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A Whale With A History: Sighting Twain The Humpback Over Three Decades

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Extended acoustic interactions with a humpback whale (*Megaptera novaeangliae*) were captured via playbacks of the purported "whup/throp" social call and hydrophone recordings of the animal's vocalized responses during August 2021 in Frederick Sound, Southeast Alaska. Fluke photographs identified the animal as a female named Twain (HappyWhale.com identity SEAK-0401) first observed some 35 years ago. We document Twain's life history via sightings made over three decades, reporting as much as is known (and allowed for public distribution) about Twain. The observational history gives illuminating snapshots of the long history of the individual behind the acoustic interactions.

Keywords: Megaptera novaeangliae, humpback whale, nonhuman communication, interspecies communication, animal vocalization, mirror study, ocean acoustics

I. INTRODUCTION

Recently in Southeast Alaska, a scientific team encountered a humpback whale (*Megaptera novaeangliae*) and engaged the animal in a half-hour long exchange of acoustic calls and responses. Apparently, the animal was motivated to communicate. This, in turn, led to an interest in this particular animal—later identified as a female named Twain (HappyWhale.com identity SEAK-0401) first seen in 1987, almost a third of a century ago. Reference [1] reports on details of the encounter, her identification, and quantitative analyses of the hydrophone recordings of the extended encounter.

The following complements that report by recounting Twain's life history via visual observations made over three decades, presenting as much as is known (and allowed for public distribution). Though episodic, the nearly two-dozen observations made in Hawaii and Southeast Alaska illuminate the long history of the animal that engaged in the acoustic interactions. Though decidedly incomplete, the thirty years of documented observations very likely covers the majority of Twain's life, giving an indirect view into her individuality.

Table III lists the current dozen and a half documented sightings of Twain. Data there include dates, times, locations, and observers. Figures 2 and 3 present a photographic gallery of her flukes—images cataloged and used to identify her over the years. The first set contains historical fluke photos, while the second set documents recent encounters including that of the acoustic interactions, in the last two years.

Figure 1a shows Twain's migration paths between sightings, illustrating the long ($\approx$ 3000 mile) seasonal (Summer-to-Winter and Winter-to-Summer) trajectories typical of her humpback cohort. Figure 1b shows the same but for sightings around west Maui, Hawaii—the cohort's winter breeding grounds. And, Figure 1c shows the paths in and around Southeast Alaska, largely centered on Frederick Sound—the cohort's summer feeding grounds.

The data collected here is publicly available and was largely extracted from the online database HappyWhale.com [2]. However, when possible and permitted, it includes observations from other databases and from individual observers.

II. ACOUSTIC INTERACTIONS

To motivate collecting observations of Twain's long life history, it will help to summarize the results reported in Ref. [1]. This sets the scientific context and grounds the interest in this individual animal.

Though unidentified at the time, Twain was encountered on 18 August 2021, documented both by fluke photograph (see Fig. 3a) and by hydrophone recording. The most notable event occurred when reviewing the hydrophone recording: there was a singularly clear example of the purported humpback "whup/throp" social call [3–8]. That recording was selected for use in the next day's acoustic playback experiments.

The extended call-and-response exchanges occurred on 19 August. The exchanges were initiated by the very close approach (20 m) of the animal to the research vessel. Researchers then decided to broadcast the recording of the previous day's selected call through an underwater loudspeaker. In fact, two additional playbacks were broadcast roughly a minute apart until a response vocalization—a whup/throp social call—was heard from the animal.

Fluke photographs were also taken during the exchanges; see Fig. 3b. Afterwards the animal was identified using HappyWhale.com as SEAK-0404 (Twain) from

