Reconstructed Species Composition of Neritic Tuna and Seerfish Caught by Purse Seiners in the Andaman Sea of Thailand

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Abstract

Neritic tunas and seerfishes in the Andaman Sea of Thailand are caught by small-scale purse seiners. There are four species of neritic tuna, i.e., longtail tuna (*Thunnus tonggol*), Kawakawa (*Euthynnus affinis*), frigate tuna (*Auxis thazard*) and bullet tuna (*A. rochei*), and two species of seerfish, i.e., narrow-barred Spanish mackerel (*S. commerson*) and Indo-Pacific king mackerel (*Scomberomorus guttatus*) caught by the purse seiners. The neritic tuna and seerfish catch data are annually submitted to the IOTC secretariat. However, there are some major discrepancies between the species composition of the annual retained catches (reported through form 1RC) and the geo-referenced catches (reported through form 3AR). In addition, there are some species aggregates that were reported in the geo-referenced catches, e.g., species code AG06, standing for a mix of Kawakawa, frigate, and bullet tuna and a mix of narrow-barred Spanish mackerel and Indo-Pacific king mackerel. This paper aims to reconstruct the species composition of neritic tuna and seerfish by using monthly port sampling information. The mixed neritic tuna and seerfish catches were disaggregated back to 2006 by month while the total catches remained the same as previously reported. The form 1RC and form 3AR were corrected and will be submitted to the IOTC secretary.

Keywords: neritic tuna, seerfish, species composition, Andaman Sea, Thailand

1. Introduction

Neritic tunas and seerfishes in the Andaman Sea of Thailand are caught by small-scale purse seiners. There are four species of neritic tuna, i.e., longtail tuna (*Thunnus tonggol*), Kawakawa (*Euthynnus affinis*), frigate tuna (*Auxis thazard*) and bullet tuna (*A. rochei*), and two species of seerfish, i.e., narrow-barred Spanish mackerel (*S. commerson*) and Indo-Pacific king mackerel (*Scomberomorus guttatus*) caught by the purse seiners. The neritic tuna and seerfish catch data are annually submitted to the IOTC secretariat. However, some species were missing from the annual catch data reported to the IOTC Secretariat. For example, for neritic tuna, bullet tuna and frigate tuna only appeared in the annual catch from 2018 and, for seerfish, there was only narrow-barred Spanish mackerel reported (Figure 2 and 3). These missing species were due to the previous Thai statistical system which reported only the catches of some major species while other species were combined.

Prior to 2016, the catch and species composition data collection were carried out by Provincial Fisheries Offices. Then, the data were submitted to and analyzed by the Information and Communication Technology Center located in the Department of Fisheries Headquarters in Bangkok. The catches of 66 species/group of species were reported in the annual fisheries statistic books of Thailand including two species of neritic tunas, i.e., Kawakawa and longtail tuna, and Spanish mackerel (Information and Communication Technology Center, 2016). The catches of frigate tuna and bullet tuna were combined in the Kawakawa catch whereas the catch of Indo-Pacific king mackerel was combined in the Spanish mackerel catch. The catches of frigate tuna, bullet tuna and Kawakawa were reported to the IOTC Secretariat as species code AG06 standing for a mix of Kawakawa, frigate tuna, and bullet tuna while the catch of longtail tuna was individually reported because it was clearly sorted out from other neritic tunas and used as raw material for canned tuna.

During the transition period of 2016 - 2017, the catch data was collected from the fishing logbook instead of monthly port sampling carried out by the Provincial Fisheries Offices. However, the fishing masters recorded the total catch of neritic tuna in the fishing logbook since it is difficult to estimate the weight by species in a fishing operation due to the catch is mixed species. Therefore, only Kawakawa catch, which frigate tuna and bullet tuna were combined, and longtail tuna catch were reported to the IOTC Secretariat.

