

## 10 Blue jack mackerel (*Trachurus picturatus*) in Subdivision 10.a.2 (Azores grounds)

The blue jack mackerel, *Trachurus picturatus* Bowdich, 1825 (*Carangidae*), is the only species of genus *Trachurus* that occurs in the Azores region (northeastern Atlantic). It is a pelagic species found around the islands' shelves, banks, and seamounts up to 300 m in depth. However, a different size structure was observed between the islands' shelf and offshore areas. The island shelf areas seem to function as nursery or growth zones, while the seamount/bank offshore areas act as feeding zones where adults predominate (Menezes et al., 2006).

In the Azores, the *T. picturatus* is exploited by different fleets and métiers. The main catches are those of the artisanal fleet that operates with several types of surface nets, the most important being the purse-seines. Also, bottom longline and handline fisheries catch this species, but not as a target species. Purse-seines are also used by the tuna bait boat fleet, which targets the *T. picturatus* to be used as live bait for tuna. The blue jack mackerel is also popular among recreational anglers who fish along the islands' coast.

The *T. picturatus* landings were considerably high during the 1980s. However, changes in the local markets lead to a substantial reduction in the catches afterwards. This reduction was accompanied by a sharp decrease in the fleet targeting small pelagic fishes. Since then, the yields have maintained a low level due to a voluntary auto regulation adopted by the fishermen's associations and later (since 2014) limited by local regulations with conditioned daily catch limits. Despite this landings reduction, this fishery still strongly impacts some fishers communities, which directly depend on this fishery's income.

### 10.1. Blue Jack Mackerel in ICES areas

The blue jack mackerel has a broad geographical distribution within the Eastern Atlantic waters and can be found from the southern Bay of Biscay to south Morocco, including the Macaronesia archipelagos, Tristan de Cunha and Gough Islands and also in the western part of the Mediterranean Sea and the Black Sea (Smith-Vaniz, 1986). It's a pelagic fish species whose characteristic habitat includes the neritic zones of island shelves, banks, and seamounts (Smith-Vaniz, 1986). It has a shoal behaviour and preys mainly on crustaceans—common in Madeira, the Azores, the Canaries and Portuguese continental waters.

So far, no studies have been attempted to address distinct populations in this species' distribution range. Some studies on growth and biological characteristics from Madeira, Azores, and the Canary islands (Garcia et al., 2015; Isidro, 1990; Jesus, 1992; Gouveia, 1993; Vasconcelos *et al.*, 2006; Jurado-Ruzafa & Santamaría, 2013) indicated similar growth-rates and reproductive season. However, biological differences in age at first maturity seem to exist between individuals from the Azores compared with those from the Madeira and Canary Islands (Jesus, 1992; Jurado-Ruzafa & Santamaría, 2013). The morphometric studies on *T. picturatus* from the Azores archipelago (Isidro, 1990), the west coast coast of Portugal (Mendes et al., 2004) and the western Mediterranean (Merella et al., 1997) revealed similar population parameters for the estimated relationships. On the contrary, some variation was found between different geographic areas in the number of soft spines from the second dorsal fin (Shabonev & Kotlyar 1979; Smith-Vaniz, 1986). However, meristic characters are heavily influenced by the environmental conditions experienced by the fish while in the larval stages. Therefore, in the case of migratory oceanic species, such as *T. picturatus*, they are usually considered of reduced utility for identifying stock units.

Several studies have successfully used parasites as biological markers. Gaevskaya and Kovaleva (1985) conducted a research survey on the parasites of *T. picturatus* from the Azores and Western Sahara. Their study identified some protozoan and helminth parasites showing differences in prevalence. The myxosporean *Kudoa nova* was found in Western Sahara samples but not in the Azores archipelago banks. Similarly, some digeneans (Platyhelminths: *Digenea*) found in the Azores banks were not observed in the samples from Western Sahara and vice-versa. The apicomplexan, *Goussia cruciata*, which is common in *T. picturatus* from the Mediterranean (Kalfa-Papaioannou & Athanassopoulou-Raptopoulou, 1984) and more recently from Madeira waters (Gonçalves, 1996), was not found in the Azores or Western Sahara. These variations in the occurrence of parasites could indicate the existence of different populations of *T. picturatus*. Further studies on helminth parasite occurrence showed differences in species diversity and parasitic infection levels (Costa *et al.* 2000, 2003).

