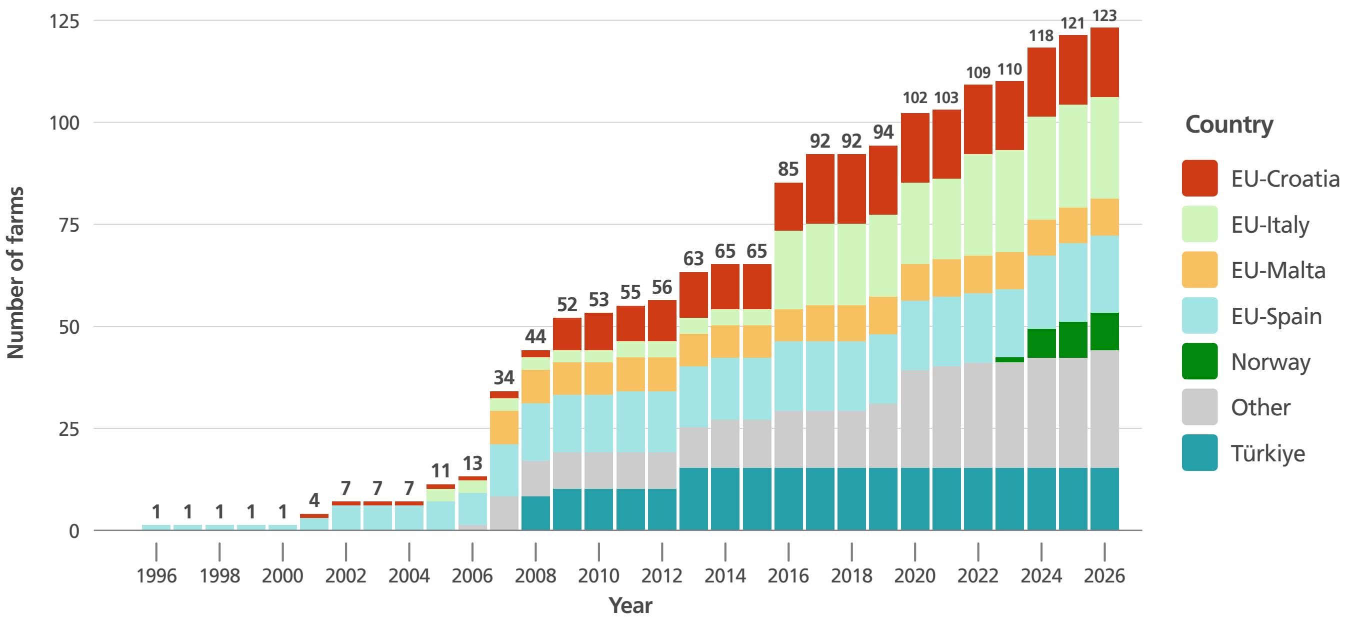


Figure 5. Cumulative number of licensed ABFT farming facilities by country, 1996 to 2026. Source: ICCAT.
Note: the figure shows licensed facilities, not necessarily active farms; some licensed facilities may be inactive or non-operational.


Atlantic bluefin tuna inside a farming cage. (© CIWF)

Increase in catches for farming purposes

Most ABFT used for farming are caught using purse seine fishing, because this method keeps the fish alive for transfer to cages. The expansion of tuna farming has reinforced the use of purse seine fishing. Purse seine catches account for 63% to 93% of reported ABFT catches, with around 99% of purse seine-caught tuna in the Mediterranean transferred to farms for fattening[11].

Reported purse seine catches by ICCAT show a significant increase during the 1990s, alongside the expansion of tuna farming (Figure 6). Total purse seine catches averaged around 24,874 tonnes per year between 1994 and 1998, the highest catch period in the dataset (Figure 6). After another high period between 2004 and 2008, when catches averaged around 19,258 tonnes per year, purse seine catches decreased following the introduction of stricter management measures by ICCAT. However, they have increased again since then. In 2023 and 2024, total purse seine catches reached 24,953 tonnes and 24,783 tonnes respectively. This means that current reported catches are now the same as they were in 1994 to 1998, the highest catch period in the dataset, and around 29% higher than during 2004 to 2008, when ICCAT felt it necessary to reduce catch quotas to prevent overfishing (Figure 6).

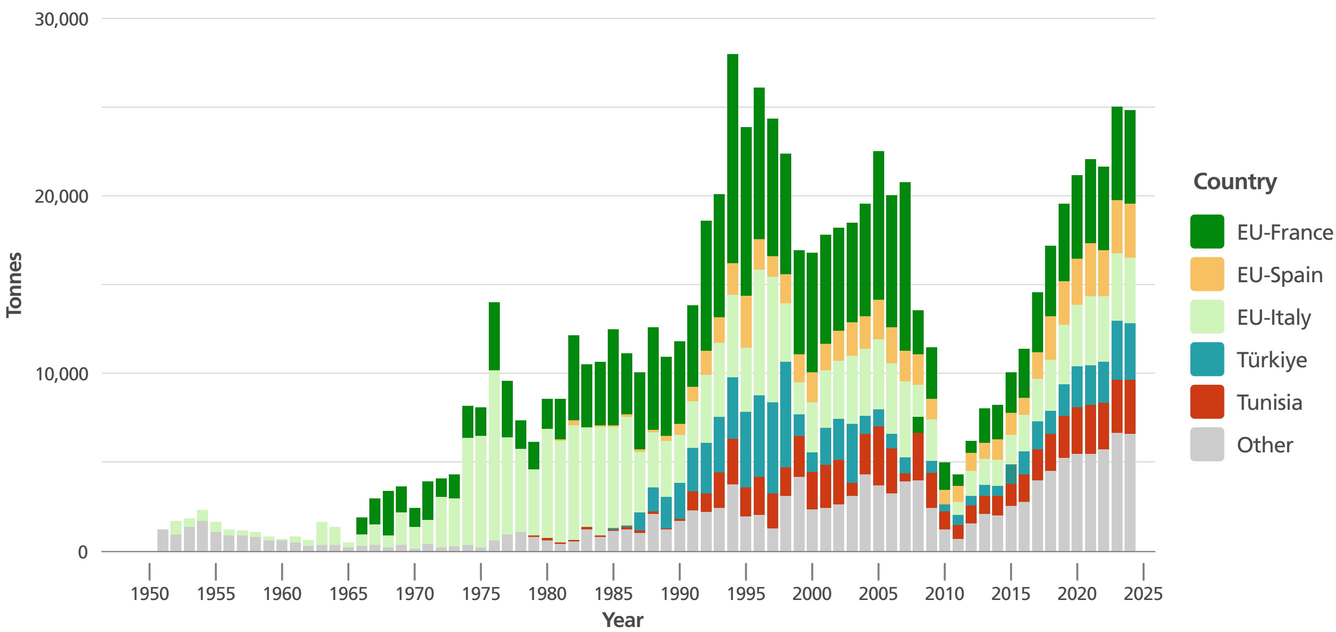


Figure 6. Atlantic bluefin tuna purse seine catches from 1950 to 2024 in the Mediterranean Sea. Source: ICCAT.