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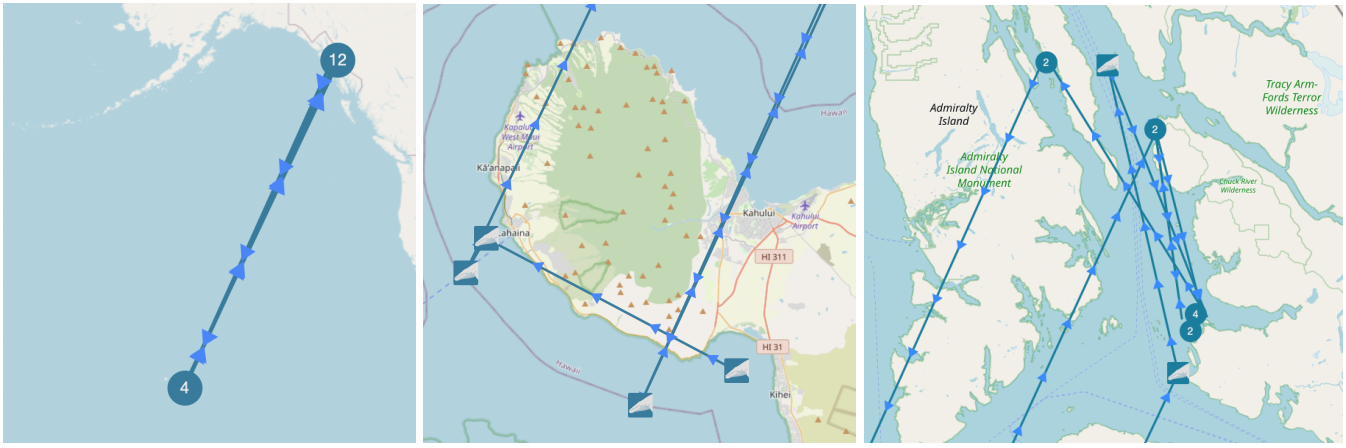

(a) Twain North Pacific trajectories. (b) Twain Maui trajectories. (c) Twain Southeast Alaska trajectories.

FIG. 1: Twain's migration trajectories between sightings: (Left) Pacific Ocean (16 sightings), (Middle) West Maui (4 sightings), and (Right) Southeast Alaska (12 sightings). (Map images from HappyWhale.com.)

uploaded fluke photographs. Reference [1]'s statistical analyses of the hydrophone recordings corroborated that the exchanges involved a single individual and that the individual was the animal who's whup/throp call had been recorded the previous day and used, inadvertently and unintentionally, as the playback call during the exchanges.

Rapid access to the HappyWhale.com online database greatly facilitated identifying the animal encountered. It should also be pointed out that this was also helped in large measure by being in line-of-sight of a land-based cell tower that gave online access to HappyWhale.com. The fluke shots were matched in short order as SEAK-0401, after properly preparing and uploading them.

Reference [1] provides fuller detail. The following complements that report with the long history of Twain's sightings in Southeast Alaska and Hawaii.

III. SIGHTINGS

One of the conundrums animal behavior databases such as HappyWhale.com are rapidly coming to address is that a number of observers have seen and photographed the same animal. One consequence is that a given animal becomes known by a large number of identification labels and the supporting observation data is stored across many databases. For example, Table I lists the ten current IDs for Twain. Needless to say, this redundant labeling both aids and complicates confident identification.

Humpback whale morphology cooperates to some extent to ameliorate these problems and improve unique identifications. The ventral side of their flukes carries unique marks—genetically or not determined pigmentations and shapes, cuts, and abrasions due to fishing-gear entanglements or encounters with boats, ships, killer whales, and great white sharks—to mention a few sources of their unique markings. Happywhale.com takes properly formatted user-uploaded fluke photographs and applies a machine-learning image-classification algorithm to these markings to compare a subject animal to those fluke photos already uploaded and identified. It does so with remarkably high accuracy.

There are other databases than this, though. In many cases, these have been assembled over many years by hand by working marine biologists and citizen scientists alike. One *Humpback Whales of Southeast Alaska*, that was used here, is maintained by the University of Alaska Southeast (UASE) [9]. And, there are individual whale watchers that curate their own collection of humpback photo IDs.

Organization (Database)	Identification
Happy Whale	SEAK-0401
	AK19_0098
UASE	FS02-24a-01a
UASE	FS03-11(34A)
	HI04-0062
	HW-MN0440644
	PWF-NP_3005
Oregon State	OSUWTG-MnSEAK-314
	SPLASH-430588
	SEAK-2450

TABLE I: The diversity of Twain identifying labels. Perhaps of use in finding other sightings.

