Total fishery extractions for Qatar: 1950-2010[1]

Dalal Al-Abdulrazzak

Sea Around Us Project, Fisheries Centre, University of British Columbia,
2202 Main Mall, Vancouver, BC, V6T 1Z4, Canada
d.alabdulrazzak@fisheries.ubc.ca

Abstract

Qatar is an Arab state that occupies a small peninsula on the northeasterly coast of the much larger Arabian Peninsula. It shares its southern border with Saudi Arabia and is surrounded by the Persian Gulf on the other sides. Qatar's fish catches have increased sharply over the past decade due to increased fishing effort, in response to the increasing demand emanating from a rapidly growing population. Following the reconstruction approach, all available peer-reviewed and grey literature was searched for qualitative and/or quantitative data on catches that are missing from the statistics reported to FAO. Overall, data reported to the FAO from 1950-2010 underestimate catches by 38%. In the period between 1970 and 1993, discards from Qatar's bottom trawl fishery were equivalent to 30% of the reported catch. This study illustrates the urgent need to establish management infrastructure for fisheries monitoring and regulation enforcement, especially given Qatar's rate of population increase.

Introduction

Qatar is a small Arab country located on a peninsula on the western shores of the Persian Gulf, and borders Saudi Arabia in the South. The island country of Bahrain lies to the northwest of Qatar (Figure 1), whose maritime boundaries with Bahrain have only been settled as of 2001. Qatar's small size and proximity to other Arab states means that it shares marine resources with Saudi Arabia, Bahrain, and the United Arab Emirates, which further emphasizes the need for regional fisheries management cooperation.

Qatar has been ruled as an absolute monarchy of the Al-Thani family since 1825, but also was a British protectorate until it gained independence in 1971. Up until the 1940s, it was one of the poorest Gulf States, with an economy based solely on pearl diving. However, rapid industrialization following the development of the oil and gas industries has vastly increased the country's economy, and today it has the second highest GDP per capita in the world.

Qatar's waters are characterized by extreme meteorological and hydrological conditions, with water temperatures reaching over 33°C during the summer, leading to high evaporation and salinity levels. Its fisheries are almost entirely confined to the eastern side of the peninsula, which has a maximum depth of 50 m (Al-Ansi and Priede 1996). Over 150 fish species belonging to 50 families have been recorded in Qatari waters, and of these, the majority belong to the families Lethrinidae (17.2%), Serranidae (16%), Carangidae (12.6%), 'Pomadasydae'[2] (9.1%) and Scombridae (8%) (El Sayed 1992; Al-Ansi *et al.* 2002). During 1995-1996, a 'red tide' occurred which was probably the reason why 30-40 tonnes of dead fish subsequently washed up on shore (Al-Ansi *et al.* 2002).

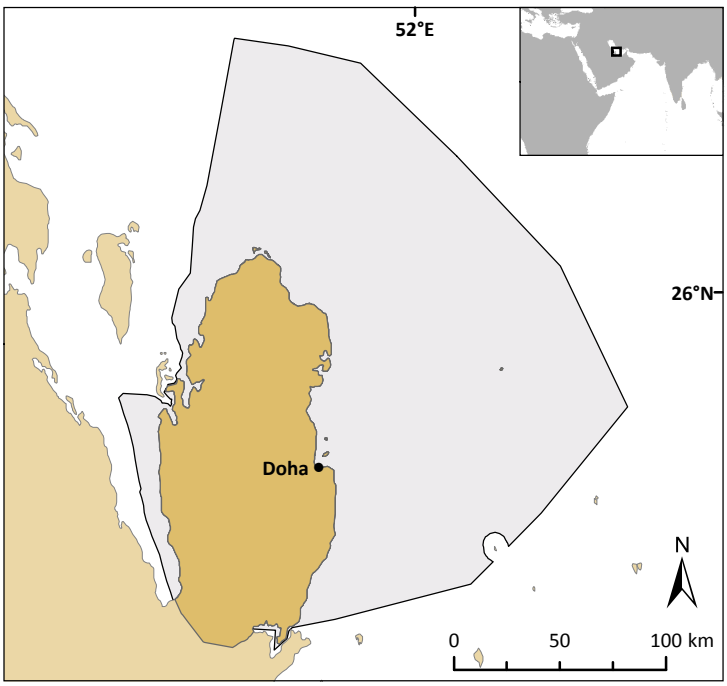

Figure 1. Map of Qatar, showing the extent of its EEZ (in grey).

