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FEBRUARY 2021

## SEA TURTLE TAGGING IN THE MARIANA ISLANDS TRAINING AND TESTING (MITT) STUDY AREA

### REDUCED INTERIM REPORT

**Marine Turtle Biology and Assessment Program (MTBAP)**  
**Protected Species Division (PSD)**  
**Pacific Islands Fisheries Science Center (PIFSC)**  
**NOAA Fisheries**

**PREPARED FOR THE U.S. PACIFIC FLEET ENVIRONMENTAL READINESS OFFICE**  
**Under Interagency Agreement NMFS-PIC-18-008**  
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## BACKGROUND

The United States Navy developed monitoring questions for the Mariana Islands Training and Testing (MITT) study area under the Mariana Islands Range Complex Monitoring Plan (MIRCMP), including questions specifically related to marine turtles as required under the Endangered Species Act (ESA) of 1973. To support the needs of the U.S. Pacific Fleet Environmental Readiness Office, the Marine Turtle Biology and Assessment Program (MTBAP) of the National Oceanic and Atmospheric Administration (NOAA) has been conducting research on marine turtle abundance and spatial-temporal ecology in the nearshore waters of Saipan, Tinian, and Guam since 2013, under a series of Interagency Agreements (IAA).

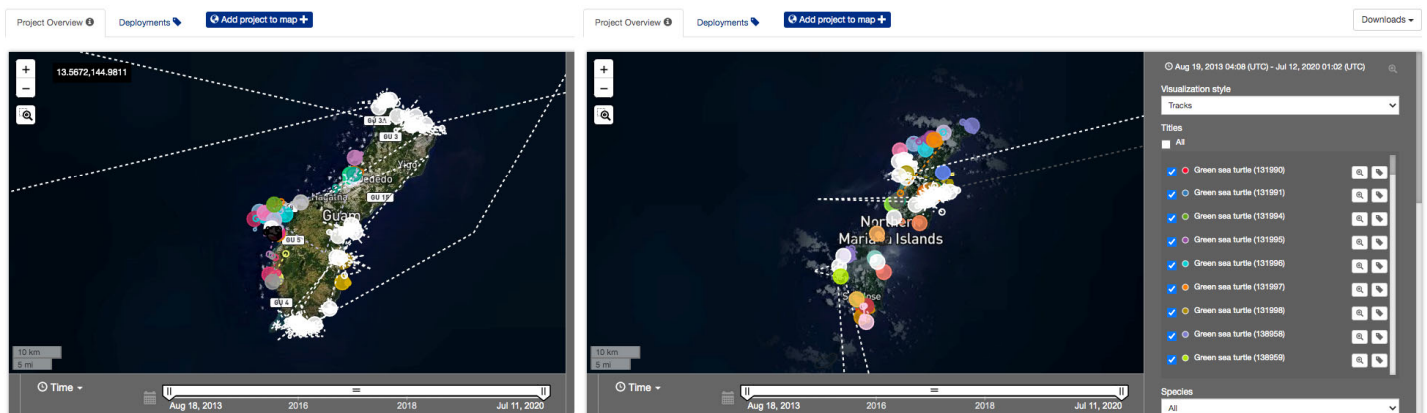
## PROGRESS ON FIELD RESEARCH AND DATA ANALYSIS

The period of performance for the most recent IAA (NMFS-PIC-18-008) was originally scheduled to end on 30 September 2020. Nonetheless, the onset of the Covid19 pandemic in early 2020 limited the ability of MTBAP to conduct field work, develop research tools, and analyze findings, thus the closing date for the IAA was extended until September 2021 and then to 2023. This is the first report since the extension was put in place. As a result of the limited MTBAP activities feasible since the onset of the Covid19 pandemic, this document constitutes a reduced interim report. We summarize the limited activities conducted since the most recent report ([DR-20-003](#)) and refer the reader to that document for more comprehensive information on methods and results that are not included in this report. Subsequent reports will once again incorporate more extensive details on methodologies, as well as a more thorough compilation and analysis of research findings.

