

## POLAND'S FISHERIES CATCHES IN THE BALTIC SEA (1950-2007)<sup>1</sup>

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### ABSTRACT

Total marine fisheries catches in the Baltic Sea by Poland were estimated from 1950-2007 using a method called 'catch reconstruction'. Using ICES landing statistics (which have included Polish catches since 1955) as our reported data baseline, we created a more comprehensive catch-data time-series that accounts for 'adjustments to ICES landing statistics' (from sources such as ICES working group stock assessment reports and the Polish Maritime Industry), unreported ('unallocated') landings, discards, and recreational catches. ICES attributes approximately 7 million tonnes of fish to Poland from 1950-2007, our reconstruction for the same time period estimated 9.5 million tonnes, an increase of 35%. Unreported landings of cod (*Gadus morhua*) seem to be a major problem in Poland, and our reconstruction estimates almost 1 million tonnes landed illegally between 1990 and 2007. Despite this, we still believe this reconstruction remains a conservative estimate of the true rate of marine resource exploitation by Poland in the Baltic Sea. Baltic Sea fish stocks have shown significant changes since 1950, and strategies such as increased data collection to include all fishery sectors, increased accountability and transparency at the decision-making level in an ecosystem-based management context, and increased compliance with fishing restrictions, would all increase the chances of the stocks' recovery.

### INTRODUCTION

Poland is located on the south coast of the Baltic Sea (Figure 1) with a total land area of 312,679 km<sup>2</sup> and a population of approximately 38 million (Anon., 2009a). The capital city, Warsaw, is situated near the centre of the country, about 450km from the coast. Poland is bordered by Germany to the west, the Czech Republic and Slovakia to the south, and Ukraine, Belarus, Russia and Lithuania to the east (Figure 1). After WWII, Poland was aligned with the Eastern Bloc. In 1989, the country transformed to a free market economy, completing its economic transition by joining the European Union (EU) in 2004. Poland is considered the most successful post-communist country in eastern Europe, with an annual economic growth rate of over 6.0% (Ram, 2007). Fisheries have never contributed significantly to the economy, but the industry is deemed important to the social fabric, especially in coastal areas (FAO, 2007). There are three main sectors: 1) deep-sea trawlers; 2) cutter fisheries; and 3) coastal boat



**Figure 1.** Map of the Baltic Sea with ICES subdivisions and surrounding countries. Poland's coastline borders ICES subdivisions 24, 25 and 26.

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fisheries. Deep-sea trawlers operate exclusively in the north Atlantic, east Atlantic, and Antarctic. Cutter vessels contribute approximately 88% of Polish reported landings in the Baltic, with coastal vessels (considered artisanal) contributing the remaining 12%. This report will address only those catches of coastal, cutter, and recreational fisheries in the Baltic, which operate mainly in ICES sub-divisions 24-26 (Figure 1).

Overall, Poland obtains more than 80% of its reported landings from the Baltic (Anon., 2008). According to the International Council for the Exploration of the Sea (ICES, 2009a), Poland's landings are mainly comprised of three species: sprat (*Sprattus sprattus*); herring (*Clupea harengus*); and cod (*Gadus morhua*). Overall, Poland's landings increased steadily from the 1950s-1970s, experienced a brief decline through privatization of the industry in the 1990s, and increased slightly in the early 2000s.

Since Poland joined the EU in 2004, landings have declined overall for a number of reasons. These include the EU fleet capacity reduction programme, rising fuel costs, falling fish prices and decreasing shares of EU Total Allowable Catches (TACs) for cod; Poland's most economically important species. Since 2004, the entire Baltic fleet has been reduced from 1,374 vessels, to 866 vessels (Anon., 2006b; 2008). In 2005, reported landings of the cutter fleet consisted predominantly of sprat (68%), herring (17%), and cod (11%; FAO, 2009) which were caught with gillnets, hooks and trawls. Boats of the coastal fleet are generally less than 15 m, and primarily use gillnets within 12 nautical miles of the shore. The reported landings of these vessels in 2005 were cod (28%), flatfishes (27%), and herring (22%; FAO, 2009). Poland has a flounder-directed (*Platichthys flesus*) gillnet fishery which operates predominantly within ICES sub-division 25 (Figure 1; ICES, 2005b).

Historically, all Polish landings were reported from ICES division IIIId (prior to 1980). In 1978, reporting by ICES subdivision was initiated in the Baltic (ICES, 1995). ICES division IIIId became equivalent to ICES subdivisions 24-32, which represents the Baltic Sea (Figure 1; Table 1). ICES divisions IIIb and IIIc are equivalent to ICES sub divisions 23 and 22, respectively (Figure 1; Table 1), and are collectively known as the 'transition zone' between the Skagerrak and Baltic Sea (ICES, 1995). Since reporting by subdivision began, Poland has reported roughly equal landings from subdivisions 25 and 26 (about 45% of the Polish total in each) and a small portion (about 10%) in subdivision 24 (Table 2). In the 2000s, a very small amount of sprat was reported from subdivisions 27, 28 and 29 (Table 2).

Sport and recreational fishing began in the late 1980s. It became more popular after 1993, when some fishers converted their commercial cutters into recreational tour boats fishing for cod (Radtke and Dabrowski, 2007). A severe lack of quantitative record exists, however a restrictive quota was created in 2004 to control angling of cod to some extent. An initiative to distribute public surveys seeks to obtain further information regarding recreational fishing activities (ICES, 2005a).

Before 1989, Poland administered the regulations of the Baltic Sea Commission (CPMR), and all fish sold on local markets were distributed through the government-owned company, Centrala Rybna. All exports and imports were managed by Rybex, which was also government-owned. Privatization of the fishing industry reduced the number of nationally owned vessels from 226 in the early 1990s, to 8 in 2006. Though privatization in the 1990s had seemingly little effect on reported landings, IUU (Illegal, Unreported and Unregulated fishing) were reportedly non-existent in Poland prior to the early 1990s

**Table 1.** ICES divisions and corresponding subdivisions representing the Danish Sound, Belt and Baltic Sea. Source: (ICES, 1987).

ICES Division	ICES Subdivision
IIIb- Sound	23
IIIc- Belt Sea	22
IIId- Baltic Sea	24-32

**Table 2.** Percent distribution of Poland's reported landings by ICES subdivision, by decade (1980-2007). Prior to 1980 all landings were reported from ICES division IIIId. Data source: (ICES, 2009).

Fishing area	Reported landings (%)		
	1980-1989	1990-1999	2000-2007
ICES Division <sup>a</sup>			
IIId	37.0	n/a <sup>b</sup>	n/a <sup>b</sup>
ICES Subdivision			
24	6.6	9.9	8.4
25	30.7	46.1	46.7
26	25.9	44.1	44.8
27	0.0	0.0	0.03
28	0.0	0.0	0.05
29	0.0	0.0	0.03

<sup>a</sup> historically, landings were reported by ICES division as opposed to subdivision. In 1978, reporting began by subdivision (ICES, 1987). Consequently, some reporting in the 1980s is by division and some by subdivision. <sup>b</sup> not-applicable.

(Anon., pers. comm.).<sup>2</sup> Historically, fishers had strict quotas and were required to land their catches along with detailed reports at national collection points. Fishers were thus unable to sell directly to the market, which made IUU fishing unprofitable (Anon., pers. comm.). Poland joined the EU in 2004 and became subject to the rules of the Common Fisheries Policy (CFP). This included a reduction in fleet capacity and a new TAC system which consequently, made over-fishing and underreporting very economical for private fishers, and especially those targeting cod. The EU commission banned Poland from cod fishing after discovering one particular fisher had registered only 1/3 of cod landings in the first semester of 2007 (Anon., pers. comm.). The country is now being forced to make up for underreported landings with additional reductions to Poland's current share of the TAC for cod. ICES estimates underreporting in the Polish cod fishery ranges between 35-45% (Anon., pers. comm.), the World Wildlife Fund 50% (Anon., 2009b), and an estimate of more than 300% was obtained from a highly reliable anonymous source interviewed in 2008.

In the first half of the 1970s, Poland's cod fishery was one of the most important of its kind in the Baltic. Polish landings accounted for 30% of the total cod landings from the Baltic, and about 38% of these were taken from the eastern stock (Subdivisions 25-32; ICES, 1995). These stocks are now considered to be in the worst condition of any cod in the Baltic, and thus the majority of Poland's management schemes are concerned with the conservation of this species. Minimum mesh size, landing size, closed areas and seasons are being used as current management controls on cod fishing. The introduction of the Bacoma trawl in 2004 has also helped to reduce bycatch of juvenile cod (FAO, 2007). Polish fishers have displayed very strong opposition to fishing bans as well as the repercussions associated with unregulated and underreported fishing. They argue that even with increased individual fishing quotas, the reduction in fleet capacity in combination with low overall TACs for commercial species, and high fuel prices have made fishing unprofitable. Although Poland's share of EU quotas for cod have been exceeded consistently since 2004, their TACs for herring and sprat are often left unfulfilled (up to 50%). This is due to the low prices for herring and sprat in comparison to cod, as well as the increased imports from countries such as Norway. Despite these drawbacks to marine fisheries, the processing sector in Poland has grown consistently since 2004 (FAO, 2009).

The purpose of this study is to provide an estimate of Poland's total fisheries catches (in contrast to reported landings) in the Baltic Sea from 1950-2007. The 'ICES catch statistics database' provides landings data for Poland from 1955-2007 (ICES, 2009a). These data are reported landings only, with no apparent effort to fully represent the total catch (which would account for IUU as well as reported landings). Therefore, for the purposes of this report the ICES catch statistics will be referred to as ICES 'landings statistics' to better reflect the nature of the data. Estimates of IUU in this study include data source adjustments to reported landings, unreported (referred to as 'unallocated' by ICES) landings, discards, and recreational catches. Our approach utilizes previously reported data by ICES, a review of the academic and grey literature, as well as correspondence with local experts. Our correspondence with local authorities entailed high degrees of desired anonymity by those interviewed. We would like to acknowledge those who provided information despite the risks involved pertaining to job security in the politically charged atmosphere which surrounds the topic of IUU and other controversial fisheries issues.