Since 2018, Thailand has introduced a new national catch data collection system which resulted in frigate tuna and bullet tuna being reported disaggregated from other neritic tuna catch. The data from the landing declaration issued by fishing ports was gathered and used for statistic purpose. The landing declaration has been developed as a part of traceability

system; thus, the fish weight is more accuracy. However, the catch of frigate tuna, bullet tuna and Kawakawa are still combined since they are normally sold all together while longtail tuna is sorted out and sold separately from other neritic tunas. In addition, narrow-barred Spanish mackerel and Indo-Pacific king mackerel are both weighted and sold together resulting in combined weight. Therefore, the data from the fishing vessel sampling survey, i.e., species composition from purse seiners, conducted by the Marine Fisheries Research and Development Division has been used to disaggregated the mix of frigate tuna, bullet tuna and Kawakawa and the mix of narrow-barred Spanish mackerel and Indo-Pacific king mackerel. Currently, there are the catch of 71 species/group of species reported in the annual fisheries statistic books (Fisheries Development Policy and Planning Division, 2023). The catch of five more species have been reported to support the IOTC work, i.e., frigate tuna, bullet tuna, skipjack tuna, Indo-Pacific sailfish and marlins.

This paper aims to reconstruct the species composition of neritic tuna and seerfish by using monthly port sampling information. This work was carried out in accordance with Para. 30 of the Report of the 13th Session of the IOTC Working Party on Neritic Tunas stating that The WPNT ACKNOWLEDGED that Thailand confirmed the possibility of revising their historical catches backwards as many years as possible depending on the data availability to increase the species-level resolution and report these updates back to the Secretariat for inclusion in the IOTC databases and Para. 81 stating that The WPNT NOTED that currently both seerfish species are being reported as one species in Thailand and ENCOURAGED Thailand to consider methods to improve the individual species reporting.

2. Method

Small purse seiners were sampled at fishing ports in six provinces along the Andaman Sea Coast of Thailand (Figure 1). The number of sampled purse seiners was at least 40 vessels/month. The 40-50 kg fish per vessel was sampled to identify the species caught. The species composition of frigate tuna, bullet tuna and Kawakawa was made up 100% by month. It was then used to disaggregate the mixed frigate tuna, bullet tuna and Kawakawa catch reported to the IOTC Secretariat. The species composition of frigate tuna, bullet tuna and Kawakawa was analyzed as follows.

$$\text{Species composition}_{F} = \frac{\sum_{i=1}^{n} \text{Catch}_{Fi}}{\sum_{i=1}^{n} \text{Total catch}_{FBKi}} \text{ x } 100$$

$$\text{Species composition}_{B} = \frac{\sum_{i=1}^{n} \text{Catch}_{Bi}}{\sum_{i=1}^{n} \text{Total catch}_{FBKi}} \text{ x } 100$$

$$\text{Species composition}_{K} = \frac{\sum_{i=1}^{n} \text{Catch}_{Ki}}{\sum_{i=1}^{n} \text{Total catch}_{FBKi}} \text{ x } 100$$

where Catch_{Fi}, Catch_{Bi} and Catch_{Ki} are the catch of frigate tuna, bullet tuna and Kawakawa, respectively, from purse seiner i, Total catch_{FBKi} is the total catch of frigate tuna, bullet tuna and Kawakawa from purse seiners i and n is the number of purse seiners sampled.