## PUBLIC ACCESS TO RESEARCH RESULTS (PARR) AND THE ANIMAL TRACKING NETWORK (ATN)

Working with the Integrated Ocean Observing System (IOOS), a national-regional partnership aimed at providing current and past integrating ocean information, in 2020 MTBAP provided public access to all of the satellite tags deployed during under the NOAA-PACFLEET IAA. This was achieved via the creation of a [NOAA-PACFLEET web project](#) (Figure 1) within the Animal Tracking Network (ATN). Creation of the web project

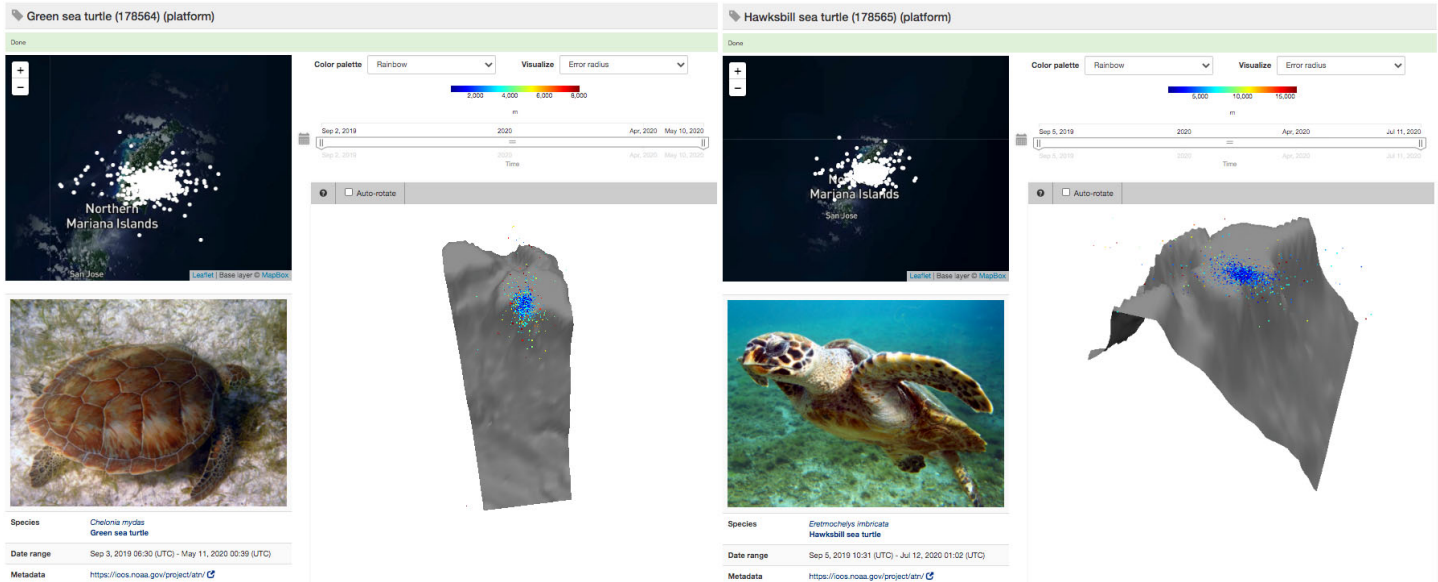
### Marine Turtle Movement and Habitat Use in the U.S. Pacific Fleet Mariana Islands Training and Testing (MITT) Study Area, 2013-2020



**Figure 1.** Visual of the NOAA-PACFLEET webpage within the Animal Tracking Network, which displays all satellite tracks deployed during the project timeframe. The webpage includes various features (e.g., Argos location class filtering), but remains under development.

required MTBAP undertake extensive data formatting and upload to ATN's data assembly center (DAC), which is hosted by Axiom Data Science. MTBAP also worked with these partners and the satellite tag manufacturer Wildlife Computers to establish a data pipeline to feed tag telemetry data directly into ATN. This collaboration currently provides "real-time" visualization of all satellite tags deployed as part of the project, thus serving as an accessible community resource and advancing the project toward fulfilling its Public Access to Research Results (PARR) requirements.

Within the [NOAA-PACFLEET web project](#), users are able to visualize multiple tags locations simultaneously, as well as access individual webpages for each tag deployment, which provide unique details for each turtle and tag, including species, deployment date (adjustable time slider), and location positions displayed over three-dimensional bathymetry (Figure 2). The [NOAA-PACFLEET web project](#) and the entire ATN website is relatively new and still under development, thus remains rudimentary in some aspects. As such, the webpages frequently incur errors and mapping often include erroneous locations. MTBAP continues working with the developers to improve the [NOAA-PACFLEET web project](#).



