

September 3, 2021

Ms. Kim Damon-Randall
Director, Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, Maryland 20910

Via US Mail and Electronic Mail

Dear Ms. Damon-Randall:

This letter corrects erroneous take exposure estimates provided by the Bureau of Ocean Energy Management (BOEM) to the National Marine Fisheries Service (NMFS) for consideration in its incidental take regulation (ITR) under the Marine Mammal Protection Act (MMPA) for geological and geophysical (G&G) survey activities related to the Outer Continental Shelf Oil and Gas Program in portions of the Gulf of Mexico (GOM). The final rule became effective on April 19, 2021 (86 FR 5322). BOEM would like to continue discussions with NMFS to determine the effect of this error on the existing rule and any remedies for moving forward.

Background

On February 25, 2020, BOEM submitted a letter to NMFS (GM 673E) updating the proposed action and action area for the then ongoing incidental take regulation (ITR) process under the Marine Mammal Protection Act (MMPA) for geological and geophysical (G&G) survey activities related to the Outer Continental Shelf Oil and Gas Program in portions of the Gulf of Mexico (the ITR). In that letter, BOEM explained that most of the Eastern Planning Area (EPA) and a small section of the Central Planning Area (CPA) were and would remain under a Congressional leasing moratorium under the Gulf of Mexico Energy Security Act (GOMESA) (P.L. 109-432, §104) through June 2022. BOEM further explained, that while the leasing moratorium does not prohibit G&G activities related to oil and gas exploration, G&G activities are not likely to be proposed during the 5-year period of the ITR in the EPA and those portions of the CPA subject to the leasing moratorium (GOMESA Area).

Based on the above, BOEM removed the GOMESA Area from the proposed action/geographic scope in its petition for the ITR. At the same time, BOEM and the Bureau of Safety and Environmental Enforcement also submitted a joint letter to NMFS revising the proposed action in the ongoing Endangered Species Act (ESA) Section 7 consultation for all oil and gas activities in the GOM, including G&G survey activities, to reflect this change in the action area for the consultation as well as the ITR process.

Subsequent to the change in the proposed action for the ITR, BOEM and NMFS staff began a series of discussions via email and telephone to clarify and review how revised exposure estimates would be calculated given the removal of the GOMESA Area. Upon completion of those discussions BOEM developed the revised take numbers and NMFS published the final ITR

in the Federal Register on January 19, 2021 and the ITR became effective 90-days later on April 19, 2021 (86 FR 5322).

On June 8, 2021, NMFS reached out to BOEM indicating they had discovered a discrepancy between the revised exposure/take estimates provided by BOEM when addressing the removal of the GOMESA area and the underlying modeling results informing the calculator tool developed by Jasco for NMFS to use when processing Letters of Authorization (LOAs) under the ITR. According to NMFS, it appeared that the calculator tool was returning LOA take numbers for some species in excess of the take numbers calculated for the rule. BOEM and NMFS held an initial virtual meeting to better understand the issue on June 10, 2021.

On a July 7, 2021 follow-up call, and after BOEM completed a preliminary review of the take estimates, BOEM walked NMFS through how the discrepancy may have happened, errors largely caused by the timing of the previous Administration's direction to remove the GOMESA area, the large number of calculations, and the short time frame within which to provide the revised information back to NMFS. Specifically, BOEM had erred in factoring the species' densities into the exposure estimates which erroneously multiplied the species' density a second time, as the densities had already been accounted for in the formula. This error resulted in underestimates of exposures for certain species and zones. BOEM and NMFS closed the July 7 call noting BOEM intended to recalculate the estimates to remedy that error. The information below reflects the updated calculations from BOEM.

Survey Activity Area and Levels

The figure below shows the GOMESA AREA and how it coincides with the Acoustic Impact Modeled Zones from the GOM Programmatic G&G FEIS (2017). Table 1 provides projected survey activity levels in 24-hr survey days based on the area removal. Table 2 provides the overall percentage *reduction* in survey area for each modeled zone.