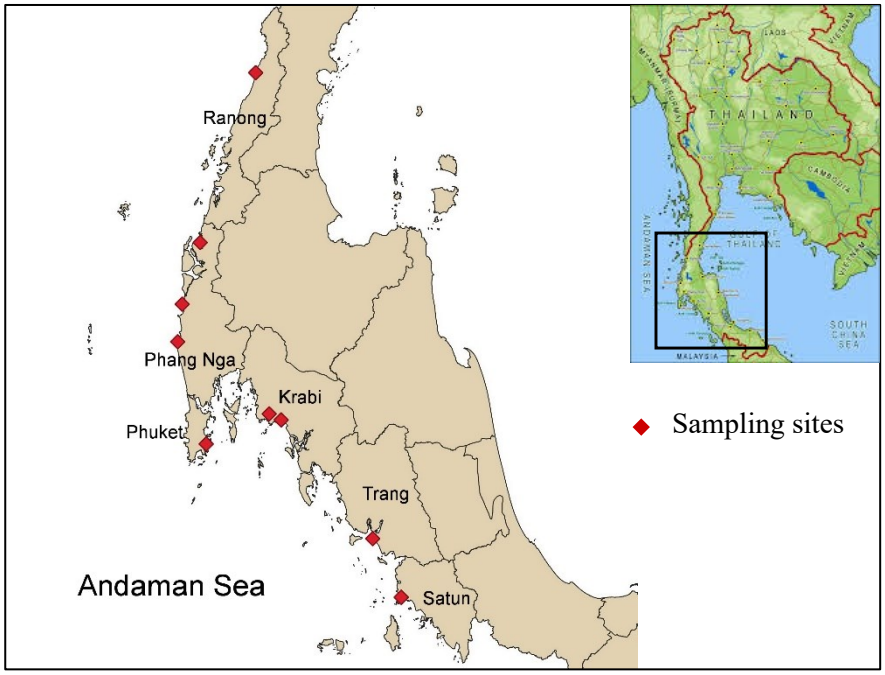

Figure 1 Sampling sites of purse seiners along the Andaman Sea Coast of Thailand

Also, the species composition of seerfish, i.e., narrow-barred Spanish mackerel and Indo-Pacific king mackerel was made up 100% by month. The species composition of seerfish was analyzed as follows.

$$\text{Species composition}_{NB} = \frac{\sum_{i=1}^{n} \text{Catch}_{NBi}}{\sum_{i=1}^{n} (\text{Catch}_{IP} + \text{Catch}_{NB})_i} \text{ x } 100$$

$$\text{Species composition}_{IP} = \frac{\sum_{i=1}^{n} \text{Catch}_{IPi}}{\sum_{i=1}^{n} (\text{Catch}_{IP} + \text{Catch}_{NB})_i} \text{ x } 100$$

where $Catch_{NBi}$ and $Catch_{IPi}$ are the catch of narrow-barred Spanish mackerel and Indo-Pacific king mackerel, respectively, from purse seiner i, and n is the number of purse seiners sampled.

The monthly species composition data are available since 2006 which were used to disaggregate the mixed frigate tuna, bullet tuna and Kawakawa catch and the mixed narrow-barred Spanish mackerel and Indo-Pacific king mackerel catch reported to the IOTC Secretariat.

3. Result

For neritic tuna catch between 2006 and 2017, only catches of Kawakawa and longtail tuna were reported to the IOTC Secretariat (Figure 2). The catches of frigate tuna and bullet tuna were combined in the catch of Kawakawa. The species composition data from monthly fishing vessel sampling surveys were used to disaggregate the catch of Kawakawa while the total catch of mixed frigate tuna, bullet tuna and Kawakawa previously reported remained the same. For example, the catch of Kawakawa, i.e., mixed frigate tuna, bullet tuna and Kawakawa, in 2006 was 8,348 tons. When the catch of Kawakawa was disaggregated to frigate tuna, bullet tuna and Kawakawa, the catches were 2,027, 493 and 5,828 tons respectively totaling 8,348 tons. While, the catch of longtail tuna remained at 2,047 tons (Figure 4 and Annex 1 – 2).

Between 2018 and 2021, catches of four neritic tuna species were reported; however, the composition of frigate tuna, bullet tuna and Kawakawa was slightly changed resulting to changes in catch. While the catches of longtail tuna were not changed (Figure 2 and 4, and Annex 1 – 2).

For seerfish catch between 2006 and 2022, the catch of Indo-Pacific king mackerel was combined with the catch of narrow-barred Spanish mackerel. Thus, only the catch of narrow-barred Spanish mackerel was reported (Figure 3). Then, it was disaggregated by using species composition data from monthly fishing vessel sampling surveys while the annual total catches remained unchanged. For example, in 2006, the catch of narrow-barred Spanish mackerel was reported at 482 tons. When disaggregated, the catches of narrow-barred Spanish mackerel and of Indo-Pacific king mackerel were 239 and 243 tons respectively totaling 482 tons (Figure 5 and Annex 1 – 2).