## METHODS

The 'ICES Catch Statistics database' (ICES, 2009a), is the only publicly available resource available that presents annual landings data for all taxa and all fishing areas within the Baltic Sea. For the purposes of our catch reconstruction, we referred to the ICES catch statistics as the 'ICES landings statistics', which reflects the true nature of the data presented (i.e., the database presents '*reported landings*', not total catches). Thus, ICES landings statistics provided the official baseline for our reconstruction to which 4 categories of Illegal, Unreported and Unregulated (IUU) catches were added to estimate total catch: i) '*adjustments*', being positive or negative additions to reported data, based on reputable ICES stock assessment working group data (ICES, 2009b), as well as national datasets; ii) '*unreported landings*' (referred to by ICES as 'unallocated' catches) being catches taken but not reported to officials; iii) '*discards*', being fish caught and disposed of at sea; and iv) '*recreational catches*'. Adjustments to reported landings provided the best estimate of commercial landings in Poland from 1950-2007, to which estimates of unreported landings, discards and recreational catches were added. When sufficient data to derive

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<sup>2</sup> Many sources interviewed for or interacted with in this report expressed a strong desire to remain anonymous for personal reasons.

anchor points in specific years were unavailable, we applied the default approaches outlined in chapter 1 for former eastern bloc countries.

We created six taxonomic groups to facilitate our catch reconstruction for the main commercially targeted species including cod (eastern and western stocks), herring, sprat, and Atlantic salmon (*Salmo salar*). We also reconstructed catches specific to a group of flatfishes: plaice (*Pleuronectes platessus*); flounder; and turbot (*Psetta maxima*), as well as a miscellaneous group for all ‘other’ taxa.

### *Illegal, Unreported and Unregulated (IUU) catches*

The following outlines the specific methods derived for estimating IUU in Poland to supplement officially reported landings from ICES. Adjustments were made for all species during the early 1950s using Polish national datasets that provided information to supplement many missing landings data from ICES. In later years, adjustments to cod, salmon and flatfish landings used ICES stock assessment working group data (Table 3). Unreported landings and discards were accounted for as rates (percentages), which were applied to reconstructed catches. Rates of unreported landings were applied to the sum of ICES landings statistics and adjustments, while discard rates were applied to the sum of ICES landings statistics, adjustments, and unreported landings. Recreational catches were estimated using a combination of German and Danish data. The addition of IUU to ICES landings statistics represents Poland’s total marine fisheries catches from the Baltic Sea from 1950-2007.

#### Adjustments to ICES landings statistics

Fisheries data were extracted from the ‘ICES landings statistics database’ for Poland for the years 1950-2007. Data was missing for all species from 1950-1055, and salmon data were missing from 1950-1959. Preliminary adjustments consisted of adding the national data to supplement these missing records (Table 3). There were some discrepancies in groupings of taxa between the national dataset and ICES landings statistics, and therefore, ‘flatfishes nei’ from the Polish dataset were treated as ‘flounder’ (part of our flatfish group); and ‘other taxa’ as ‘finfishes nei’ which were included in our ‘others’ grouping (Table 3).

In later years, adjustments were made to cod, salmon and flatfish landings using information from ICES stock assessment working group reports (ICES, 2007; 2008a; 2008b; Table 3). To maintain a consistent and conservative approach in our reconstruction, we made adjustments in all years that data were available for cod from the ICES stock assessment working group data for Poland (Table 3). Adjustments to the ICES landings statistics of cod were based on the separately reported landings of eastern cod (Tables 2.3.1 in ICES, 2007) and western cod (Tables 2.4.1 in ICES, 2007). The reported landings of ICES were adjusted using the combined total for both cod stocks (Table 3).

Landings of salmon and flatfishes were adjusted only when a greater value was presented in the ICES stock assessment working group report (Table 3). ICES stock assessment working group data (ICES, 2008a) also allowed us to introduce a higher degree of taxonomic detail to landings of flatfishes from ICES landings statistics from 1970 to 2005. ICES stock assessment working group data present landings for turbot, plaice and flounder which when summed, were equivalent to data presented for ‘flatfishes nei’ in the ICES landings statistics (Table 3).

**Table 3.** Sources and time periods for which adjustments to ICES landings statistics were made in Denmark, 1950-2007.

Common name	Data source	
	National <sup>a</sup>	ICES stock assessment working group <sup>b</sup>
Sprat	1950-1954	-
Herring	1950-1954	-
Eastern cod	1950-1954	1965-2007
Western cod	-	1997-2007
Salmon	1950-1959	1998-2007
European eel	1950-1954	-
Flounder (Flatfishes nei)	1950-1954	-
Plaice	-	1970-2005
Turbot	-	1973-2005
Flounder	-	1973-1974 & 1978-2003
Others (Finfishes nei)	1950-1954	-

<sup>a</sup> The Polish Maritime Fish Industry Statistical database (Anon., 1989); <sup>b</sup> ICES stock assessment working group reports (ICES, 2007; 2008a; 2008b).

### Unreported landings

Due to regulations and state control in former eastern bloc countries prior to the 1990s, a value of 0% was assigned for unreported landings between 1950 and 1990. During this time period, all landed catch had to be delivered directly to national authorities and all fish sold for a similar price. These regulations gave fishers little incentive to not report and the consequences of non-compliance were severe (Anon. pers. comm.). Therefore, we proceeded with the assumption that unreported landings were minimal prior to 1990. It is unlikely that underreporting never occurred, but information beyond this general assumption was unavailable. A possibility of state-controlled misreporting (potentially for strategic cold-war reasons) also remains unresolved.

To phase in the behavior of underreporting during the transition to a market economy (with the collapse of the former eastern bloc), we performed a linear interpolation between 1990 (0%) and our first anchor point in 1993 for cod, salmon, herring, and 'others'. The category 'others' in this instance, was designated for all taxa for which species-specific information on unreported landings were unavailable (including all flatfishes). All unreported landings were estimated by applying an annual percentage to the sum of ICES landings statistics and adjustments.

*Cod*: According to an open letter authored in 2007/2008 by Dr. Zbigniew Karnicki, former Vice-Director of the Polish Sea Fisheries Institute (MIR, see Appendix A), beginning in the 1990s, the Polish government actively sought to subvert EU rules by encouraging industry noncompliance. Additional information, obtained from anonymous sources during interviews conducted in 2008 by the UBC Fisheries Centre, indicated that from the 1990s to the present, underreporting of cod catches has been at least 300% of reported landings. The source interviewed, who has extensive experience in fisheries issues in Poland, further stated that this value may even underestimate unreported landings in the early 1990s (Anon. pers. comm.) Therefore, a rate of 300% was assigned for the period 1993-2007. Linear interpolation was used to phase in the behavior of underreporting from 0% to 300% between 1990 and 1993.

*Salmon*: Records from the early 1990s indicate that at least 50% of salmon landings were unreported (ICES 2008b). Therefore, a fixed rate of 50% was applied to nominal landings in all years between 1993 and 2007 (Table 4). To account for the transition to a market economy, a linear interpolation was performed between 1990 (0%) and our first anchor point in 1993 (50%).

*Herring*: To determine a rate of unreported landings for herring in 1993, we used trade data (from 2003-2007) and compared imports and exports, as well as consumption and nominal landing (Anon., 2006b) and (Anon., 2008). Trade data were used as reported, without the use of product to live weight conversions due to the uncertainty of product form and to stay conservative in our estimates (W. Swartz, pers. comm., UBC Fisheries Centre). Rates of unreported landings were derived annually for the period 2003-2007. The value derived for 2003 (86%) was carried back as a fixed rate to 1993 (Table 4). We interpolated between 0% in 1990 and our first anchor point (86%) in 1993 to phase in the behavior of underreporting (Table 4).

*'Others'*: No data pertaining to unreported landings were available for species other than cod, salmon and herring. Therefore, we estimated rates of unreported landings for all 'others' (including flatfish) using the default approach outlined in chapter 1 of this report (Table 5). To derive anchor points for 'others' we used the minimum estimates of unreported catches for salmon, cod and herring from 1993, 1994 and 2007 to create an average for this group in each of these years. To remain conservative, we used half of these

**Table 4.** Rates (%) used as anchor points to estimate unreported landings (t) for herring based on data from the Sea Fisheries Institute in Gdynia (2005) and (2007). Interpolated values indicated by dashed line (-).

Year	Unreported landings (%)
1950-1990	0 <sup>a</sup>
1991-1992	-
1993-2003	86 <sup>b</sup>
2003	86
2004	113
2005	109
2006	143
2007	134

<sup>a</sup> assumed default value; <sup>b</sup> rate from 2003.

**Table 5.** Anchor points (%) used for estimating unreported landings for others from 1950-2007 based on sources (Tables 2.3.1 and 2.4.1 in ICES, 2007; Table 2.1.2. in ICES, 2008a). Dashed lines (-) indicate years when linear interpolations were used.

Year	Unreported landings (%)
1950-1990	0.0
1991-1992	-
1993	20.3
1994	26.9
1995-2006	-
2007	11.2

values to represent the rates of unreported landings for ‘others’ (Table 5). These rates were applied to total landings (ICES landings statistics + adjustments) in 1993, 1994, and 2007. Linear interpolations were performed between 1990 (0%) and our first anchor point in 1993 (15.4%), and in all other intervening years (Table 5).