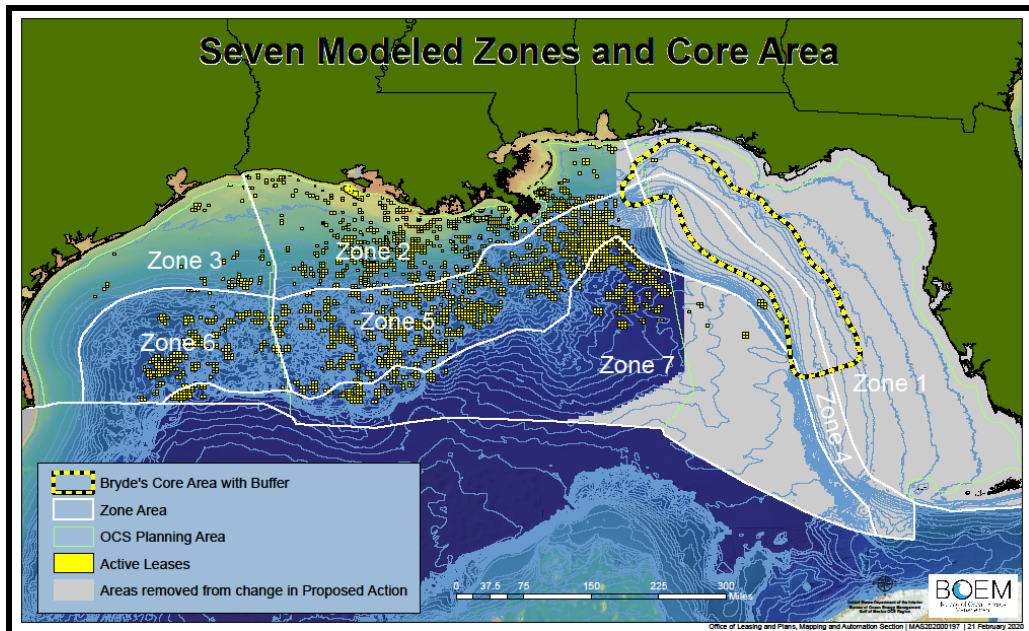


Table 1. Projected Levels of Effort in 24-hr Survey Days for Five Years, by Zone and Survey Type

Note: BOEM provided NMFS with Table 1 before the ITR was finalized; however, the activity table in the final ITR is incorrect. The final, published ITR activity table erroneously presents the *difference* in activity levels between the proposed ITR and the revised levels after GOMESA removal. Table 1 presents the revised activity levels with the GOMESA removal and should be used instead.

Year	Zone ²	2D ³	3D NAZ ³	3D WAZ ³	Coil ³	VSP ³	Total (Deep) ³	Shallow hazards ⁴	Boomer ⁴	HRG ⁴	Total (Shallow) ⁴
1	1	0	0	0	0	0	0	0	0	0	0
	2	0	236	0	0	0	236	2	0	18	20
	3	0	30	0	0	0	30	0	0	4	4
	4	0	0	0	0	0	0	0	0	0	0
	5	54	373	184	79	2	692	0	0	25	25
	6	0	186	49	21	0	256	0	0	10	10
	7	46	346	166	71	1	630	0	0	23	23
	Total	100	1171	399	171	3	1844	2	0	80	82
2	1	0	0	0	0	0	0	0	0	0	0
	2	0	354	42	19	0	415	2	0	18	20
	3	0	0	0	0	0	0	0	0	4	4
	4	6	0	0	0	0	6	0	0	0	0
	5	0	373	184	79	2	638	0	0	25	25
	6	0	99	0	0	0	99	0	0	11	11
	7	20	336	162	69	1	588	0	0	23	23
	Total	26	1162	388	167	3	1746	2	0	81	83
3	1	0	0	0	0	0	0	0	0	0	0
	2	0	236	0	0	0	236	2	0	18	20
	3	0	0	0	0	0	0	0	0	4	4
	4	0	0	0	0	0	0	0	0	0	0
	5	0	328	154	66	2	550	0	0	26	26
	6	0	186	49	21	0	256	0	0	12	12
	7	0	306	139	60	1	506	0	0	24	24
	Total	0	1056	342	147	3	1548	2	0	84	86
4	1	0	0	0	0	0	0	0	0	0	0
	2	0	354	42	19	0	415	2	1	16	19
	3	0	30	0	0	0	30	0	0	3	3
	4	12	11	0	0	0	23	0	0	0	0
	5	27	237	92	40	2	398	0	0	26	26
	6	0	99	0	0	0	99	0	0	12	12
	7	63	255	94	40	1	453	0	0	24	24
	Total	102	986	228	99	3	1418	2	1	81	84
5	1	0	0	0	0	0	0	0	0	0	0
	2	0	236	0	0	0	236	0	0	19	19
	3	0	0	0	0	0	0	0	0	3	3
	4	0	17	0	0	0	17	0	0	0	0
	5	0	283	184	79	2	548	2	1	24	27
	6	0	99	0	0	0	99	0	0	13	13
	7	0	313	162	69	2	546	2	1	23	26
	Total	0	948	346	148	4	1446	4	2	82	88

Table 2. Percentage Reduction in Survey Area for Each Modeled Zone

Modeled Zone	Percentage Reduction in Area
1	100.0
2	2.7
3	0.0
4	98.2
5	4.0
6	0.0
7	33.0

Corrected Exposure Estimates

The attached Tables 3-14 provide the corrected exposure estimates. Two points to note. Previously, exposure estimates from VSP surveys were combined with 2-D surveys. In this update, VSP exposures are estimated using the 2-D model results but the exposure estimates for VSP are presented separately to be consistent with other survey types. Also, as a reminder, each of the values presented in these tables have been rounded off to the nearest whole number for ease of reading and comparison. Since the summary total provided throughout these tables are calculated before this rounding occurs, they may vary slightly due to this rounding.