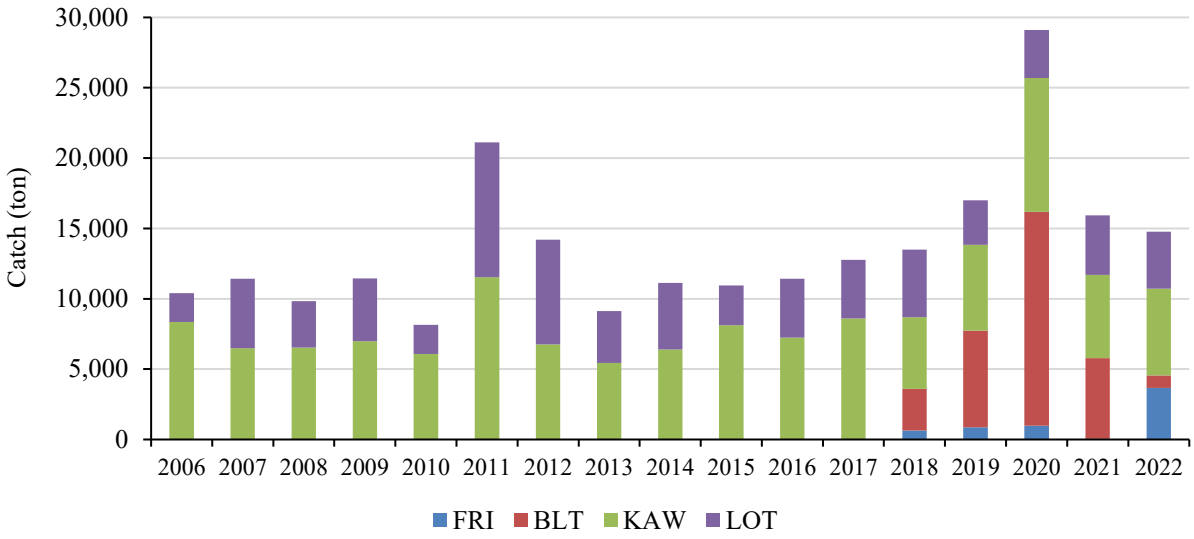

Figure 2 Annual catch data of neritic tunas reported to the IOTC Secretariat through IOTC FORM 1: NOMICAL CATCH for the Thai small purse seine fishery for the period 2006 – 2022

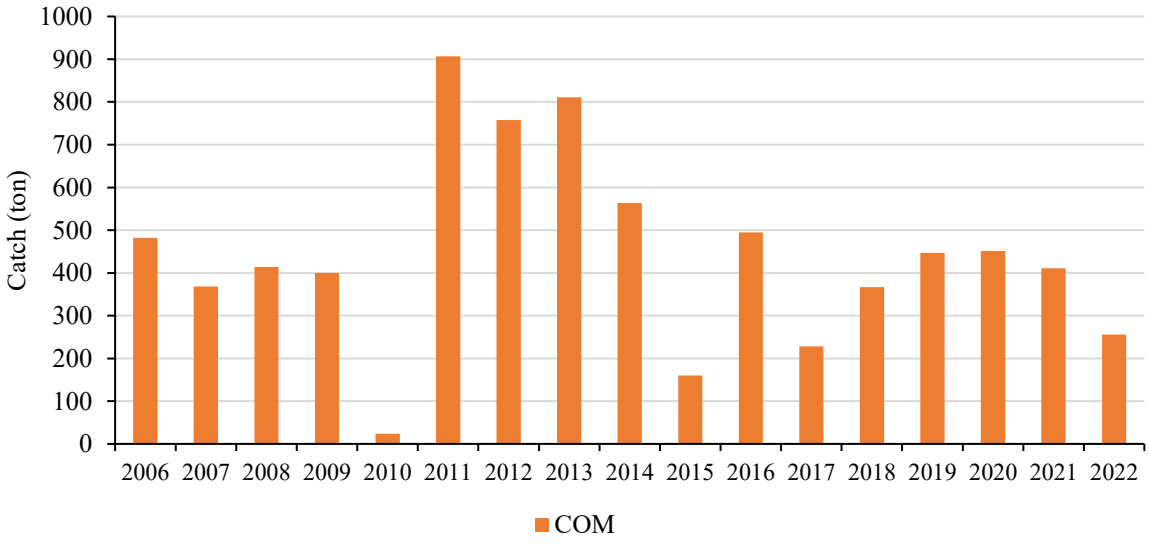

Figure 3 Annual catch data of seerfishes reported to the IOTC Secretariat through IOTC FORM 1: NOMICAL CATCH for the Thai small purse seine fishery for the period 2006-2022