Qatari fisheries are artisanal in nature and are composed of 2 distinct vessel types: traditional *dhows* and small outboard-powered fibreglass vessels both with an operational range of 60-100 km (Al-Ansi and Priede 1996). Both vessel types target pelagic and demersal species, with fish traps (*gargoor*) being the most common fishing gear, followed by

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[2] Now part of the family Haemulidae (see www.fishbase.org)

gillnets, hand and troll lines. Seasonal trolling and hand-lining for Spanish mackerel (*Scomberomorus* spp.) also takes place. The commercial shrimp fishery was closed in 1993 and periodic re-assessments of the country's shrimp stocks have not warranted its re-opening. Since the closure of the Qatari National Fishing Company (QNFC), which operated 3 bottom trawlers, a sharp increase in the number of artisanal boats occurred, in order to compensate for the decreased CPUE (El Sayed 1996).

As in neighbouring countries, the ownership of vessels is restricted to citizens, while actual fishing operations employ expatriate labour from India, Bangladesh, and Iran. Due to increased standards of living as a result of the oil boom, few Qatari's are drawn to fishing. Yet, per capita fish consumption in the country is 16.5 kg·year^{-1}, more than twice the average in the Arab world for 1995.

Fisheries management in Qatar is rudimentary at best, although in theory, vessel fishing licenses are required. No fisheries management plans exist and as a result, policy directions for fisheries management are unclear and subject to frequent change. Basic stock assessment data, rates of effort, and fishery market potentials are also lacking (El Sayed 1992). In 1998, the Fisheries Department of the Ministry of Municipal Affairs and Agriculture ceased issuing new fishing licenses, capping the fleet at 515 vessels (Morgan 2004). No restrictions were places on gear or vessel size, and as a result, new higher-capacity vessels were introduced to replace the smaller vessels in the fleet, hence the increased fishing effort in recent years. Because robust stock assessments are lacking, it is uncertain to what extent the increased fishing effort can be sustained.

Illegal fishing is a major problem for Qatar, given the small scale and economic importance of the industry. Illegal fishing (such as by driftnets) is common because enforcement agencies are unable to ensure compliance with regulations (Morgan 2004; Richer 2009). In addition, a growing and uncontrolled recreational fishing sector, estimated to deploy over 1,000 crafts, catches significant quantities of fish (Morgan 2004).

Methods

This contribution follows the conceptual framework of the catch reconstruction method as outlined by previous studies (Zeller *et al.* 2006; Zeller *et al.* 2007; Jacquet *et al.* 2010; Le Manach *et al.* 2012).

A preliminary step in this reconstruction was to attempt to improve the taxonomic resolution of the reported data. Prior to 1982, the data presented by the FAO on behalf of Qatar consist solely of "marine fishes nei" and "green tiger prawn". In 1982, 20 new taxa entered the data and the proportion (and tonnage) of "marine fishes nei" greatly decreased. Therefore, it was assumed that species which appeared in 1982 were being caught previously, and thus could be used to disaggregate the miscellaneous category. For the period 1950-1981, the species proportions from the 1982 data (excluding the green tiger prawn) were applied to the "marine fishes nei" catch to disaggregate it into more informative taxonomic groups. The disaggregated data were then used as the baseline for the reconstruction.

Al-Abdulrazzak and Pauly (2013) estimate that in 2005, 17 *hadrah* (tidal weirs) contribute to an annual catch of 286 ± 100 t annually, despite their being banned since 1994 (M.S. Al-Muhindi, Ministry of Fisheries, pers. comm.). It was assumed that *hadrah* were more abundant prior to the ban in 1994, and therefore that 286 t were caught annually from 1994-2010, and twice that amount (572 t) prior to the ban. The species composition of *hadrah* in Al-Abdulrazzak and Pauly (2013) was also used here.

To estimate recreational catch, the same method as was used in the Kuwait reconstruction, was applied, where a 0.12% participation rate was applied to total population from 1960-2010 to obtain a time series of recreational fishers, and a conservative estimate of 1 kg of fish per trip, along with 104 fishing days per year (See Kuwait, Al-Abdulrazzak, this volume). Similarly, Kuwait's reconstructed recreational catch species composition ratios were applied.

