

# Catch and length data of swordfish (*Xiphias gladius*) for the WCNPO and EPO areas from the Taiwanese fisheries

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## Abstract

Catch data of Pacific swordfish by the fisheries of Taiwan during 1954-2016 were obtained from the Oversea Fisheries Development Council (OFDC) of Taiwan. Recent five-years total catches of swordfish in the WCNPO and EPO indicated a decreasing and increasing trend overtime, respectively. Lower jaw fork length data (cm) of swordfish collected from the Taiwanese distant-water longline fishery in the western central North Pacific Ocean (WCNPO) and eastern tropical Pacific Ocean (EPO) were summarized using violin plot during 2004-2016. Length compositions are stable in both areas. However, fish with lower jaw fork length less than 100 cm was not observed after 2014.

## Introduction

Swordfish (*Xiphias gladius*), a.k.a. broadbill swordfish, inhabit a wide region of the Pacific between the latitudes of 50°N and 50°S (Ward et al., 2000). Several stock structures have been proposed for Pacific swordfish (Alvarado Bremer et al., 2006; Ichinokawa and Brodziak, 2008). Recent genetic model in Lu et al. (2016) shows complex genetic population structure in the Pacific. To account for some stock structure uncertainty, we presented here the Catch and length data of swordfish for the Taiwanese distant-water longline fishery in the area of western central North Pacific Ocean (WCNPO) and eastern tropical Pacific Ocean (EPO), respectively. This paper aims to provide updated available fishery data for swordfish in the areas of WCNPO and EPO caught by Taiwanese fisheries, including catch estimates by fishery and size frequency data in lower jaw fork length.

## Materials and methods

Nominal catch data of Pacific swordfish caught by the fisheries of Taiwan were obtained from the Oversea Fisheries Development Council (OFDC) of Taiwan. For the distant-water longline fishery, we separated the swordfish catch into the WCNPO and EPO areas according to the logbook information. Furthermore, we separated swordfish catch from the offshore longline fishery into the two areas based on monthly catch reports

from captains and vessel monitoring system (VMS) (Su et al., 2014). Catches from the offshore and coastal fisheries such as gillnets, set-nets, and harpoons were assigned to the WCNPO area because these fisheries only operated in waters near Taiwan. Lower jaw fork length data (cm) of swordfish collected from the Taiwanese distant-water longline fishery in the WCNPO and EPO were summarized using violin plot during 2004-2016.

## Results and discussion

Time-series catches of swordfish in the WCNPO and EPO caught by the fisheries of Taiwan were shown in **table 1**. The catches in WCNPO area were fluctuated around 1000 mt during 1959-1999 while catches were generally less than 100 mt in EPO. However, the catches in both WCNPO and EPO have increased since 2000 (**Fig. 1**). The catch in WCNPO during 2001-2009 was relatively stable at around 3,700 mt, but has declined thereafter. The EPO catch reached a peak of 3000 mt in 2002 then dramatically decreased to 735 mt in 2008, and then increased continuously until present. The majority of swordfish catch in WCNPO was contributed by the offshore longline fishery while catch in EPO was mainly caught by distant-water longline fishery. Only a small amount of swordfish catch was reported for the “others” in WCNPO.

Length compositions of swordfish harvested by the Taiwanese distant-water longline fishery in the areas of WCNPO and EPO were shown in **Fig. 2**. The result indicated the mean lengths of measured fishes seem relatively stable during 2004-2016 in both areas (**Fig. 2 and Table 2**). However, fishes with lower jaw fork length less than 100 cm were not found after 2014.

