PALOS VERDES SHELF

Annual Angler Outreach Report

August 2022 – July 2023

United States Environmental Protection Agency

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For more information about fish contamination from the Palos Verdes Shelf Superfund Site, please visit: www.pvsfish.org

For more information about California fish advisories, please visit: www.oehha.ca.gov/fish

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LIST OF ACRONYMS AND ABBREVIATIONS

BPSOS	Boat People SOS
Cabrillo	Cabrillo Marine Aquarium
CCHC	Chinese Christian Herald Crusade
DBS&A	Daniel B. Stephens & Associates, Inc.
DDT	Dichloro-diphenyl-trichloroethane
EPA	U.S. Environmental Protection Agency
FCEC	Fish Contamination Education Collaborative
PCB	Polychlorinated biphenyl

SUMMARY

The purpose of the U.S. Environmental Protection Agency (EPA) Palos Verdes Shelf institutional controls program is to protect Southern California's most vulnerable populations from the health risks associated with eating fish contaminated with polychlorinated biphenyls (PCBs) and dichloro-diphenyl-trichloroethane (DDT). This report presents data collected from August 2022 to July 2023 to evaluate program effectiveness and recommend program improvements. The Fish Contamination Education Collaborative (FCEC) conducted public outreach at local piers, bait shops, and community events to educate anglers about ways to reduce their exposure to PCBs and DDT by avoiding certain fish, such as the white croaker. Overall, the institutional controls program has been effective in reaching anglers and community members to increase awareness of fish contamination associated with the Palos Verdes Shelf Superfund Site.

Outreach to pier anglers reached 10,539 anglers actively fishing along the coast of Los Angeles. Data show that angler activity is generally increasing from COVID-19 pandemic lows. Pier signs, tip cards, and the outreach team contributed most to angler awareness, suggesting that current outreach efforts are effective at educating local anglers about fish contamination. Outreach efforts can be improved by updating current outreach materials, standardizing outreach approaches, and providing consistent training of outreach staff. Bait shop outreach did not reach the goal of 40 active bait shop locations, but many of the current locations did request additional materials. Overall, the identification and tracking of bait shop turnover continues to be effective, and it is recommended that 4 additional shops be added to meet the program goal of 40 locations. The FCEC participated in 11 local community events, reaching people from communities that may be more vulnerable to fish contamination. Outreach at community events continues to be successful in educating these communities about the risk of consuming contaminated fish. Despite community events being one of the less influential awareness sources among pier anglers, community events provide an opportunity to educate communities that may not participate directly in subsistence or sport fishing practices but may be consuming fish caught from the Palos Verdes Shelf. Continued research into which community events are more effective is recommended, including targeting events with themes that are attractive to anglers, such as sportfishing expositions or boat shows. Additionally, the FCEC Booth in a Box and interactive fishing game require updates to maintain a professional appearance and standardize messaging, observation, and data tracking across the different events.

Electronic outreach has not been effective at increasing awareness of fish contamination; however, it is recommended that website updates be prioritized to establish the website as a repository of public information and resources. The FCEC is working to redesign outreach materials that will include a QR code to the pvsfish.org website to promote education and awareness through the website. The semiannual FCEC Partner meetings continue to be an important forum for the agencies, outreach groups, and other involved entities to provide updates on project activities, share ideas, and discuss program improvements. Overall, the FCEC has effectively worked together to inform the public and vulnerable communities regarding safe fishing practices and health risks associated with consumption of contaminated fish from the Palos Verdes Shelf Superfund Site.

1. INTRODUCTION

The Palos Verdes Shelf Superfund Site is part of the Montrose Chemical Corporation Superfund Site, located in Los Angeles County, California (Figure 1). The Palos Verdes Shelf became contaminated with PCBs and DDT from the inland Montrose Chemical plant and other industries that discharged their waste into the ocean through the Los Angeles County sanitation sewer outfall pipes from 1953 to 1971 (Figure 1). Today, about 34 square miles of ocean sediment on the Palos Verdes Shelf are contaminated with these legacy pollutants. Although the contaminated sediment is too deep for human contact, some fish in the area accumulate these organic pollutants at levels that make them unsafe to eat.

Figure 1. Map of Contaminated Sediment at the Palos Verdes Shelf Superfund Site

The EPA initiated institutional controls at the Palos Verdes Shelf Superfund Site in September 2001. Institutional controls refer to non-engineered measures, such as outreach and signage, that aim to prevent or reduce exposure to contaminants at a site. The purpose of the institutional controls program at Palos Verdes Shelf is to minimize human exposure to PCBs and DDT by reducing the consumption of contaminated fish, particularly white croaker. The institutional controls program includes public education and outreach, fish monitoring, and enforcement of white croaker catch bans. In 2003, the EPA established the FCEC with representatives from federal, state, and local agencies; non-government organizations; and community-based organizations to implement public outreach and education activities. In

September 2009, the EPA selected an interim remedy for Palos Verdes Shelf Superfund Site that included the continuation and strengthening of the institutional controls program.

The institutional controls program aims to reduce human consumption of contaminated fish by increasing awareness and understanding of local contamination and fish advisories. The program has three main components: angler outreach, community outreach, and enforcement. Angler outreach activities are used to engage anglers and communities that are vulnerable to fish contamination and disseminate educational materials (e.g., program tip cards, brochures, and comic books) that provide information and resources about contaminated fish species. In 2014, the EPA conducted the Palos Verdes Seafood Consumption Study to identify local demographic and subsistence subgroups within the general fishing population of the Palos Verdes Shelf area that may be disproportionately exposed to contaminants based on the types and quantity of fish species consumed, including consideration of cooking methods. The following four key communities were identified as more vulnerable to fish contamination from the Palos Verdes Shelf Superfund Site: Chinese community in San Gabriel Valley, Vietnamese community in Orange County, and Hispanic and African American communities in Los Angeles County.

PCBs and DDT pose a significant risk to public health and are listed on the EPA Integrated Risk Information System as probable human carcinogens and on the State of California's Proposition 65 list of pollutants known to cause cancer. Additionally, exposure to elevated levels of PCBs can result in skin irritation, liver disease, and endocrine disfunction. Exposure to elevated levels of DDT can negatively impact the nervous and endocrine systems, liver function, and child development. The EPA monitors PCB and DDT concentrations in white croaker and barred sand bass on the Palos Verdes Shelf to evaluate the effectiveness of natural recovery processes and improve modeling of contaminant fate and transport. While PCB and DDT concentrations in fish tissues have generally declined since the 1990s, concentrations in white croaker remain above the risk-based cleanup levels.

This Annual Angler Outreach Report summarizes outreach conducted between August 2022 and July 2023 through the following outreach activities:

- Angler Outreach
- Bait Shop Outreach
- Electronic Outreach
- Community Event Outreach
- FCEC Partners Meetings

Additionally, this report presents results from previous years to understand overall trends in the program's outreach efforts and effectiveness.

2. OVERVIEW OF THE INSTITUTIONAL CONTROLS PROGRAM

The institutional controls program aims to prevent human exposure to Palos Verdes Shelf Superfund Site contamination by educating impacted communities about safe fishing practices and the health risks associated with eating contaminated fish.