Unreliable data prevent proper analysis of the wild populations

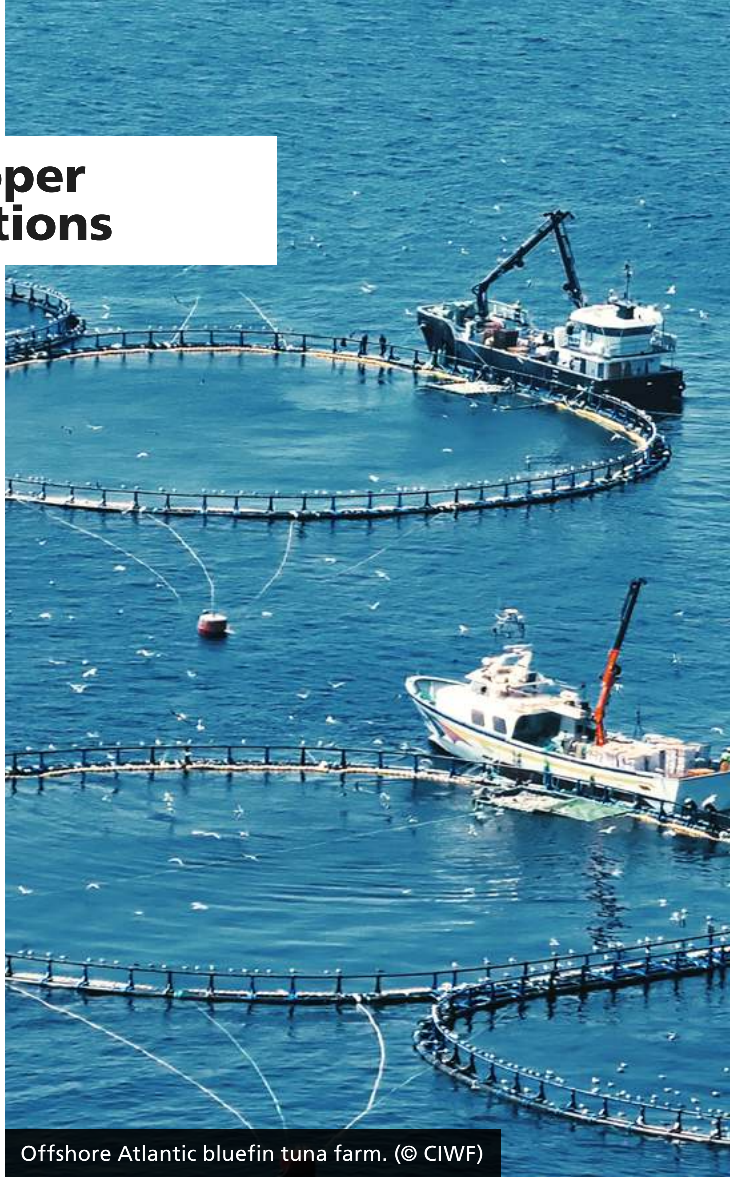
Effective management of ABFT wild populations requires reliable, transparent, comparable data across the whole supply chain. Without accurate data, it is impossible to verify whether quotas are being respected, whether fish numbers are increasing or declining, or whether the volumes of tuna reaching final markets are consistent with what was legally caught. This report reviewed publicly-available ABFT catches, production, and trade datasets and found major inconsistencies across official international databases, raising serious concerns about industry transparency and accountability. Allowing this industry to expand, and continuing to subsidise it, without a robust and transparent evidence base is an irresponsible approach to fisheries governance, especially when it may be increasing pressure on a species with a history of severe overfishing.

Lack of gear-specific catch data

Capture-based farming depends on purse seine fisheries[10], yet FAO FishStatJ and Eurostat do not provide gear-specific catch data (catches reported by fishing gear used), unlike ICCAT. This prevents clear identification of catches linked to farming and limits independent assessment of the system. As a result, the fishing pressure associated with tuna farming remains difficult to distinguish from total ABFT catches, reducing transparency and public accountability.

Aquaculture production: FAO and Eurostat datasets are inconsistent

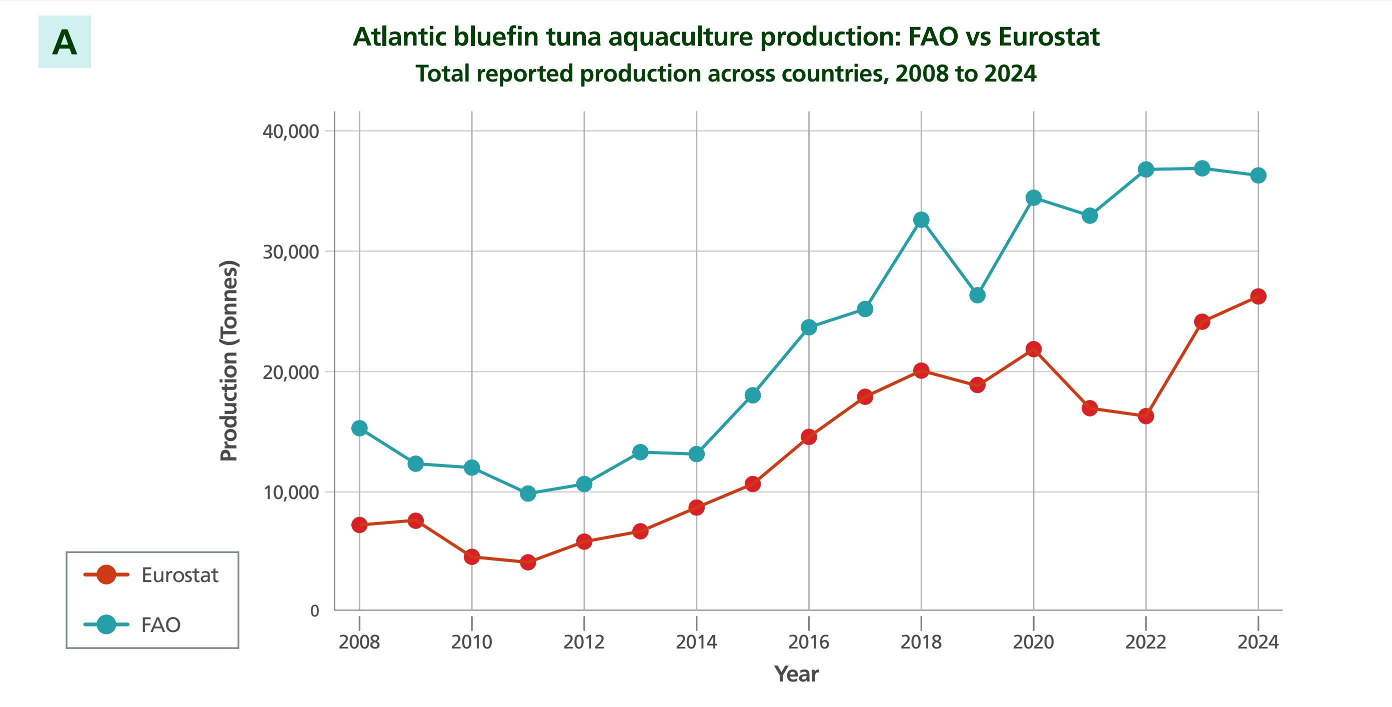
Aquaculture production data from the FAO FishStatJ and the Eurostat aquaculture production databases were compared for the period 2008 to 2024 across major Mediterranean producer countries (Figure 7). The analysis revealed large discrepancies in ABFT production, with FAO generally reporting higher values (Figure 7A). For example, in the period between 2022 and 2024, FAO reported about 35,000 tonnes annually, compared with 25,000 to 26,000 tonnes in Eurostat (a 9,000-tonne gap). Country-level differences are substantial (Figure 7B). For example, Croatia and Malta showed major differences, Greece appeared only in FAO, and several other countries had partial or irregular reporting (Figure 7B).