We look forward to continued conversations with NMFS regarding impacts of this corrected information on the current ITR and any potential remedies where needed. Please advise when you are ready for these conversations.

William Y. Brown
Chief Environmental Officer
Bureau of Ocean Energy Management

(Note: This is a duplicate of a letter signed and sent on September 3, 2021. The original letter inadvertently retained an attorney-client privilege header used during the internal drafting process that has been removed from this duplicate. The digital signature above reflects the transmittal date of this duplicate.)

ATTACHMENTS

Table 3. Estimate Level A and Level B Exposures Estimates per Species Summing All Survey Types (unmitigated) for Years 1 – 5 and Total for All Five Years

Species	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²
Atlantic spotted dolphins	322	129,567	413	169,819	282	113,884	401	165,184	273	110,349	1,691	688,803
Beaked whales	45	207,896	38	174,855	39	172,890	27	122,804	35	155,271	184	833,718
Common bottlenose dolphins	1,896	635,117	2,686	938,172	1,741	581,158	2,697	940,835	1,710	573,791	10,730	3,669,072
Bryde's whales	14	537	13	505	11	429	9	341	12	448	59	2,260
Clymene dolphins	399	99,006	327	81,067	350	83,859	234	56,069	294	71,978	1,604	391,980
False killer whales	92	22,204	80	19,084	79	18,717	58	13,591	72	16,897	381	90,494
Fraser's dolphins	44	11,912	39	10,228	38	10,004	27	7,312	35	9,117	183	48,573
Killer whales	4	1,155	3	1,025	3	956	2	740	3	932	16	4,809
Kogia	3,147	14,424	2,783	12,597	2,655	11,959	1,774	8,743	2,606	11,255	12,965	58,979
Melon-headed whales	218	60,712	192	51,672	190	50,798	131	35,674	170	45,877	901	244,733
Pantropical spotted dolphins	2,267	503,560	2,039	446,194	1,928	415,793	1,476	314,999	1,871	402,443	9,581	2,082,989
Pygmy killer whales	66	15,251	58	13,020	57	12,801	42	9,181	53	11,654	276	61,908
Risso's dolphins	91	24,814	80	21,101	79	20,761	55	14,535	73	18,792	377	100,003
Rough-toothed dolphins	129	33,821	120	31,967	112	28,787	91	24,876	102	26,193	554	145,645
Short-finned pilot whales	64	18,280	50	13,735	58	15,941	36	9,856	44	12,331	252	70,142
Sperm whales	39	40,112	35	33,121	34	33,859	23	22,564	31	29,036	162	158,692
Spinner dolphins	239	77,546	229	72,741	200	62,594	157	49,720	211	65,282	1,036	327,882
Striped dolphins	158	38,257	137	32,871	136	31,885	98	22,689	124	29,266	654	154,968

1. Level A threshold is peak SPL for MF & HF cetaceans, SEL for LF cetaceans
2. Level B threshold is the step function (Wood 2012).

Table 4. Annual Exposure Estimate Totals by Species for 2-D Surveys (8,000 in³ airgun array, 1 vessel) for Years 1-5 and Total for All Five Years and

Species	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²
Atlantic spotted dolphins	3	2,594	0	297	0	0	3	1,890	0	0	6	4,781
Beaked whales	2	13,249	0	1,974	0	0	1	10,573	0	0	3	25,796
Common bottlenose dolphins	7	6,810	2	1,064	0	0	7	5,534	0	0	16	13,408
Bryde's whales	0	40	0	8	0	0	0	35	0	0	1	83
Clymene dolphins	11	5,212	3	594	0	0	11	3,795	0	0	25	9,601
False killer whales	3	1,166	1	219	0	0	3	1,020	0	0	6	2,405
Fraser's dolphins	1	652	0	133	0	0	1	593	0	0	2	1,378
Killer whales	0	66	0	19	0	0	0	71	0	0	0	156
Kogia	102	856	24	155	0	0	99	738	0	0	225	1,749
Melon-headed whales	5	3,408	1	493	0	0	4	2,690	0	0	9	6,591
Pantropical spotted dolphins	83	29,975	29	7,071	0	0	99	29,129	0	0	212	66,174
Pygmy killer whales	2	820	1	160	0	0	2	729	0	0	5	1,709
Risso's dolphins	2	1,398	1	219	0	0	2	1,136	0	0	4	2,753
Rough-toothed dolphins	3	1,556	1	251	0	0	3	1,280	0	0	7	3,088
Short-finned pilot whales	1	809	0	103	0	0	1	610	0	0	2	1,521
Sperm whales	1	2,194	0	162	0	0	1	1,421	0	0	2	3,777
Spinner dolphins	8	5,185	2	1,204	0	0	9	5,001	0	0	19	11,390
Striped dolphins	5	2,187	1	339	0	0	6	1,771	0	0	12	4,296

1. Level A threshold is peak SPL for MF & HF cetaceans, SEL for LF cetaceans
2. Level B threshold is the step function (Wood 2012).