2.1 ANGLER OUTREACH

While the contaminated sediment bed at Palos Verdes Shelf Superfund Site is too deep for direct human contact (40–200 meters), contaminants can build up in the food web, including certain fish that are caught and consumed by the public. The EPA conducted a human health risk assessment and determined that exposure to PCBs and DDT through the consumption of certain fish presented the greatest potential for adverse human health effects. In 2003, the EPA initiated the angler outreach program, which aims to mitigate risk to human health by minimizing the consumption of contaminated fish.

Local organizations, including Heal the Bay and Cabrillo Marine Aquarium (Cabrillo), perform regular in-person outreach at popular fishing piers along the coast of Los Angeles to educate anglers about the five contaminated fish that are unsafe to eat: white croaker, barred sand bass, topsmelt, black croaker, and barracuda. Angler outreach activities are conducted during the day at nine fishing piers located between Santa Monica Pier and Seal Beach Pier (Figure 2). In 2017, the FCEC expanded the angler outreach program to include evening outreach at two popular fishing piers (Venice and Redondo Beach Piers) to reach subsistence anglers who may fish after typical work hours. These piers were chosen based on previous observations that evening anglers frequent these piers and that the piers have safe evening access for the outreach team.

Angler outreach objectives include educating active anglers about fish contamination and local fish advisories, how to identify fish species, and how to prepare fish to reduce contaminants. The outreach team also collects data including whether the angler is an adult or child, if they are aware of fish contamination, how they learned about fish contamination, language(s) spoken during the conversation, residence zip code, and what types of fish they caught. The data collected during angler interviews is used to evaluate the effectiveness of the angler outreach program.

In addition to active angler outreach, the EPA posts signs listing the five contaminated fish ("Do Not Consume" signage) at 12 locations along the coast of Los Angeles (Figure 2). The outreach team monitors sign conditions during routine pier angler outreach activities and annually inspects all signs. Details about the pier sign program are provided in the Palos Verdes Shelf Annual Pier Sign Summary Report and can be found at www.pvsfish.org/partner-documents.

Figure 2. Map of Piers and Beaches with Posted "Do Not Consume" Fish Signs

2.2 BAIT SHOP OUTREACH

The EPA supplies educational materials to angler retail and bait shops in Los Angeles and Orange Counties to increase angler awareness of fish contamination. These materials (e.g., tip cards in English, Spanish, Vietnamese, and Chinese) are displayed in the shops along with FCEC contact information to encourage ongoing education and communication. The goal is to display FCEC outreach materials at 40 angler retail stores and bait shops in areas in which there is high angler activity. Outreach is conducted twice per year to determine if bait shops participating in the outreach program are still in operation and need more materials. The FCEC prioritizes outreach to bait shops located near popular fishing piers and in areas with high pier angler use as determined through pier angler zip code data analyses.

2.3 ELECTRONIC OUTREACH

The EPA, in collaboration with the FCEC, maintains the Palos Verdes Shelf Superfund Site institutional controls website (http://pvsfish.org/). The website serves as a public repository of

documents and information, including FCEC meeting summaries and presentations, annual outreach and enforcement reports, and electronic versions of outreach materials. Additionally, the website hosts a sign-up page for the FCEC electronic newsletter, in which people can request to receive the semi-annual newsletter by email. Regular maintenance of the FCEC website includes updating the event calendar, uploading new FCEC documents, distributing the newsletter, updating maps, and responding to inquiries submitted through the "Contacts" page.

2.4 COMMUNITY EVENT OUTREACH

The EPA, in collaboration with the FCEC, conducts outreach at local community events to increase awareness of fish contamination and fish advisories. Outreach is performed by local organizations including Boat People SOS (BPSOS) and Chinese Christian Herald Crusades (CCHC), as well as an environmental consulting firm, Daniel B. Stephens & Associates, Inc. (DBS&A). Outreach efforts target communities that are more vulnerable to fish contamination (women and children, and Chinese, Vietnamese, Hispanic, and African American communities). Community outreach partners participate in about 20 local events per year to educate attendees about the risks of eating fish contaminated with PCBs and DDT from the Palos Verdes Shelf. FCEC members utilize the Booth in a Box which is a collection of display materials that provides Palos Verdes Shelf contamination history and potential health risk information. The Booth in a Box contains tablecloths and table runners for professional appearance, outreach materials such as tip cards and fish ID cards, and a magnetic fishing game to attract families to the booth. FCEC participation at these events provides opportunities to engage with community members and share educational outreach materials to help both adults and children understand local fish contamination and identify fish that are safe to eat.

2.5 FISH CONTAMINATION EDUCATION COLLABORATIVE PARTNERS MEETING

The EPA hosts two FCEC meetings per year to provide updates on program messaging, outreach and enforcement activities, and pier sign conditions. These meetings also serve as platforms for members to provide feedback and recommendations, exchange information, and discuss any issues related to the program. The FCEC meetings were originally held in-person; however, following the COVID-19 pandemic the meetings have transitioned to a hybrid format to allow for increased attendance and accessibility.

3. DATA COLLECTION AND ANALYSIS APPROACH

3.1 ANGLER OUTREACH

Heal the Bay and Cabrillo conduct angler outreach during the day at nine fishing piers located within the contaminated sediment area between Santa Monica Pier and Seal Beach Pier (Figure 1). Heal the Bay performs angler outreach three days per week at eight piers (Santa Monica Pier, Venice Pier, Hermosa Beach Pier, Redondo Beach Pier, Rainbow Harbor, Pier J, Belmont Pier, and Seal Beach Pier) and Cabrillo performs angler outreach one day per week at the Cabrillo Pier (Figure 2). The outreach team of both Heal the Bay and Cabrillo educates anglers at the piers about fish contamination and distributes FCEC tip cards. Daytime outreach by Heal the Bay is generally conducted on Thursdays or Fridays, Saturdays, and Sundays from 10:00 a.m. to 2:00 p.m. Heal the Bay typically visits four piers up to three times per week on a rotating weekly schedule, conducting daytime outreach at each of the eight pier locations up to six days per month. Daytime outreach at Cabrillo Pier is conducted every week, but the day of the week and timing varies depending on staff schedules. The difference in outreach frequency between Heal the Bay and Cabrillo is noteworthy, as Cabrillo's outreach was conducted roughly twice as often as Heal the Bay's based on pier locations. In some cases, this makes it difficult to directly compare the data collected at the Cabrillo Pier to the other eight pier locations. Evening outreach is generally conducted at Venice and Redondo Beach Piers on Saturdays from 4:00 p.m. to 8:00 p.m. During this reporting year, Seal Beach Pier was temporarily closed due to structural damage and repairs in January 2023; therefore, outreach data are not available for this location during that month.