Offshore Atlantic bluefin tuna farm. (© CIWF)

Missing or zero values in FAO or Eurostat databases should not be interpreted as evidence that no farming activity took place in a given country or year. Scientific literature provides clear evidence of production in years and countries where official databases have no records. Cyprus, for example, had three registered ABFT farms in 2015 with a cumulative authorised capacity of 3,000 tonnes, with two farms being active that year[13]. A similar issue occurred in 2022 for Italy and Cyprus. According to the scientific literature, Italy had 18 active ABFT farms with a total capacity of 17,700 tonnes, while Cyprus had three farms with a total capacity of 3,000 tonnes[11]. However, no production data were reported for these countries in the international databases.

This suggests that the true scale of the industry is likely larger than either database reported and highlights the urgent need for the data to be properly assessed so that the full impacts of the industry can be determined and addressed.



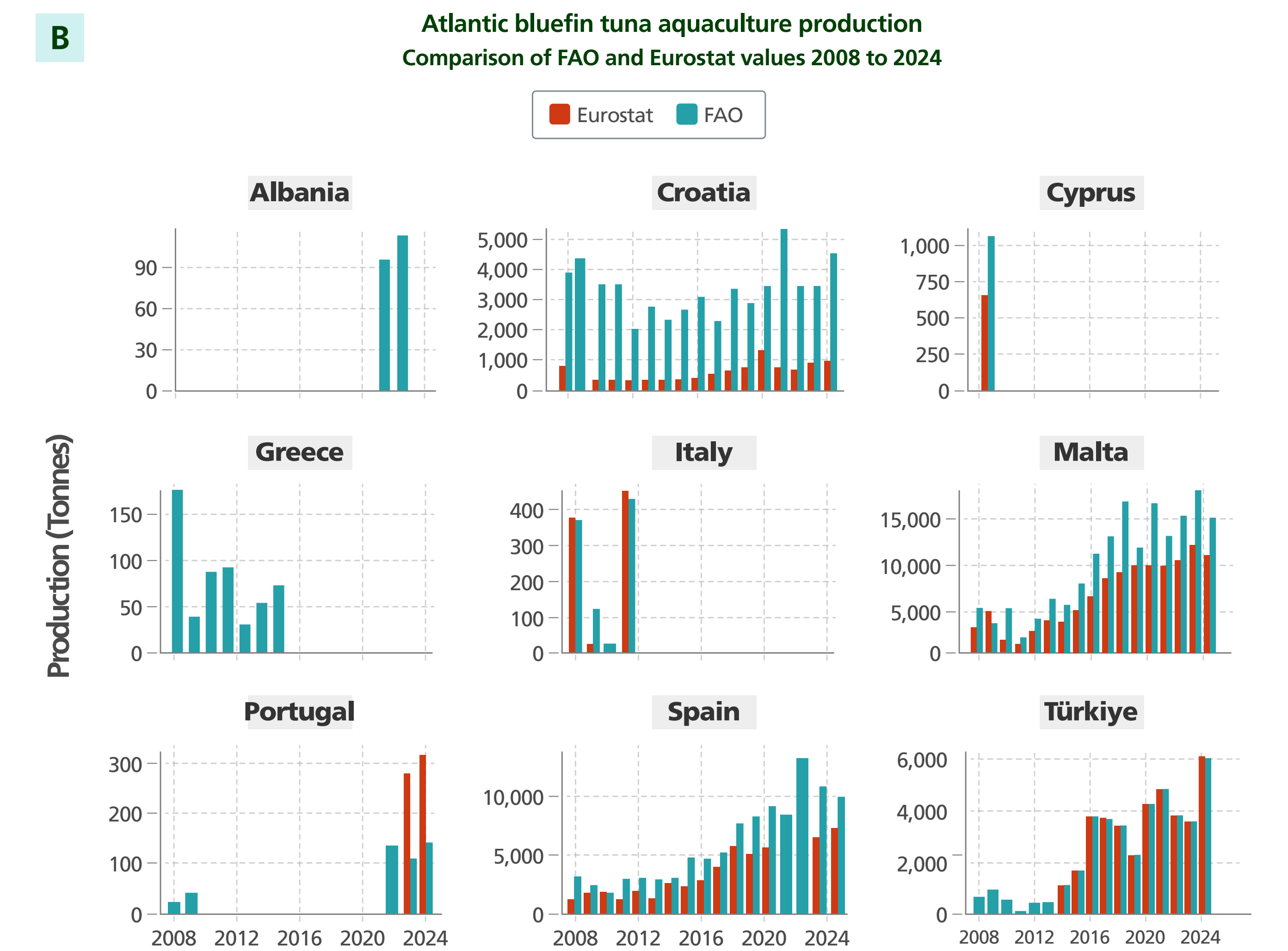


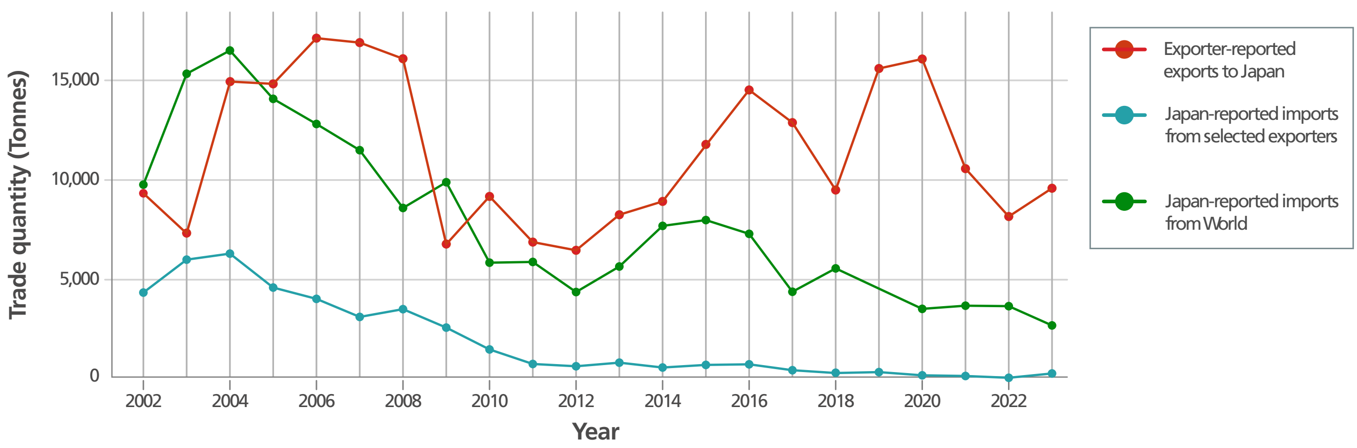
Figure 7. Discrepancies reported in Atlantic bluefin tuna aquaculture production between FAO and Eurostat from 2008 to 2024. Panel A shows total reported aquaculture production across the selected Mediterranean producer countries. Panel B shows country-level comparisons.

Trade data: The flows to Japan cannot be verified

A comparison analysis was performed between Japan's imports of ABFT and the export figures from relevant producer countries (Figure 8). The results showed that producer countries reported higher exports of ABFT to Japan, than Japan reported as imports. Exports reported by individual countries to Japan were even higher than Japan's total reported ABFT imports from the entire world (Figures 8A and 8B). Differences in reporting systems, product classification, re-export, timing, or use of trade codes may contribute to this mismatch. However, the scale of the discrepancy raises serious concerns because it prevents reliable verification of trade flows, obscures the real size of the market, and weakens traceability across the supply chain. Without consistent trade data, it is difficult to determine whether the ABFT reaching final markets is fully aligned with reported catches, farming production and trade records.