The blue jack mackerel is an economically vital resource, especially in the Macaronesian islands of Azores and Madeira, where it is the main pelagic fish species caught by the local (artisanal) fisheries. The hypothesis that the fluctuations in landings can be due to changes in availability or abundance, and not just by changes in fishing effort, is supported for the Portuguese mainland by observing fluctuations in the abundance indices obtained from demersal research surveys.

## 10.2. The fishery in 2021

Official landings for 2021 include commercial landings from small purse-seiners (and other surrounding nets), landings from hooks and lines *métiers*, and unsold purse-seine landings withdrawn at the port (daily catch limits) and used as bait on longline and handline fisheries.

Other catches include longline bait, tuna (live) bait, and recreational catches. In 2021 estimates of recreational catches are available for recreational boat fishing. Estimates for shore recreational anglers are still unavailable.

### 10.1.1 10.2.1. Fishing Fleets

*Trachurus picturatus* is mostly landed by the artisanal fleet, using purse-seines and other surrounding nets, targeting juveniles. In 2021, the total number of vessels licensed to small pelagic fish was 179, and the landings of this fleet represented around 85% of total blue jack mackerel (official) landings in the Azores.

Despite having a license to fish small pelagics, many of these vessels carry out multipurpose artisanal fishing, which varies between lifting gears, hook gears and, often, even traps and gill-nets. They are often (and for this reason) classified as polyvalent vessels and not as vessels mainly using purse-seines.

The artisanal purse-seines fleet comprises small open deck vessels, mostly with less than 12 meters of overall length, targeting juveniles of *T. picturatus*. Included in this group of vessels (licensed for this fishing gear) is the proper "mackerel fleet" – vessels dedicated exclusively to capturing small pelagics and of which the blue jack mackerel is the predominant target species. The active "Mackerel fleet" composition shows a regular decrease in recent years, from around 50 vessels in 2010 to 24 in 2021. The number of small purse-seine vessels and the number of vessels of the "Mackerel fleet" for the last twenty-five years is shown in Figure 10.2.1.1.

The longline and handline fleets catch around 15% of the total official landings of *T. picturatus*. These fleets catch the adult stock mainly to use it as bait to catch other demersal species with high economic value. Only the excedent is landed.

### 10.1.2 10.2.2. Catches

Catches of blue jack mackerel, including landings (from artisanal purse-seines, longliners & handliners) and other catches (longline bait plus discards from the longline fishery, tuna live bait, and recreational catches) from 1978 to 2021, are presented in Table 10.2.2.1. Purse-seine catches over daily sales limits are withdrawn from the human consumption market and recorded as fish for bait (but also with daily limits). These catches have been included in official landings only since 2018.

Total average yearly catches of blue jack mackerel in the Azores for the period 2000-2021 are shown in Figure 10.2.2.1. The average annual catches of blue jack mackerel in the Azores for 2000-2021 are around 1700 tonnes, while official landings in the same period are, on average, 1000 tonnes. Despite this relative stability, there has been a downward trend in official landings over the last ten years, which average around 800 tons.

In the tuna fleet, live bait catches (*Trachurus picturatus*) are related to the occurrence of tuna – years with a shortage of tuna will reflect small catches of live bait. Concerning longliners, the changes in yields observed in recent years are mainly related to the use and even preference of this species for bait (since the quality of the bait is high) and not to landings (since the market price for adults tends to be lower).