The result then of combing through these databases and contacting their curators and a number of individual contributors is compiled in Table III. It catalogs all known sightings of humpback whale Twain.

The majority of the 20 sightings listed in Table III are available via HappyWhale.com. Searching for "SEAK-

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(a) PWF (1987).

(b) Flip Nicklin, WT (2004).

(c) Fred Sharpe, AWF (2008).

(d) Eric Marshall, ASA (2009).

(e) JRM, NMFS (2009).

(f) Unknown, Unknown (2010).

(g) Jim Nahmens, ASA (2011).

(h) Craig Hayslip, OSU (2015).

(i) Craig Hayslip, OSU (2015).

(j) PWF (2017).

(k) Dennis Rogers (2019).

(l) Meagan Jones (6 August 2019)

FIG. 2: Historical humpback whale Twain (SEAK-0401) sightings in chronological order: Total historical sightings: 15; First, at least as early as 1987 or rumored as early as 1984 or 1985 in Maui, Hawaii. See Table I for alternate identification tags and Table III for sighting details.

0401" there retrieves the majority of the sightings listed in Table III, including the documenting fluke photographs. Using the latter one can verify the animal's identification for themselves, once a familiarity with the fluke markings is developed.

For the latter in Twain's case on the left side of the fluke underside there are three diagonal line-markings, with the middle line consisting of three while circles. This allowed moderately rapid visual identification, even in the presence of highly-variable photographic quality and fluke orientation.

In addition to an ID label and fluke photograph, reported sightings typically, but not always, include date, time, and latitude and longitude of the encounter. Occasionally, there are circumstantial comments; see, for example Table III's Comment column.

The apparent first sighting, the earliest listed on HappyWhale was in 1987. However, there are personal communications the suggest much earlier sightings in 1984-1985 [10]. Thus, the available documentation indicates that Twain is at least 34 years old and, perhaps, even more than 37 years old. Given a speculated lifespan of

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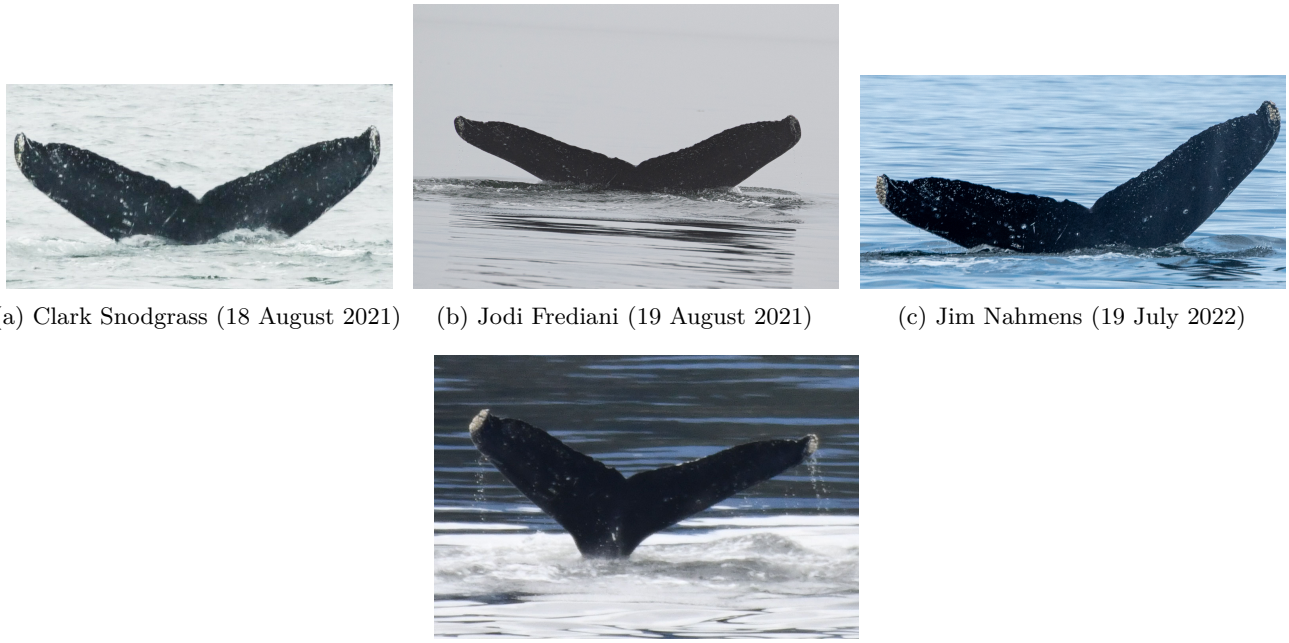