Table 5. Annual Exposure Estimate Totals by Species for 3-D NAZ Surveys (8,000 in³ airgun array, 2 vessels) for Years 1-5 and Total for All Five Years

Species	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²
Atlantic spotted dolphins	282	110,971	342	138,499	251	100,188	343	139,310	240	96,216	1,459	585,184
Beaked whales	29	125,104	26	112,290	27	113,273	19	80,639	22	94,636	123	525,942
Common bottlenose dolphins	1,768	587,334	2,333	789,808	1,636	546,123	2,386	806,115	1,605	537,383	9,728	3,266,763
Bryde's whales	9	305	9	305	8	268	6	209	8	255	40	1,342
Clymene dolphins	270	59,323	229	51,881	248	54,073	172	37,393	200	43,382	1,119	246,053
False killer whales	63	13,619	56	12,401	57	12,346	42	9,135	49	10,500	268	58,003
Fraser's dolphins	31	7,184	28	6,531	28	6,508	21	4,823	24	5,581	132	30,627
Killer whales	2	666	2	619	2	597	2	457	2	546	11	2,884
Kogia	1,227	8,540	1,126	7,898	1,105	7,674	818	5,650	973	6,712	5,248	36,474
Melon-headed whales	153	36,265	138	32,797	138	32,772	99	23,393	117	27,493	645	152,720
Pantropical spotted dolphins	1,483	291,341	1,371	271,833	1,331	261,007	1,025	196,560	1,232	235,134	6,441	1,255,874
Pygmy killer whales	45	9,223	41	8,322	41	8,338	30	6,035	36	7,115	192	39,033
Risso's dolphins	59	14,644	53	13,252	53	13,236	39	9,486	47	11,164	252	61,782
Rough-toothed dolphins	92	22,417	88	22,310	83	20,327	70	18,244	73	17,717	406	101,015
Short-finned pilot whales	47	11,482	38	9,318	44	10,658	29	7,053	32	8,015	189	46,526
Sperm whales	23	24,704	21	21,803	21	22,470	15	15,423	18	17,877	99	102,277
Spinner dolphins	152	44,082	150	43,616	135	38,879	109	30,596	134	37,358	679	194,530
Striped dolphins	105	22,452	94	20,467	95	20,246	70	14,585	82	17,199	445	94,950

1. Level A threshold is peak SPL for MF & HF cetaceans, SEL for LF cetaceans
2. Level B threshold is the step function (Wood 2012).

Table 6. Annual Exposure Estimate Totals by Species for 3-D WAZ Surveys (8000 in³ airgun array, 4 vessels) for Years 1-5 and Total for All Five Years

Species	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²
Atlantic spotted dolphins	15	12,657	28	24,878	13	10,829	21	19,272	13	11,213	90	78,848
Beaked whales	4	55,596	3	48,561	3	47,634	2	25,276	3	48,561	15	225,628
Common bottlenose dolphins	33	32,747	116	119,440	28	27,982	101	104,832	30	29,226	309	314,227
Bryde's whales	1	158	1	158	1	132	0	79	1	158	3	685
Clymene dolphins	43	27,465	32	22,934	38	23,706	17	11,915	32	22,934	163	108,955
False killer whales	8	5,586	7	4,880	7	4,793	4	2,589	7	4,828	32	22,676
Fraser's dolphins	4	3,226	4	2,832	4	2,765	2	1,506	3	2,809	16	13,138
Killer whales	0	336	0	308	0	285	0	169	0	308	2	1,406
Kogia	1,490	3,976	1,339	3,598	1,271	3,386	702	1,862	1,339	3,597	6,141	16,419
Melon-headed whales	21	16,614	18	14,575	18	14,224	9	7,597	18	14,575	84	67,585
Pantropical spotted dolphins	236	145,660	208	134,130	202	123,591	113	71,509	208	134,126	968	609,015
Pygmy killer whales	6	3,924	5	3,424	5	3,361	3	1,821	5	3,424	24	15,954
Risso's dolphins	10	7,036	9	6,147	9	6,030	5	3,145	9	6,146	41	28,504
Rough-toothed dolphins	10	7,416	10	7,119	9	6,367	6	4,051	9	6,398	43	31,351
Short-finned pilot whales	6	4,701	4	3,408	5	4,144	2	1,728	4	3,408	22	17,389
Sperm whales	7	10,303	7	8,745	6	8,872	4	4,474	7	8,745	31	41,138
Spinner dolphins	29	22,682	28	22,406	24	19,024	14	11,307	28	22,406	123	97,826
Striped dolphins	17	10,873	14	9,676	15	9,285	8	5,071	14	9,676	67	44,581

1. Level A threshold is peak SPL for MF & HF cetaceans, SEL for LF cetaceans
2. Level B threshold is the step function (Wood 2012).