The year 2019 stands out as a year in which a value was higher than the average of the last ten years, which is due, in particular, to the great abundance of juveniles that year. This resulted in significant landings exceeding the established daily sales limits, so excedent catches were withdrawn from the human consumption market and stored as bait fish. Some decrease that occurred in 2020 is justified by the pandemic experienced worldwide caused by COVID-19, which caused several stoppages in the fisheries sector. In 2021, this situation seems to have been overcome, with the values regularising to the last decade's average values.

### 10.1.3 10.2.3. Effort

The nominal fishing effort (number of fishing days) for the main fleet (active artisanal purse-seiners – "Mackerel fleet") for 2010 – 2021 is presented in Figure 10.2.3.1. In 2021, the number of trips of only 21 of these vessels represented 95% of the total number of official landings of blue jack mackerel in the Azores. The landings of these 21 vessels represented about 70% of the value and weight (official) of blue jack mackerel landed.

Nominal LPUE (landings per unit effort) for the Sao Miguel and Terceira islands purse-seine fleet, which represents, on average, 90% of the landings of the artisanal purse-seine fleet, has increased slightly in the last years (Figure 10.2.3.2). However, the validity of these indices needs to be further studied.

## 10.3. Basis of the advice

In 2018, the stock category of *Trachurus picturatus* in 10.a.2 changed from category 3 to category 5, and a precautionary buffer of 20% was applied to the advised catches. The reasons pointed out were that:

- (i) Different length-based reference points were explored but were not found appropriate since catches from the different fisheries do not represent the full-length composition of the stock;

- (ii) stock size indicators previously used (directed fishery from artisanal purse-seiners and bait for tuna fishery) target only juveniles, thus probably are not reflecting the whole dynamics of the stock;
- (iii) handliners and longliners were targeting adults, although they seem minor compared to purse-seiners;
- (iv) and no data available from tuna bait, recreational fishery, and longline (bait) fisheries were available in the previous assessment for 2016 and 2017.

Since then, the advice for blue jack mackerel in Azores grounds is based on the ICES framework for category 5 stocks (ICES, 2012) and it's provided every two years.

## 10.4. Catch scenarios for 2023 and 2024

The advice for this stock is biennial, so the 2022 advice is valid for 2023 and 2024: *ICES advises that when the precautionary approach is applied, catches should be no more than 702 tonnes in each of the years 2023 and 2024.*

ICES framework for category 5 stocks was applied (ICES, 2012). ICES cannot assess the stock and exploitation status relative to MSY and precautionary approach (PA) reference points because the information to define reference points is not available. For stocks without information on abundance or exploitation, ICES considers that a precautionary reduction of catches should be implemented where there is no ancillary information clearly indicating that the current level of exploitation is appropriate to the stock. The PA buffer was not applied since 2018 and therefore was applied this year.

## 10.5. Management considerations

The Azores Administration put in place in October 2014 (and last updated in 2018) a specific management measure (local regulations with daily catch limits) for the purse-seine fleet and human consumption, primarily to regulate markets. This measure allows only 200kg or 300kg of catch per vessel, per day, depending on the island (Sao Miguel or Terceira islands – once the landings of juvenile blue jack mackerel on these islands represent more than 95% of the total landings of the artisanal purse-seine fleet). It also states that fishing and consequent landings shall be forbidden on weekends and set quantities for unsold purse-seine landings withdrawn at the port.

## 10.6. Suggested inter-seasonal work

In 2019, the Working Group discussed different (or complementary) approaches that could have been taken into account for the 2020 assessment and proposed intersessional work. However, due to COVID-19, much of the work was not put into practice. The 2022 Working Group updated the suggestions for intersessional work:

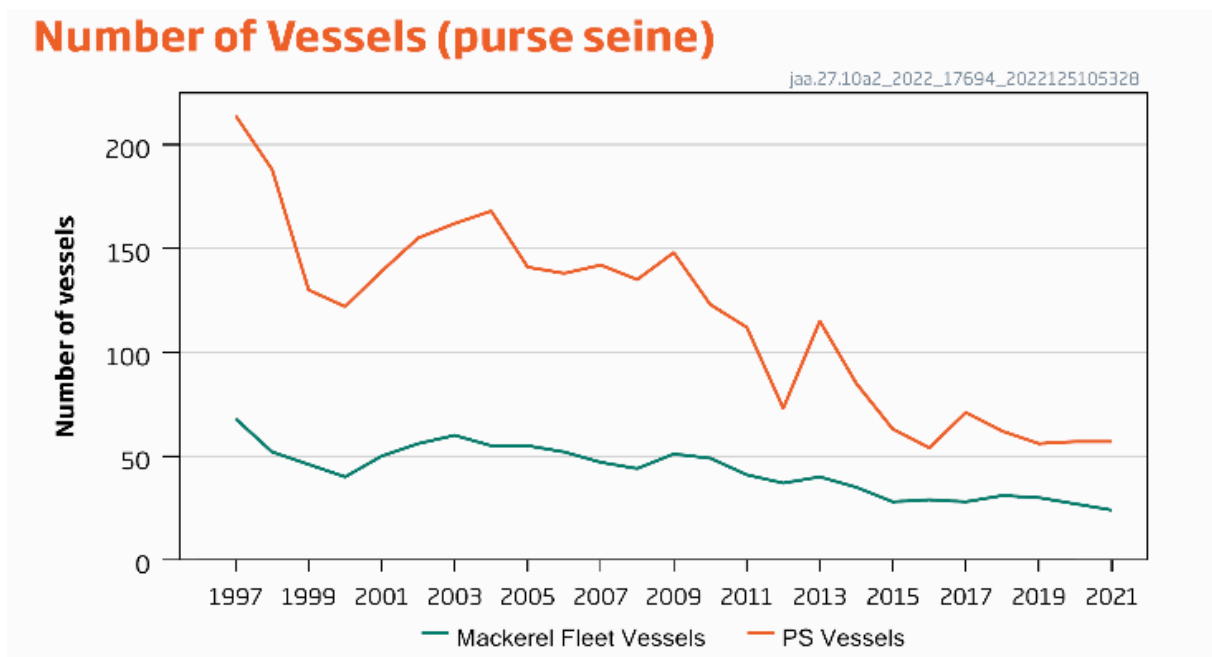
- Continue track of (Catch, effort) CPUE indexes of different fleets;
- Explore alternative indicators for the purse-seiners, e.g. the number of times the maximum daily catches were reached, etc.;
- Use the market selling records of the small purse-seiners targeting blue jack mackerel to compute indicators of availability as the number of days when the maximum daily allowable catch of blue jack mackerel is landed by the vessels

(per month or annually) in relation to the number of fishing days by month of every particular vessel;