During pier outreach, the outreach team focuses on approaching anglers that are actively fishing. Typical angler interactions begin with a casual greeting and introduction of outreach staff. If the angler is willing to participate, the team explains that some fish are contaminated with harmful chemicals and that eating these fish can pose risks to their health. The outreach staff provides the angler with a FCEC tip card and explains how anglers can reduce their risk by following local fish advisories and avoiding the five "Do Not Consume" fish. The outreach team may also highlight fish that are safer to eat and ways to cook fish that can reduce potential exposure. During discussions with anglers, the outreach team records the following data:

- Whether the angler was an adult or child
- Whether the angler agreed to speak with the outreach team
- Whether the angler had been previously contacted by the outreach team
- Whether the angler was aware of the contamination, and if so, how they became aware of the contamination (i.e., pier signs, tip cards, the outreach team, community events, media, internet, friend/family, or other)
- The language(s) spoken during the conversation

- Number of tip cards distributed and in which languages (English, Spanish, Chinese, and Vietnamese)
- The zip code in which the angler lives, if provided
- The type and quantity of fish caught

These outreach data are used to determine the impact and effectiveness of the angler outreach program. The total number of anglers contacted is tallied monthly to track progress toward the annual goal of reaching 11,600 pier anglers. The FCEC monitors the effectiveness of angler outreach by tracking the percentage of anglers that were aware of local fish contamination. The FCEC also tracks the languages spoken by anglers to determine if the available tip card translations (English, Spanish, Vietnamese, and Chinese) remain appropriate for the current angler community. Outreach staff recorded angler responses in English, Spanish, and Chinese, and noted other languages where possible. While the data may indicate that many of the anglers responded in English, it is possible that bi- and multi-lingual respondents may not have been recorded. The tracking of bi- and multi-lingual respondent's primary and alternative languages has been identified as a potential data gap that will be addressed in the next reporting year.

3.2 BAIT SHOP OUTREACH

Bait shop outreach is conducted in the cities of Huntington Beach, Seal Beach, Long Beach, San Pedro, Redondo Beach, Hermosa Beach, Manhattan Beach, Hawthorne, Marina Del Rey, Venice, Culver City, and Santa Monica (Figure 3). DBS&A resumed in-person bait shop outreach activities in May 2023 after use of telecommunications during the COVID-19 pandemic. These activities assess bait shop inventories of FCEC outreach materials (tip cards in English, Spanish, Chinese, and Vietnamese), needs for tip card replacement, and any other pertinent observations from the bait shop representatives.

During each visit, DBS&A collects qualitative data including bait shop location turn-over, how many bait shops request outreach materials, and how many of the materials were distributed in each language.

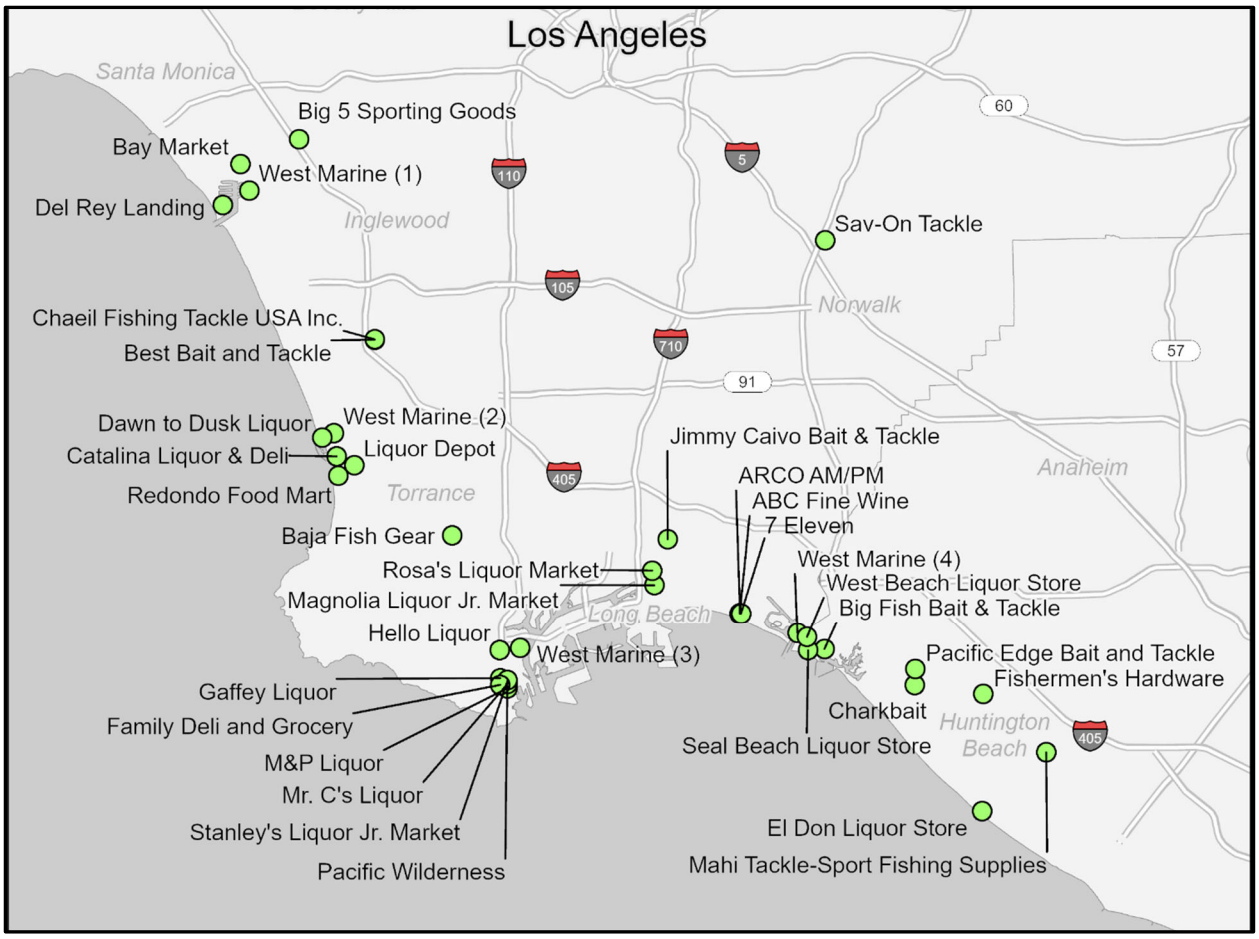

Figure 3. Map of Active Bait Shops that Display Fish Contamination Education Collaborative Outreach Materials

3.3 ELECTRONIC OUTREACH

The FCEC website has historically had low navigation rates, and the EPA paused recording browsing data in 2023. While the FCEC Facebook page remains active, the EPA has paused social media posting activities due to the level of effort and minimal effectiveness in reaching the public. The EPA actively responds to inquiries submitted by the public through the pvsfish.org contact email and webpage. Additionally, the EPA regularly updates the pvsfish.org website and posts a newsletter and upcoming FCEC community events.

3.4 COMMUNITY EVENT OUTREACH

DBS&A, CCHC, and BPSOS typically attend 8–10 community events per year. However, in 2023, the EPA expanded the number of community events to 20 events per year. During each community event, outreach partners set up the FCEC Booth in a Box and distribute informational materials while educating event attendees about fish contamination from the Palos Verdes Shelf. Event attendees are encouraged to fill out the event sign-in sheet with the option to provide an email address to receive the semi-annual FCEC newsletter. Community

outreach partners document the communities reached, event information (e.g., date/time, location), number of event attendees, number of FCEC booth visitors, number of outreach materials distributed, attendee impressions of the outreach materials, what activities draw the most interest, and any observations made by outreach partners or community members attending the event. The FCEC uses these data to determine the effectiveness of each community event and inform future events for FCEC participation.

4. RESULTS

4.1 ANGLER OUTREACH

The annual goal for angler outreach was for the outreach team to contact a minimum of 11,600 pier anglers. In total, the outreach team contacted 10,539 anglers, falling short of the goal by 1,061 anglers. The outreach team contacted 9,077 anglers during daytime outreach and 1,462 anglers during evening outreach. Table 1 (day) and Table 2 (evening) summarize the total number of anglers contacted by the outreach team per month. As noted in Section 3.1, Seal Beach Pier was temporarily closed for repairs, and as a result, data are not provided for January 2023 at that location.