Table 7. Annual Exposure Estimate Totals by Species for Coil Survey (8,000 in³ airgun array, 4 vessels) for Years 1-5 and Total for All Five Years

Species	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²
Atlantic spotted dolphins	21	3,331	42	6,129	18	2,851	32	4,690	19	2,915	132	19,917
Beaked whales	11	13,944	9	12,026	9	11,980	5	6,313	9	12,026	43	56,288
Common bottlenose dolphins	77	8,145	225	27,777	66	6,969	193	24,248	65	7,150	626	74,290
Bryde's whales	4	35	4	35	3	29	2	18	4	35	16	151
Clymene dolphins	74	7,005	62	5,658	64	6,081	34	2,967	62	5,658	297	27,368
False killer whales	18	1,833	16	1,584	16	1,577	9	846	16	1,569	75	7,409
Fraser's dolphins	8	849	7	732	7	731	4	390	7	727	33	3,430
Killer whales	1	87	1	79	1	74	0	44	1	79	3	363
Kogia	327	1,053	294	946	279	899	155	493	294	946	1,350	4,337
Melon-headed whales	40	4,424	35	3,807	34	3,802	19	1,995	35	3,807	163	17,835
Pantropical spotted dolphins	465	36,585	431	33,161	395	31,195	238	17,801	431	33,160	1,960	151,902
Pygmy killer whales	13	1,284	12	1,114	11	1,103	7	597	12	1,114	55	5,211
Risso's dolphins	20	1,737	17	1,482	17	1,495	9	767	17	1,482	80	6,963
Rough-toothed dolphins	23	2,431	22	2,285	20	2,092	12	1,299	20	2,077	97	10,185
Short-finned pilot whales	10	1,288	8	907	9	1,139	4	465	8	907	39	4,706
Sperm whales	7	2,912	6	2,411	6	2,517	3	1,246	6	2,411	30	11,497
Spinner dolphins	50	5,597	49	5,515	42	4,691	25	2,816	49	5,515	215	24,133
Striped dolphins	31	2,744	28	2,389	27	2,355	15	1,262	28	2,389	129	11,139

1. Level A threshold is peak SPL for MF & HF cetaceans, SEL for LF cetaceans
2. Level B threshold is the step function (Wood 2012).

Table 8. Annual Exposure Estimate Totals by Species for VSP (2-D survey as proxy) for Years 1-5 and Total for All Five Years

Species	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²
Atlantic spotted dolphins	0	96	0	96	0	96	0	96	0	96	1	480
Beaked whales	0	441	0	441	0	441	0	441	0	512	0	2,277
Common bottlenose dolphins	0	252	0	252	0	252	0	252	0	252	1	1,261
Bryde's whales	0	1	0	1	0	1	0	1	0	1	0	7
Clymene dolphins	0	175	0	175	0	175	0	175	0	201	2	901
False killer whales	0	38	0	38	0	38	0	38	0	45	0	197
Fraser's dolphins	0	21	0	21	0	21	0	21	0	26	0	109
Killer whales	0	2	0	2	0	2	0	2	0	3	0	10
Kogia	3	29	3	29	3	29	3	29	4	33	17	149
Melon-headed whales	0	113	0	113	0	113	0	113	0	132	1	585
Pantropical spotted dolphins	2	932	2	932	2	932	2	932	3	1,185	12	4,913
Pygmy killer whales	0	26	0	26	0	26	0	26	0	32	0	135
Risso's dolphins	0	49	0	49	0	49	0	49	0	53	0	248
Rough-toothed dolphins	0	52	0	52	0	52	0	52	0	60	1	268
Short-finned pilot whales	0	29	0	29	0	29	0	29	0	30	0	146
Sperm whales	0	77	0	77	0	77	0	77	0	83	0	391
Spinner dolphins	0	188	0	188	0	188	0	188	0	194	1	945
Striped dolphins	0	72	0	72	0	72	0	72	0	85	1	372

1. Level A threshold is peak SPL for MF & HF cetaceans, SEL for LF cetaceans
2. Level B threshold is the step function (Wood 2012).

Table 9. Annual Exposure Estimate Totals by Species for HRG Surveys (90 in³ airgun array) for Years 1-5 and Total for All Five Years

Species	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²
Atlantic spotted dolphins	0	12	0	12	0	12	0	13	0	1	0	51
Beaked whales	0	0	0	0	0	0	0	0	0	34	0	34
Common bottlenose dolphins	0	53	0	56	0	57	0	62	0	3	0	232
Bryde's whales	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphins	0	0	0	0	0	0	0	0	0	3	0	3
False killer whales	0	0	0	0	0	0	0	0	0	1	0	1
Fraser's dolphins	0	0	0	0	0	0	0	0	0	0	0	0
Killer whales	0	0	0	0	0	0	0	0	0	0	0	0
Kogia	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whales	0	0	0	0	0	0	0	0	0	2	0	2
Pantropical spotted dolphins	0	0	0	0	0	0	0	0	0	17	0	17
Pygmy killer whales	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphins	0	0	0	0	0	0	0	0	0	1	0	1
Rough-toothed dolphins	0	1	0	1	0	1	0	1	0	1	0	5
Short-finned pilot whales	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whales	0	0	0	0	0	0	0	0	0	2	0	2
Spinner dolphins	0	0	0	0	0	0	0	0	0	2	0	2
Striped dolphins	0	0	0	0	0	0	0	0	0	1	0	1

1. Level A threshold is peak SPL for MF & HF cetaceans, SEL for LF cetaceans
2. Level B threshold is the step function (Wood 2012).