A

Atlantic bluefin tuna trade with Japan: exporter reports vs Japan import reports
Same HS codes: 030194, 030235 and 030345, 2002 to 2023



B

Atlantic bluefin tuna trade with Japan: mirror statistics comparison
Exporter-reported exports to Japan vs Japan-reported imports from each exporter, 2002 to 2023

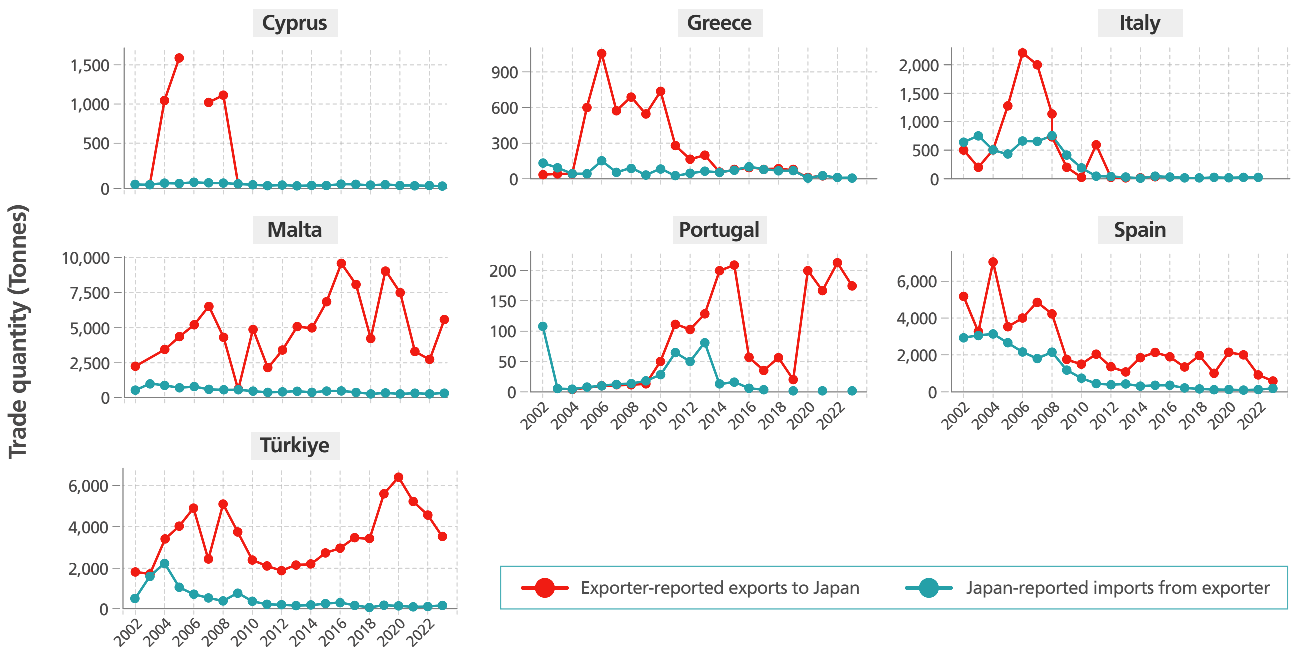


Figure 8. Discrepancies in reported Atlantic bluefin tuna trade with Japan from 2002 to 2023. Panel A compares exporter-reported exports of Atlantic bluefin tuna to Japan from selected Mediterranean producer countries with Japan-reported imports from those same countries and Japan-reported imports from the world, using the same HS[14] codes: 030194, 030235 and 030345. Panel B shows the mirror-statistics comparison by exporter country.
Source: UN Comtrade.

Systemic transparency issues


Large number of bluefin tuna fish displayed for sale at Katsuura fishing port, Japan. (© linegold / iStock)

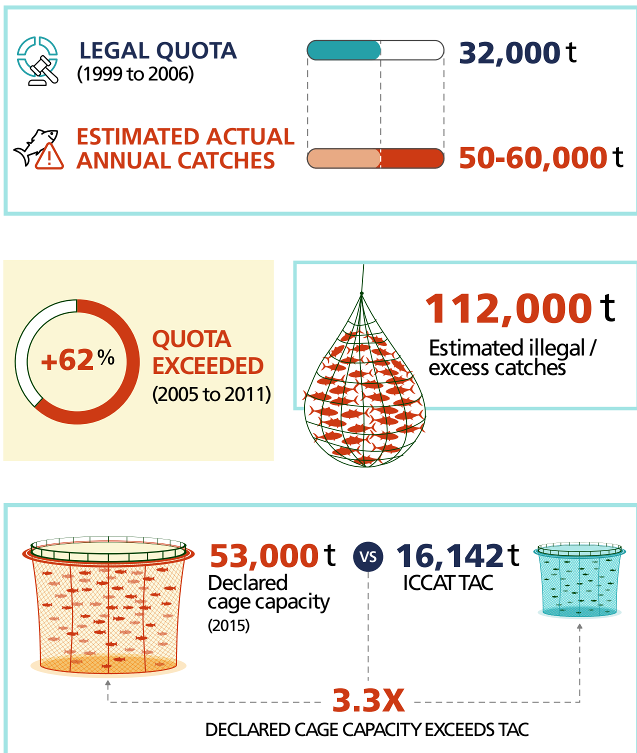
For decades, ABFT wild stocks management has been affected by overfishing, weak governance, and poor transparency, issues that were worsened by the rise and expansion of tuna farming. Driven by the high economic value of tuna for the Japanese sushi and sashimi market, tuna farming increased demand for live wild-caught ABFT and created new challenges for ICCAT to monitor and control catches. Between 1999 and 2006, when farming was expanding rapidly, ICCAT set a Total Allowed Catch – the maximum legal harvest permitted each year (TAC) – of 32,000 tonnes for the Eastern Atlantic and Mediterranean stock, while its scientific committee estimated actual annual catches at 50,000 to 60,000 tonnes[13].

Further evidence of weak control comes from estimates that the TAC was exceeded by 62% between 2005 and 2011, representing around 112,000 tonnes of additional catches[15,16].

In 2006, a World Wide Fund for Nature-commissioned report found that EU, Libyan, and Turkish fleets were responsible for Illegal, Unreported, and Unregulated (IUU) catches equivalent to at least 40% of the 32,000-tonne ICCAT quota at the time. Most of these illegal catches were reportedly transported mainly to Japan[17]. The seriousness of the crisis was reflected in Monaco's 2009 proposal to list ABFT under CITES Appendix I, which would have banned international commercial trade, although the proposal was rejected in 2010[18]. In 2009, the Mediterranean population of ABFT was classified as endangered on the International Union for Conservation of Nature (IUCN) Red List, and in 2011, ABFT was globally classified as 'endangered'. Since 2008, ICCAT reduced quotas which supported stock recovery, and ABFT was reassessed globally as 'Least Concern' by the IUCN in 2021. However, the increase in farming capacity continues to raise transparency concerns: declared Mediterranean cage capacity has exceeded TAC levels, including in 2015, when capacity was over 53,000 tonnes against a TAC of 16,142 tonnes[18].

Therefore, rather than reducing pressure on wild ABFT, tuna farming has added more pressure on wild stocks and added a profitable and poorly transparent layer to the system.

Key figures:



How tuna farming could drive ABFT back to being at risk

The data presented in this report shows that tuna farming has been closely linked to the pressures that drove Atlantic bluefin tuna into severe overfishing. The seriousness of the overfishing was reflected in Monaco's 2009 proposal to list ABFT under CITES Appendix I, and IUCN classifying ABFT as an 'endangered' species.

Today:

1. Tuna farming has expanded substantially. Farmed ABFT production increased nearly 19-fold between 2003 and 2024, and more than doubled between 2008 and 2024. By 2024, reported farmed production was almost equal to reported wild capture. At the same time, licensed ABFT farming facilities increased from 13 in 2006 to 123 in 2026.