**Figure 2.** Example of two Individual turtle tag deployment webpages within the NOAA-PACFLEET ATN web project. The webpages provide unique details for each turtle and tag, including species, transmission dates, and location positions displayed over three-dimensional bathymetry.

## SATELLITE TAG TRANSMISSION SUMMARIES

Although it was not feasible to conduct field activities in 2020 due to Covid19 restrictions, we continued to collate data from tags that were still active during the most recent report. A total of 111 satellite tags were deployed during the various IAAs associated with this effort, which initiated in 2013, and all have now ceased transmitting. Details on these tag deployments, including species, tag type, foraging habitat location, tag deployment date, Argos ID number, turtle size (SCL), last Argos signal, tag life (days), tag status, and mean tag life (days) by location, for the islands of Tinian, Saipan, and Guam, are available in [Table 1](#), [Table 2](#) and [Table 3](#), respectively.

For green turtles, tags transmitted data for an average of 174 days on Saipan (sd = 138.1, n = 33 tags), 154 days on Tinian (sd = 82.1, n = 18 tags), and 168 days on Guam (sd = 78.4, n = 46 tags). For hawksbill turtles, tag life was 426 days on Saipan (sd = 498.0, n = 5 tags), 572 days on Tinian (sd = 320.6, n = 6 tags), and 477 days on Guam (sd = 388.3, n = 3 tags). For the three islands and tag models combined by species, tags lasted an average of 168 days (sd = 101.7, n = 97 tags) on green turtles and 500 days (sd = 379.0 n = 15) on hawksbill turtles. Maximum tag life was 721 days for green turtles (Argos ID 131995 tagged on the northern shore of Saipan at Spotlight) and 1,270 days for hawksbill turtles (Argos ID 85496 tagged on the west coast of Saipan at Balisa). Hawksbill turtle shells are thicker and more keratinized than green turtle shells, which tend to be thinner and oilier; this difference likely contributes to the longer tag retention times observed on hawksbill turtles.

**Table 1.** Summary of tags deployed on turtles in Tinian from 2013 to 2019.

TINIAN Satellite Tag Deployments								
Species - Tag model	Deploy location	Deploy Date	Argos ID	SCL (cm)	Last Signal Argos	Tag Life (Argos days)	Tag Status 12/18/18	Mean Tag Life (Argos days)
Green turtles - SPLASH	Dumpcoke Cove	10/28/16	166341	84.1	2/8/17	104	inactive	116
	Fleming Point	7/21/14	138959	54.3	11/26/14	128	inactive	
	Tohgong	5/16/16	152584	54.9	12/16/16	214	inactive	147
	Tohgong	5/16/16	142753	56.5	5/31/16	15	tag failed	
	Dangkolo	5/15/16	142747	52.6	11/19/16	188	inactive	
	Chulu	5/15/16	142750	51.6	10/31/16	169	inactive	
	Tinian Harbor	10/28/16	166348	47.6	5/12/17	196	inactive	163
	Tinian Harbor	10/28/16	166338	44.4	2/15/17	111	inactive	
	Tachungnya Bay	10/26/16	166339	44.4	3/1/17	126	inactive	
	Tachungnya Bay	10/26/16	166344	52.8	2/17/17	114	inactive	
	Tachungnya Bay	10/26/16	166337	48.2	2/8/17	105	inactive	
	Tachungnya Bay	10/26/16	166345	44	1/4/17	70	inactive	
	Red Wall	11/12/15	152580	56	9/30/16	323	inactive	
	Red Wall	11/12/15	152586	61.1	4/17/16	157	inactive	
	Red Wall	11/12/15	152583	54.2	9/17/16	310	inactive	
Red Wall	11/12/15	152578	59.5	1/9/16	58	inactive		
Red Wall	11/12/15	152569	53	7/18/16	249	inactive		
Red Wall	11/12/15	152574	55.4	3/27/16	136	inactive		
Hawksbill - SPLASH	Dumpcoke Cove	10/28/16	166342	56.2	2/9/17	104	inactive	636
	Fleming Point	8/20/13	85493	61.7	2/28/16	922	inactive	
	Fleming Point	7/21/14	138963	72.3	4/27/16	647	inactive	
	Fleming Point	7/21/14	131989	58.1	12/8/16	872	inactive	
	Dangkolo	5/15/16	142755	62.8	12/28/17	592	inactive	592
Hawksbill turtle - SPOT	Tachungnya Bay	10/26/16	166355	40	8/17/17	295	inactive	295