Although Qatar's bottom trawl fishery is considered "semi-industrial" by FAO (Morgan 2004), for the purposes of this report it was considered to be industrial. Ibrahim (1989) estimates that 496-635 t were discarded by Qatar's bottom trawl fishery for 1986-1987. The study also presents the percent contribution of the bottom trawl fishery to the total finfish landings (excluding sharks) and the average percent contribution (32%) was used to determine the amount of finfish reported landings from 1970 (start of the fishery) to 1993 (when it was closed) that came from the bottom trawl fishery. A discard rate of 50% (Ibrahim *et al.* 1989) was applied to the bottom trawl fishery (i.e., 50% of the total catch was discarded). The same study also provided a discard rate of 4% (of the total catch) for the rest of the artisanal fishery, and this rate was applied to all other artisanal finfish catches (reported, unreported, and discarded). Discarded species composition originates from the same Ibrahim *et al.* (1989) study.

Qatar reports requiem shark landings for 1982 and 1983 (1 and 5 t respectively), but not for other years. However, studies exist which show that sharks are frequently caught in both targeted and bycatch fisheries (Al-Ansi and Priede 1996; Moore 2012), and a graph in Sivasubramaniam and Ibrahim (1983) documents monthly shark landings in 1982 at Al Khor, eastern Qatar. Annual shark landing data of 133 t were extracted from Sivasubramaniam and Ibrahim (1983), and a per capita rate for 1983 estimated (0.00048 t). Neighbouring UAE and Saudi Arabia report steadily increasing shark landings to FAO, but both are also known to be shark fin re-exporting countries and

therefore it is difficult to interpret these trends (Moore 2012). As a conservative estimate, it was assumed the per capita shark rate was constant from 1950-1994, but then declined to 90% from 1995-1999, 80% from 2000-2005, 70% from 2006-2007, and 60% from 2008-2010. A 3-year moving average was used for smoothing.

Driftnets were banned in 1989, but continue to be used routinely with 2-3 violations occurring per day (Richer 2009). A rough estimation of illegal driftnet catch is presented here which was inspired by the work of Sumaila *et al.* (2006). First, because of the large numbers of violations occurring, it is assumed that 10% of 515 registered vessels take part in illegal driftnetting. Next, the ratio of registered vessels to total reported catch is estimated, to obtain the annual total catch per vessel from 1989-2010. For illegal fishing to be worthwhile, the expected penalty must be at least equal to the expected gain; it is here conservatively assumed that vessels deploying driftnets are catching 20% more than they would legally (i.e., deploying *gargoor* traps from their boats instead of illegal driftnets). Finally, the annual total catch per vessel fishing illegally was multiplied by the estimated number of participating vessels (56) to estimate illegal driftnet catches for from 1989-2010.

Like other countries in the Gulf, commercial fishing is undertaken by foreign labourers who have a high incentive to subsistence fish. In order to estimate this sector, it was assumed that fishers (0.0066% of the population) take home an average of 5 kg per week, and extrapolate from the start of the oil boom in 1960 to 2010. Because these catches are composed of less desirable species subsistence catches were assigned based on the family level of discarded species.

Results and discussion

For the period of FAO reporting, 1950-2010, reported catches for Qatar are annually, on average, under-reported by 62% (Figure 2a; Appendix Table A1). Total catches reported to the FAO over the same period were 258,253 t, while the methods used here estimate an additional 98,900 t were extracted but unreported.

Catch data as reported by the FAO on behalf of Qatar show a steady increase of catches, more than doubling in the last few decades (Al Jedah *et al.* 1999; Feidi 2005), with a sharp increase from 2001 until 2010. This is unsurprising given that Qatar's population grew from 770,000 in 2001 to 1.4 million in 2009 (Sale *et al.* 2011), generating an increase in demand and a corresponding increase in effort, with new, higher-capacity vessels replacing the older smaller vessels in the fleet (Morgan 2004).

The five main taxa caught by Qatar are Lethrinidae (18%), Serranidae (9%), *Scomberomorus commerson* (8%), Carangidae (6%), and Siganidae (5%) (Figure 2b; Appendix Table A2).