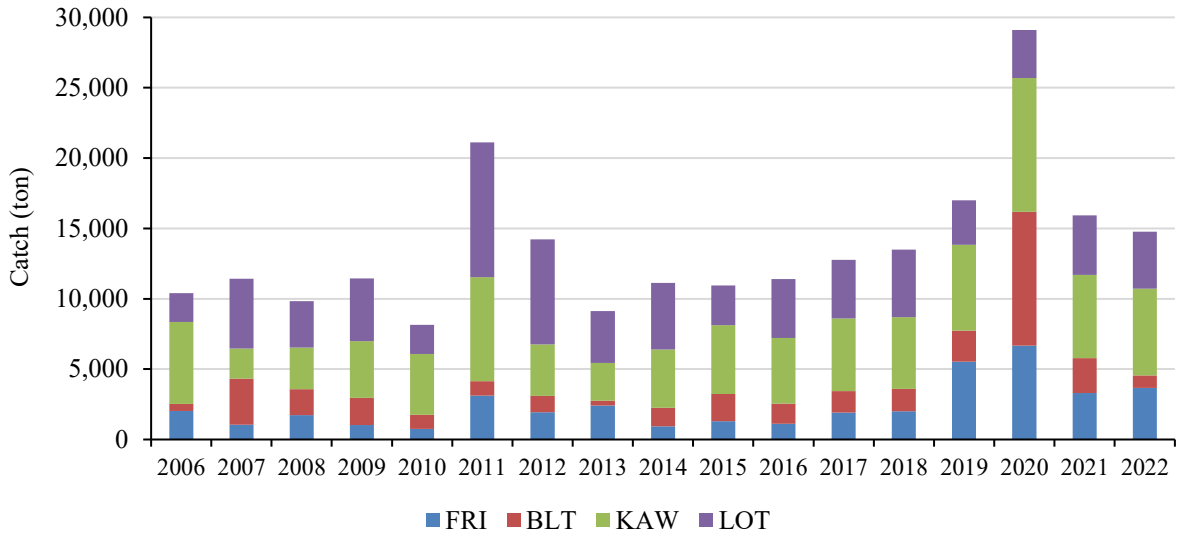

Figure 4 Reconstructed annual catch data of neritic tunas for the Thai small purse seine fishery for the period 2006 – 2022