### Discards

Discards were estimated for four separate categories: i) underwater discards (mortality caused by deployed fishing gear); ii) ghostfishing (a result of entrapment in lost fishing gear); iii) boat-based discards (usually a result of fishers’ selective behaviors onboard); and iv) seal-damaged discards. In Poland however, only categories the first three categories were applicable. Discards were estimated by applying annual rates (%) to estimates of our total annual landings (the sum of ICES landings statistics, and adjustments, and unreported landings) of each of the applicable taxa.

*Underwater discards:* Underwater discards were estimated only for herring and sprat since these taxa are the main pelagics targeted by trawl (Zeller *et al.*, this volume). In the Baltic Sea, herring and sprat are targeted by the same trawl fleet. Thus, the pelagic trawl fishery is inherently mixed, and uncertainty exists in species composition of landings data (ICES, 2009b). It is also known that landings statistics often reflect only the targeted species (HELCOM, 2009). Thus, information attained regarding underwater discards was applied to landings of both herring and sprat. Rahikainen *et al.* (2004) related underwater discard amounts to observed catches of herring in the trawl fishery. We transformed these data into an approximate underwater discard rate of 9% of reported landings caught by trawl (Zeller *et al.*, this volume). In Poland, landings of herring and sprat were not recorded by gear type, so we reduced the underwater discard rate to 5% to account for any other gear types used, and to remain conservative in our estimate. Thus, a rate of 5% was applied to herring and sprat landings (i.e. ICES landings statistics, adjustments and unreported landings) for all years between 1950 and 2007.

*Ghostfishing:* In a recent FAO report, lost and discarded fish gear were reported to contribute to approximately 10% of marine litter globally; resulting in increasingly significant threats to fish stocks (Macfadyen *et al.*, 2009). Brown *et al.* (2005) reported that during a 28 month study period, between 3 and 906 t of cod were caught by lost nets (based on data from Tschernij and Larsson, 2003). When compared to the total reported or landed catch in the same area, during the same time period, catches by lost gear were equivalent to approximately 0.01-3.2 % of the total catch of cod (Brown *et al.*, 2005). We assumed lost gear has similar effects on all species, excluding pelagics (herring and sprat), and applied the average (1.65%) from Brown *et al.* (2005) to landings from 1950 to 2007.

*Boat-based discards:* As part of the former eastern bloc, we assumed that Polish fishers did not engage in discarding associated with economic and quota incentives prior to the early 1990s. More indirect forms of discarding would have occurred however, due to the inherent effects of fishing gear on catch and we consider that fish unfit for landing, and inedible or unpalatable fauna would likely have been discarded at sea. Due to the absence of any specific data to account for these types of discards, we assigned a conservative rate of 2% to all species from 1950-1990 excluding herring and sprat (Zeller *et al.*, this volume). From 1993-2007, we derived annual boat-based discard rates for cod and salmon based on default methods described in Zeller *et al.* (this volume). Default discard rates were also used for flatfishes and ‘others’ (Zeller *et al.*, this volume; Anon., 2006a), except whiting for which species-specific discard data were available (Anon., 2006a).

**Table 6.** Anchor points (%) used for estimating boat based discards for cod and salmon from 1950-2007 based on sources (Tables 2.4.1, 2.4.5b and 2.4.20 in ICES, 2008a; Table 2.4.5b in ICES, 2007). Dashed lines (-) indicate years when linear interpolations were used.

Year	Eastern cod	Western cod	Salmon
1950-1989	2.0	2.0	2.0
1990-1992	-	-	-
1993	3.4	14.5	14.1
1994	2.1	10.6	12.9
1995	1.7	11.3	13.9
1996	1.2	15.7	15.1
1997	3.9	10.0	14.9
1998	3.4	17.3	14.2
1999	2.5	11.6	14.8
2000	6.8	12.5	10.3
2001	3.2	11.2	15.0
2002	2.2	10.4	15.8
2003	2.8	15.8	15.4
2004	1.8	10.1	15.6
2005	3.0	18.6	15.2
2006	13.2	8.6	17.4
2007	11.3	8.3	14.2

We derived annual discard rates beginning in 1993 for eastern cod, western cod, and salmon. As country specific discard data were unavailable, we used our default and assumption-based approach (Zeller *et al.*, this volume). These methods produced annual Baltic-wide discard rates (%) for eastern cod, western cod, and salmon (Table 6), which were applied to the sum of ICES landings statistics, plus adjustments, plus unreported landings to estimate the total boat-based discards (t) for these species.

To estimate discards for the remaining taxa in Poland we relied on information from a study conducted by the Danish National Institute of Aquatic Resources (Anon., 2006a). We transformed the tonnages of discards reported for the Danish fleet over one year period to a percentage of Denmark's reported landings for the respective taxa. Discard rates were assigned annually as fixed rates (1993-2007) to the sum of ICES landings statistics, adjustments, and unreported landings. A linear interpolation was done between 1990 (0%) and our first anchor point in 1993, to phase in the behavior of boat-based discarding. We applied the following rates to the respective taxa in Poland: dab (33%), plaice (34%), flounder (48%), turbot (38%), brill (38%), whiting (38%) and 'others' (6.24%; Zeller *et al.*, this volume).

### Recreational catches

Sport and recreational fishing in Poland began in the late 1980s (Radtke and Dabrowski, 2007). Recreational catches were estimated for Poland by using a combination of Polish data regarding the number of recreational fishers between 1999 and 2007 (Anon., 1989), with taxon-specific, *per capita* catch data for Germany in 2005-2006 (Anon., 2007a) Recreational catch rates were presented by (1999) for cod, herring and flounder. To remain conservative, we applied half of the German recreational catch rates (Table 8) to the estimated number of recreational fishers in Poland (Table 7), to estimate recreational catches of cod, herring and flounder from 1986-2007.

**Table 7.** The number of Polish recreational fishers from 1986-2007 in Poland. Interpolated values indicated by dashed (-) line. Data source: (Anon., 1989).

Year	Polish fishers
1986	0
1987-1998	-
1999	6,300
2000	13,700
2001	16,100
2002	21,500
2003	26,500
2004	31,500
2005	38,000
2006	79,043
2007	79,043 <sup>a</sup>

<sup>a</sup>2006 value carried forward.

**Table 8.** Recreational catch rates (t·fisher<sup>-1</sup>) by species used to estimate Poland's recreational catches (Anon., 2007).

Common name	Catch rate (t·fisher <sup>-1</sup> )
Cod	0.011746
Herring	0.000251
Flounder	0.000912

## RESULTS

Our results estimate the total marine fisheries catches in Poland from 1950 to 2007. The reconstruction of Poland's catches uses ICES landings statistics as baseline data to represent all reported landings during the study period (1950-2007). To reconstruct Poland's total catches we estimated four components of Illegal, Unreported and Unallocated (IUU) catches to supplement our baseline data from ICES. The first step, which we termed '*adjustments*', sought to correct any misreported or missing landings from the ICES data. Reported landings were adjusted both negatively and positively using ICES stock assessment working group data (ICES, 2008a; ICES, 2007; ICES, 2008b) as well as national data from the Polish Maritime Fish Industry (Anon., 1989). Secondly, we estimated '*unreported landings*' as a proportion of ICES landings statistics plus adjustments. '*Discard*' rates were then estimated and applied to our total reconstructed landings (ICES landings statistics + adjustments + unreported landings). Finally, '*recreational catches*' were estimated beginning in the 1990s when Poland became independent with the disintegration of the former Eastern Bloc. The sum total of ICES landings statistics, adjustments, unreported landings, and recreational catches represents an estimate of the total fisheries catches from the Baltic Sea by Poland for the period 1950-2007 (see Appendix Tables B1-B7 for complete time series data on all additions to taxonomic catch data, by catch component).

### ICES landings statistics

The ICES landings statistics database presented a total of approximately 7 million tonnes for all species landed from all fishing areas by Poland within the Baltic Sea for the period 1950-2007 (Figure 2). The

three species accounting for the largest portion of landings according to ICES were cod, herring and sprat (Table 9). These taxa comprise over 92% of the total landings between 1950 and 2007. Flatfishes and 'others' makeup approximately 7% of landings, and salmon less than 1% of the total landings reported between 1950 and 2007 by ICES.

**Table 9.** Reported landings (t) from the ICES landings statistics database for Poland (1950-2007; ICES, 2009a).

Common name	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2007
Cod	216,638	492,997	609,074	711,242	235,002	129,933
Herring	73,082	259,301	577,166	712,145	406,681	220,437
Sprat	36,675	137,810	414,159	190,838	505,630	621,642
Flatfishes	6,504	27,010	46,908	36,296	55,759	69,397
Salmon	0	1,936	875	2,144	2,356	1,035
'Others'	14,239	37,674	89,357	62,812	37,417	33,392

ICES landings data for salmon were missing from 1950-1959 while all other taxa were missing landings data from 1950-1955. Thus, ICES landings data reported during this decade underestimate Poland's actual landings (Table 9). According to ICES, cod and herring landings peaked in the 1980s (Figure 2; Table 9), salmon peaked in the 1990s (Table 9), 'others' peaked in the 1970s, while flatfish and sprat landings have their highest reported landings in the most recent decade (2000-2007).

### *Illegal, Unreported and Unregulated (IUU) catches*

IUU catches including adjustments, unreported landings, discarded and recreational catches totaled an estimated 2.5 million tonnes over the period of study (1950-2007). Presented below are the individual components and their respective contributions to our estimate of the total IUU catches in Poland.

#### Adjustments to ICES landings statistics

Overall, our adjusted landings did not show substantial differences from those officially reported by ICES over the period of study, 1950-2007 (Figure 2).