(a) Clark Snodgrass (18 August 2021) (b) Jodi Frediani (19 August 2021) (c) Jim Nahmens (19 July 2022)

(d) Lars Rasmussen (12 August 2022)

FIG. 3: Recent humpback whale Twain (SEAK-0401) sightings (2021 and on): Most recently seen: 12 August 2022, Petersburg Borough, AK. See Table I for alternate identification tags and Table III for sighting details.

70 years the observation record covers the majority of Twain's life.

The gallery presented here of over thirty-five years of fluke photos does lead to further interesting observations and questions.

For example, the July 2019 sighting notes that Twain was seen with a calf. While the recent July and August 2022 sightings suggest that Twain was participating in bubble-net feeding groups. In addition, the gallery also allows one to see how much Twain's fluke markings changed. Encrustations—barnacles and vegetal growths—on her fluke tips clearly change, as expected. Also, between 2008 and 2009 Twain's left fluke trailing edge took on a semi-circular divot. This is seen in the photos on the left fluke, close to and to the left of the fluke notch. This feature particularly helpful for identification in later years. It is clearly seen in all photos since 2009. See Fig. 4.

IV. CONCLUSION

Twain's documented long life-history adds a new dimension to the recent extended acoustic exchanges reported in Ref. [1]. Rather than the latter being a singular encounter—and one unlikely to be repeated given the exigencies of very remote field work—it is now associated with an individual animal—a female, mother, widely traveled, with a record of health and interactions indelibly recorded on her fluke.

While there is still much to extract from the documented history and the acoustic interactions, a number of lessons have been learned and hopes for the future kindled.

The clear benefit of humpback fluke databases to appreciating a bit of Twain's long life is unassailable. This leads, especially coming in the current setting motivated by acoustic interactions with Twain, one to advocate for expanded databases that include, for example, acoustic recordings of individual vocalizations, especially of identified individuals. This is certainly going to be necessary to make headway on understanding humpback social and song communication.

As desirable as these augmented databases will be, creating them presents a series of daunting tasks: from the shear serendipity required in the field to re-engage particular individuals—especially those like Twain who appear to have some motivation or interest in acoustically interacting, to the signal processing methods that will be required for automatic individual identification. These challenges seem to call for a radically new and greatly expanded research effort in cetacean biology and animal communication coordinated with mathematical and technical innovations.

ADDITIONAL INFORMATION

Correspondence and requests for materials should be addressed to the first author. The authors would very much appreciate new and also corrected information to help complete as much as possible of Twain's life history.