Table 1. Number of Day Anglers Contacted per Month

Date	Belmont	Cabrillo	Hermosa	Pier J	Rainbow Harbor	Redondo	Santa Monica	Seal Beach[1]	Venice	Total
Aug 2022	155	177	64	50	28	113	69	110	63	**829**
Sept 2022	201	128	75	73	34	121	58	96	58	**844**
Oct 2022	167	124	73	45	26	100	40	79	42	**696**
Nov 2022	130	110	84	46	23	106	78	47	53	**677**
Dec 2022	43	76	33	26	11	66	39	17	27	**338**
Jan 2023	89	65	19	49	17	60	22	--	14	**335**
Feb 2023	87	45	25	56	27	41	43	50	23	**397**
Mar 2023	93	54	21	58	21	69	57	43	26	**442**
Apr 2023	266	153	57	105	35	131	91	92	89	**1,019**
May 2023	245	115	60	41	23	160	79	31	68	**822**
June 2023	228	203	66	88	35	210	178	80	116	**1,204**
July 2023	242	154	83	86	44	285	234	135	211	**1,474**
Pier Total	**1,946**	**1,404**	**660**	**723**	**324**	**1,462**	**988**	**780**	**790**	**9,077**

Table 2. Number of Evening Anglers Contacted per Month

Date	Redondo	Venice	Total
Aug 2022	74	84	**158**
Sept 2022	80	75	**155**
Oct 2022	77	64	**141**
Nov 2022	43	42	**85**
Dec 2022	30	18	**48**
Jan 2023	24	25	**49**
Feb 2023	36	25	**61**
Mar 2023	39	34	**73**
Apr 2023	79	67	**146**
May 2023	117	53	**170**
June 2023	92	59	**151**
July 2023	132	93	**225**
Pier Total	**823**	**639**	**1,462**

1 Seal Beach Pier was temporarily closed for repairs, and as a result, data are not provided for January 2023 at that location.

4.1.1 Number of Daytime Anglers Contacted

Heal the Bay contacted 7,673 daytime anglers and Cabrillo contacted 1,404 daytime anglers for a total of 9,077 daytime anglers (Table 1). The number of anglers contacted by the outreach team differed by month, suggesting seasonal variations in the number of anglers fishing at the piers (Figure 4). Generally, angler activity increased from January to July and declined from August to December. This is consistent with past years, in which angler numbers increased in the spring and summer and declined in fall and winter. Belmont Pier showed especially strong seasonality in the number of anglers contacted. The most popular pier for daytime fishing was Belmont Pier, making up 21.4 percent of the total daytime anglers contacted. Redondo Pier (16.1 percent) and Santa Monica Pier (10.9 percent) were also popular fishing piers for daytime anglers. Cabrillo Pier is reported as 15.5 percent of anglers contacted during daytime outreach efforts; however, as noted in Section 3.1, Cabrillo Pier outreach is performed roughly twice as often as the other pier locations and so a direct comparison is not possible. Rainbow Harbor continues to be the least popular pier for fishing, comprising 3.6 percent of the total anglers contacted during daytime outreach activities.

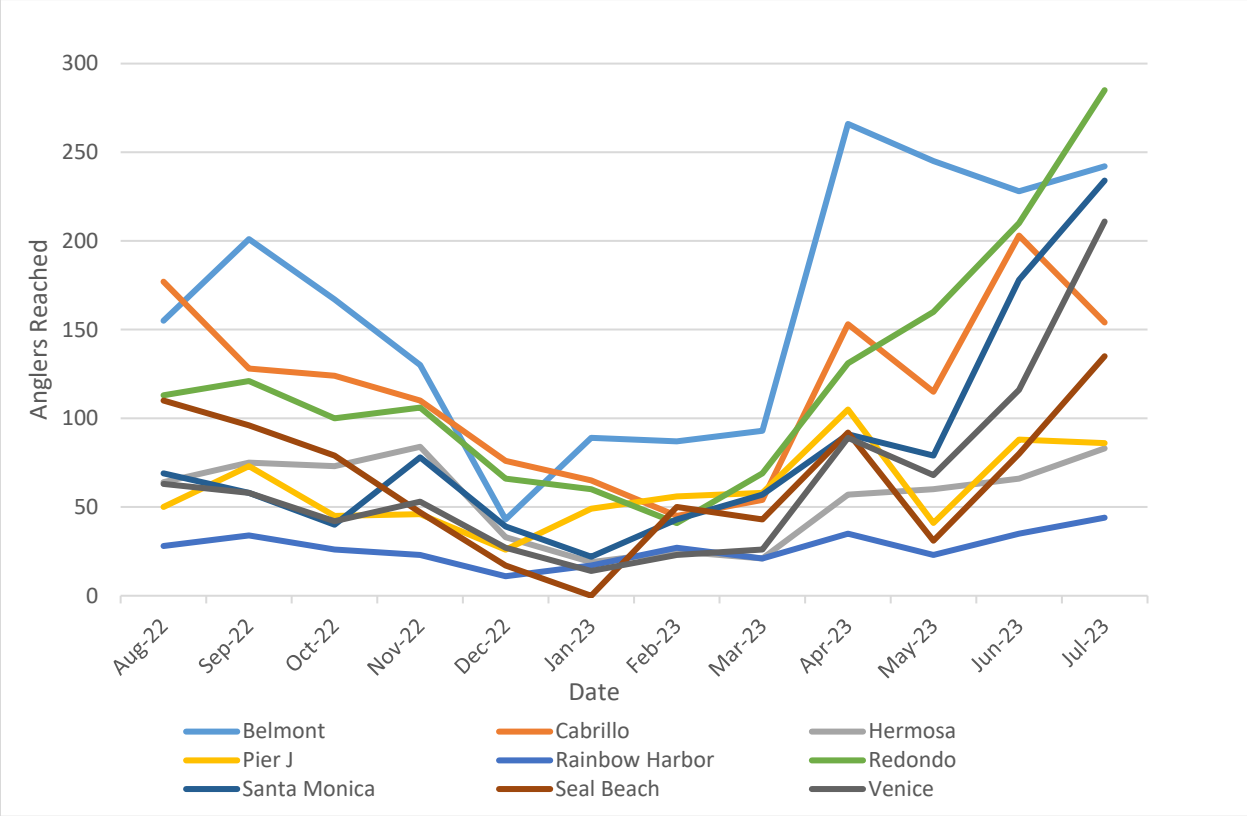

Figure 4. Number of Day Anglers per Month[2]

[2] Direct comparison of Cabrillo Pier data is not possible due to the frequency of outreach activities varying at this location. See Section 3.1 for explanation of differing outreach schedules.