2. Purse seine catches have returned to historically high levels. In 2023 and 2024, reported catches reached 24,953 tonnes and 24,783 tonnesrespectively, almost identical to the 1994 to 1998 average of 24,874 tonnes per year, the highest catch period in the dataset. These recent catches are also around 29% higher than the 2004 to 2008 average of 19,258 tonnes per year, bringing catches back to levels comparable with those recorded before stricter ICCAT measures were introduced and Atlantic bluefin tuna were declared endangered by IUCN.

3. In addition, the reporting of tuna catches lacks sufficient transparency to record the actual numbers of ABFT accurately. Public datasets still do not provide gear-specific data, making it difficult to identify catches linked to farming. Reported tuna aquaculture production is inconsistent between FAO and Eurostat, and trade flows to Japan cannot be fully verified.

Collectively, the **expansion of farming capacity, renewed purse seine catches**, and **lack of transparent and accurate data** could drive **significant increases in overfishing** that led to the tuna becoming endangered in the 2000s. Unless action is taken, the future of ABFT could be at **serious risk.**

Atlantic bluefin tuna crowded inside a sea cage. (© CIWF)

4. Animal welfare issues

Atlantic bluefin tuna (ABFT) experience serious welfare risks at every stage of the current production system (**Figure 9**). As wild, non domesticated, fast swimming animals with high oxygen demands and regional endothermy, they are totally unsuited to farming systems[19,20].

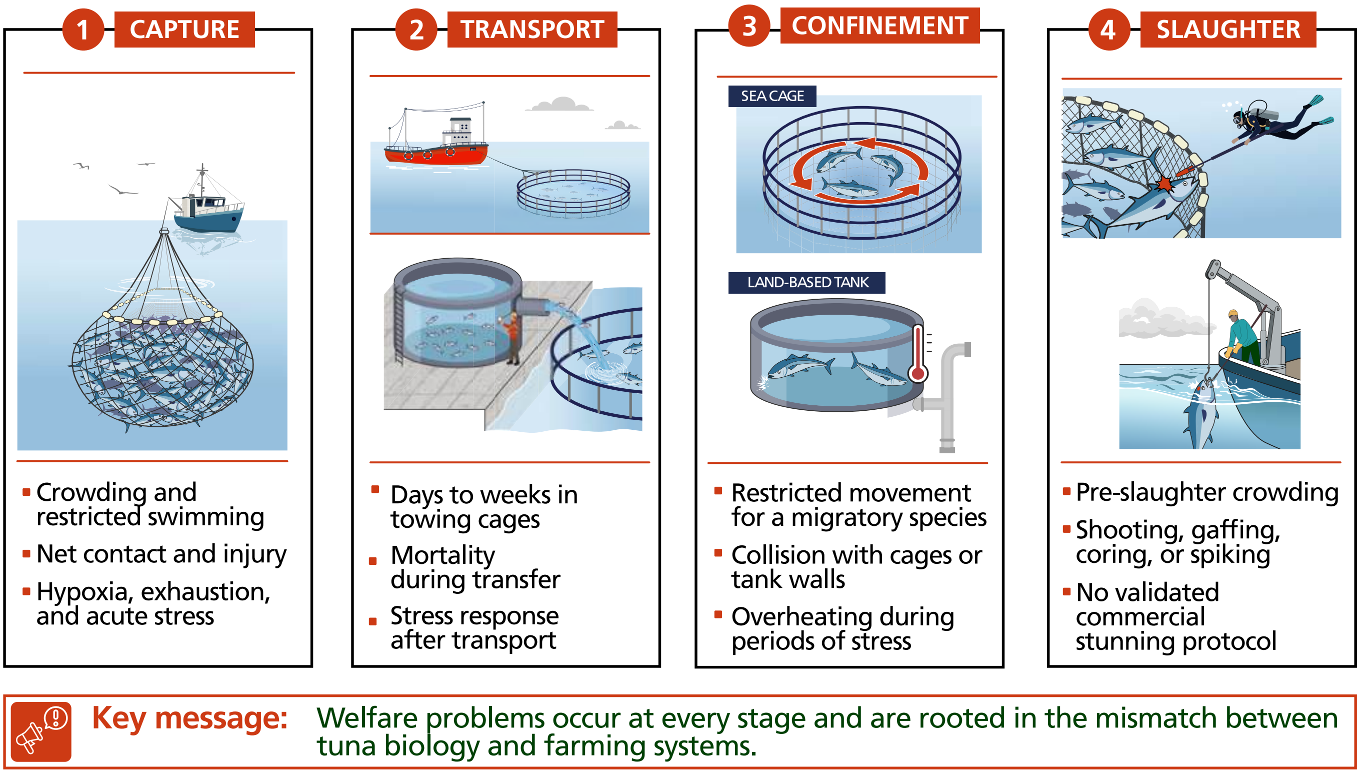


Figure 9. The main animal welfare issues in Atlantic bluefin tuna farming.

Capture

Purse seine capture exposes these sentient animals to acute stress from crowding, restricted swimming, physical contact with netting and other fish, hypoxia, and exhaustion from attempts to escape (Figure 9)[19]. Because ABFT must swim continuously to breathe and maintain balance, confinement during capture is especially stressful and harmful[19]. ABFT wild-caught individuals have not undergone any domestication process, making them especially vulnerable to suffering during this process[19].

Captive Atlantic bluefin tuna with severe skin damage on their face. (© CIWF)

Transport

After capture, live tuna are transported into towing cages to farms over periods ranging from days to months[10]. Already stressed, they face further handling, restricted movement, and altered water conditions (Figure 9). Reported mortality during transport and towing varies between countries and operations, but available figures indicate that this stage can cause substantial losses. In Spain, mortality during transport decreased from around 21% in 1995 to around 4% in 2000[21]. In Türkiye, transport mortality has been reported at around 10%, while in Croatia, mortalities during transfer to farms have been estimated at around 10% to 15%[21,22].

Closed cycle or hatchery-based systems face similar issues, where the transport of juveniles causes physiological stress and high post-transfer mortality[23]. Stress responses were observed regardless of transport distance, and nearly 50% of transported juveniles died within one week of being stocked in sea cages[23].

Confinement

At farms, ABFT are held in sea cages, severely restricting a species adapted for long distance migration and continuous swimming. Because ABFT must keep swimming to breathe efficiently, restricted space and crowding make confinement a physiological constraint, affecting oxygenation and elevating stress hormones[20,22] (Figure 9). Moreover, as regionally endothermic animals, handling and crowding can also cause overheating[22].

Land based systems improve environmental control but introduce wall collision risks for this fast swimming species (Figure 9), with poor low light vision[23,24]. Larval and juvenile survival remains extremely low, with less than 1% surviving for seven days and 0.44% surviving the first 30 days of life[20], due to sinking syndrome, cannibalism, disease, and stress from transfer between tanks[20].

Slaughter

The European Food Safety Authority (EFSA) identified pre-slaughter crowding as the main welfare hazard for farmed tuna[22]. Before slaughter, fish are concentrated into smaller spaces, exposing them to crowding, restricted swimming, handling, noise, food deprivation, and stressful conditions[22].