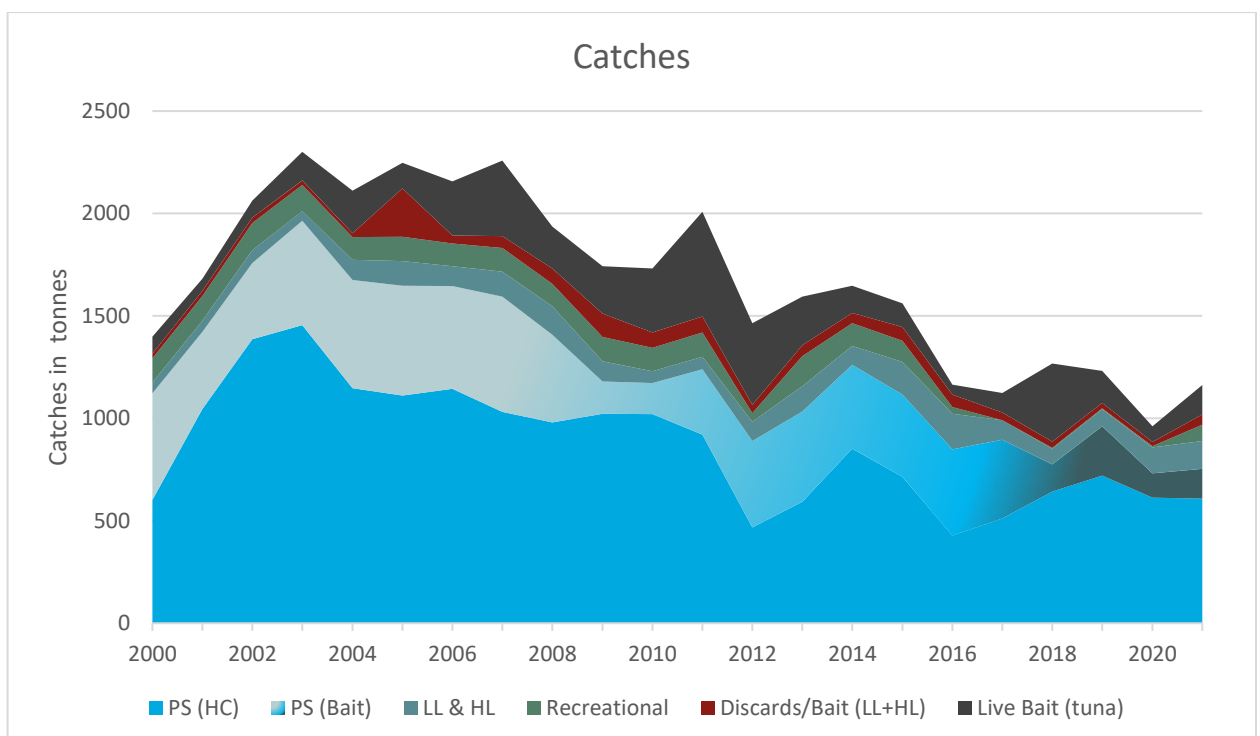
- Relate the former to the maximum catch of other species being landed so that some definition of métier might be derived or inferred for the daily fishing trips. This can potentially distinguish the number of fishing days targeting blue jack mackerel from those targeting other species.
- Monitor and track in time catch length distributions (for any purpose, including landings or selling as live bait, bait for hooks or discards) of different fleets;
- To assess growth (Von Bertalanffy) parameters of blue Jack mackerel;
- Try length-based methods, but with some changes from what has been done in the past: for example, (i) using the longline length distribution series to verify stability in the length or age distribution; (ii) use any trends in mean length or age composition as an indicator of overall population mortality; (iii) use these series as an indicator of global (medium-term) changes in overall exploitation on the stock.
- Check whether other fisheries may or may not serve as an overall mortality indicator or an alarm indicator if normal series variability deviates.

## 10.7. References

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**Figure 10.2.1.1.** Blue jack mackerel in Azores grounds. Number of small purse-seine vessels and the number of vessels of the "Mackerel fleet" in the Azores (ICES Subdivision 10.a2) from 1997 to 2021.



**Figure 10.2.2.1.** Blue jack mackerel in Azores grounds. Landings and other catches. Landings include purse-seine catches for human consumption – PS (HC) – purse-seine catches for bait – PS (Bait) – and have unsold purse-seine landings withdrawn at the port as well as longline and handline landings (LL & HL). Other catches include recreational catches, discards/longline bait, and tuna live bait.