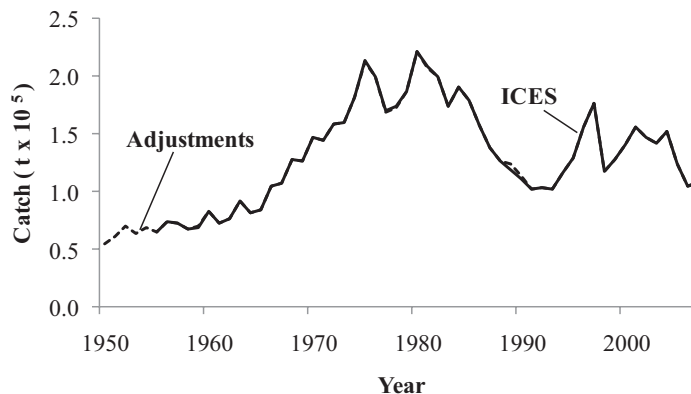
However, adjustments were made between 1950 and 1959 for salmon, and between 1950 and 1954 for all other taxa since these data were missing from ICES landings statistics (Figure 2; Table 10). Between 1950 and 1959, national data from the Polish Maritime Industry contributed a total of 320,181 t of adjustments for all species (Figure 2).

Adjustments sourced from ICES stock assessment working group data were used for cod during the 1980s and 1990s with a total of approximately 7,000 t added to cod landings. The majority of adjustments to cod from ICES stock assessment working group data were for the eastern stock (approximately 98%) between 1955 and 2007.

**Table 10.** Adjustments (t) to reported landings from ICES landings statistics (1950-2007).

Common name	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2007
Cod	255,803	0	403	4,058	3,204	312
Herring	42,821	0	0	0	0	0
Sprat	8,408	0	0	0	0	0
Flatfishes	4,101	0	-3,492	1,159	741	1,404
Salmon	1,634	0	0	0	21	94
'Others'	7,414	0	0	0	0	0

Landings for flatfishes were accounted for by species specific landings for flounder, plaice and turbot. The totals for these three species formed the basis for adjustments to the ICES 'flatfishes nei' group (Table 10).



**Figure 2.** ICES landings statistics and adjustments to ICES landings for Poland from 1950-2007.



Overall, both positive and negative adjustments from both national and ICES working group data summed to 328,085 t, adding approximately 4.6% to landings officially reported by ICES. This increased officially reported landings from 7.1 million tonnes to approximately 7.4 million tonnes for the period 1950 to 2007.

### Unreported landings

Unreported landings were estimated only between 1990 and 2007 (Figure 3) due to Poland's alignment with the former Eastern Bloc prior to this time and the assumption that during this time eastern bloc countries reported all landings (see methods). Unreported landings were estimated by applying unreported landings rates (%). Unreported landings peaked in the mid-1990s, and to have declined steadily through the most recent decade in accordance to our adjusted landings totals (Figure 3).

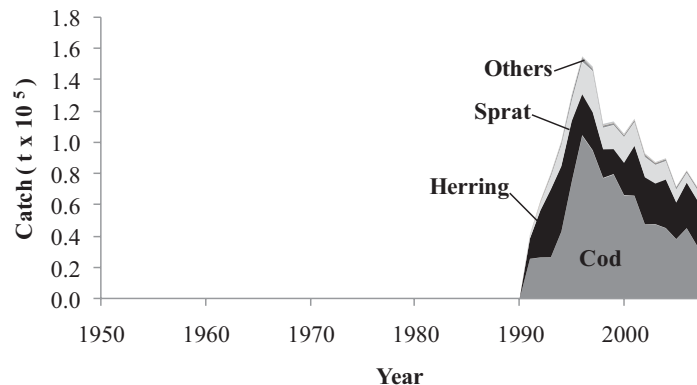


Figure 3. Poland's unreported landings by taxa, 1950-2007.

Cod had the greatest amount of unreported landings between 1990 and 2007 (Figure 3), due to sources which indicated underreporting was occurring at a rate of 300% of reported landings. Unreported landings of eastern cod totaled approximately 915,000 t between 1990 and 2007, and unreported landings of western cod totaled 29,000 t for the same time period. Unreported landings of cod totaled an estimated 945,000 t (or 57% of unreported landings of all species) during the period 1990-2007 (Table 11).

Unreported landings of herring were fairly similar in the 1990s and 2000s, totaling between approximately 255,000 and 220,000 t in each decade (Table 11). Unreported landings of sprat were approximately half the magnitude of the unreported landings of herring, and totaled approximately 100,000 t and 87,000 t in the 1990s and 2000s respectively. Flatfishes, salmon and 'others' comprised much less significant components of the total unreported landings (Figure 3; Table 11) and when combined, they represented only about 2% of the unreported landings of all species between 1990 and 2007.

Table 11. Unreported landings (t) derived for all species fished by Poland (1950-2007).

Common name	1950-1989	1990-1999	2000-2007
Cod	0	553,724	390,736
Herring	0	255,080	223,912
Sprat	0	105,147	86,565
Flatfishes	0	11,496	9,351
Salmon	0	711	565
'Others'	0	6,832	4,636

### Discards

We accounted for 3 discard categories in Poland: i) underwater discards; ii) ghostfishing; and iii) boat-based discards. Discard rates were applied to landings (ICES landings statistics + adjustments + unreported landings) to estimate discards. Prior to Poland's independence from the former Eastern Bloc, only underwater discards (5% of landings) for herring and sprat, and ghostfishing (1.65% of landings for all species excluding herring and sprat) were assumed to have occurred. Thus, underwater discards of herring and sprat contributed the largest amounts to discards, but ghostfishing of cod was also important due to high catch volumes (Figure 4; Table 12).

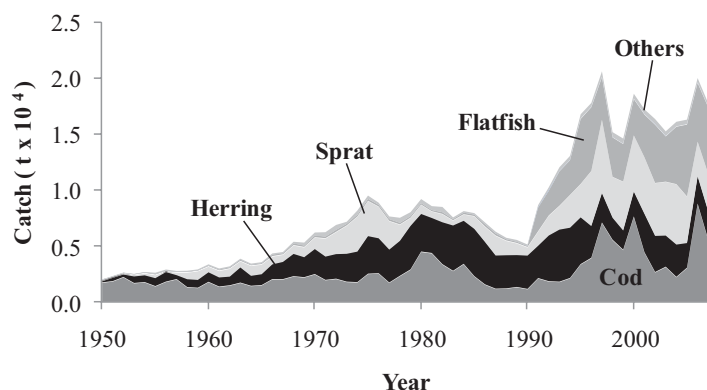
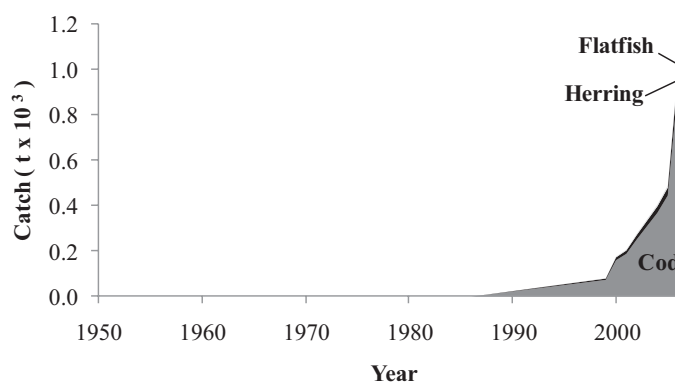


Figure 4. Total discards (t) of cod, herring, sprat, flatfishes and 'others' (1950-2007).

Boat-based discarding was assumed to have become a concern when Poland became independent after the breakup of the former eastern bloc in the early 1990s. Thus, we assume that the transition from a state-

controlled economy to a market based economy, and the associated economic incentives induced discarding practices (Figure 4). Though discards of individual taxa have fluctuated since this time, the total discards of the top four discarded species (cod, herring, sprat and flatfishes) remained relatively constant through the 1990s and 2000s, averaging at approximately 33,000 t in both decades (Figure 4; Table 12). Salmon and 'others' had noticeably lower discard totals due to low catch volumes, and low rates of discarding, respectively (Table 12).



**Figure 5.** Total recreational catches (t) for cod, herring and flatfishes (1950-2007).

Discards of all species peaked in the most recent decade (2000-2007) with a total of approximately 138,000 t. Between 1990 and 2007, discards of cod, sprat and flatfishes increased, while those of herring, salmon and 'others' decreased. In general, discards of flatfishes may be of most concern, having increased approximately 100-fold from 390 t in the 1950s to more than 39,000 t in the most recent decade (Table 12). According to our analysis, flatfishes experience the highest rate of discarding, highlighting that despite relatively low catch volumes of flatfish, their discards appear to have exceeded those of any other species in the most recent decade (28% of all discards; Table 15).

**Table 12.** Discards (t) for cod, herring, sprat, flatfishes, salmon and 'others', by decade (1950-2007).

Common name	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2007
Cod	17,244	17,994	22,246	26,108	33,804	37,593
Herring	5,795	12,965	28,858	35,607	33,088	22,217
Sprat	2,254	6,891	20,708	9,542	30,539	35,410
Flatfishes	387	986	1,585	1,367	32,187	39,135
Salmon	60	71	32	78	416	280
'Others'	790	1,375	3,262	2,293	3,184	3,136

Over the entire period of study, discards of cod accounted for 32%, herring 28%, sprat 22%, flatfishes 15%, and salmon and 'others' combined approximately 3% of all discards from 1950-2007 (Figure 4; Table 12).