ACKNOWLEDGMENTS

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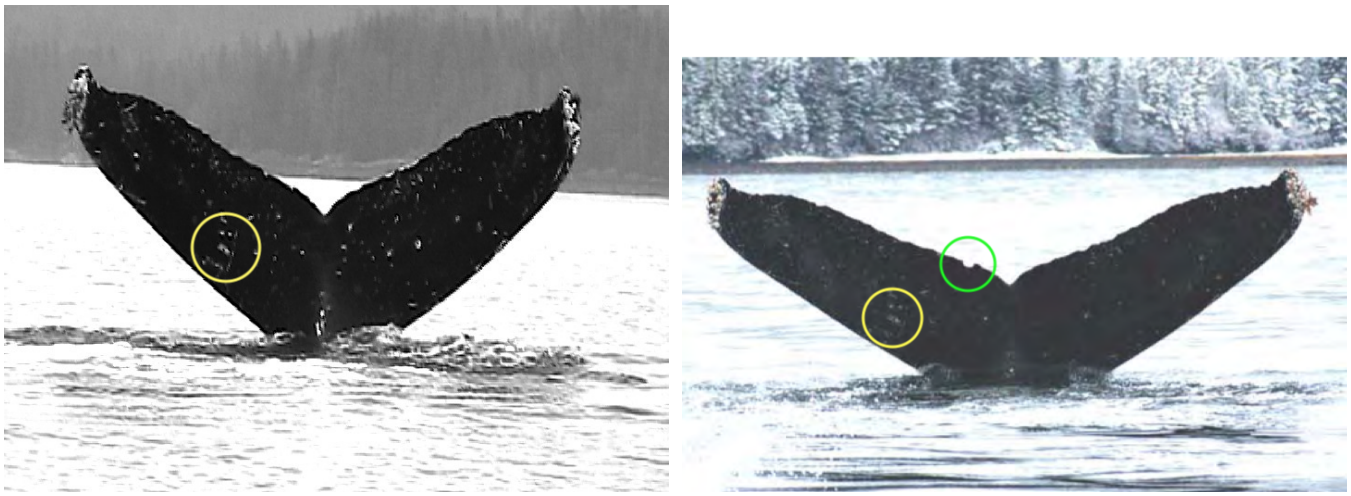

(a) Fred Sharpe, AWF (2008). (b) JRM, NMFS (2009).

FIG. 4: Evolution of Twain's identifying fluke marks: (Left) In 2008 the characteristic three-parallel-line marks (yellow circle) are apparent. (Right) In 2009 these marks are seen again, but in addition a semi-circular divot appears on the left trailing fluke edge (green circle). Also, note the characteristic, for Twain, barnacle growth on the fluke tips.

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Photo	Observer	P	URL
Fig. 2a	PWF	CC	https://au-hw-media-m.happywhale.com/e0c55c41-d51e-41ff-8d29-cf66fb2628c5.jpg
Fig. 2b	Flip Nicklin	CC	https://au-hw-media-m.happywhale.com/f7e1d0e9-e3f6-4e15-a120-fe00ca27c97c.jpg
Fig. 2c	Fred Sharpe	Yes	https://au-hw-media-m.happywhale.com/7555bb8c-09a3-45f4-b207-f01ed6b6ac3f.jpg
Fig. 2d	Eric Marshall	CC	https://au-hw-media-m.happywhale.com/41a2dfa5-308d-40a4-8767-17fd62dc1358.jpg
Fig. 2e	JRM		https://www.alaskahumpbacks.org/flukeIDcatalog.html
Fig. 2g	Jim Nahmens	CC	https://au-hw-media-m.happywhale.com/ad36bba6-e614-4c33-a1d8-f6fb6b4eb7ba.jpg
Fig. 2h	Craig Hayslip		https://www.alaskahumpbacks.org/flukeIDcatalog.html
Fig. 2i	Craig Hayslip	CC	https://au-hw-media-m.happywhale.com/a4f5be82-3a56-48a6-866a-b934f4ef9d75.jpg
Fig. 2j	PWF	CC	https://au-hw-media-m.happywhale.com/f5ba0f7b-8e49-4b26-ae05-1127252d1259.jpg
Fig. 2k	Dennis Rogers	CC	https://au-hw-media-m.happywhale.com/5cc654a9-1cf8-42ca-bd34-3576b274df72.jpg
Fig. 2l	Meagan Jones	CC	https://au-hw-media-m.happywhale.com/aa984d7c-8adf-4995-87e1-997cd950f64a.jpg
Fig. 3a	Clark Snodgrass	Yes	https://au-hw-media-m.happywhale.com/f1cbf0c0-e45b-4f7c-821b-9d73c6fdb055.jpg
Fig. 3b	Jodi Frediani	CC	https://au-hw-media-m.happywhale.com/fcf4aa5b-a960-4183-995f-697611bebb21.jpg
Fig. 3c	Jim Nahmens	CC	https://au-hw-media-m.happywhale.com/cca96efd-59e8-4b69-8315-1cbb2e72f665.jpg
Fig. 3d	Lars Rasmussen	CC	https://au-hw-media-m.happywhale.com/cd9c7518-deb2-4203-9e8a-b51798b0729c.jpg

TABLE II: Photo credits: P = Permission {CC: Public domain or CC BY-ND 4.0 https://creativecommons.org/licenses/by-nd/4.0/ or CC BY-NC-SA 4.0 https://creativecommons.org/licenses/by-nc-sa/4.0/; Yes, or No}. Twain sightings http://happywhale.com/individual/15200.