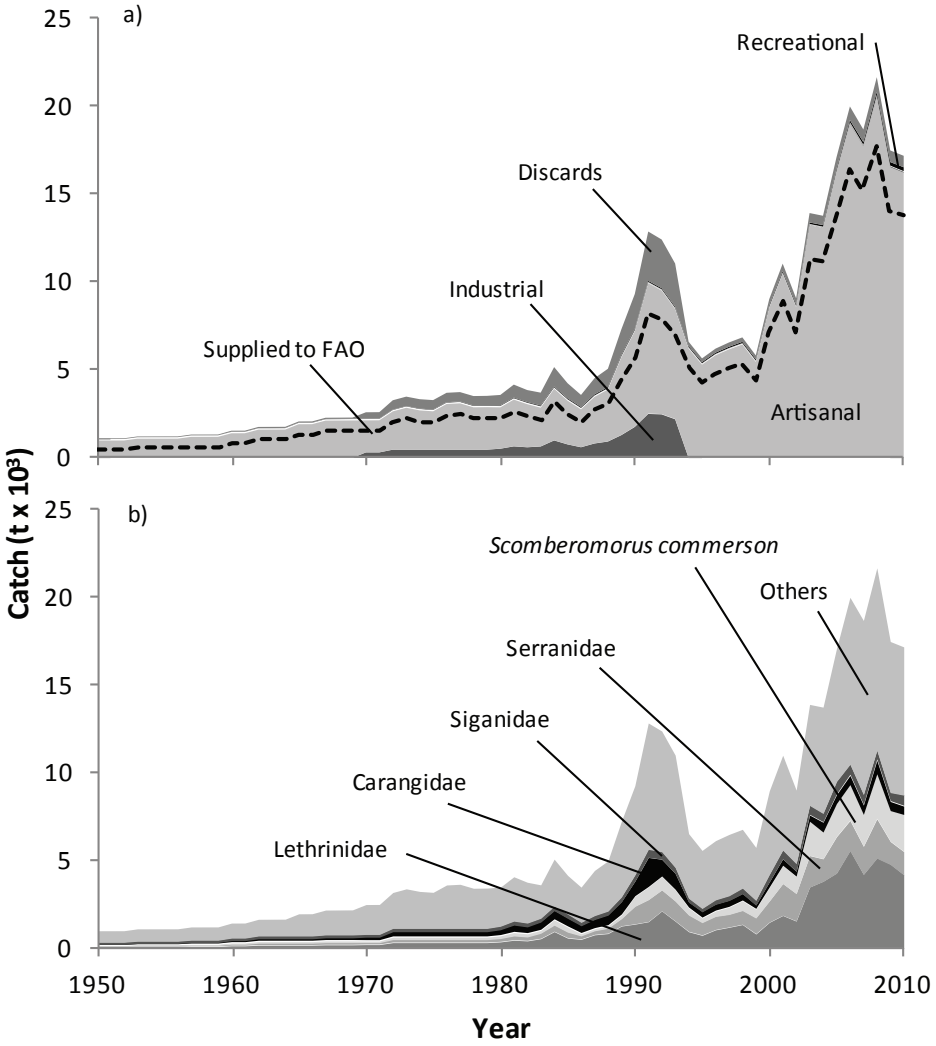

Figure 2. Total reconstructed catch for Qatar by a) sector (with comparison to FAO data), and b) major taxa, 1950-2010. Note that the subsistence sector is not visible on the sector graph (a) and recreational catches are only slightly visible at the end of the time period (black fill).

In particular, the reconstruction highlights the extent of illegal fishing in Qatar. The small scale and minor economic value of Qatar's fisheries means that directing resources at fisheries enforcement is not economically justifiable (Morgan 2004). Although Qatar has banned the use of *hadrah* since 1994, the contribution of Al-Abdulrazzak and Pauly's (2013) suggests that from 286 to 572 t (or 429 t on average) of fish are caught annually by

hadrah since 1994. In addition, it was estimated that on average, 1,082 t were caught annually by illegal driftnetting from 1989 to 2010. These estimates of illegal catches presented here are very tentative, and are likely to be replaced by higher figures when the assumptions used here are replaced by field estimates.

The reconstruction also highlights the magnitude of discarding in the region. For the years when the QNFC was operational (1970-1993), discards from the bottom-trawl fishery constituted 30% of reported catch; of this, 38% consisted of fish of length above 15 cm, i.e., suitable for human consumption (Ibrahim *et al.* 1989). An additional 18% was greater than 20 cm and of commercial value in Qatar (Ibrahim *et al.* 1989). If retained, these fish could have increased QNFC's annual income by more than 15-30% (Ibrahim *et al.* 1989).