Table 10. Annual Exposure Estimate Totals by Species for Boomer Surveys for Years 1-5 and Total for All Five Years

Species	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²
Atlantic spotted dolphins	0	0	0	0	0	0	0	5	0	0	0	5
Beaked whales	0	0	0	0	0	0	0	0	0	12	0	12
Common bottlenose dolphins	0	0	0	0	0	0	0	21	0	1	0	22
Bryde's whales	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphins	0	0	0	0	0	0	0	0	0	1	0	1
False killer whales	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphins	0	0	0	0	0	0	0	0	0	0	0	0
Killer whales	0	0	0	0	0	0	0	0	0	0	0	0
Kogia	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whales	0	0	0	0	0	0	0	0	0	1	0	1
Pantropical spotted dolphins	0	0	0	0	0	0	0	0	0	6	0	6
Pygmy killer whales	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphins	0	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphins	0	0	0	0	0	0	0	0	0	0	0	1
Short-finned pilot whales	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whales	0	0	0	0	0	0	0	0	0	1	0	1
Spinner dolphins	0	0	0	0	0	0	0	0	0	1	0	1
Striped dolphins	0	0	0	0	0	0	0	0	0	0	0	0

1. Level A threshold is peak SPL for MF & HF cetaceans, SEL for LF cetaceans
2. Level B threshold is the step function (Wood 2012).

Table 11. Annual Exposure Estimate Totals by Species for Side-Scan Sonar, Sub-bottom Profiler, and Multibeam Survey for Years 1-5 and Total for All Five Years

Species	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²
Atlantic spotted dolphins	1	4	1	4	1	4	1	3	1	4	4	18
Beaked whales	0	4	0	4	0	4	0	4	0	4	0	18
Common bottlenose dolphins	10	27	10	27	10	27	9	23	11	27	50	130
Bryde's whales	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphins	0	0	0	0	0	0	0	0	0	0	0	0
False killer whales	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphins	0	0	0	0	0	0	0	0	0	0	0	0
Killer whales	0	0	0	0	0	0	0	0	0	0	0	0
Kogia	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whales	0	0	0	0	0	0	0	0	0	0	0	0
Pantropical spotted dolphins	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whales	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphins	0	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphins	0	0	0	0	0	0	0	0	0	0	0	1
Short-finned pilot whales	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whales	0	0	0	0	0	0	0	0	0	0	0	0
Spinner dolphins	0	0	0	0	0	0	0	0	0	0	0	0
Striped dolphins	0	0	0	0	0	0	0	0	0	0	0	0

1. Level A threshold is peak SPL for MF & HF cetaceans, SEL for LF cetaceans
2. Level B threshold is the step function (Wood 2012).

Table 12. Total Exposure Annually for Years 1-5 and Total for All Five Years for All Deep-Penetration Seismic Surveys

Species	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²
Atlantic spotted dolphins	321	129,648	412	169,900	282	113,964	400	165,259	272	110,440	1,687	689,209
Beaked whales	45	208,334	38	175,293	39	173,328	27	123,242	35	155,734	184	835,931
Common bottlenose dolphins	1,886	635,289	2,676	938,341	1,731	581,326	2,688	940,981	1,700	574,011	10,681	3,669,949
Bryde's whales	14	539	13	506	11	431	9	342	12	449	59	2,268
Clymene dolphins	399	99,181	327	81,243	350	84,034	234	56,244	295	72,175	1,605	392,877
False killer whales	92	22,242	80	19,122	79	18,755	58	13,629	72	16,942	381	90,690
Fraser's dolphins	44	11,932	39	10,249	38	10,025	27	7,333	35	9,142	183	48,682
Killer whales	4	1,157	3	1,027	3	958	2	742	3	935	16	4,819
Kogia	3,151	14,454	2,786	12,626	2,658	11,988	1,777	8,772	2,610	11,287	12,982	59,128
Melon-headed whales	218	60,825	192	51,786	190	50,911	131	35,788	170	46,007	901	245,316
Pantropical spotted dolphins	2,269	504,492	2,041	447,126	1,930	416,725	1,479	315,931	1,874	403,605	9,593	2,087,879
Pygmy killer whales	66	15,277	58	13,046	57	12,827	42	9,207	53	11,686	276	62,042
Risso's dolphins	91	24,863	80	21,149	79	20,810	55	14,584	73	18,844	378	100,251
Rough-toothed dolphins	129	33,872	120	32,018	112	28,837	91	24,927	102	26,252	554	145,907
Short-finned pilot whales	64	18,309	50	13,764	58	15,970	36	9,885	44	12,361	252	70,288
Sperm whales	39	40,189	35	33,198	34	33,936	23	22,641	31	29,116	162	159,080
Spinner dolphins	239	77,734	229	72,929	201	62,782	157	49,908	211	65,472	1,037	328,824
Striped dolphins	158	38,328	137	32,943	136	31,957	98	22,760	124	29,349	655	155,338

1. Level A threshold is peak SPL for MF & HF cetaceans, SEL for LF cetaceans
2. Level B threshold is the step function (Wood 2012).