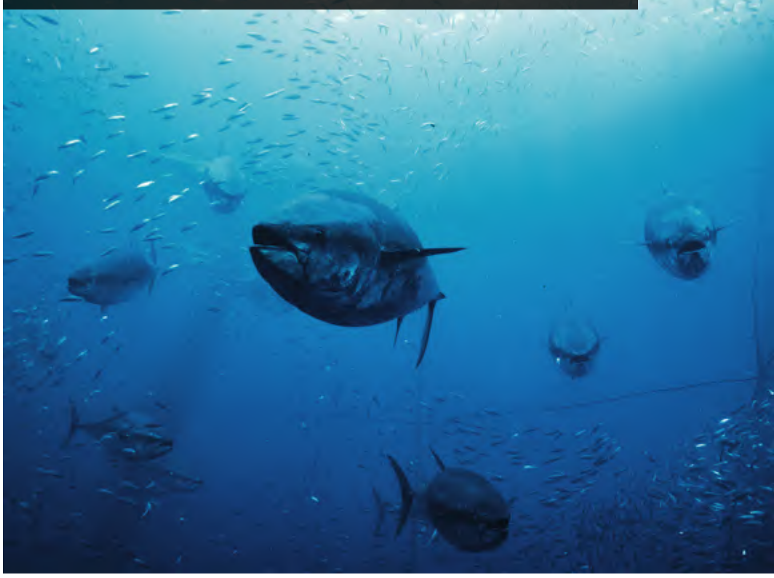
In the EU, the main slaughter methods are underwater shooting, shooting from the surface, and coring or spiking (killing methods that physically destroy the brain via a directly inserted spike or metal core)[22]. Underwater shooting is considered the least harmful option, but misaimed shots can occur, and immediate death is not always guaranteed. Surface shooting involves more intense crowding and higher stress before killing. Gaffing, impaling a fish with a hook, before spiking, raises major welfare concerns because it involves spearing the fish through the gills and lifting it to the surface while completely aware, followed by suffocation out of water and brain coring[22]. This is the most inhumane of the three slaughter methods[22]. The EFSA recommends developing welfare procedures and alternatives to gaffing conscious fish, although no validated commercial-scale stunning protocol yet exists for ABFT[22].

5. Public funding for tuna farming developments

Public funding has played an important role in supporting the development of Atlantic bluefin tuna (ABFT) farming in Europe. The projects identified in this report show that EU, national, and regional funds have been used to support research, infrastructure, technical development, and industry capacity linked to ABFT aquaculture.

Based on the available records compiled in Table 1 (**Annex**), at least €64.9 million in public or public-related financial support has been identified, which illustrates the scale of investment being directed towards more intensive production systems. The table also includes a separate €70 million investment in a land-based breeding facility aiming for commercial production by 2030[b].

Captive bluefin tuna feeding on small pelagic fish. (© CIWF)



b. https://www.mispeces.com/noticias/El-Proyecto-de-Next-Tuna-Spain-de-Castellon-mas-cerca-de-ver-la-luz/

Because this investment combines private and public funding, it has not been included in the final total. These figures should be treated as a rough and conservative estimate rather than a complete funding total. Transparency varies between funding portals; some national and institutional sources report only partial beneficiary-level amounts, and more recent ABFT-related funding is difficult to reconstruct from publicly available sources.

Public funding for ABFT farming has followed a clear shift from early research on domestication, reproduction, and larval rearing, to broader support for infrastructure, feed development, and commercialisation. This means that public money has not only supported basic scientific research, but it has also helped build a more intensive tuna farming industry. Future public funding should prioritise low-trophic aquaculture, such as bivalves and seaweed, which can provide ecological services while supporting sustainable food systems, food security, animal welfare, and coastal communities. This would help reduce pressure on wild fish stocks and align with the EU Strategic Guidelines for a more sustainable and competitive aquaculture sector.

6. Tuna farming sustainability concerns

Inefficient feed use and dependence on wild fish

Atlantic bluefin tuna (ABFT) farming remains dependent on wild fish, both for stocking farms and for feed. Most ABFT used for farming are caught alive during the reproduction season, when fishing pressure can affect spawning individuals and the future reproductive capacity of the stock[25]. Although ABFT may spawn during transport or in cages, stress can reduce spawning success, and the survival of eggs produced under these conditions remains unclear[25]. Reliance on wild tuna for stocking, together with the use of small pelagic fish (SPF) as feed, creates interconnected pressures on marine ecosystems and raises major sustainability concerns[12].

ABFT have high energy demands because they swim continuously, are active predators, and have elevated metabolic needs[9]. These biological traits make ABFT highly resource-intensive to farm, with very high Fish-In Fish-Out (FIFO) ratios and poor feed conversion efficiency[26-28]. As a result, they are generally fed whole SPF, including sardines, anchovies, herring, and mackerel, rather than formulated feeds based on fishmeal and fish oil (FMFO)[10].

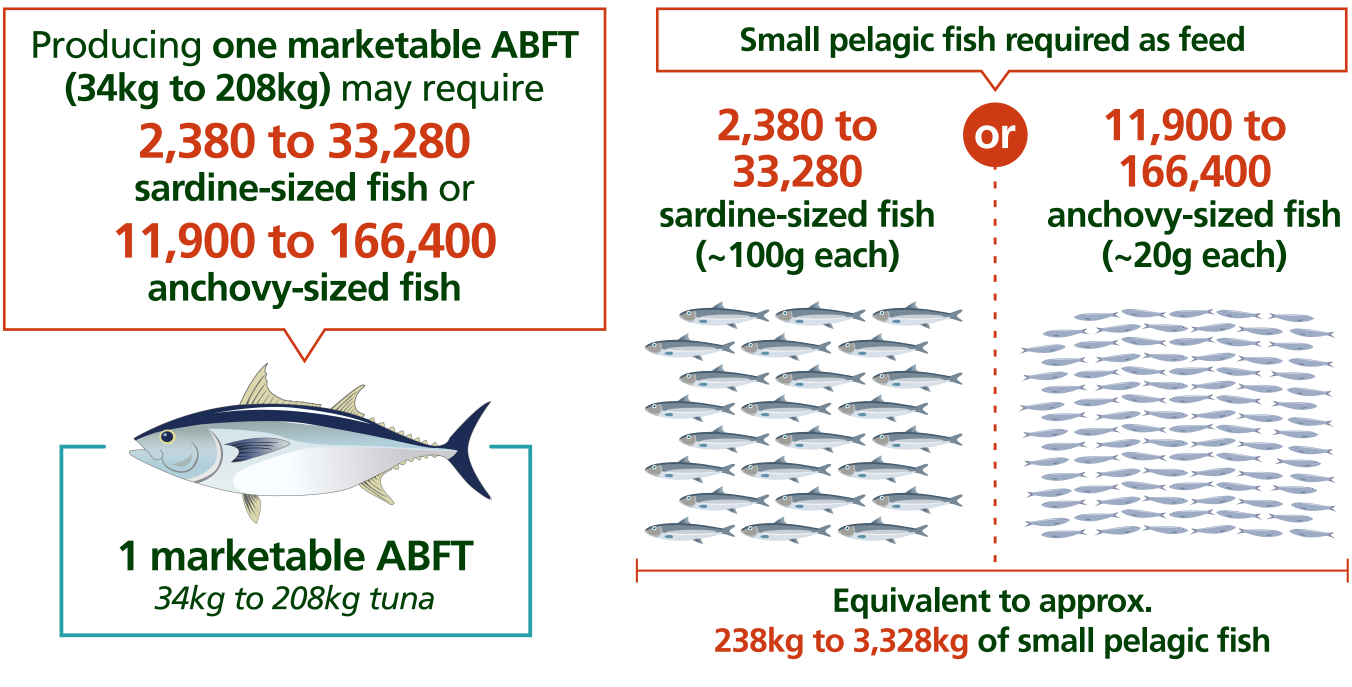


Figure 10. Estimated quantity of SPF required to produce marketable Atlantic bluefin tuna.

The FIFO ratio is estimated at 7.2 for ABFT fattening and 16.3 for full grow-out farming of juveniles, compared with around 0.96 for salmon and 0.11 for tilapia[29]. ABFT also convert feed inefficiently, with only around 5% of energy intake used for growth[27].