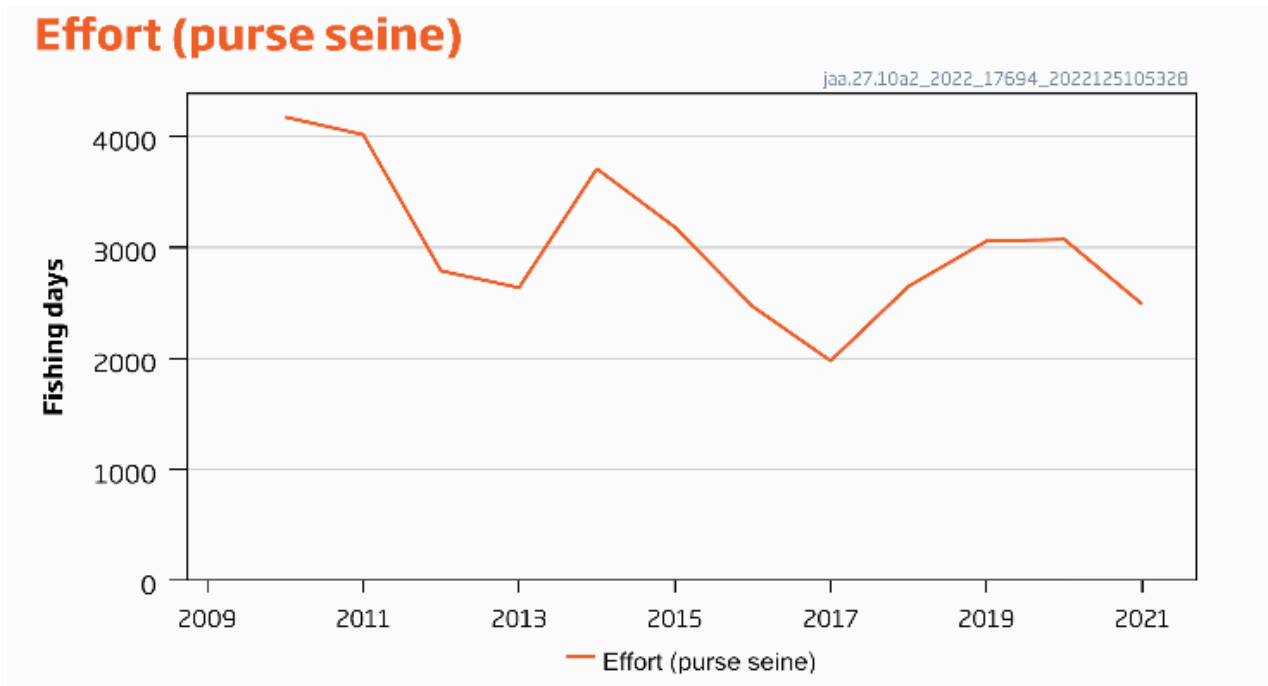


Figure 10.2.3.1. Blue jack mackerel in Azores grounds. Nominal effort (number of Fishing days) of the "Mackerel fleet" for 2010 – 2021.