### Recreational catches

Since the mid-1980s when recreational fishing began, the predominant species caught was cod (Figure 5). Since this time, annual catches of cod have increased to approximately 928 t (2006-2007), totaling 4,105 t over the entire period of study (1950-2007). Recreational catches of cod accounted for approximately 0.3% of our total catch reconstruction for cod between 1986 and 2007 (the period in which recreational fishing occurred), and 0.11% of our total reconstructed catch for cod over the period of study (1950-2007).

**Table 13.** Recreational catches (t) for cod, herring, sprat, flatfishes, salmon and 'others' in Poland, 1950-2007.

Common name	1950-1979	1980-1989	1990-1999	2000-2007
Cod	0	34	484	3,587
Herring	0	3	38	279
Flatfishes	0	1	10	77

Recreational catches of herring and flatfishes totaled only about 407 t between 1986 and 2007, comprising about 9% of all recreational catches combined. Due to increasing numbers of recreational fishers, recreational catches of all species appear to have increased dramatically since the onset of recreational fishing in the 1990s.

### *Total reconstructed catch*

Our catch reconstruction for Poland, which included all taxa and all fishing areas of the Baltic Sea, totaled 9.5 million tonnes (Figure 6). Our catch reconstruction included reported landings from ICES landings statistics plus our additional estimates of IUU (adjustments to reported landings, unreported landings, discards, and recreational catches [Figure 7]) for the period from 1950 to 2007. Our estimates of IUU

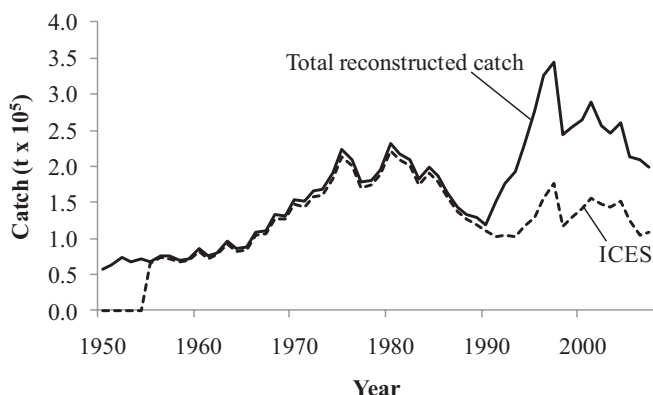
added approximately 35% to landings reported by ICES between 1950 and 2007 (Figure 6). The majority of our additions of IUU occurred after 1990 (Figure 6), when Poland was no longer part of the former eastern bloc, and became subject to the policies of the EU and a market economy. During this time (1990-2007), our additions of IUU added almost 2 million tonnes to reported landings (Figure 6). Prior to 1990, our reconstruction accounted for an additional 541,000 t over the period from 1950 to 1989. During this period (1950-1989), our IUU estimates were mainly comprised of discards as well as adjustments to missing reported landings between 1950 and 1954 for all species.

Considering previously reported landings and our additional estimates of IUU, each component comprised the following proportion of our total catch reconstruction (1950-2007): reported data from ICES landings statistics, 74%; adjustments, 3.5%; unreported landings, 17.3%; discards, 5.1%, and recreational catches, 0.05% (Figure 7; Table 14). Thus, unreported landings and discards were the most significant additions of IUU to reported landings. As mentioned above, cod was found to have the highest unreported

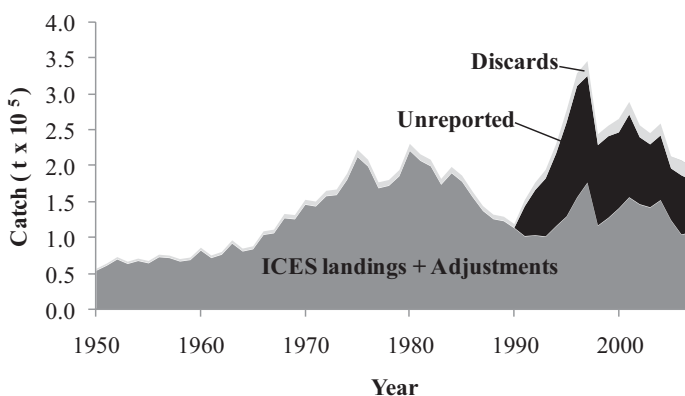
landings and discards (1950-2007). Flatfishes were found to have the most significant rate of discarding since the 1990s, and greatest volume of discards in the most recent decade

(2000-2007). In general, reported landings peaked in the 1970s with about 1.7 million tonnes (Table 14), while our total catch reconstruction peaked in the 1990s with approximately 2.3 million tonnes (Table 14). The majority of this difference was made up by unreported landings (Figure 7), which totaled approximately 1.65 million tonnes between 1990 and 2007 (Figure 7; Table 14).

Overall, cod was the dominant catch throughout the study period, totaling approximately 3,800,000 t between 1950 and 2007 (Table 15). Herring and sprat were close seconds with totals of approximately 2.9 and 2.2 million tonnes respectively (Table 15). Flatfishes and 'others'



**Figure 6.** Total reconstructed catch (t) of cod, herring, sprat, flatfishes and 'others' contrasted with officially reported data from ICES landings statistics (1950-2007).



**Figure 7.** Total reconstructed catch for Poland by component from 1950-2007.

**Table 14.** Total reconstructed catches (t) for cod, herring, sprat, flatfishes, salmon, and 'others' in Poland, by IUU component (1950-2007).

Component	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2007
ICES landings	347,138	956,728	1,737,539	1,715,477	1,242,845	1,075,836
Adjustments	320,181	0	-3,089	5,217	3,966	1,810
Unreported landings	0	0	0	0	932,989	715,764
Discards	26,530	40,282	76,690	74,995	133,219	137,771
Recreational	0	0	0	37	532	3,942

**Table 15.** Total reconstructed catches (t) for cod, herring, sprat, flatfishes, salmon, and 'others' in Poland (1950-2007).

Common name	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2007
Cod	489,685	510,991	631,723	741,443	826,218	562,161
Herring	121,698	272,266	606,024	747,755	694,887	466,845
Sprat	47,337	144,701	434,867	200,380	641,316	743,617
Flatfishes	10,992	27,996	45,001	38,823	100,193	119,364
Salmon	1,694	2,007	907	2,222	3,504	1,973
'Others'	22,443	39,049	92,619	65,105	47,433	41,164

comprised much lesser components of the catch total each with about 300,000 t over the period of study (1950-2007). Salmon had the lowest catches estimated with a total of approximately 12,000 t caught between 1950 and 2007 (Table 15).

## DISCUSSION

Poland has reported annual landings data to ICES since 1955, which are available online from the publicly accessible electronic database, 'ICES catch statistics' (ICES, 2009a). The total landings reported by Poland to ICES for the period of study (1950-2007), were approximately 7 million tonnes. Our reconstruction of Poland's total fisheries catches in the Baltic Sea for the same time period were estimated to be approximately 9.5 million tonnes. Thus, our estimates of IUU contributed 35% more catches to what was reported to ICES by Poland between 1950 and 2007. Estimates of IUU were consistently conservative, using minimum estimates with linear interpolations between data anchor points. Therefore, our catch reconstruction is believed not to overestimate the total catch for Poland between 1950 and 2007. Thus, our estimates of Poland's total catches are more accurate than the current assumption of zero IUU in catch statistics reported to ICES, and although they are not statistically precise *per se*, they provide vital information for the management of Baltic fish stocks. This catch reconstruction is thus a best estimate of Poland's total catch, accounting for all fisheries sectors, using methods applied successfully to elsewhere (Zeller *et al.*, 2006; Zeller *et al.*, 2007; Zeller and Pauly, 2007).

Our catch reconstruction showed unreported landings of cod in Poland to be the most dominant form of IUU, totaling almost 1 million tonnes between 1990 and 2007. In 2007, the European Commission was finally able to launch a lawsuit against Poland for underreported landings of Baltic cod (EC, 2009). Discrepancies in the balance between landings, domestic consumption, imports and exports of cod suggest unreported landings are three times the magnitude of reported landings in recent years (Anon., 2007b). Widespread documentation of this fact by the scientific community and the media has labeled Poland as one of the main culprits of IUU fishing of cod in the Baltic Sea. While cod has evidently been overexploited (EC, 2009), decreased cod TACs have had little effect on stock recovery thus far. A recovery plan was proposed in 2006 by the European Commission to decrease cod TACs by 10% annually, but the plan lacked strategy for fishers to adapt to decreased fishing opportunities (WWF Denmark, 2006). This may have increased the potential for unreported landings of cod.

We presented relatively low levels of underreporting and discarding of herring and sprat catches. FAO (2009) reports that about 50% of Poland's herring and sprat quotas remain uncaught due to the low profitability of these species, which are mainly caught for industrial purposes (FAO, 2009). These factors result in little incentive to not report all landed catches. Economic incentives also drive fishers to catch high quantities, as opposed to high quality catches, providing little incentive to discard or high-grade catches at sea. Overall, discards of all species in our catch reconstruction contributed 20% to the total IUU estimates for Poland. A very rough estimate of recreational catches contributed less than 1% of all IUU catches.

Reconstructed catches in Poland peaked in the 1990s, when catches of cod and salmon reached their highest levels. In the most recent decade, catches of these two species have declined, while those of sprat have increased. This shift in catch composition has resulted in a decrease in economic yield per unit biomass (Thulin and Andrushaitis, 2003). This shift also represents a decrease in the mean trophic level of fisheries catches, which can be indicative of fishing down the marine food web (Pauly *et al.*, 1998). These impacts are significant in their effects on the interactions between all species. For example, the increase in sprat and decrease in cod has altered trophic interactions which are contributing to the eutrophication of the Baltic Sea (Casini *et al.*, 2008).