**Table 2.** Summary of tags deployed on turtles in Saipan from 2013 to 2019.

SAIPAN Satellite Tag Deployments								
Species - Tag model	Deploy location	Deploy Date	Argos ID	SCL (cm)	Last Signal Argos	Tag Life (Argos days)	Tag Status 12/18/18	Mean Tag Life (Argos days)
Green turtles - SPLASH	Wing Arch	10/26/17	171252	54.3	NA	NA	tag failed	219
	Pau Pau Beach	10/26/17	171245	59.5	1/7/18	73	inactive	
	Pau Pau Beach	10/26/17	171253	49.2	10/28/18	367	inactive	
	Aqua Reef	10/25/17	171250	55.7	5/3/18	190	inactive	
	Tanapag Lagoon	10/29/16	166347	47	6/30/17	244	inactive	
	Outer Managaha	10/27/17	171254	46.3	1/5/18	70	inactive	183
	Balisa	8/18/13	85491	60.9	10/15/13	59	inactive	
	Balisa	8/19/13	85495	66.1	1/19/14	154	inactive	
	Balisa	8/19/13	85494	60.4	5/3/14	257	inactive	
	Balisa	8/21/13	85492	62.5	9/17/14	392	inactive	
	Fishing Basin	9/5/19	178567	55.4	2/17/20	165	inactive	
	Fishing Basin	9/5/19	178568	67.4	NA	NA	tag failed	
	Chalan Kanoa	11/14/15	152585	50.2	4/18/16	157	inactive	169
	Chalan Kanoa	11/14/15	152575	67.1	2/1/16	79	inactive	
	Chalan Kanoa	10/27/16	166343	64.3	7/25/17	271	inactive	
	Coral Ocean Point	10/27/16	166346	44	3/7/17	132	inactive	132
	Lao Lao Bay	11/13/15	152576	55.6	3/28/16	137	inactive	84
	Lao Lao Bay	11/13/15	152572	63.5	12/29/15	46	inactive	
	Lao Lao Bay	11/13/15	152571	56.7	1/13/16	62	inactive	
	Lao Lao Bay	11/13/15	152579	65	1/18/16	67	inactive	
	Lao Lao Bay	11/13/15	152581	53.6	12/21/15	38	inactive	
	Dan Dan	9/4/19	178566	65.5	2/7/20	156	inactive	
	Spotlight	7/22/14	131995	61.7	7/11/16	721	inactive	451
	Cow Town	7/22/14	138958	63.9	1/19/15	181	inactive	
Tank Beach	8/5/18	171235	54.9	10/5/18	61	inactive	140	
Tank Beach*	8/5/18	171255	47.1	1/6/19	154	inactive		
Forbidden Island	9/3/19	176781	50.3	9/24/19	21	inactive		
Forbidden Island	9/3/19	178562	63.3	11/30/19	88	inactive		
Forbidden Island	9/3/19	178563	50	5/26/20	266	inactive		
Forbidden Island	9/3/19	178564	62.9	5/11/20	251	inactive		
Hawksbill turtles - SPLASH	Aqua Reef	10/25/17	171251	50.3	12/19/18	420	inactive	420
	Balisa	8/18/13	85496	66.6	2/8/17	1270	inactive	1270
	Dan Dan	9/4/19	178565	72.6	7/12/20	312	inactive	312
Green turtles - SPOT	Pau Pau Beach	10/26/17	171257	37.6	3/28/18	153	inactive	181
	Aqua Reef	10/25/17	171256	43.3	4/21/18	178	inactive	
	Outer Managaha	10/27/17	171259	42.1	5/27/18	212	inactive	
Hawksbill turtles - SPOT	Pau Pau Beach	10/27/17	171258	42.4	11/16/17	20	Tag failed	20
	Coral Ocean Point	10/27/16	166354	40	2/12/17	108	inactive	108