Table 13. Total Exposure Annually for Years 1-5 and Total for All Five Years for All HRG Surveys

Species	Year 1		Year 2		Year 3		Year 4		Year 5		Total	
	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²
Atlantic spotted dolphins	1	15	1	16	1	16	1	21	1	5	4	74
Beaked whales	0	4	0	4	0	4	0	4	0	49	0	63
Common bottlenose dolphins	10	80	10	83	10	84	9	106	11	32	50	384
Bryde's whales	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphins	0	0	0	0	0	0	0	0	0	3	0	3
False killer whales	0	0	0	0	0	0	0	0	0	1	0	1
Fraser's dolphins	0	0	0	0	0	0	0	0	0	0	0	1
Killer whales	0	0	0	0	0	0	0	0	0	0	0	0
Kogia	0	0	0	0	0	0	0	0	0	1	0	1
Melon-headed whales	0	0	0	0	0	0	0	0	0	2	0	2
Pantropical spotted dolphins	0	0	0	0	0	0	0	0	0	23	0	23
Pygmy killer whales	0	0	0	0	0	0	0	0	0	1	0	1
Risso's dolphins	0	0	0	0	0	0	0	0	0	1	0	1
Rough-toothed dolphins	0	1	0	1	0	1	0	2	0	1	0	6
Short-finned pilot whales	0	0	0	0	0	0	0	0	0	1	0	1
Sperm whales	0	0	0	0	0	0	0	0	0	3	0	3
Spinner dolphins	0	0	0	0	0	0	0	0	0	3	0	3
Striped dolphins	0	0	0	0	0	0	0	0	0	2	0	2

1. Level A threshold is peak SPL for MF & HF cetaceans, SEL for LF cetaceans
2. Level B threshold is the step function (Wood 2012).

Table 14. Estimate Level A and Level B Exposures Estimates for All Analyzed Gulf of Mexico Species per Survey Types (unmitigated) for Years 1-5 and Total for All Five Years for

Survey Type	1		2		3		4		5		Total	
	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²	Level A ¹	Level B ²
2-D	240	78,177	66	14,464	0	0	252	68,016	0	0	558	160,656
3-D NAZ	5,840	1,389,655	6,143	1,563,951	5,301	1,268,982	5,297	1,405,106	4,892	1,174,284	27,474	6,801,978
3-D WAZ	1,941	370,956	1,833	437,221	1,657	316,410	1,012	278,202	1,731	332,537	8,175	1,735,326
Coil	1,200	95,285	1,268	108,037	1,024	81,579	766	68,257	1,083	83,965	5,341	437,123
VSP	7	2,593	7	2,593	7	2,593	7	2,593	10	3,023	39	13,396
HRG	0	66	0	69	0	70	0	76	0	68	0	350
Boomer	0	0	0	0	0	0	0	26	0	24	0	50
Side-scan sonar, sub-bottom profiler, and multibeam scanner	11	34	11	34	11	34	10	30	12	35	55	167
Total	9,233	1,934,172	9,321	2,123,776	7,994	1,667,075	7,338	1,819,713	7,718	1,590,913	41,604	9,135,650

1. Level A threshold is peak SPL for MF & HF cetaceans, SEL for LF cetaceans
2. Level B threshold is the step function (Wood 2012).

1. Additional explanation of the 2020 process for revising the projected levels of effort based on revised scope of activity (removal of GOMESA). We acknowledge that the projected levels of effort in the September 3 letter are the same as those provided in BOEM’s February 2020 document concerning “Updated Exposure Estimates for NMFS’ proposed Incidental Take Regulations for Oil and Gas related Geological and Geophysical Activities in the Gulf of Mexico,” and that the 2020 document included a brief summary of considerations made in revising the levels of effort in reflection of removal of the GOMESA area. However, NMFS has determined that in order to properly evaluate the corrected exposure estimates relative to the estimates included in the proposed rule prior to removal of the GOMESA area, we need to better understand this process.

For example, the 2020 letter stated that “The values presented in Table 1 are based on two basic assumptions embedded in the original GOM Programmatic G&G EIS analysis: a) Since the future location of a particular survey cannot be known with certainty, impacts are calculated for each modeled zone for each survey type instead using average values for marine mammal densities in those zones, and b) the total activity in a zone per survey type is directly tied to the [level of effort] planned for that survey type, in that zone in that year. If portions of these areas are removed, as is the case here (removal of the GOMESA area), then the corresponding surveys are also removed from the activity levels. They are not moved in space (to another zone) or time (to another year), they are [simply] eliminated.” Does this mean that all effort originally projected to occur was reduced on a zone-specific basis by the percentage of area removed (Table 2 of the September 3 letter), or was a different process followed?