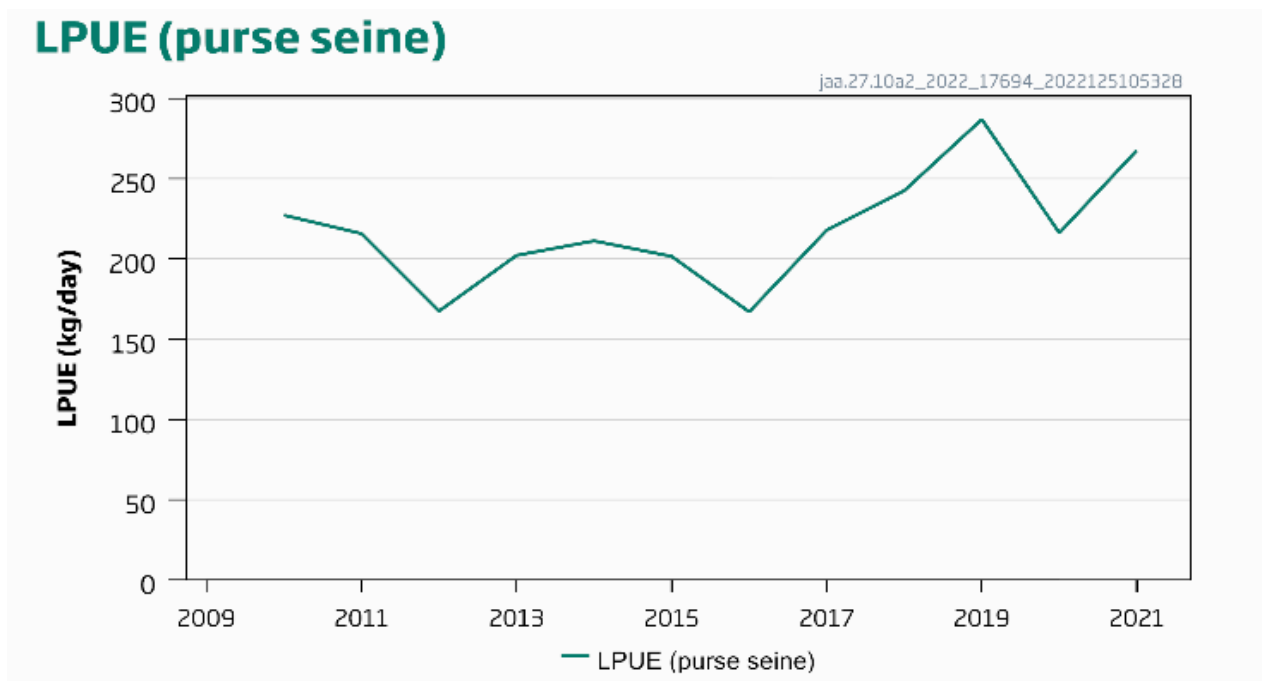


Figure 10.2.3.2. Blue jack mackerel in Azores grounds. Nominal LPUE (kg/day) of the "Mackerel fleet" for 2010 – 2021.

**Table 10.2.2.1. Blue jack mackerel in Azores grounds. History of catches (in tonnes) of blue jack mackerel (*Trachurus picturatus*) in Subdivision 10.a.2.**

Year	Official landings			Additional catches				Total ICES catches
	Purse-seine (human consumption)	Purse-seine (withdrawn at the port and used for bait) <sup>1</sup>	Longline + handline	Recreational	Longline (discards and used for bait)	Tuna bait	Purse-seine (withdrawn at the port and used for bait) <sup>1</sup>	
1978	2657		78	129	15	115	0	2995
1979	4114		61	130	15	118	0	4439
1980	2920		70	132	22	210	0	3354
1981	2104		39	135	9	229	0	2516
1982	2429		43	142	10	239	0	2862
1983	3711		67	142	21	231	0	4172
1984	3180		62	135	17	295	0	3689
1985	3442		60	136	11	303	0	3952
1986	3282		58	135	9	433	0	3918
1987	2974		53	139	8	491	0	3666
1988	3032		55	143	8	586	0	3824
1989	2824		50	138	9	352	0	3373
1990	2472		48	117	11	345	584	3577
1991	1247		33	115	6	242	421	2064
1992	1226		35	121	6	249	486	2123
1993	1684		70	130	22	375	742	3023
1994	1745		59	125	18	264	636	2847
1995	1769		79	119	24	474	688	3153
1996	1642		123	110	38	351	656	2920
1997	1849		72	110	31	259	599	2920
1998	1387		120	111	52	308	606	2584
1999	609		84	119	37	141	565	1555
2000	602		53	117	23	83	521	1399
2001	1046		55	121	24	59	376	1681
2002	1387		63	132	28	82	371	2063
2003	1455		47	128	21	140	510	2301
2004	1148		98	111	19	208	528	2112
2005	1111		120	120	236	124	536	2247
2006	1145		96	111	40	264	501	2157
2007	1032		122	115	58	370	562	2259
2008	980		139	110	75	205	428	1937
2009	1023		98	119	115	230	157	1742
2010	1021		57	114	75	313	152	1732
2011	920		62	118	79	510	319	2008
2012	467		94	42	41	399	422	1465
2013	592		123	147	54	237	441	1594
2014	852		91	112	49	134	410	1648
2015	714		160	103	67	116	402	1562
2016	428		174	32	61	48	421	1164
2017	511		95	N/A	37	96	385	1124
2018	643	132	77	4	31	381		1268
2019	720	241	83	5	26	156		1231
2020	613	119	127	5	21	77		962
2021	609	145	135	81	57	143		1170

<sup>1</sup> Purse seine catches in excess of daily sales limits are withdrawn from the human consumption market but are recorded as fish for bait. Starting in 2018, these catches are included in official landings.