Our methods used as much of the information that was accessible to us as possible to derive estimates of IUU. When country-specific information was not available for Poland from national sources or correspondence with experts, we derived estimates from Baltic-wide statistics presented in ICES stock assessment working group data, since no reports of Polish IUU catches were available from ICES landings statistics. Confidentiality agreements between the Baltic countries and ICES prevent a clear presentation of country-specific data, preventing a more accurate estimate of the total extraction of fisheries resources from the Baltic Sea. Thus, overall, our methodology was compromised by a lack of transparency between the EU Member States of the Baltic Sea and the responsible scientific agency, ICES. Country-specific information pertaining to unreported landings of cod and herring were acquired from correspondence

with local experts and trade statistics, and thus, there is likely more validity to these estimates than would have otherwise been made using our default methods (as explained above).

This lack of transparency to the public, who are the ultimate beneficiaries and decision makers, severely affects fisheries policy and management. Although ICES makes scientifically-based recommendations for TACs, the responsible management commissions have had a history for overriding recommendations (which are based on long-term goals for the ecosystem), with the short term, socio-economic interests of the fishing industry. Ecosystem-based fisheries management will only be possible with increased transparency, where all landings, discards and recreational catches are reported openly, so all aspects of the marine ecosystem can be considered in management decisions (not just the target species). This will also hold both fishers and decision makers accountable for the types of actions which have driven a common resource into significant decline. To attain this level of transparency, increased enforcement is necessary. Vessel monitoring systems and 100% observer coverage are two ways of preventing IUU fishing, and the unnecessary waste caused by discarding unwanted catches at sea. If these types of enforcement could be implemented successfully, all fish caught would be returned to port, and reported landings would equate to total catch, providing a transparent source of data for the public and scientific community to evaluate.

## ACKNOWLEDGMENTS

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## APPENDIX A: Open letter by Zbigniew Karnicki

There are moments in life where one must make difficult decisions. There are principles in life that one should not breach. One of these principles is to abide the rectitude and independence of scientific opinions. Polish Baltic fishery is going through one of the toughest moments in history. That is why those responsible for fishery should obtain a full spectrum of knowledge concerning the cause of this crisis, in order to be able to use this knowledge as a base to consider different ways to resolve this situation and make responsible decisions. The Sea Fisheries Institute (MIR) in Gdynia is the sole scientific institution [*att. trans.* in Poland] which collects data for the use of the Common Fisheries Policy of the European Union and carries out research necessary to manage Baltic fishery. MIR research concerns fishery resources and the economics of fishery. The statutory obligation of MIR is to report information to the fishery administration in coherence with the best scientific knowledge, based on facts and fully documented data. As vice-director of MIR responsible for scientific research my duty was to follow this principle.

On September 11<sup>th</sup>, I received from the minister of the Maritime Economy Ministry (MGM) Marek Grobarczyk a fax requesting answers to the following questions:

1. What repercussions will the Polish fish branch face after stopping cod fishery in accordance with European Commission regulation 804/2007?
2. What negative consequences for Poland may arise due to violating the ban on cod fishery?

This fax was not addressed to the director of MIR but directly to me. On September 12<sup>th</sup>, I sent via fax a response based on my best knowledge to minister M. Grobarczyk, ending with the following conclusions:

- In light of the above I believe that breaching the CE Regulation 804/2007 will have decisively negative consequences for Polish Baltic fishery and also a wider negative effect for Poland as a member of the European Union.
- Instead of igniting a dispute with the European Commission I believe that it is necessary to begin a dialogue with the fishery branch on how to lessen the negative impact of the current situation both today and – especially - in the following years.
- It is also necessary to negotiate with the European Commission in order to establish the volume of over-fishing the cod quota by our fishermen and minimize the sanctions for the current situation in the following years. The minimization of further, negative steps taken by the European Commission may only be possible on the basis of well-documented activities led by the State and aimed at limiting unreported fishing, both in the current year and in the following years.

Two days later minister M. Grobarczyk sent to the director of MIR a fax containing the following content:

*Dear Sir,*

*I would like to inform you that MIR is obtaining signals, coming from different communities, regarding the inadequate consideration of comments and postulates of these communities in the process of preparing position papers and opinions by MIR's employees. This phenomenon seems to be especially urgent in the context of research on the Baltic cod resources, which – for obvious reasons – is the object of particular interest of the government and public opinion in Poland.*

*In connection with the above I would like to express my deep disquiet with this state of the matter especially since these remarks mostly apply to the attitude of director Zbigniew Karnicki. Taking into consideration the great sensitivity of the issue at stake I cannot remain oblivious to this type of signals, I therefore ask you to consider the possibility of recalling director Karnicki from his duties and calling in his place a person which guarantees adequate objectivity in the future activities of MIR.*

*Signed: Marek Grobarczyk*

From the content above it is obvious that the minister believes that MIR, and its science director in particular should, when formulating his opinions, take into consideration the position of the fishery community. In summary, MIR scientists, often prominent experts with international reputation, should present the opinion that “there is plenty of cod in the sea” and not publicize the results of independent cod

resource research carried out in cooperation with all Baltic countries, which show just the opposite. Apart from this, we should assure that breaching the basic principles of the common fisheries policy of the European Union will not have negative consequences for Polish fishery, which definitely has little to do with the truth.

I believe that this is an unacceptable threat to independence of scientific opinion in general and MIR in particular. It also shows that the Ministry is not interested in finding out the details of the scientific basis for the cod resource assessment and the causes of the current crisis, but only expects MIR to give opinions serving the demands of a part of the fishery community or political interest. Minister M. Grobarczyk to this day has not found the time to meet with MIR representatives in order to have presented to him the opinion about the economic situation of Polish fishery based on data obtained by MIR directly from ship owners.

In light of the facts listed above I came to the conclusion that the only solution in this situation is to facilitate MIR's director decision and resign from the post myself, at the same time passing my decision to the public opinion as a protest against the fisheries policy led by the Maritime Economy Ministry.

I would like to underline that, in coherence with my best knowledge as a man concerned with fishery for the past 50 years, including 15 years of engagement in Polish, European and world fishery problems on the post of fishery policy director at FAO/United Nations in Rome, that the highest price for the current politics of the Minister will be paid by Polish fishermen. I fully sustain my opinion, based on my knowledge of European Union law, that the European Commission will sustain in force the regulation 804/2007 - enforcing a ban on cod fishery for Poland up to the end of this year, will demand that Poland, and *de facto* Polish fishermen, return the cod quota excess in the following year, and that Polish cod fishery, due to the current activities of the Ministry, will be under the special surveillance of EU inspectors. This will lead to the continuation of the liquidation process of Polish fishery caused by irresponsible political decisions.

That is why I hereby call upon Minister M. Grobarczyk to immediately begin talks with fishery organizations on the possibilities and methods of limiting the effects of the current crisis in the fishery sector.

Telling fishermen "we are not encouraging you to fish, but if you decide to do so you will not be punished" is unacceptable. It leads to a further fragmentation of the community and reinforcement of the position of the European Commission by showing that the Polish fishery administration does not have a clear policy towards fishery and is not controlling the situation.

Sincerely,

Zbigniew Karnicki, PhD



## APPENDIX B

**Appendix Table B1.** ICES landing statistics, adjustments to ICES landing statistics, unreported landings, discards, recreational catch, and reconstructed total for Poland (t).

Year	ICES landing statistics	Adjustments	Un-reported	Dis-cards	Re-creational	Total
1950	0	54,724	0	2,058	0	56,782
1951	0	61,746	0	2,361	0	64,107
1952	0	70,425	0	2,666	0	73,091
1953	0	64,151	0	2,547	0	66,698
1954	0	68,278	0	2,716	0	70,994
1955	64,970	41	0	2,651	0	67,662
1956	73,344	191	0	2,941	0	76,476
1957	72,184	185	0	2,812	0	75,181
1958	67,331	201	0	2,829	0	70,361
1959	69,309	239	0	2,950	0	72,498
1960	82,806	0	0	3,404	0	86,210
1961	72,358	0	0	3,032	0	75,390
1962	77,043	0	0	3,224	0	80,267
1963	92,583	0	0	3,907	0	96,490
1964	81,513	0	0	3,469	0	84,982
1965	84,602	0	0	3,595	0	88,197
1966	104,652	0	0	4,378	0	109,030
1967	106,912	0	0	4,504	0	111,416
1968	127,860	0	0	5,422	0	133,282
1969	126,399	0	0	5,348	0	131,747
1970	146,647	149	0	6,252	0	153,048
1971	144,222	107	0	6,279	0	150,608
1972	158,239	425	0	6,928	0	165,592
1973	160,521	-278	0	7,213	0	167,456
1974	181,736	-230	0	8,217	0	189,723
1975	213,665	-309	0	9,556	0	222,912
1976	200,298	-246	0	8,921	0	208,973
1977	170,046	-321	0	7,690	0	177,415
1978	174,520	-1,351	0	7,568	0	180,737
1979	187,645	-1,035	0	8,067	0	194,677
1980	221,785	145	0	9,243	0	231,173
1981	208,893	-794	0	8,611	0	216,710
1982	200,369	59	0	8,538	0	208,966
1983	174,538	142	0	7,602	0	182,282
1984	190,702	38	0	8,167	0	198,907
1985	178,757	107	0	7,987	0	186,851
1986	157,424	116	0	7,155	0	164,695
1987	137,791	244	0	6,328	6	144,369
1988	126,496	66	0	5,780	13	132,355
1989	118,722	5,094	0	5,585	19	129,420
1990	110,620	3,366	0	5,176	25	119,187
1991	102,493	5	41,080	8,667	31	152,277
1992	103,626	-16	62,178	10,210	38	176,035
1993	102,001	6	78,951	11,899	44	192,901
1994	116,500	-81	99,408	12,941	50	228,818
1995	129,569	259	129,223	16,608	56	275,716
1996	155,817	398	153,017	17,610	63	326,905
1997	176,979	130	146,037	20,462	69	343,676
1998	117,144	22	110,722	15,103	75	243,066
1999	128,096	-123	112,373	14,544	81	254,972
2000	141,154	56	104,546	18,566	177	264,499
2001	156,551	71	114,488	17,195	208	288,513
2002	146,897	57	92,708	16,345	278	256,285
2003	142,684	-21	87,380	15,273	342	245,658
2004	152,076	610	90,216	16,162	407	259,470
2005	124,106	649	72,073	16,353	491	213,671
2006	104,628	21	82,418	20,069	1,020	208,157
2007	107,740	367	71,936	17,808	1,021	198,872

**Appendix Table B2.** ICES landing statistics, adjustments to ICES landing statistics, unreported landings, discards, recreational catch, and reconstructed total for cod (*Gadus morhua*) for Poland (t).