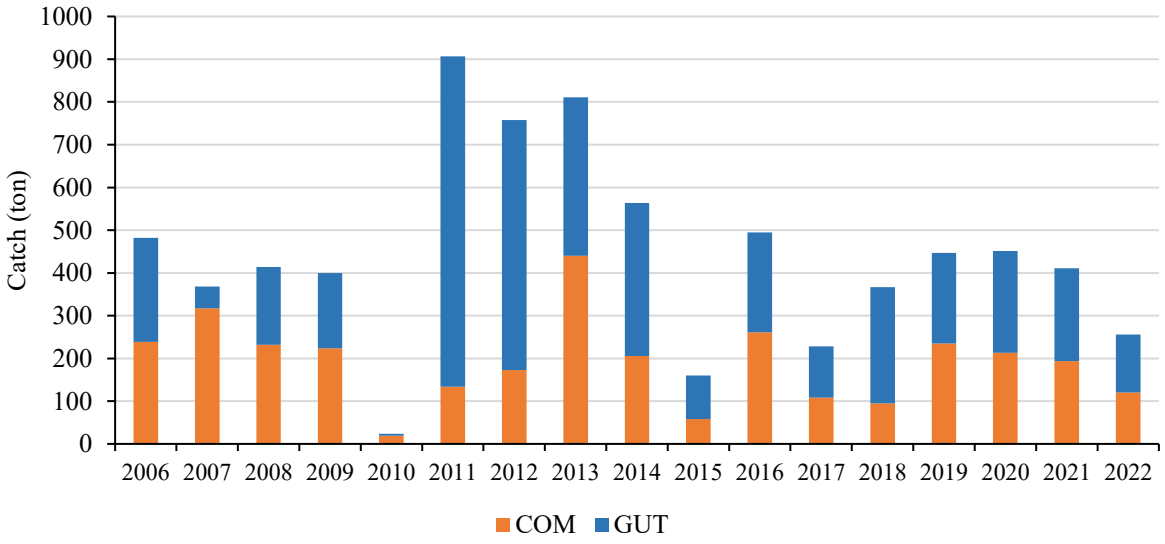

Figure 5 Reconstructed annual catch data of neritic tunas for the Thai small purse seine fishery for the period 2006 – 2022

Reference

Information and Communication Technology Center. 2016. Fisheries Statistics of Thailand 2014. Paper No. 11/2016. Information and Communication Technology Center, Department of Fisheries, Ministry of Agriculture and Cooperatives. 87 pp. Available at https://www4.fisheries.go.th/local/file_document/20200714161551_1_file.pdf

Fisheries Development Policy and Planning Division. 2023. Fisheries Statistics of Thailand 2022. Paper No. 12/2023. Fisheries Development Policy and Planning Division. Department of Fisheries, Ministry of Agriculture and Cooperatives. 86 pp. Available at https://www4.fisheries.go.th/local/file_document/20230913110030_1_file.pdf

Annex 1 Summary of neritic tuna and seerfish catches reported through IOTC FORM 1: NOMINAL CATCH for the period of 2006 - 2022

Year	FRI	BLT	KAW	LOT	Total neritic tuna	COM	GUT	Total seerfish
2006	2,027	493	5,828	2,047	10,395	239	243	482
2007	1,061	3,275	2,132	4,948	11,416	317	51	368
2008	1,724	1,849	2,959	3,313	9,845	232	182	414
2009	1,018	1,953	4,022	4,445	11,438	224	176	400
2010	764	999	4,310	2,084	8,157	19	5	24
2011	3,117	1,019	7,408	9,568	21,112	134	773	907
2012	1,937	1,161	3,673	7,450	14,221	173	585	758
2013	2,427	334	2,680	3,679	9,120	440	371	811
2014	934	1,329	4,132	4,735	11,130	206	358	564
2015	1,294	1,935	4,891	2,818	10,938	58	102	160
2016	1,110	1,442	4,671	4,183	11,406	261	234	495
2017	1,907	1,525	5,172	4,164	12,768	108	120	228
2018	2,010	1,585	5,104	4,798	13,497	95	272	367
2019	5,523	2,217	6,101	3,162	17,003	235	212	447
2020	6,664	9,521	9,509	3,415	29,109	213	238	451
2021	3,304	2,485	5,916	4,234	15,939	194	217	411
2022	3,667	892	6,166	4,041	14,766	120	136	256

Annex 2 Summary of neritic tuna and seerfish catches by month reported through IOTC FORM 3: CATCH AND EFFORT for the period of 2006 - 2022