Table 3 summarizes the percentage of daytime anglers who were new or repeat respondents per month. On average, 41 percent of anglers had not been previously contacted by the outreach team (new respondents) and 51 percent of daytime anglers were repeat respondents across all fishing pier locations (8 percent of anglers declined to comment). The proportion of new respondents was highest at Cabrillo Pier (48 percent) and lowest at Santa Monica Pier (35 percent). Though Cabrillo Pier receives roughly twice the amount of outreach effort compared to the other eight piers, the proportion of new respondents to repeat respondents is not likely impacted by this difference as it is calculated as a percent of total anglers contacted at individual pier locations. The other 7 piers averaged between 36 percent and 45 percent for new respondents. Only 8.3 percent of new respondents were already aware of the fish contamination. Pier J had the highest relative proportion of repeat respondents (58 percent), while Seal Beach Pier (44 percent) and Cabrillo Pier (45 percent) had the lowest proportion of repeat respondents. The remaining piers averaged between 49 percent and 56 percent for repeat daytime respondents. The percentage of repeat respondents that reported being unaware of the contamination was less than 1 percent. This small percentage of respondents that reported having talked to the outreach team but still being unaware of the contamination is not easily explained; however, it is possible that respondents incorrectly reported previously speaking with the outreach teams, or that the outreach teams incorrectly recorded responses during conversational data gathering.

Table 3. Percent of New and Repeat Respondents during Daytime Outreach[3]

Date	Belmont		Cabrillo		Hermosa		Pier J		Rainbow Harbor		Redondo		Santa Monica		Seal Beach		Venice		Monthly Average	
	New	Repeat	New	Repeat	New	Repeat	New	Repeat	New	Repeat	New	Repeat	New	Repeat	New	Repeat	New	Repeat	New	Repeat
Aug 2022	30%	55%	30%	70%	41%	58%	54%	46%	39%	39%	45%	41%	48%	45%	65%	25%	51%	37%	**45%**	**46%**
Sept 2022	49%	35%	32%	68%	37%	61%	40%	55%	47%	47%	32%	51%	45%	40%	60%	25%	31%	52%	**41%**	**48%**
Oct 2022	43%	47%	27%	73%	37%	62%	31%	64%	77%	19%	46%	47%	43%	48%	59%	33%	52%	31%	**46%**	**47%**
Nov 2022	33%	42%	27%	67%	43%	56%	41%	52%	30%	70%	37%	50%	28%	54%	47%	40%	34%	53%	**36%**	**54%**
Dec 2022	26%	56%	17%	83%	30%	61%	15%	69%	27%	73%	44%	41%	28%	46%	47%	29%	52%	15%	**32%**	**53%**
Jan 2023	93%	7%	41%	34%	100%	0%	100%	0%	88%	12%	88%	12%	82%	18%	--	--	86%	14%	**85%**	**12%**
Feb 2023	36%	55%	27%	27%	64%	32%	30%	63%	52%	48%	34%	56%	16%	72%	48%	46%	9%	74%	**35%**	**53%**
Mar 2023	29%	61%	92%	8%	33%	67%	19%	72%	43%	57%	32%	52%	19%	65%	35%	47%	23%	65%	**36%**	**55%**
Apr 2023	23%	70%	81%	19%	19%	75%	26%	65%	31%	69%	34%	62%	19%	71%	34%	52%	22%	67%	**32%**	**61%**
May 2023	27%	65%	73%	27%	25%	67%	22%	76%	39%	61%	34%	57%	38%	52%	32%	68%	43%	46%	**37%**	**58%**
June 2023	25%	66%	59%	41%	26%	70%	30%	59%	29%	69%	34%	54%	32%	61%	41%	51%	33%	53%	**34%**	**58%**
July 2023	38%	53%	75%	25%	41%	59%	23%	73%	16%	84%	28%	62%	22%	70%	25%	67%	21%	77%	**32%**	**63%**
Pier Average	**37%**	**51%**	**48%**	**45%**	**41%**	**56%**	**36%**	**58%**	**43%**	**54%**	**41%**	**49%**	**35%**	**54%**	**45%**	**44%**	**38%**	**49%**	**41%**	**51%**

Notes:
(%) indicates the percentage of anglers at each pier that have never been interviewed by outreach personnel (New) versus anglers who were previously interviewed by outreach personnel (Repeat).

3 The percentage of new and repeat respondents will not add up to 100% as a portion of contacted respondents declined to provide information.

4.1.2 Day Angler Awareness of Fish Contamination

Table 4 summarizes the percentage of daytime anglers who responded that they were aware of the contamination. Across all nine piers, about 69 percent of anglers were aware of local fish contamination. Anglers fishing at Hermosa Beach Pier had the highest awareness rate of any pier, with 85 percent of anglers indicating that they were already aware of fish contamination. Angler awareness was lowest at Cabrillo Pier with just 36 percent reporting to be aware of fish contamination. The overall percent awareness is somewhat consistent with the previous reporting period in which 72 percent of anglers reached reported being aware of the contamination, versus this reporting period's overall awareness of 69 percent.

Table 4. Percent of Day Anglers that were Aware of Fish Contamination

	Pier									
Date	Belmont	Cabrillo	Hermosa	Pier J	Rainbow Harbor	Redondo	Santa Monica	Seal Beach[4]	Venice	Monthly Average
Aug 2022	72%	13%	94%	46%	57%	80%	87%	70%	76%	66%
Sept 2022	63%	22%	92%	70%	94%	69%	59%	79%	69%	68%
Oct 2022	67%	5%	92%	78%	50%	67%	83%	73%	74%	65%
Nov 2022	55%	9%	68%	63%	100%	66%	59%	55%	72%	61%
Dec 2022	70%	6%	82%	85%	100%	70%	62%	41%	33%	61%
Jan 2023	30%	40%	47%	20%	29%	20%	36%	--	43%	33%
Feb 2023	71%	95%	96%	77%	78%	63%	72%	80%	74%	78%
Mar 2023	68%	26%	100%	81%	100%	62%	68%	81%	81%	74%
Apr 2023	78%	69%	86%	77%	100%	81%	82%	74%	81%	81%
May 2023	79%	29%	90%	90%	78%	82%	72%	97%	68%	76%
June 2023	84%	51%	94%	76%	89%	75%	75%	75%	66%	76%
July 2023	68%	68%	81%	85%	93%	80%	79%	82%	91%	81%
Pier Average	**67%**	**36%**	**85%**	**71%**	**81%**	**68%**	**69%**	**73%**	**69%**	**69%**

Notes:
(%) indicates the percentage of anglers at each pier that were previously aware of the fish contamination.

4.1.3 Sources of Day Angler Awareness

To identify the most effective outreach strategies, Heal the Bay and Cabrillo asked anglers how they originally learned about local fish contamination (i.e., pier signs, tip cards, outreach team, internet, community events, media, friend/family, or other). Table 5 summarizes the sources of information that contributed to their awareness of the contamination. Pier signs were the most reported source of information about fish contamination, with 51.9 percent of anglers attributing their awareness of fish contamination to reading the "Do Not Consume" pier signs. The pier outreach team was also commonly cited as the source of angler awareness (20.8 percent) as well as the tip cards (20.2 percent). The outreach team and the tip cards were reported by anglers as distinct awareness sources. However, these two sources are likely more connected to each other than the other awareness sources, as the outreach teams consistently distributed the tip cards during their outreach activities. In other words, anglers may be citing

4 Seal Beach Pier was temporarily closed for repairs, and as a result, data are not provided for January 2023 at that location.

the tip card as their awareness source, despite receiving the tip card from the outreach team during their interaction at the pier. However, since tip cards are also distributed through designated local bait shop locations and community events, the two awareness sources are reported separately.