“Does this mean that all effort originally projected to occur was reduced on a zone-specific basis by the percentage of area removed (Table 2 of the September 3 letter), or was a different process followed?”
 Yes, projected effort was reduced by zone proportionally to the percentage of the area removed.

The level of effort estimates used in the 2020 update and the 2021 correction were based on the estimates contained within the EIS document. The EIS covers a span of 10 years from 2015-2024. As most of those years have since passed and the ITR will be valid for 5 years, the update applied generic years 1 through 5. These 5 years are taken from the first 5 years of the 10 year estimates in Table 1 of the Proposed Rule. The estimated levels of effort were obtained as described in the 2020 update and 2021 correction. The levels of effort for all surveys and years within each zone were reduced by the percentage reduction of area excluded associated with the GOMESA removal.

The number of days of effort projected for year 1 of 3D NAZ surveys by zone from the Proposed Rule are given in the second column (Days of 3D NAZ (Proposed)) of the below table. The percentage reduction of area resulting from the GOMESA removal for each zone is presented in column 3 (Percentage reduction), and the updated levels of effort, in days, for each zone in year 1 are given in the 4th column (Days of 3D NAZ (updated)). This was done for all 5 years and all survey types.

Zone	Days of 3D NAZ (Proposed)	Percentage reduction	Days of 3D NAZ (updated)
1	0	100.0	0
2	243	2.7	236
3	30	0.0	30
4	0	98.2	0
5	389	4.0	373
6	186	0.0	186
7	515	33.0	346

Column 4 can be calculated from columns 2 and 3 by the following equation and some rounding to integer values.

$$Proposed\ Effort \times \frac{(100 - area\ reduction)}{100} \qquad \qquad \qquad Eq\ 1$$

2. To facilitate NMFS' evaluation of the corrected exposure estimates, please provide a detailed written description of the process involved in producing the revised take numbers submitted in 2020, the error(s) in that process, and the process involved in correcting those numbers. Please include all relevant equations.

When calculating estimated takes for the 2020 update, BOEM multiplied the modeled number of animals above threshold per day of survey ($N_{z,s,t}$), for each type of survey in each zone, by the habitat-based density of the species in each zone ($\rho_{z,t}$) and the number of days of effort for each survey and zone by year ($LoE_{z,s,y}$). However, the species' habitat-based density had already been included in the modeled number of animals above threshold ($N_{z,s,t}$). The species' habitat-based density had therefore been factored in twice.

$$N_{z,s,t} \times LoE_{z,s,y} \times \rho_{z,t} \quad \text{Eq 1}$$

Observing that the resultant numbers did not make sense, BOEM attempted to rectify the issue, by applying approximated species-specific scaling factors (C_t).

$$N_{z,s,t} \times LoE_{z,s,y} \times \rho_{z,t} / C_t \quad \text{Eq 2}$$

In the 2021 correction, BOEM calculated the estimated takes as the product of the number of animals above threshold per day of survey ($N_{z,s,t}$), for each type of survey in each zone, and the number of days of effort for each survey and zone by year ($LoE_{z,s,y}$).

$$N_{z,s,t} \times LoE_{z,s,y} \quad \text{Eq 3}$$

These equations were, or should have been, performed for each species, survey type, zone, year, and criteria (Level A/B). The data presented in previously published results were aggregated over some or all of these factors (year, survey, zone) so comparing errant BOEM derived values was challenging.

$N_{z,s,t}$ is the number of individuals of a species, t , expected above threshold for a given survey, s , in each zone, z . The number of individuals already includes the species' habitat-based density ($\rho_{z,t}$) for each species and zone.

$LoE_{z,s,y}$ is the level of effort in days per year, y , for each survey type, s , in each zone, z .

$\rho_{z,t}$ is the habitat-based density for each species or taxonomic group, t , in each zone, z .

C_t is the approximated correction factor for each species, t .

The species-specific correction factors (c_t) applied to the incorrect calculations are provided here for transparency. All other values are available to NMFS in previous documents or products provided by JASCO Applied Sciences.

Species	Correction (c_t)
Atlantic spotted dolphin	5.0
Beaked whales (Cuvier/Blainville/Gervais)	1.0
Bottlenose dolphin	40.0
Bryde's whale	1.0
Clymene dolphin	4.0
False killer whale	1.0
Fraser's dolphin	1.0
Killer whale	1.0
Kogia (dwarf, pygmy sperm whale)	1.0
Melon-headed whale	2.2
Pantropical spotted dolphin	20.0
Pygmy killer whale	1.0
Risso's dolphin	1.0
Rough-toothed dolphin	1.0
Short-finned pilot whale	1.0
Sperm Whale	1.0
Spinner dolphin	4.0
Striped dolphin	1.5