## References

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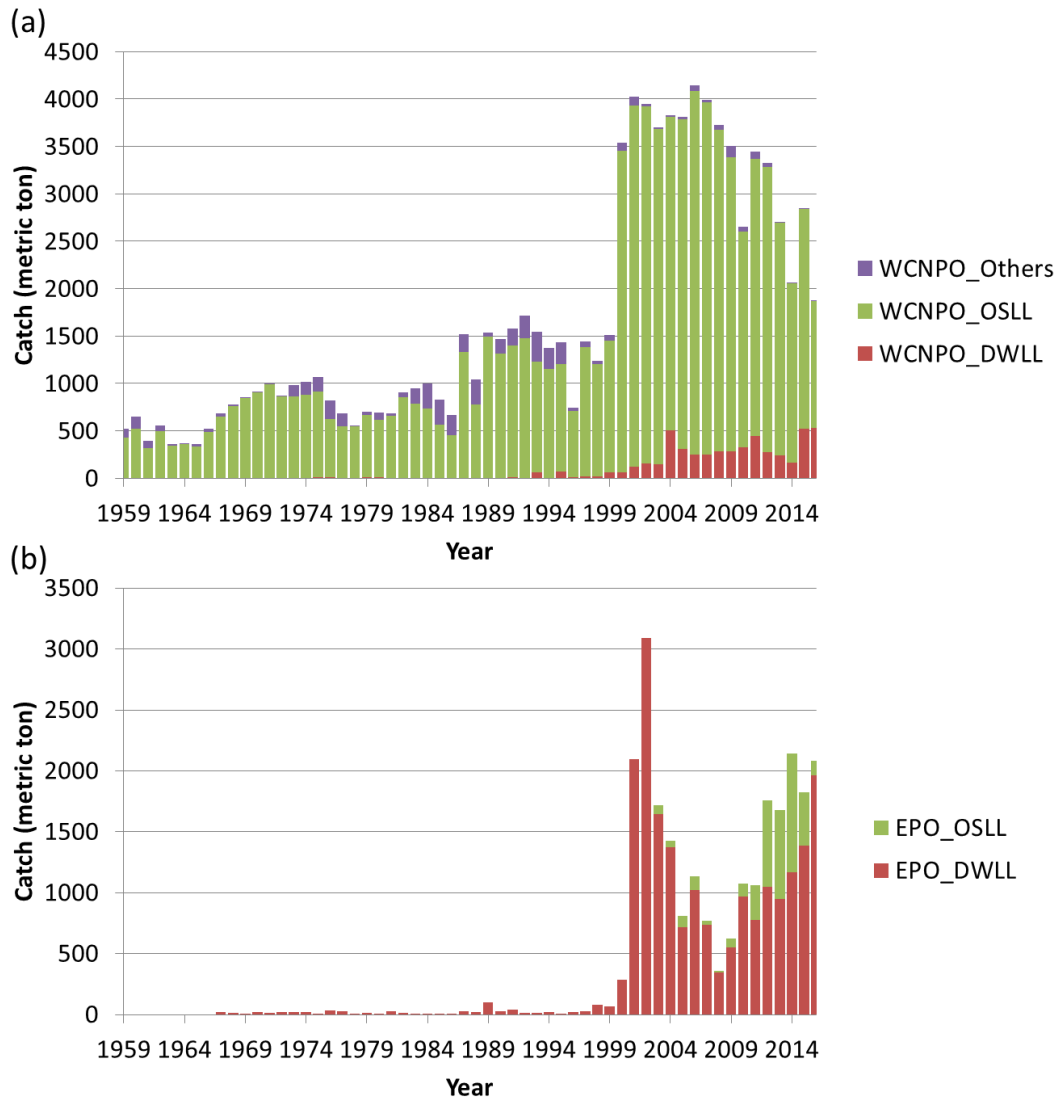


Figure 1. Time-series of swordfish catches caught by the fisheries of Taiwan in (a) the western central North Pacific Ocean (WCNPO) and (b) the eastern tropical Pacific Ocean (EPO) during 1959-2016.