**Table 3.** Summary of tags deployed on turtles in Guam from 2013 to 2019.

GUAM Satellite Tag Deployments								
Species - Tag model	Deploy location	Deploy Date	Argos ID	SCL (cm)	Last Signal Argos	Tag Life (Argos days)	Tag Status 12/18/18	Mean Tag Life (Argos days)
Green turtles - SPLASH	Tanguisson	10/17/17	171249	48.2	7/11/18	267	inactive	200
	Tumon Bay	10/17/17	171248	48.8	9/1/18	319	inactive	
	Tumon Bay	10/17/17	171247	62.7	10/12/18	360	inactive	
	Tumon Bay	10/17/17	171246	53.6	6/28/18	254	inactive	
	Tumon Bay	10/18/17	171240	66.6	12/7/17	50	inactive	
	Tumon Bay	10/18/17	171241	73.2	4/1/18	165	inactive	
	Tumon Bay	10/18/17	171242	58.2	2/24/18	129	inactive	
	Tumon Bay	10/18/17	171243	56.4	12/15/17	58	inactive	
	Sewer Island	10/19/17	171244	47.1	NA	NA	tag failed	154
	Piti Bomb Holes	5/22/17	166336	56	10/23/17	154	inactive	
	Apra Harbor	7/16/14	131994	49.2	12/26/14	163	inactive	197
	Apra Harbor	7/16/14	131991	58.3	3/4/15	231	inactive	
	Apra Harbor	7/17/14	138960	58.6	1/4/15	172	inactive	
	Apra Harbor	7/18/14	138965	59.3	2/23/15	220	inactive	
	Orote Point	5/12/16	131996	60.8	8/24/16	104	inactive	204
	Orote Point*	5/13/16	142752	82.3	11/12/16	183	inactive	
	Orote Point	5/13/16	142748	63.8	4/2/17	325	inactive	
	Dadi Beach	7/16/14	131998	64.3	12/18/14	155	inactive	128
	Dadi Beach	7/16/14	131990	54.3	1/7/15	175	inactive	
	Dadi Beach	7/17/14	138961	66	9/13/14	58	inactive	
	Dadi Beach	7/17/14	131997	55.2	12/26/14	162	inactive	
	Dadi Beach	11/17/15	152577	65.6	4/30/16	165	inactive	
	Dadi Beach	11/18/15	152582	73.4	1/16/16	59	inactive	
	Dadi Beach	11/18/15	152570	76	3/17/16	121	inactive	
	Sella Bay	11/1/16	166335	49.3	6/15/17	226	inactive	226
	Talofofo	8/7/18	171233	44.7	11/29/18	114	inactive	110
	Talofofo	8/7/18	171234	55.9	10/26/18	80	inactive	
	Talofofo	8/7/18	176760	69.8	11/9/18	94	inactive	
	Talofofo	8/7/18	176761	53.2	1/5/19	151	inactive	
	Pago Bay	8/8/18	176762	50	11/29/18	113	inactive	101
	Pago Bay	8/8/18	176763	44.8	11/8/18	92	inactive	
	Pago Bay	8/8/18	176764	47.9	11/13/18	97	inactive	
	Cocos Island, Achang Reef	8/9/18	176765	64.7	6/1/19	296	inactive	294
Cocos Island, Achang Reef	8/9/18	176766	63.9	5/28/19	292	inactive		
Pati Point*	9/7/19	178569	67.5	6/4/20	271	inactive	179	
Tarague	9/8/19	178570	64.6	5/5/20	240	inactive		
Tarague	9/8/19	178571	59.6	11/30/19	83	inactive		
Tarague	9/9/19	178572	44.4	5/10/20	244	inactive		
Tarague	9/9/19	178573	84.9	2/26/20	170	inactive		
Ritidian Channel	9/9/19	178574	47.6	1/2/20	115	inactive		
Ritidian Channel	9/9/19	178576	48.6	1/16/20	129	inactive		
Hawksbill turtles - SPLASH	Orote Point	5/12/16	142756	52.9	NA	NA	tag failed	208
	Orote Point	5/23/17	166340	55.7	12/17/17	208	inactive	922
	Achang Reef*	8/20/13	85493	61.7	2/28/16	922	inactive	
Ritidian Channel	9/9/19	178575	43	7/6/20	301	inactive	301	
Green turtles - SPOT	Sella Bay	11/1/16	166351	43.7	3/18/17	137	inactive	142
	Sella Bay	11/1/16	166353	40.8	3/27/17	146	inactive	125
	Cocos Island, Achang Reef	8/9/18	171260	36.9	12/13/18	126	inactive	
	Cocos Island, Achang Reef	8/9/18	171261	41.4	12/10/18	123	inactive	
	Tarague*	9/9/19	171263	40.8	3/10/20	183	inactive	183