Month	2006						2007						2008					
	FRI	BLT	KAW	LOT	COM	GUT	FRI	BLT	KAW	LOT	COM	GUT	FRI	BLT	KAW	LOT	COM	GUT
1	222	0	894	0	1	58	384	90	92	894	20	0	49	466	106	341	9	12
2	189	96	776	386	0	38	26	388	50	862	13	2	109	233	261	385	23	0
3	307	1	832	292	0	30	50	34	317	721	18	0	81	493	177	462	0	24
4	358	11	412	201	0	27	149	3	670	475	22	0	325	5	90	321	23	0
5	158	54	260	144	8	22	50	533	204	183	24	0	211	15	270	279	35	0
6	129	36	531	279	15	0	84	250	327	221	38	0	314	44	131	123	40	0
7	93	7	146	30	24	0	32	237	41	142	40	0	46	2	415	121	45	0
8	240	280	573	14	2	4	59	636	121	93	44	0	138	0	358	169	42	6
9	66	0	99	0	13	11	1	70	7	86	23	23	72	1	448	202	0	45
10	27	4	142	42	1	47	6	127	39	94	40	0	268	67	297	122	7	53
11	28	0	206	162	104	0	107	254	111	213	35	0	0	479	0	504	0	28
12	210	4	957	497	71	6	113	653	153	964	0	26	111	44	406	284	8	14
Total	2,027	493	5,828	2,047	239	243	1,061	3,275	2,132	4,948	317	51	1,724	1,849	2,959	3,313	232	182

Annex 2 (Continue)

Month	2009						2010						2011					
	FRI	BLT	KAW	LOT	COM	GUT	FRI	BLT	KAW	LOT	COM	GUT	FRI	BLT	KAW	LOT	COM	GUT
1	13	270	424	435	3	28	66	212	90	162	0	0	187	10	199	2,180	4	9
2	167	319	256	455	30	1	14	178	64	159	0	0	31	118	399	1,171	0	0
3	226	12	554	477	11	17	77	39	867	145	12	1	10	6	277	1,067	7	7
4	82	13	534	418	0	27	88	207	421	161	3	0	21	140	526	543	14	0
5	101	270	163	337	0	32	48	218	89	93	0	0	0	0	1,198	330	21	315
6	38	277	202	336	0	36	41	107	141	44	0	0	648	557	1,630	818	6	0
7	110	7	329	291	34	0	133	4	143	452	0	0	193	85	843	86	16	0
8	40	393	76	331	37	0	25	22	202	154	0	0	22	0	49	157	6	26
9	98	107	387	382	42	0	172	6	279	385	0	0	119	0	347	206	0	0
10	28	0	494	336	1	35	24	0	138	84	0	0	1,365	0	988	1,072	43	416
11	36	0	485	337	35	0	23	3	505	114	4	4	258	0	780	543	17	0
12	79	285	118	310	31	0	53	3	1,371	131	0	0	263	103	172	1,395	0	0
Total	1,018	1,953	4,022	4,445	224	176	764	999	4,310	2,084	19	5	3,117	1,019	7,408	9,568	134	773

Annex 2 (Continue)

Month	2012						2013						2014					
	FRI	BLT	KAW	LOT	COM	GUT	FRI	BLT	KAW	LOT	COM	GUT	FRI	BLT	KAW	LOT	COM	GUT
1	232	14	458	1,274	14	0	25	53	154	1,532	11	0	33	34	317	1,117	1	12
2	365	67	390	1,752	6	3	4	73	110	855	15	0	81	105	229	879	3	8
3	79	177	256	1,017	9	7	35	49	303	617	6	50	132	96	244	664	22	4
4	160	150	135	491	13	6	55	42	303	21	145	0	98	132	231	206	7	33
5	21	100	51	145	0	227	107	16	350	363	20	0	113	121	251	192	0	122
6	19	35	186	3	12	0	555	41	337	57	0	10	77	281	588	232	0	11
7	53	51	77	30	24	0	356	58	109	91	48	0	98	140	252	178	0	22
8	32	0	155	126	30	0	0	0	339	124	0	7	19	37	179	160	20	0
9	220	0	408	374	3	5	116	0	37	0	22	0	58	29	292	236	13	0
10	205	1	478	827	9	299	5	1	68	0	21	173	79	118	500	421	62	135
11	349	4	668	597	50	0	89	0	51	19	152	87	68	79	384	239	68	0
12	202	562	411	814	3	38	1,080	1	519	0	0	44	78	157	665	211	10	11
Total	1,937	1,161	3,673	7,450	173	585	2,427	334	2,680	3,679	440	371	934	1,329	4,132	4,735	206	358

Annex 2 (Continue)