Table 5. Sources of Day Angler Awareness

Pier	Signs	Tip Card	Outreach Team	Internet	Events	Media	Friends/Family	Other
Belmont	54.0%	27.8%	12.3%	2.2%	0.6%	0.6%	0.8%	1.7%
Cabrillo	14.0%	2.7%	62.1%	7.7%	0.0%	6.0%	7.2%	0.3%
Hermosa	58.9%	23.7%	13.9%	1.2%	0.0%	0.1%	0.0%	2.2%
Pier J	44.6%	21.9%	24.4%	2.0%	3.3%	0.5%	0.2%	3.1%
Rainbow Harbor	60.5%	11.8%	23.2%	1.0%	1.4%	0.0%	0.0%	2.1%
Redondo	59.0%	26.9%	10.0%	1.6%	0.5%	0.9%	0.0%	1.1%
Santa Monica	59.9%	14.3%	22.3%	2.0%	0.0%	0.3%	0.5%	0.7%
Seal Beach	68.6%	23.5%	5.0%	1.5%	0.0%	0.2%	0.4%	0.8%
Venice	63.2%	19.3%	13.2%	1.5%	0.0%	0.5%	0.0%	2.3%
Percent (Total Sources)	**51.9%**	**20.2%**	**20.8%**	**2.6%**	**0.5%**	**1.2%**	**1.3%**	**1.5%**

Notes:
(%) indicates the percentage of anglers at each pier that became aware of contamination from each source.

Figure 5 shows the percentage of anglers that became aware of fish contamination per information source from 2018 to 2023. Compared to previous years, more anglers attributed their awareness of fish contamination to reading the pier signs (40 percent in previous years compared to 52 percent from August 2022 to July 2023). Anglers reported less awareness from tip cards and the outreach team, dropping from 27 percent and 31 percent in the previous reporting period, respectively, to 21 percent and 20 percent. Other information sources did not contribute significantly to angler awareness: media (1.2 percent), internet (2.6 percent), other sources (1.5 percent), friends/family (1.3 percent), and community events (0.6 percent).

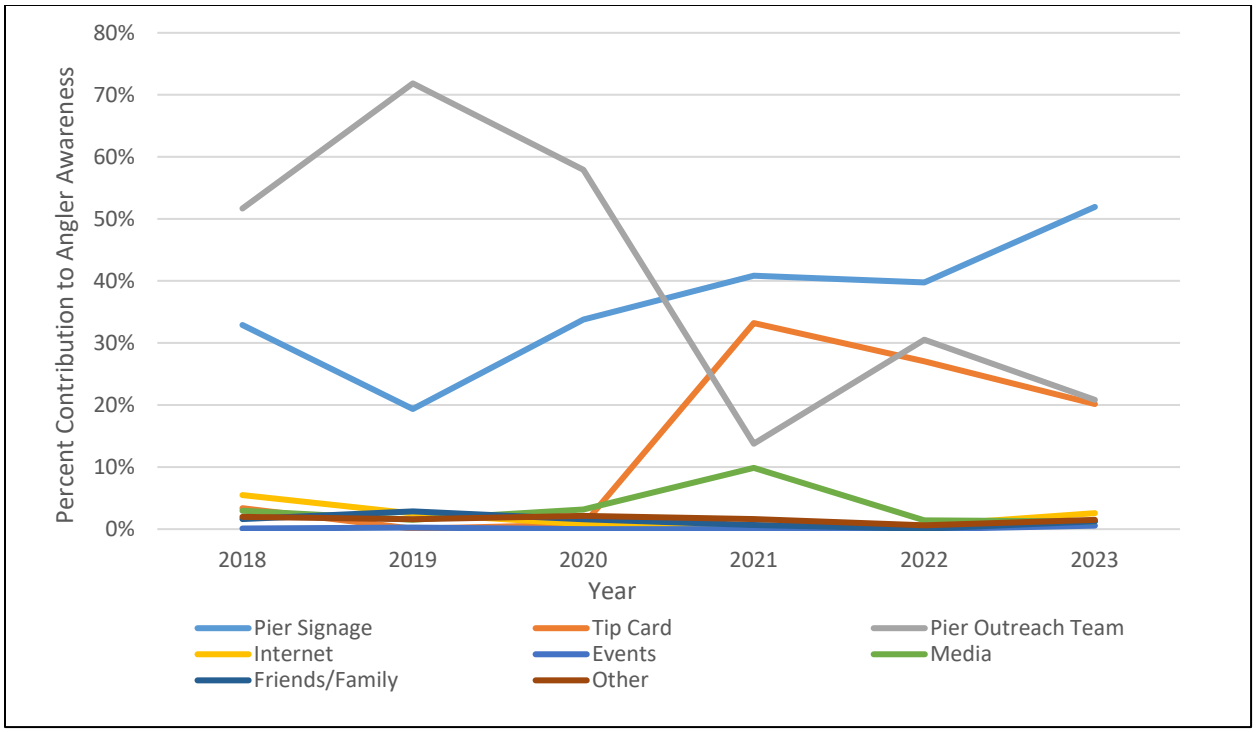

Figure 5. Sources of Information that Contributed to Angler Awareness of Fish Contamination Over Time (2018–2023)

4.1.4 Number of Evening Anglers Contacted

Heal the Bay performed evening angler outreach on Saturdays at Redondo Beach and Venice Beach Piers and contacted a total of 1,462 anglers. The number of anglers contacted by the outreach team varied by month, suggesting seasonal variations in the number of anglers fishing at the piers (Figure 6). Generally, angler activity increased from January to July 2023 and declined from August to December 2023. These trends are consistent with daytime fluctuations reported above. On average, 54 percent of anglers contacted were new respondents and 31 percent were repeat respondents (Table 6). These percentages are similar to the 2021–2022 reporting year in which 57 percent of anglers were new and 43 percent were repeat respondents.