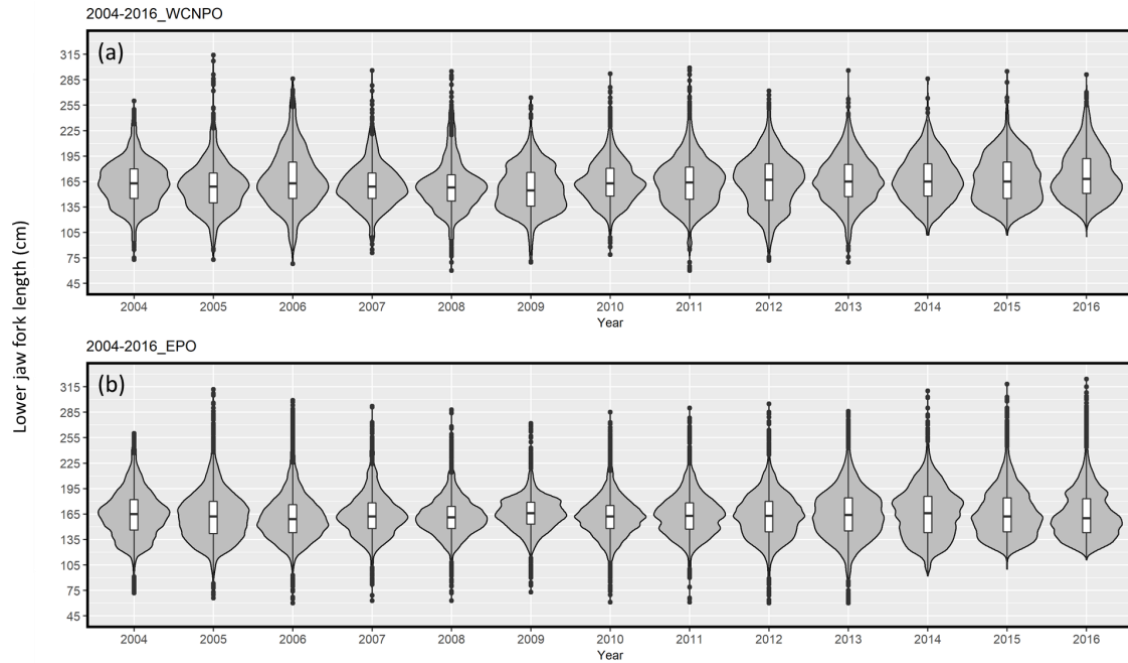


Figure 2. Length frequency distributions of swordfish caught by the Taiwanese distant-water longline fishery in (a) the western central North Pacific Ocean (WCNPO) and (b) the eastern tropical Pacific Ocean (EPO).

Table 1. Catch estimates (mt) of swordfish caught by the fisheries of Taiwan in the western and central North Pacific Ocean (WCNPO) and the eastern tropical Pacific Ocean (EPO) during 1959-2016. DWLL= distant-water longline; OSLL=offshore longline; Others = catches from offshore gillnet, coastal longline, coastal gillnet, coastal set-net, coastal harpoon and other fisheries.

Year	WCNPO_DWLL	WCNPO_OSLL	WCNPO_Others	EPO_DWLL	EPO_OSLL
1959		427	91		
1960		520	127		
1961		318	73		
1962		494	62		
1963		343	18		
1964	0	358	10	0	
1965	0	331	27	0	
1966	0	489	31	0	
1967	0	646	35	21	
1968	0	763	12	15	
1969	0	843	7	6	
1970	0	904	5	24	
1971	0	992	3	14	
1972	0	862	11	22	
1973	0	860	119	19	
1974	0	880	136	22	
1975	11	899	153	8	
1976	10	613	194	31	
1977	3	542	141	27	
1978	0	546	12	6	
1979	7	661	33	16	
1980	11	603	76	7	
1981	1	656	25	25	
1982	1	855	49	14	
1983	0	783	166	5	
1984	0	733	264	9	
1985	0	566	259	8	
1986	0	456	211	11	
1987	1	1328	190	25	
1988	0	777	263	23	
1989	4	1491	38	103	
1990	5	1309	154	29	
1991	10	1390	180	44	

1992	2	1473	243	16	
1993	58	1174	310	13	
1994	0	1155	219	18	
1995	71	1135	225	2	
1996	10	701	32	24	
1997	20	1358	61	26	
1998	22	1178	41	80	
1999	63	1385	61	69	
2000	64	3390	86	283	
2001	121	3812	91	2095	
2002	155	3766	27	3088	
2003	144	3543	11	1648	72
2004	502	3311	16	1375	54
2005	309	3479	26	717	93
2006	250	3830	61	1024	114
2007	248	3718	26	734	36
2008	279	3395	48	349	12
2009	286	3101	121	549	76
2010	325	2272	52	970	107
2011	445	2921	78	779	286
2012	278	3001	48	1047	713
2013	237	2456	11	947	730
2014	166	1891	8	1167	978
2015	524	2315	8	1387	434
2016	530	1337	5	1961	120

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Table 2. Summary statistics of length composition data (lower jaw fork length, cm) collected from the Taiwanese distant-water longline fishery in the western and central North Pacific Ocean (WCNPO) and eastern tropical Pacific Ocean (EPO).

Year	WCNPO				EPO			
	Average	Median	Minimum	Maximum	Average	Median	Minimum	Maximum
2004	163.01	163	73	260	165.37	165	72	260
2005	159.14	159	73	314	163.03	162	66	312
2006	167.70	163	68	286	161.79	159	60	299
2007	161.31	159	81	296	164.70	162	63	292
2008	160.91	158	60	295	162.01	161	63	288
2009	156.46	154.5	70	264	165.63	166	73	272
2010	164.45	163	79	292	162.26	162	61	285
2011	164.61	164	60	299	164.05	163	61	290
2012	165.19	167	72	272	162.91	163	60	295
2013	166.60	165	70	296	165.09	164	60	286
2014	168.02	165	102	286	166.36	166	92	310
2015	167.78	165	102	295	165.80	162	100	331
2016	172.66	168	100	291	164.53	160	111	360