Given the country's rapidly growing population, the corresponding increase in recreational fishing is unsurprising. However, Morgan (2004) predicts that the catch of the recreational sector (which is unmonitored) could one day exceed that of the commercial sector. Thus, management issues for this growing sector must be addressed. Unlike neighbouring countries, Qatar currently meets most of the fish demands of its 1.8 million residents, only importing 1,679 t in 2001 (Morgan 2004). However, Qatar's reliance on imports is likely to increase in light of its growing population.

In order to accommodate expanding industries and rapid population growth, major coastal development projects are underway resulting in land reclamation and dredging, with little to no studies on their short- and long-term ecological impacts on marine life (Sheppard *et al.* 2010). These development projects are certain to impact fisheries yet are not addressed, since no formal management plan exists for any fishery. In addition, although fishery input controls are used (gear restrictions, limiting number of vessels, etc.), they are ineffective because compliance is limited. Given these rapid developments, the lack of stock assessments and fishery management plans is cause to worry about the future prospects of Qatar's fish stocks.

The reconstruction approach undertaken here accounts for missing sectors, including discards, shark catches, illegal and recreational catches. Thus, the reconstructed time series may better reflect the catches extracted from Qatar's marine ecosystems from 1950-2010 than the official statistics. Although the reconstructed time series are entirely dependent on the assumptions made by this study, they are preferable to the alternative of assuming 'zero' catch for sectors with missing data components. Thus, despite considerable data uncertainties and lack of precision, conservative catch reconstruction approaches are far less misleading (particularly in with respect for fisheries policy formulation) than assuming no data means 'zero' catch.

Acknowledgements

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Appendix Table A1. FAO landings vs. total reconstructed catch (t) for Qatar, 1950-2010, as well as catch by sector.

Year	FAO landings	Total reconstructed catch	Industrial	Artisanal	Subsistence	Recreational	Discards
1950	400	1,030	0	990	0	0	40
1951	400	1,030	0	990	0	0	40
1952	400	1,030	0	990	0	0	40
1953	500	1,130	0	1,090	0	0	44
1954	500	1,130	0	1,090	0	0	44
1955	500	1,130	0	1,090	0	0	44
1956	500	1,140	0	1,090	0	0	44
1957	600	1,240	0	1,190	0	0	48
1958	600	1,240	0	1,190	0	0	48
1959	600	1,240	0	1,190	0	0	48
1960	800	1,460	0	1,400	1	6	56
1961	800	1,460	0	1,400	1	6	56
1962	1,000	1,670	0	1,600	1	7	65
1963	1,000	1,680	0	1,600	1	8	65
1964	1,000	1,680	0	1,610	1	8	65
1965	1,300	1,990	0	1,910	1	9	65
1966	1,300	1,990	0	1,910	1	10	65
1967	1,500	2,200	0	2,120	1	11	69
1968	1,500	2,200	0	2,120	2	12	69
1969	1,500	2,210	0	2,120	2	12	69
1970	1,500	2,510	310	1,820	2	14	364
1971	1,500	2,520	310	1,820	2	15	364
1972	2,000	3,190	470	2,170	2	16	534
1973	2,200	3,400	470	2,380	2	18	534
1974	2,047	3,250	470	2,230	3	19	534
1975	1,989	3,200	470	2,180	3	20	534
1976	2,400	3,620	470	2,590	3	21	534
1977	2,433	3,660	470	2,630	3	23	534
1978	2,200	3,430	470	2,400	3	24	534
1979	2,200	3,440	470	2,410	3	25	534
1980	2,178	3,500	520	2,350	4	28	594
1981	2,604	4,080	660	2,650	4	31	739
1982	2,331	3,770	610	2,450	5	34	683
1983	2,114	3,630	650	2,200	5	38	733
1984	3,174	5,080	1,000	2,930	6	42	1,110
1985	2,485	4,160	770	2,480	6	46	862
1986	1,981	3,500	610	2,150	7	49	685
1987	2,679	4,440	820	2,640	7	52	919
1988	3,088	4,990	930	2,950	8	55	1,041
1989	4,376	7,230	1,300	4,400	8	57	1,462
1990	5,704	9,240	1,770	5,420	8	59	1,981
1991	8,137	12,800	2,520	7,400	8	60	2,807
1992	7,847	12,340	2,490	7,010	8	61	2,769
1993	6,996	10,980	2,210	6,240	8	61	2,458
1994	5,088	6,530	0	6,210	9	62	247
1995	4,273	5,580	0	5,300	9	63	209
1996	4,741	6,130	0	5,830	9	64	231
1997	5,033	6,480	0	6,160	9	66	244
1998	5,281	6,770	0	6,440	9	68	255
1999	4,399	5,750	0	5,450	10	71	215
2000	7,142	8,950	0	8,520	10	74	344
2001	8,866	10,970	0	10,460	10	76	424
2002	7,157	8,990	0	8,560	11	78	344
2003	11,295	13,850	0	13,220	11	82	537
2004	11,134	13,690	0	13,060	12	89	528
2005	13,935	17,020	0	16,240	14	102	658
2006	16,376	19,920	0	19,010	17	122	772
2007	15,190	18,600	0	17,720	20	147	715
2008	17,688	21,580	0	20,560	24	174	830
2009	14,064	17,410	0	16,530	27	199	662
2010	13,760	17,110	0	16,210	30	219	650