duced Interim Report  
FIRST Sea turtle tagging in the MITT study area



### **PROGRESS TOWARDS SUMMARY OF TASKS**

#### *(1) Capture and tag sea turtles in the MITT study area, and deploy biotelemetry devices*

A total of 160 turtles were captured (with identification tags applied) and 111 satellite tags deployed in the MITT study area from 2013 through 2020.

#### *(2) Process and analyze biotelemetry data and other survey data*

All tags have ceased transmitting at the time of this report. The PIFSC MTBAP staff will conduct in-depth analyses of satellite tagging data in the upcoming IAA timeframe, including mapping migrations, calculating home ranges, and evaluating dive parameters (i.e., time at depth, maximum dive depth, time at temperature, and dive duration).

#### *(3) Prepare annual reports*

Completed annually according to established IAAs and associated extensions.

### **PROGRESS TOWARDS GUIDING QUESTIONS FROM THE FY13-15 MONITORING PLAN**

- (i) Are there locations of greater cetacean and/or sea turtle concentration around Guam, Saipan, and Tinian? Efforts are on-going to answer this question. With each of the field expeditions (carried out during previous performance periods) we expanded our survey efforts to new areas of the Mariana Islands and encounter turtles in most locations around Guam, Saipan, and Tinian. The following areas appear to have high turtle density based on the boat-based snorkel survey observations and captures, as well as analysis of aerial survey data from Guam: (1) in Guam, the waters inside Apra Harbor near San Luis, Gab Gab, out to Spanish Steps including Dadi and Tipalao beaches outside of the harbor, Tumon Bay, Cocos Island, Cocos Lagoon, and Achang Bay (Martin et al. 2016), as well as between Pago Bay and Talofofu Bay. Although hawksbills can be found around the island, they comprised a much greater proportion of the turtles observed and caught in the area of Double Reef in northwest Guam; (2) in Saipan, the area stretching from the Balisa Channel to Managaha Island, as well as Lao Lao Bay and Puntan Gloria along the east side of the island, and (3) virtually the entire west coast of Tinian. These areas are primarily dominated by patch reef communities where the turtles both forage and rest.
- (ii) What is the occurrence and/or habitat use of sea turtles in areas that the Navy conducts underwater detonations? Dozens of turtles have been outfitted with satellite tags inside and just outside of Apra Harbor (including capture sites at Orote Point, Dadi Beach, and Piti Bomb Holes). From the former spatial analysis of the GPS locations and movements from these satellite tags, we have not seen direct overlap of the turtles and their core use or home range areas with the Agat Bay Mine Neutralization Site, Piti Point Mine Neutralization Site, and Outer Apra Harbor Underwater Detonation Site. However, turtles are spending significant amounts of time in and moving through areas within 1–2 km of these sites, and the lack of overlapping GPS points could be due to the relatively low frequency of GPS locations obtained from these tags (often a maximum of one per day). Analyses and filtering of Argos location classes (see supplemental materials) may provide more data on daily locations.

### **ACTIVITIES PLANNED FOR 2021**

We will continue evaluating the feasibility of conducting an in-water survey expedition for Guam, Saipan, and Tinian between June through November (weather and covid19 restrictions dependent) of 2021 to survey new areas or those requiring additional monitoring and satellite tag deployment. We will also continue to advance our data sharing outlet (i.e., [NOAA-PACFLEET web project](#)) to increase public access to our research. Analysis of telemetry data is ongoing and will allow us to better understand marine turtle home range, habitat preferences, and depth use, as well as movement

within and outside of the Mariana Islands. These analyses will provide the basis of a minimum of one manuscript intended for journal submission in 2022 or 2023.

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