Year	ICES landing statistics	Adjustments	Un-reported	Dis-cards	Re-creational	Total
1950	-	48,048	0	1,754	0	49,802
1951	-	51,159	0	1,867	0	53,026
1952	-	61,248	0	2,236	0	63,484
1953	-	46,606	0	1,701	0	48,307
1954	-	48,742	0	1,779	0	50,521
1955	39,030	0	0	1,425	0	40,455
1956	49,953	0	0	1,823	0	51,776
1957	56,151	0	0	2,050	0	58,201
1958	36,509	0	0	1,333	0	37,842
1959	34,995	0	0	1,277	0	36,272
1960	49,412	0	0	1,804	0	51,216
1961	37,892	0	0	1,383	0	39,275
1962	40,942	0	0	1,494	0	42,436
1963	47,514	0	0	1,734	0	49,248
1964	39,735	0	0	1,450	0	41,185
1965	41,498	0	0	1,515	0	43,013
1966	56,007	0	0	2,044	0	58,051
1967	56,003	0	0	2,044	0	58,047
1968	63,245	0	0	2,308	0	65,553
1969	60,749	0	0	2,217	0	62,966
1970	68,440	0	0	2,498	0	70,938
1971	54,151	0	0	1,977	0	56,128
1972	56,746	347	0	2,084	0	59,177
1973	49,790	0	0	1,817	0	51,607
1974	48,650	0	0	1,776	0	50,426
1975	69,318	0	0	2,530	0	71,848
1976	70,466	0	0	2,572	0	73,038
1977	47,703	-1	0	1,741	0	49,443
1978	64,113	0	0	2,340	0	66,453
1979	79,697	57	0	2,911	0	82,665
1980	123,486	0	0	4,507	0	127,993
1981	120,942	-941	0	4,380	0	124,381
1982	92,541	0	0	3,378	0	95,919
1983	76,474	0	0	2,791	0	79,265
1984	93,429	0	0	3,410	0	96,839
1985	63,260	0	0	2,309	0	65,569
1986	43,237	-1	0	1,578	0	44,814
1987	32,667	0	0	1,192	6	33,865
1988	33,351	0	0	1,217	11	34,580
1989	31,855	5,000	0	1,345	17	38,217
1990	28,730	3,298	0	1,169	23	33,220
1991	25,748	0	25,748	2,137	28	53,662
1992	13,314	0	26,628	1,857	34	41,833
1993	8,909	0	26,727	1,817	40	37,493
1994	14,426	-91	43,005	2,147	46	59,533
1995	25,001	-1	75,000	3,388	51	103,439
1996	34,856	-1	104,565	3,951	57	143,428
1997	31,659	0	94,977	7,102	63	133,800
1998	25,778	0	77,334	5,564	68	108,745
1999	26,581	-1	79,740	4,672	74	111,066
2000	22,120	0	66,360	7,646	161	96,287
2001	21,992	0	65,976	4,444	189	92,601
2002	15,892	-4	47,665	2,678	253	66,484
2003	16,029	-87	47,827	3,155	311	67,235
2004	15,090	30	45,360	2,249	370	63,099
2005	12,767	-5	38,286	3,067	446	54,562
2006	15,080	11	45,273	8,792	928	70,084
2007	10,963	367	33,990	5,562	928	51,811

**Appendix Table B3.** ICES landing statistics, adjustments to ICES landing statistics, unreported landings, discards, recreational catch, and reconstructed total for herring (*Clupea harengus*) for Poland (t).

Year	ICES landing statistics	Adjustments	Un-reported	Dis-cards	Re-creational	Total
1950	-	3,303	0	165	0	3,468
1951	-	7,196	0	360	0	7,556
1952	-	5,794	0	290	0	6,084
1953	-	13,046	0	652	0	13,698
1954	-	13,482	0	674	0	14,156
1955	15,507	0	0	775	0	16,282
1956	18,418	0	0	921	0	19,339
1957	8,385	0	0	419	0	8,804
1958	15,448	0	0	772	0	16,220
1959	15,324	0	0	766	0	16,090
1960	18,407	0	0	920	0	19,327
1961	17,635	0	0	882	0	18,517
1962	16,848	0	0	842	0	17,690
1963	28,370	0	0	1,419	0	29,789
1964	19,160	0	0	958	0	20,118
1965	20,724	0	0	1,036	0	21,760
1966	27,743	0	0	1,387	0	29,130
1967	32,143	0	0	1,607	0	33,750
1968	41,186	0	0	2,059	0	43,245
1969	37,085	0	0	1,854	0	38,939
1970	46,018	0	0	2,301	0	48,319
1971	43,022	0	0	2,151	0	45,173
1972	45,343	0	0	2,267	0	47,610
1973	51,213	0	0	2,561	0	53,774
1974	55,957	0	0	2,798	0	58,755
1975	68,533	0	0	3,427	0	71,960
1976	63,850	0	0	3,193	0	67,043
1977	60,212	0	0	3,011	0	63,223
1978	63,850	0	0	3,193	0	67,043
1979	79,168	0	0	3,958	0	83,126
1980	68,614	0	0	3,431	0	72,045
1981	64,005	0	0	3,200	0	67,205
1982	76,329	0	0	3,816	0	80,145
1983	82,329	0	0	4,116	0	86,445
1984	78,326	0	0	3,916	0	82,242
1985	85,865	0	0	4,293	0	90,158
1986	77,109	0	0	3,855	0	80,964
1987	60,616	0	0	3,031	0	63,647
1988	60,624	0	0	3,031	1	63,656
1989	58,328	0	0	2,916	1	61,246
1990	60,919	0	0	3,046	2	63,967
1991	45,991	0	13,145	2,957	2	62,095
1992	52,864	0	30,220	4,154	3	87,240
1993	50,833	0	43,588	4,721	3	99,145
1994	49,111	0	42,111	4,561	4	95,787
1995	45,676	0	39,166	4,242	4	89,088
1996	31,246	0	26,793	2,902	4	60,945
1997	28,939	0	24,814	2,688	5	56,446
1998	21,873	0	18,755	2,031	5	42,665
1999	19,229	0	16,488	1,786	6	37,509
2000	24,516	0	21,022	2,277	13	47,827
2001	37,611	0	32,250	3,493	15	73,369
2002	35,512	0	30,450	3,298	20	69,280
2003	30,703	0	26,327	2,851	24	59,906
2004	27,764	0	31,317	2,954	29	62,064
2005	21,766	0	23,637	2,270	35	47,708
2006	20,544	0	29,370	2,496	72	52,482
2007	22,021	0	29,538	2,578	72	54,209

**Appendix Table B4.** ICES landing statistics, adjustments to ICES landing statistics, unreported landings, discards, recreational catch, and reconstructed total for sprat (*Sprattus sprattus*) for Poland (t).

Year	ICES landing statistics	Adjustments	Un-reported	Dis-cards	Re-creational	Total
1950	-	1,147	0	57	0	1,204
1951	-	733	0	37	0	770
1952	-	1,252	0	63	0	1,315
1953	-	2,182	0	109	0	2,291
1954	0	3,094	0	155	0	3,249
1955	5,108	0	0	255	0	5,363
1956	580	0	0	29	0	609
1957	4,264	0	0	213	0	4,477
1958	11,544	0	0	577	0	12,121
1959	15,179	0	0	759	0	15,938
1960	9,829	0	0	491	0	10,320
1961	11,305	0	0	565	0	11,870
1962	13,651	0	0	683	0	14,334
1963	10,693	0	0	535	0	11,228
1964	17,431	0	0	872	0	18,303
1965	16,863	0	0	843	0	17,706
1966	13,579	0	0	679	0	14,258
1967	12,410	0	0	621	0	13,031
1968	14,741	0	0	737	0	15,478
1969	17,308	0	0	865	0	18,173
1970	20,171	0	0	1,009	0	21,180
1971	31,855	0	0	1,593	0	33,448
1972	38,861	0	0	1,943	0	40,804
1973	49,835	0	0	2,492	0	52,327
1974	61,969	0	0	3,098	0	65,067
1975	62,445	0	0	3,122	0	65,567
1976	56,079	0	0	2,804	0	58,883
1977	50,502	0	0	2,525	0	53,027
1978	28,574	0	0	1,429	0	30,003
1979	13,868	0	0	693	0	14,561
1980	16,033	0	0	802	0	16,835
1981	11,205	0	0	560	0	11,765
1982	14,188	0	0	709	0	14,897
1983	8,492	0	0	425	0	8,917
1984	10,954	0	0	548	0	11,502
1985	22,156	0	0	1,108	0	23,264
1986	26,967	0	0	1,348	0	28,315
1987	34,887	0	0	1,744	0	36,631
1988	25,359	0	0	1,268	0	26,627
1989	20,597	0	0	1,030	0	21,627
1990	14,299	0	0	715	0	15,014
1991	23,200	0	1,624	1,241	0	26,065
1992	30,126	0	4,218	1,717	0	36,061
1993	33,701	0	6,841	2,027	0	42,569
1994	44,556	0	11,986	2,827	0	59,369
1995	46,182	0	11,730	2,896	0	60,808
1996	77,472	0	18,593	4,803	0	100,869
1997	105,298	0	23,692	6,450	0	135,440
1998	59,091	0	12,409	3,575	0	75,075
1999	71,705	0	14,054	4,288	0	90,047
2000	84,325	0	15,263	4,979	0	104,567
2001	85,757	0	14,321	5,004	0	105,082
2002	81,244	0	12,349	4,680	0	98,273
2003	84,097	0	11,521	4,781	0	100,399
2004	95,798	0	11,783	5,379	0	112,960
2005	74,329	0	8,325	4,133	0	86,787
2006	55,890	0	6,260	3,107	0	65,257
2007	60,202	0	6,743	3,347	0	70,292

**Appendix Table B5.** ICES landing statistics, adjustments to ICES landing statistics, unreported landings, discards, recreational catch, and reconstructed total for salmon (*Salmo salar*) for Poland (t).