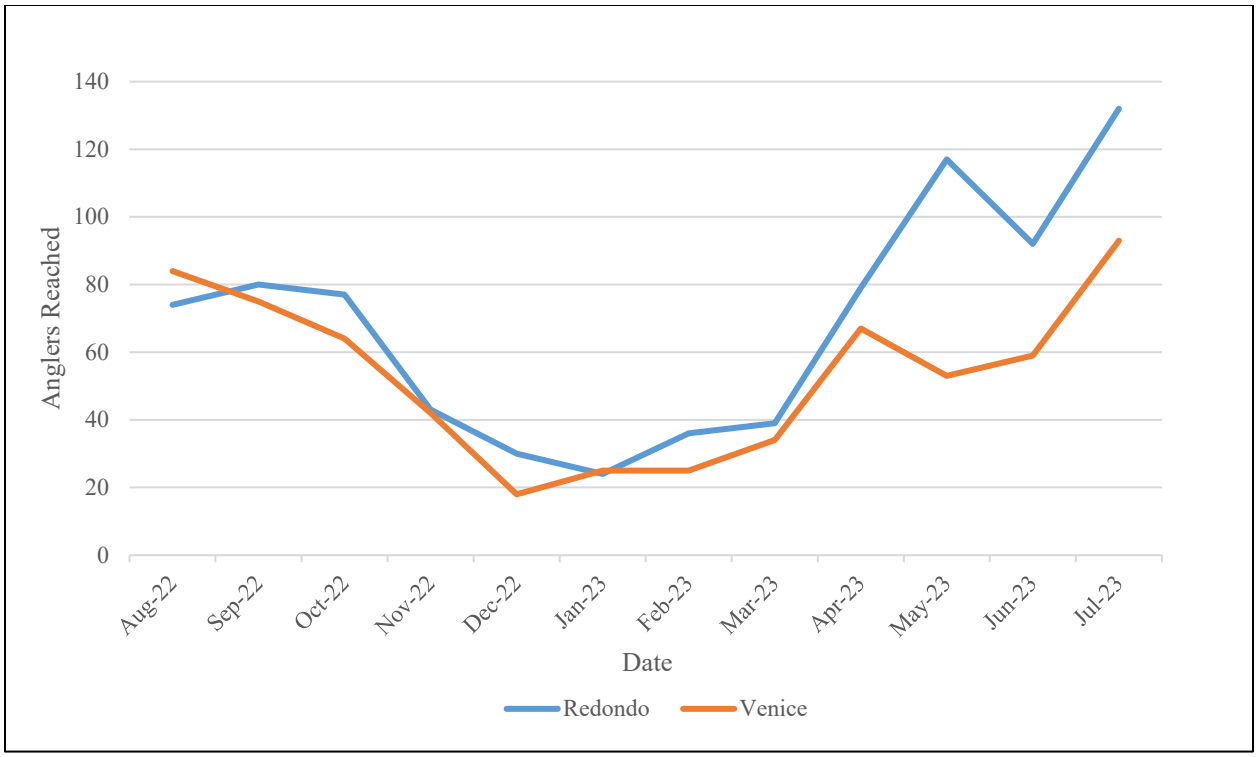

Figure 6. Number of Evening Anglers per Month

Table 6. Percent of New and Repeat Respondents during Evening Outreach[5]

Date	Redondo		Venice		Monthly Average	
	New	Repeat	New	Repeat	New	Repeat
Aug 2022	60%	37%	55%	25%	57%	31%
Sept 2022	55%	30%	57%	25%	56%	28%
Oct 2022	55%	35%	56%	31%	55%	33%
Nov 2022	58%	28%	50%	29%	54%	28%
Dec 2022	50%	30%	50%	28%	50%	29%
Jan 2023	50%	38%	64%	32%	57%	35%
Feb 2023	58%	25%	60%	28%	59%	27%
Mar 2023	51%	36%	59%	24%	55%	30%
Apr 2023	56%	30%	64%	24%	60%	27%
May 2023	46%	43%	57%	26%	51%	35%
June 2023	51%	33%	49%	32%	50%	32%
July 2023	47%	33%	48%	36%	48%	34%
Pier Average	**53%**	**33%**	**56%**	**28%**	**54%**	**31%**

4.1.5 Evening Angler Awareness of Fish Contamination

Table 7 summarizes the percentage of evening anglers who responded that they were aware of fish contamination. On average, 72 percent of anglers were already aware of local fish

5 The percentage of new and repeat respondents will not add up to 100% as a portion of contacted respondents declined to provide information.

contamination. This is a decrease from the previous reporting year in which 76 percent of anglers contacted reported awareness of fish contamination.

Table 7. Percent of Evening Anglers that were Aware of Fish Contamination

Date	Redondo	Venice	Monthly Average
Aug 2022	73%	77%	75%
Sept 2022	74%	80%	77%
Oct 2022	78%	80%	79%
Nov 2022	79%	79%	79%
Dec 2022	67%	56%	62%
Jan 2023	75%	72%	74%
Feb 2023	61%	80%	71%
Mar 2023	64%	76%	70%
Apr 2023	75%	79%	77%
May 2023	62%	72%	67%
June 2023	71%	69%	70%
July 2023	69%	65%	67%
Pier Average	**71%**	**74%**	**72%**

4.1.6 Sources of Evening Angler Awareness

Table 8 summarizes the sources of information that led to the anglers' awareness of local fish contamination. Pier signs (57.5 percent) and tip cards (40.8 percent) continue to be the most effective sources of information for increasing angler awareness of fish contamination. Other sources reported were the outreach team (0.9 percent), media (0.3 percent), internet (0.2 percent), and other (0.3 percent). These results are consistent with the previous reporting years, in which pier signage (50.4 percent) and tip cards (47.7 percent) contributed the most to angler awareness. These last two years differ from earlier reporting, in which the outreach team was often identified as a major source of awareness.

Table 8. Sources of Evening Angler Awareness

Pier	Signs	Tip Card	Outreach Team	Internet	Events	Media	Friends/ Family	Other
Redondo	53.7%	43.9%	1.6%	0.2%	0.0%	0.3%	0.0%	0.3%
Venice	62.3%	37.1%	0.0%	0.2%	0.0%	0.2%	0.0%	0.2%
Percent (Total Sources)	**57.5%**	**40.8%**	**0.9%**	**0.2%**	**0.0%**	**0.3%**	**0.0%**	**0.3%**

Notes:
(%) indicates the percentage of anglers at each pier that became aware of contamination from each source.

4.1.7 Angler Geographic Distribution and Languages Spoken

During pier outreach activities, the outreach team asked anglers if they were willing to provide their residential zip code. About 36 percent of daytime anglers (3,255 anglers) and 45 percent of evening anglers (653 anglers) provided their zip codes. Most anglers came from zip codes within Los Angeles County (87.3 percent of day anglers and 98.8 percent of evening anglers), which is consistent with previous reporting years. Day anglers also came from Orange County

(7.6 percent), Riverside County (1.4 percent), San Bernardino County (1.2 percent), and out of state and other counties in California (2.5 percent).

Figures 7 and 8 depict the geographical distributions and frequencies of zip codes reported by daytime and evening anglers, respectively. The most frequently reported zip codes for daytime anglers were San Pedro 90731 (220 respondents), Huntington Park 90255 (83 respondents), and North Long Beach 90805 (68 respondents), all in south Los Angeles. Six additional zip codes had 50 or more respondents, all of which were in Los Angeles County. The most frequently reported zip codes for evening anglers were Huntington Park 90255 (34 respondents), Hawthorne 90250 (27 respondents), and Torrance 90503 (26 respondents). Twenty-four additional zip codes had 10 or more respondents, all of which were in Los Angeles County. The following analysis and figures (Figures 7 and 8) focus on data from Los Angeles and neighboring counties.