Month	2015						2016						2017					
	FRI	BLT	KAW	LOT	COM	GUT	FRI	BLT	KAW	LOT	COM	GUT	FRI	BLT	KAW	LOT	COM	GUT
1	49	643	248	184	4	14	55	220	348	184	17	29	24	12	374	43	1	2
2	42	150	467	398	9	18	309	124	824	459	73	29	56	127	353	327	33	12
3	106	37	584	351	30	34	48	242	775	536	71	110	245	343	800	317	42	0
4	213	19	686	213	15	18	220	341	952	229	49	49	547	469	1,525	275	1	0
5	408	164	262	105	0	17	137	204	501	33	19	16	168	78	414	551	6	0
6	43	155	238	193	0	0	203	129	203	21	0	1	121	106	121	435	0	0
7	24	19	1	226	0	1	22	49	39	434	29	0	189	67	284	464	1	34
8	110	280	289	18	0	0	13	51	165	1,132	0	0	91	8	160	605	2	0
9	55	33	314	618	0	0	13	0	60	259	0	0	68	20	170	618	1	0
10	213	31	768	93	0	0	27	68	351	502	0	0	24	0	97	30	0	4
11	7	3	631	155	0	0	56	8	199	263	0	0	86	49	381	270	14	18
12	24	401	403	264	0	0	7	6	254	131	3	0	288	246	493	229	7	50
Total	1,294	1,935	4,891	2,818	58	102	1,110	1,442	4,671	4,183	261	234	1,907	1,525	5,172	4,164	108	120

Annex 2 (Continue)

Month	2018						2019						2020					
	FRI	BLT	KAW	LOT	COM	GUT	FRI	BLT	KAW	LOT	COM	GUT	FRI	BLT	KAW	LOT	COM	GUT
1	127	6	502	825	14	27	195	35	247	99	5	5	292	539	1,120	283	22	1
2	51	10	274	102	6	40	86	359	429	224	13	92	2,064	155	1,465	158	3	110
3	26	109	342	31	2	1	948	113	843	204	8	25	1,332	785	1,702	312	14	83
4	270	442	707	97	30	19	925	181	675	123	17	2	797	2,601	1,012	292	0	8
5	914	262	1,187	318	4	4	981	583	405	186	1	12	382	1,686	416	219	14	0
6	176	135	189	37	0	5	601	115	408	170	29	2	457	791	224	108	1	14
7	27	220	186	31	5	2	654	233	477	255	9	0	217	915	457	104	3	0
8	91	77	158	159	0	1	224	77	254	195	0	0	184	1,325	357	79	29	4
9	20	116	455	904	0	0	221	148	724	555	0	0	131	393	382	366	13	1
10	55	0	452	1,617	0	119	27	300	725	719	76	0	120	126	331	475	16	0
11	138	133	359	578	21	28	443	3	520	351	22	16	475	31	1,344	560	81	13
12	115	75	293	99	13	26	218	70	394	81	55	58	213	174	699	459	17	4
Total	2,010	1,585	5,104	4,798	95	272	5,523	2,217	6,101	3,162	235	212	6,664	9,521	9,509	3,415	213	238

Annex 2 (Continue)

Month	2021						2022					
	FRI	BLT	KAW	LOT	COM	GUT	FRI	BLT	KAW	LOT	COM	GUT
1	261	113	205	247	18	8	110	213	829	791	32	35
2	265	136	506	435	18	8	394	57	643	90	12	19
3	987	416	977	244	44	34	719	125	981	242	5	26
4	612	396	829	249	27	0	587	159	716	509	1	30
5	225	791	780	397	6	22	208	25	666	19	0	6
6	198	64	351	175	0	0	404	0	652	215	7	1
7	147	227	472	421	24	4	262	47	524	42	1	8
8	0	238	379	369	4	0	102	8	430	245	1	8
9	76	24	323	470	12	25	126	3	156	285	5	0
10	145	1	289	455	5	4	148	240	156	214	8	0
11	106	39	346	517	5	23	589	15	285	292	19	2
12	282	40	459	255	31	89	18	0	128	1,097	29	1
Total	3,304	2,485	5,916	4,234	194	217	3,667	892	6,166	4,041	120	136