Appendix Table A2. Total reconstructed catch (t) for Qatar by major taxa, 1950-2010.

Year	Lethrinidae	Serranidae	*Scomberomorus commerson*	Carangidae	Siganidae	Others[a]
1950	78	47	37	57	151	650
1951	78	47	37	57	151	660
1952	78	47	37	57	151	660
1953	97	59	46	70	157	700
1954	97	59	46	70	157	700
1955	97	59	46	70	157	710
1956	97	59	46	70	157	710
1957	116	71	55	84	164	750
1958	116	71	55	84	164	750
1959	116	71	55	84	164	750
1960	153	95	73	110	176	850
1961	153	95	73	110	176	860
1962	191	119	91	137	189	950
1963	191	119	91	137	189	950
1964	191	119	91	137	189	950
1965	191	119	91	137	189	1,260
1966	191	119	91	137	189	1,260
1967	210	131	100	150	195	1,410
1968	210	131	100	150	195	1,420
1969	210	131	100	150	195	1,420
1970	225	119	91	192	189	1,690
1971	225	119	91	192	189	1,700
1972	336	178	137	286	220	2,030
1973	336	178	137	286	220	2,240
1974	336	178	137	286	220	2,100
1975	336	178	137	286	220	2,040
1976	336	178	137	286	220	2,460
1977	336	178	137	286	220	2,500
1978	336	178	137	286	220	2,270
1979	336	178	137	286	220	2,280
1980	376	199	153	320	231	2,220
1981	471	250	192	400	258	2,510
1982	434	230	177	369	248	2,320
1983	555	318	158	452	248	1,890
1984	957	373	304	493	282	2,670
1985	590	345	289	467	273	2,200
1986	519	204	124	427	224	2,000
1987	777	236	114	498	254	2,560
1988	846	308	143	577	262	2,850
1989	1,271	426	213	716	311	4,290
1990	1,381	1,015	562	838	383	5,060
1991	1,515	1,257	716	1,667	480	7,160
1992	2,125	1,200	766	960	451	6,840
1993	1,550	1,145	636	911	365	6,370
1994	951	950	406	298	257	3,670
1995	747	728	255	332	224	3,290
1996	1,058	768	307	353	288	3,360
1997	1,201	736	411	355	300	3,480
1998	1,356	804	552	375	348	3,340
1999	823	913	496	206	303	3,000
2000	1,482	1,215	768	293	450	4,740
2001	1,869	1,820	1,019	367	514	5,380
2002	1,552	1,567	963	279	463	4,170
2003	3,483	1,804	1,945	356	532	5,730
2004	3,809	1,293	1,511	562	495	6,030
2005	4,276	2,094	1,882	506	721	7,540
2006	5,555	1,743	2,037	526	590	9,470
2007	4,202	1,613	1,811	534	579	9,870
2008	5,134	2,259	2,563	775	508	10,350
2009	4,778	1,318	1,750	522	485	8,560
2010	4,182	1,335	2,107	479	605	8,400

[a] Others category includes 39 additional taxonomic groups.