As a result, **producing 1kg of marketable ABFT** is estimated to **require about 7kg to 16kg of fish used as feed**[29].

Using typical weights for feed fish, this corresponds to roughly 70 to 160 wild fish per kilogram of farmed ABFT if they are sardine-sized (about 100g each), and around 350 to 800 fish per kilogram if they are anchovy-sized (about 20g each). When scaled to marketable tuna weights of 34kg to 208kg[30], a single farmed ABFT could therefore require approximately 238kg to 3,328kg of wild-caught fish as feed, equivalent to roughly 2,380 to 33,280 sardine-sized fish or 11,900 to 166,400 anchovy-sized fish (Figure 10). Beyond the inefficiency, this represents a major animal welfare concern, as billions of sentient wild fish suffer during capture, landing, and killing[31].


Aquaculture service vessel operating beside a tuna sea cage. (© CIWF)

Marine ecosystem concerns

ABFT farming relies on oily, nutrient-rich SPF, such as anchovies, sardines, herring and mackerel, to achieve the meat quality required by premium markets[10]. However, diverting large volumes of these wild fish raises sustainability concerns because SPF are valuable food resources and key components of marine ecosystems[11,29,32]. By feeding on plankton and being eaten by larger fish, marine mammals and seabirds, SPF transfer energy from the base of the food chain to higher trophic levels[33,34]. Therefore, their removal for feed reduces prey availability and contributes to wider ecosystem instability, particularly where SPF stocks are already under pressure[29,35]. Assessing these impacts is also complicated due to limited traceability. Feed fish may originate from local Mediterranean fisheries, EU waters, or imports from regions including North Africa, the UK, and Norway[10,32,36], but catch and trade records do not always identify where fish were originally harvested. For example, SPF caught in Mauritanian waters by a vessel flying a Dutch flag may be reported as Dutch catch, obscuring the true origin of fish entering feed supply chains[37]. This makes it difficult to evaluate the full ecological footprint of ABFT feed supply chains[37].

Local impacts

ABFT sea cages can affect marine environments through nutrient enrichment, from faecal matter and uneaten feed, alongside contamination from antibacterial agents, disinfectants, and antifouling chemicals[11,29]. Organic and particulate waste may accumulate beneath cages and can increase nitrogen, phosphorus, and sedimentation, affecting benthic communities[38–40], sometimes causing low-oxygen (anoxic) conditions. Compared with other Mediterranean aquaculture species such as European seabass (*Dicentrarchus labrax*), local impacts from ABFT waste may be lower because wasting whole-fish feeding is economically inefficient compared with pellet-based feeds, and farms are typically located offshore, in deeper waters where currents disperse and dilute localised contamination[39].

7. Food security and the Global South

Small pelagic fish (SPF) are central to Global South coastal communities, providing protein, essential fatty acids, and micronutrients, and ranking among the most nutritionally valuable seafoods[41]. They also support income and employment across fishing, processing, and trade sectors[42]. The diversion of SPF into aquaculture feed, particularly for ABFT farming, threatens food security in regions already facing food insecurity. In Sub-Saharan Africa, North Africa, and parts of the Mediterranean, reduced access to SPF may lower the availability of affordable protein and essential nutrients and increase pressure on small-scale fisheries[41,43].

European countries are major traders of SPF (sardines, herring, anchovies, and mackerel)[44,45]. Several ABFT-producing countries, including Türkiye, Malta, Spain, and Croatia, import SPF from regions where food-security concerns exist[44,45]. Morocco is one important example. Between 2022 and 2024, Moroccan sardines were mainly imported by Spain, Türkiye and Malta, while Malta imported substantial quantities of herring from Morocco and Türkiye[45]. Morocco was also the largest supplier of mackerel to Türkiye, Malta and Spain during this period[44]. These trade flows do not prove imported SPF are used for ABFT farming feed, because there is a lack of transparency in feed sourcing[46]. However, SPF imports raise questions about non-direct uses such as feed demand. Greater transparency is needed to identify where feed fish originate, how much is used for ABFT farming, and whether sourcing practices affect food availability in exporting regions.

Moreover, the benefits of ABFT farming are not evenly distributed. While the environmental and food system costs are concentrated in producing regions, much of the final product is exported to high-value markets elsewhere, such as Japan, the USA, and China[44]. The key question is whether it is appropriate to divert affordable, nutrient-rich wild fish into a resource-intensive production model that mainly serves high-income consumers, rather than supporting broader food security. These dynamics have direct implications for national food security, fisheries sustainability, and economic resilience, particularly in countries dependent on small pelagic fisheries.

Market vendor in Accra, Ghana (West Africa), selling small pelagic fish for human food. (© Renate-Wefers / iStock)

8. Regulatory challenges in tuna farming

The main legal international framework governing Atlantic bluefin tuna farming is the ICCAT management plan, which is translated into EU legislation through Regulation (EU) 2023/2053 (the Multiannual Management Plan for Bluefin Tuna in the Eastern Atlantic and Mediterranean). This legislation includes rules on authorised farms, caging operations, electronic catch documentation, observer coverage, stereoscopic camera controls, carry-over fish, and harvesting records. It is, therefore, mainly designed to establish quotas, trace tuna products, and prevent overexploitation and Illegal, Unreported and Unregulated (IUU) fishing, but it does not address the wider impacts of tuna farming, such as animal welfare, feed sourcing, feed transparency, and the capture of wild juveniles during the spawning period.

Animal welfare

Article 13 of the Treaty on the Functioning of the European Union requires the EU member states, when formulating and implementing policies on agriculture, fisheries and transport, to "pay full regard to the welfare requirements of animals". Given the serious welfare problems involved in capturing ABFT from the wild, transporting them, rearing them in sea cages, and slaughtering them, continued public funding, promotion, and policy support for ABFT farming is difficult to justify under this obligation.

Fish are also included within the EU's general farmed-animal welfare framework. Council Directive 98/58/EC applies to animals kept for farming purposes, including fish, and requires "member states to ensure that keepers take reasonable steps to protect welfare and avoid unnecessary pain, suffering or injury". However, EU law does not provide binding, species-specific welfare standards for farmed fish, including ABFT. As wild, highly migratory predators who must swim continuously to breathe and are vulnerable to overheating under stress, ABFT are unable to meet their basic physiological needs in sea cages or land-based tanks, contrary to the welfare principles reflected in Article 13 TFEU and Directive 98/58/EC.

EFSA has also found that no stunning methods are commercially applied to farmed ABFT in the EU, while current killing methods involve welfare risks including crowding, missed shots, gaffing, hoisting, asphyxia, pain and distress. This raises further concerns under Council Regulation 1099/2009, which requires "animals to be spared avoidable pain, distress and suffering during killing and related operations".

Feed

The EU feed law mainly addresses feed hygiene (Regulation (EC) No 183/2005), feed safety (Directive 2002/32/EC), the placing on the market and use of feed (Regulation (EC) No 767/2009), and basic traceability between immediate supplier and customer (Regulation (EC) No 178/2002. However, it does not require reporting details on the species used as feed, fishing area, or stock status. Due diligence requirements for feed manufacturers are only required for commodities linked to deforestation, such as soy (Regulation (EU) 2023/1115), but no similar requirements exist for wild-caught fish used as a feed ingredient. It also does not set a maximum Fish-In Fish-Out (FIFO) ratio for tuna feed, require a 'trimmings-first' sourcing approach, or prohibit feed ingredients from fisheries assessed as unsustainable. Therefore, EU regulation does not ensure that the wild fish used in tuna farms are sustainably sourced, traceable, or used efficiently.