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Sight	Date	Time	Location	Region	Lat	Long	Fluke	Observer	Org	Source	Comment
1	02/09/1987		Maui	Hawaii	20.766431	-156.49153	Fig. 2a		PWF	HW	First sighting
2	08/15/2002			SEAK	57.2125	-133.53417	436433			UASE	
3	08/03/2003			SEAK	57.10999	-133.80528	436444			UASE	
4	02/07/2004	10:08	Lahaina, Maui	Hawaii	20.87	-156.7		Meagan Jones	WT	HW	
5	02/07/2004		Lahaina, Maui	Hawaii			Fig. 2b	Flip Nicklin	WT	HW	
6	08/10/2008	11:54	Fanshaw Bay	SEAK	57.2	-133.5	Fig. 2c	Frederick Sharpe	AWF	HW	
7	07/11/2009	12:46	South Stephens Passage	SEAK	57.8169	-133.8427	Fig. 2d	Eric Marshall	ASA	HW	Fluke notch
8	11/15/2009	14:27		SEAK	57.75052	-134.0299	Fig. 2e	JRM	NMFS	UASE	
9	06/30/2010			SEAK			Fig. 2f			UASE	
10	07/30/2011	08:27	Entrance to Port Houghton	SEAK	57.315193	-133.47176	Fig. 2g	Jim Nahmens	ASA	HW	
11	11/14/2015	10:30	Sitka	SEAK	57.8205	-134.0587	Fig. 2h	Craig Hayslip	OSU	UASE	
12	11/14/2015	18:39	Inside Passage	SEAK	57.825291	-134.08503	Fig. 2i	Craig Hayslip	OSU	HW	
13	12/21/2017	09:35	Maui	Hawaii	20.739717	-156.57159	Fig. 2j		PWF	HW	
14	07/28/2019	14:19	Gambier Bay, Stephens Passage	SEAK	57.68264	-133.66423	Fig. 2k	Dennis Rogers	ASA	HW	With calf
15	08/06/2019	11:54	Frederick Sound	SEAK	57.30983056	-133.56564	Fig. 2l	Meagan Jones	WT	HW	
16	08/18/2021	14:55	Houghton, Frederick Sound	SEAK	57.3379	-133.49898	Fig. 3a	Clark Snodgrass	SETI	HW	
17	08/19/2021	11:34	Southwest of Point Walpole	SEAK	57.27720667	-133.54828	Fig. 3b	Jodi Frediani	SETI	HW	
18	09/19/2021	14:41	Frederick Sound	SEAK	57.290127	-133.63326	571476	Andy Szabo	AWF		
19	07/19/2022	HH:MM	Port Houghton, Stephens Passage	SEAK			Fig. 3c	Jim Nahmens	ASA	HW	Bubble net group
20	08/12/2022	HH:MM	Petersburg	SEAK			Fig. 3d	Lars Rasmussen	AQV	HW	6 socially feeding

TABLE III: Chronology of Twain sightings and their sources. Total sightings > 18. Abbreviations: HW = HappyWhale.com. SEAK = Southeast Alaska; AWF = Alaska Whale Foundation; PWF = Pacific Whale Foundation; WT = Whale Trust; ASA = Alaska Sea Adventures; OSU = Oregon State University; SETI = SETI Institute; NGST = Northrop Grumman Space Technology; AQV = Ocean Victory, American Queen Voyages. 436433: 2002-08-15_Southeast_Alaska_(SEAK)_Humpback_Whale_Catalog_436433.jpg. 436444: 2003-08-03_Southeast_Alaska_(SEAK)_Humpback_Whale_Catalog_436444.jpg. 575476: 2021-09-19_Andy_Szabo_575476.JPG.