Year	ICES landing statistics	Adjustments	Un-reported	Dis-cards	Re-creational	Total
1950	-	366	0	13	0	379
1951	-	128	0	5	0	133
1952	-	67	0	2	0	69
1953	-	71	0	3	0	74
1954	-	145	0	5	0	150
1955	-	41	0	1	0	42
1956	-	191	0	7	0	198
1957	-	185	0	7	0	192
1958	-	201	0	7	0	208
1959	-	239	0	9	0	248
1960	320	0	0	12	0	332
1961	52	0	0	2	0	54
1962	293	0	0	11	0	304
1963	335	0	0	12	0	347
1964	357	0	0	13	0	370
1965	177	0	0	6	0	183
1966	116	0	0	4	0	120
1967	61	0	0	2	0	63
1968	140	0	0	5	0	145
1969	85	0	0	3	0	88
1970	70	0	0	3	0	73
1971	58	0	0	2	0	60
1972	87	0	0	3	0	90
1973	98	0	0	4	0	102
1974	119	0	0	4	0	123
1975	88	0	0	3	0	91
1976	103	0	0	4	0	107
1977	80	0	0	3	0	83
1978	87	0	0	3	0	90
1979	85	0	0	3	0	88
1980	70	0	0	3	0	73
1981	100	0	0	4	0	104
1982	179	0	0	7	0	186
1983	196	0	0	7	0	203
1984	233	0	0	9	0	242
1985	280	0	0	10	0	290
1986	222	0	0	8	0	230
1987	401	0	0	15	0	416
1988	300	0	0	11	0	311
1989	163	0	0	6	0	169
1990	568	0	0	21	0	589
1991	350	0	58	62	0	471
1992	463	0	154	97	0	714
1993	191	0	96	45	0	332
1994	184	0	92	40	0	316
1995	133	0	67	31	0	230
1996	125	0	63	31	0	219
1997	110	0	55	27	0	192
1998	114	4	59	28	0	205
1999	118	17	68	33	0	236
2000	125	19	72	26	0	242
2001	156	24	90	45	0	315
2002	189	8	99	51	0	347
2003	176	22	99	51	0	348
2004	82	6	44	23	0	155
2005	109	5	57	29	0	200
2006	107	10	59	33	0	209
2007	91	0	46	22	0	158

**Appendix Table B6.** ICES landing statistics, adjustments to ICES landing statistics, unreported landings, discards, recreational catch, and reconstructed total for the category 'flatfish' for Poland (t).

Year	ICES landing statistics	Adjustments	Un-reported	Dis-cards	Re-creational	Total
1950	0	750	0	27	0	777
1951	0	653	0	24	0	677
1952	0	658	0	24	0	682
1953	0	717	0	26	0	743
1954	0	1,323	0	48	0	1,371
1955	1,780	0	0	65	0	1,845
1956	1,200	0	0	44	0	1,244
1957	1,174	0	0	43	0	1,217
1958	948	0	0	35	0	983
1959	1,402	0	0	51	0	1,453
1960	1,631	0	0	60	0	1,691
1961	2,157	0	0	79	0	2,236
1962	2,388	0	0	87	0	2,475
1963	2,749	0	0	100	0	2,849
1964	1,582	0	0	58	0	1,640
1965	2,418	0	0	88	0	2,506
1966	3,817	0	0	139	0	3,956
1967	2,675	0	0	98	0	2,773
1968	4,048	0	0	148	0	4,196
1969	3,545	0	0	129	0	3,674
1970	3,962	149	0	150	0	4,261
1971	4,093	107	0	153	0	4,353
1972	4,940	78	0	183	0	5,201
1973	4,278	-278	0	146	0	4,146
1974	4,668	-230	0	162	0	4,600
1975	5,139	-309	0	176	0	5,006
1976	4,394	-246	0	151	0	4,299
1977	4,879	-320	0	166	0	4,725
1978	5,418	-1,351	0	148	0	4,215
1979	5,137	-1,092	0	148	0	4,193
1980	3,429	145	0	130	0	3,704
1981	2,958	147	0	113	0	3,218
1982	4,214	59	0	156	0	4,429
1983	2,809	142	0	108	0	3,059
1984	3,865	38	0	142	0	4,045
1985	3,533	107	0	133	0	3,773
1986	5,044	117	0	188	0	5,349
1987	4,468	244	0	172	0	4,884
1988	3,030	66	0	113	0	3,209
1989	2,946	94	0	111	0	3,151
1990	2,253	68	0	85	0	2,406
1991	4,009	5	281	2,096	1	6,392
1992	3,906	-16	545	2,166	1	6,602
1993	5,101	6	1,037	2,979	1	9,123
1994	4,900	10	1,321	3,033	1	9,264
1995	8,964	260	2,343	5,694	1	17,262
1996	8,836	399	2,216	5,601	1	17,054
1997	6,168	130	1,417	3,731	1	11,448
1998	5,835	18	1,229	3,479	1	10,562
1999	5,787	-139	1,107	3,324	2	10,080
2000	5,602	37	1,021	3,222	3	9,885
2001	6,725	47	1,131	3,812	4	11,719
2002	9,232	53	1,411	5,199	5	15,901
2003	7,343	44	1,012	4,046	7	12,452
2004	8,828	574	1,156	5,155	8	15,721
2005	11,239	649	1,331	6,457	10	19,686
2006	9,583	0	1,073	5,273	20	15,950
2007	10,845	0	1,215	5,971	20	18,050

**Appendix Table B7.** ICES landing statistics, adjustments to ICES landing statistics, unreported landings, discards, recreational catch, and reconstructed total for the category 'others' for Poland (t).

Year	ICES landing statistics	Adjustments	Un-reported	Discards	Re-recreational	Total
1950	0	1,110	0	41	0	1,151
1951	0	1,877	0	69	0	1,946
1952	0	1,406	0	51	0	1,457
1953	0	1,529	0	56	0	1,585
1954	0	1,492	0	54	0	1,546
1955	3,545	0	0	129	0	3,674
1956	3,193	0	0	117	0	3,310
1957	2,210	0	0	81	0	2,291
1958	2,882	0	0	105	0	2,987
1959	2,409	0	0	88	0	2,497
1960	3,207	0	0	117	0	3,324
1961	3,317	0	0	121	0	3,438
1962	2,921	0	0	107	0	3,028
1963	2,922	0	0	107	0	3,029
1964	3,248	0	0	119	0	3,367
1965	2,922	0	0	107	0	3,029
1966	3,390	0	0	124	0	3,514
1967	3,620	0	0	132	0	3,752
1968	4,500	0	0	164	0	4,664
1969	7,627	0	0	278	0	7,905
1970	7,986	0	0	291	0	8,277
1971	11,043	0	0	403	0	11,446
1972	12,262	0	0	448	0	12,710
1973	5,307	0	0	194	0	5,501
1974	10,373	0	0	379	0	10,752
1975	8,142	0	0	297	0	8,439
1976	5,406	0	0	197	0	5,603
1977	6,670	0	0	243	0	6,913
1978	12,478	0	0	455	0	12,933
1979	9,690	0	0	354	0	10,044
1980	10,153	0	0	371	0	10,524
1981	9,683	0	0	353	0	10,036
1982	12,918	0	0	472	0	13,390
1983	4,238	0	0	155	0	4,393
1984	3,895	0	0	142	0	4,037
1985	3,663	0	0	134	0	3,797
1986	4,845	0	0	177	0	5,022
1987	4,752	0	0	173	0	4,925
1988	3,832	0	0	140	0	3,972
1989	4,833	0	0	176	0	5,009
1990	3,851	0	0	141	0	3,992
1991	3,195	0	224	173	0	3,592
1992	2,953	0	413	218	0	3,584
1993	3,266	0	663	310	0	4,239
1994	3,323	0	894	333	0	4,550
1995	3,613	0	918	357	0	4,888
1996	3,282	0	788	321	0	4,391
1997	4,805	0	1,081	464	0	6,351
1998	4,453	0	935	425	0	5,813
1999	4,676	0	916	441	0	6,034
2000	4,466	0	808	416	0	5,691
2001	4,310	0	720	397	0	5,427
2002	4,828	0	734	439	0	6,001
2003	4,336	0	594	389	0	5,319
2004	4,514	0	555	402	0	5,472
2005	3,896	0	436	397	0	4,729
2006	3,424	0	383	367	0	4,175
2007	3,618	0	405	328	0	4,352