Wild capture of juveniles

The default ICCAT minimum capture size is 30kg or 115cm, but explicit derogation allows smaller tuna to be captured by Croatia for farming purposes. Under ICCAT Recommendation 24-05, as implemented in Regulation (EU) 2023/2053, the minimum size can be reduced to 8kg/75cm for Croatian farming operations. Croatia is granted an additional tolerance, permitting catches down to 6.4kg/66cm. Capturing fish before they reach sexual maturity for commercial fattening creates a clear sustainability issue because reproductive juveniles are removed from the population and cannot contribute to the spawning stock. This conflicts with the EU's broader sustainability objectives under the Common Fisheries Policy (CFP), which generally supports the protection of juveniles through minimum conservation reference sizes.


Atlantic bluefin tuna landed after harvest. (© ajcabeza/ iStock)

Biodiversity

Tuna farming is also relevant within the broader international biodiversity framework. Under the Convention on Biological Diversity (CBD) and its Global Biodiversity Framework, countries are expected to develop and implement National Biodiversity Strategies and Action Plans (NBSAPs), setting out national measures to address pressures on biodiversity.

While these commitments are legally binding, every member state has sovereignty over its own biological resources, meaning that they may interpret their obligations in a way that suits their own national context. Every country is bound by international law to take and integrate a precautionary approach to emerging risks, and the principle is also enshrined in Article 191(2) of the Treaty on the Functioning of the EU (TFEU) and forms a fundamental pillar of EU environmental policy. However, we conclude that the principle is not being applied substantively to the expansion of carnivorous aquaculture either at the global, European or national levels. In this context, the issues identified in this report (particularly impacts on wild stocks, marine ecosystems, and food security) should be reflected both within the EU's own policy approach to the expansion of carnivorous aquaculture and at a national level by way of permitting, and national biodiversity planning and reporting processes.

9. Policy recommendations

Policy action on Atlantic bluefin tuna farming should be pursued through a combination of international biodiversity, fisheries, and regional governance frameworks. In particular, the Convention on Biological Diversity (CBD) provides a key entry point for integrating precautionary approaches into national biodiversity strategies and action plans (NBSAPs). While the EU already implements CBD commitments through its biodiversity framework, there remains a clear gap in how these commitments are applied to aquaculture. Carnivorous aquaculture systems, including tuna farming, should therefore be assessed within CBD-aligned biodiversity planning, particularly where they depend on wild capture and wild fish feed and may increase pressure on marine ecosystems.

Actions

- **An immediate, international moratorium** on new or expanded Atlantic bluefin tuna farms, with the aim of ending tuna farming, alongside an urgent assessment under CITES and IUCN reassessments of its global and Mediterranean conservation status.
- **Global, urgent action and guidance from the Convention on Biological Diversity (CBD) to member states** to take a precautionary approach on carnivorous aquaculture when delivering their national biodiversity plans.
- **Strengthened transparency and monitoring of catches**, farming, production and trade of the tuna, as well as the fish being used as feed.
- **Animal welfare assessments** to be required before any new carnivorous aquaculture farm permits are granted.
- **An end to harmful subsidies** by redirecting funds away from tuna farming and to regenerative and sustainable practices such as low-trophic species.

Atlantic bluefin tuna inside a sea cage. (© CIWF)

Annex

Table 1. ***Identified public funding for ABFT farming research, infrastructure, and industry development.***
ND = no data available. This means that the project was identified, but the amount of funding allocated to that specific project could not be found.

Country / source	Name of project	Amount (Euros)
EU	DOTT- Domestication of *Thunnus thynnus*, the Blue Fin Tuna. Strategies for European Development in the Context of a Global Market	100,000
EU	SELFDOTT - From capture based to SELF-sustained aquaculture and Domestication Of bluefin tuna, *Thunnus thynnus*	2,979,966
EU	TRANSDOTT - Translation of Domestication of *Thunnus thynnus* into an innovative commercial application	892,196
EU	REPRODOTT - Reproduction of the bluefin Tuna in Captivity	1,500,000
EU_FEMP	Next tuna RAS farm in Spain	59,062
EU-FEP	ALLOTUNA - Set up of an integrated system of the bluefin tuna (*Thunnus thynnus*) farming in the Gulf of Taranto	132,832
EU-FEP	TUNAFEED - Development of commercial diets for the cultivation of bluefin tuna (*Thunnus thynnus*)	120,000
Spain and EU	SIVATUN - development of a visual automated inspection to control the quality of the bluefin tuna meat	90,012
Spain and EU	ICAR- Infraestructura para el cultivo del atún rojo	248,000
Spain and EU	Advances in Domestication of Bluefin tuna. Capture and Domestication of the bluefin tuna juveniles (ADAR-AJAR)	582,767
Spain and EU	THYNNOS - Reproduction of Atlantic bluefin tuna (*Thunnus thynnus*) in culture conditions and production of fingerlings for grow out	11,584.35
Spain and EU	Mejora de la comercialización del atún rojo: promoción de productos, servicios y procesos JC Mackintosh	6,000,000
EU, Spain, private	Fase IV inversiones transformación de atún rojo del estrecho e instalaciones JC Mackintosh S.L.	70,000,000
Spain	NUTRITUNA	5,000
Spain	Requerimiento, metabolismo y biología molecular de los ácidos grasos esenciales de cadena larga durante el desarrollo del atún rojo atlántico (*Thunnus thynnus L.*)	ND
Spain	Piscicultura de atún rojo atlántico: cierre del ciclo y mejora de las condiciones	41,675
Spain	Características reproductoras y evaluación del potencial reproductor del atún rojo	70,265
Spain	Mejoras nutricionales en la producción de juveniles de atún rojo atlántico	75,020
Spain	Optimización de la producción de larvas y juveniles de atún rojo	151,250
Spain	Diagnóstico y control de parásitos de riesgo para la acuicultura de dorada y atún rojo en el Mediterráneo: trematodos sanguíneos y microsporidios	96,800
Spain	Apoyo técnico en la infraestructura para el cultivo del atún rojo (ICAR)	134,552

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Country / source	Name of project	Amount (Euros)
Spain	Apoyo en la tramitación de permisos para la colocación de jaulas de cultivo de atún en la costa vasca	42,600
Spain	Viabilidad conceptual de la combinación pesca y acuicultura marina para el abastecimiento de atún rojo (*Thunnus thynnus*) al mercado alimentario	82,038
Spain	CONECATUN	377,898
Spain	Proyecto piloto para la captura, transporte y mantenimiento de atunes jóvenes	ND
Spain	Desarrollo del cultivo integral del atún (*Thunnus thynnus*)	ND
Spain	Efecto del sistema de engorde y sacrificio sobre la calidad y la conservación del atún rojo	ND
Spain	Aplicación de las técnicas de cultivo de atún rojo	ND
Italy	Desarrollo de una dieta y protocolo de destete para atún	42,375
Greece	Mejoras nutricionales en la producción de juveniles de atún rojo atlántico (*Thunnus thynnus*): aspectos básicos y moleculares	97,000
Greece	Parásitos del atún rojo atlántico oriental (*Thunnus thynnus*) en poblaciones naturales y en cautividad. Comunidades y patologías asociadas	190,000
Malta (approved by the EU Commission)	State aid for the strengthening of the Bluefin tuna industry Malta	50,000,000
TOTAL AMOUNT		**64,895,563.00**

Captive Atlantic bluefin tuna feeding on small pelagic feed fish. (© CIWF)

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Caught Atlantic bluefin tuna hanging from ropes during unloading at the port. (© Alexandre Dulaunoy - Flickr (CC BY-SA 2.0)

Close-up of a captive Atlantic bluefin tuna beside a sea cage net. (© CIWF)

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