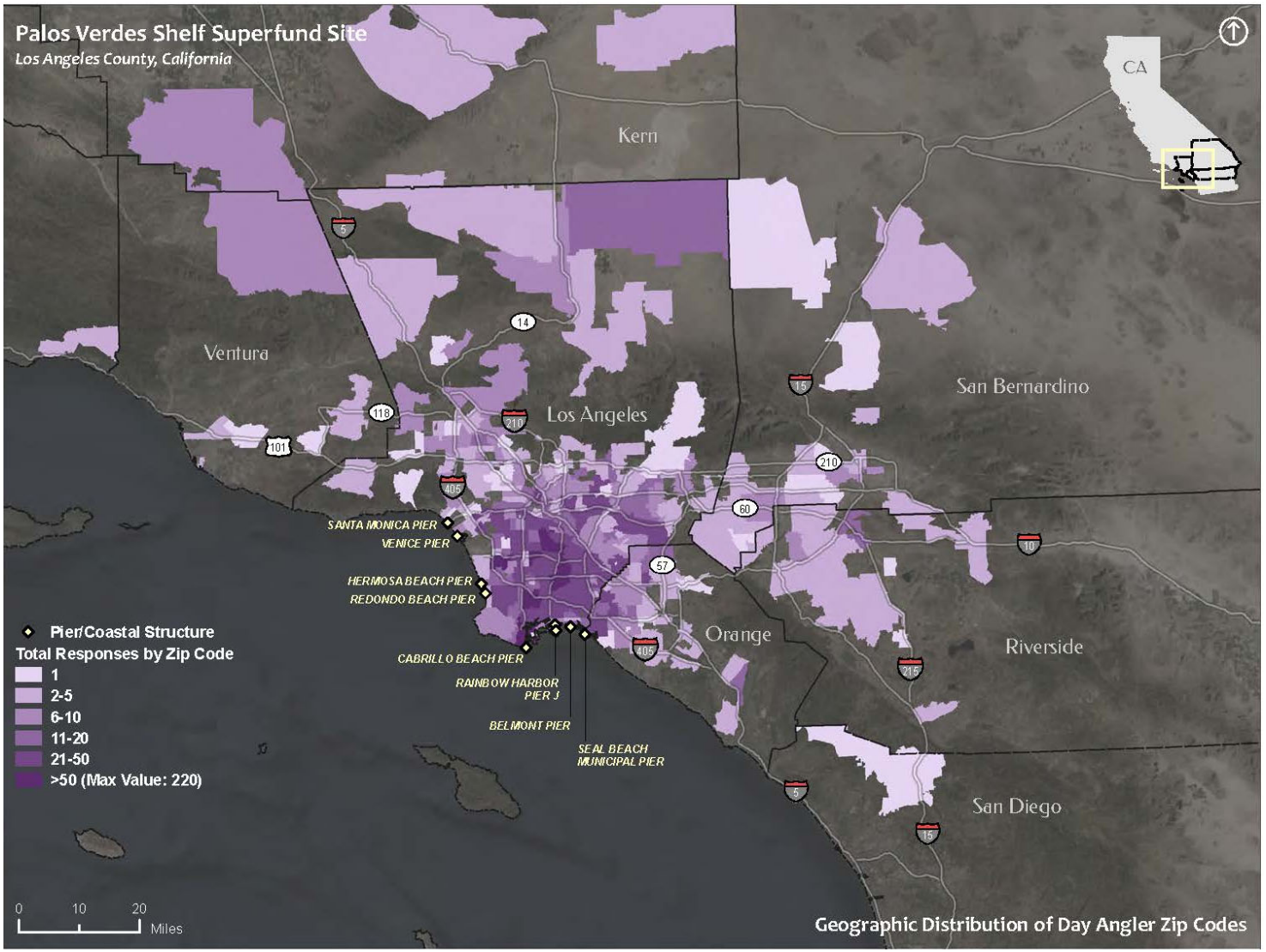

Figure 7. Geographic Distribution of Daytime Anglers per Zip Code

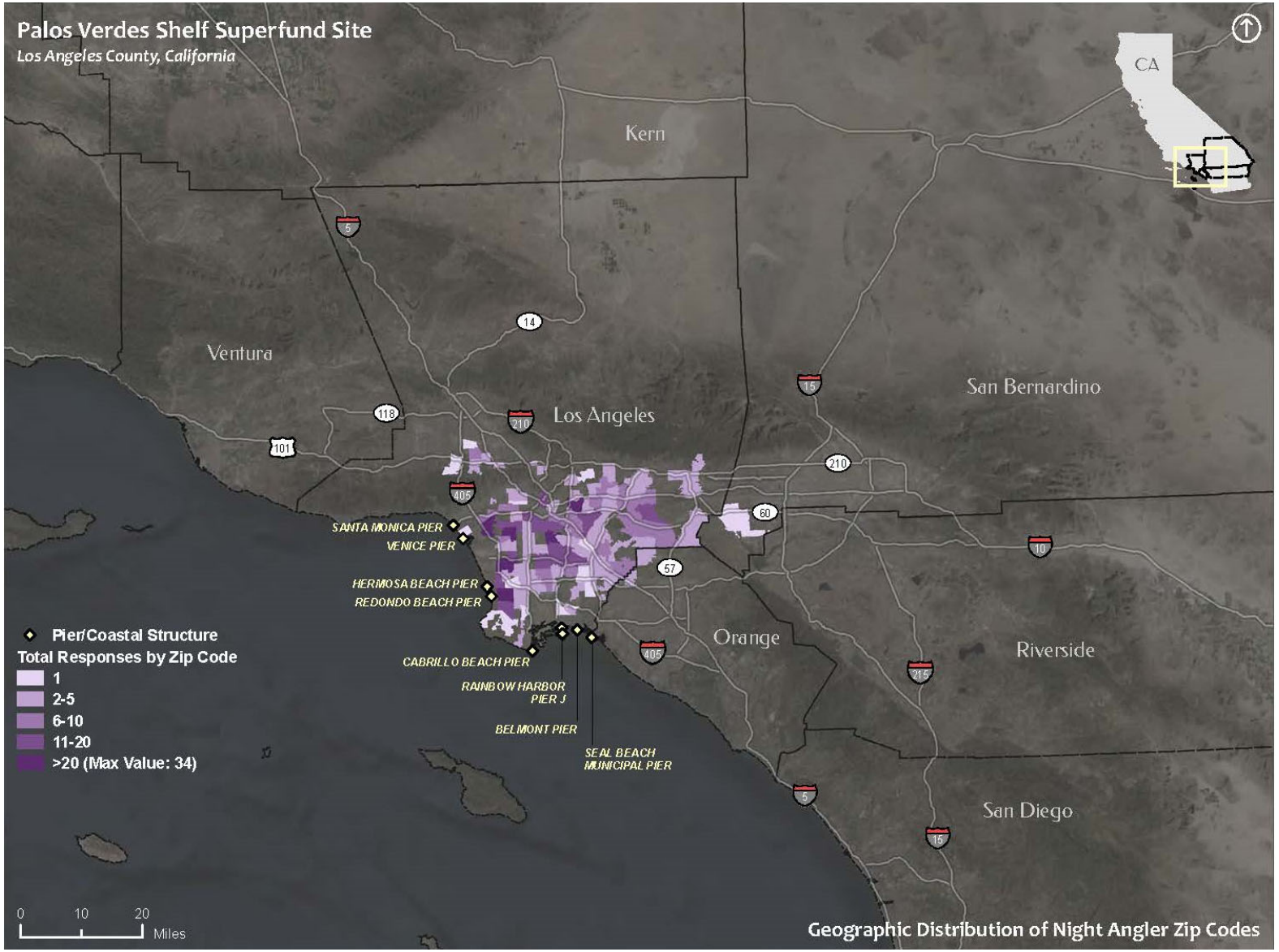

Figure 8. Geographic Distribution of Evening Anglers per Zip Code

The outreach team recorded angler responses in English (8,727 anglers), Spanish (504 anglers), Chinese (94 anglers), and Russian (5 anglers). Vietnamese-speaking respondents were not recorded by either Heal the Bay or Cabrillo during this period. Languages were recorded based on respondent-provided information or their request for tip cards in languages other than English. As noted above in this section, not all respondents were willing to provide their residential zip codes and therefore are not represented in the language distribution analysis. To determine the language distribution spoken by anglers per county, only those responses that include both a language designation and the associated residential zip code were used for analysis. Table 9 summarizes the language distribution spoken by the anglers per county. Across all piers during daytime outreach activities, 94.9 percent of anglers spoke English, 2.3 percent spoke Spanish, and 2.8 percent spoke Chinese. During evening outreach at Venice and Redondo Beach piers, 98.8 percent of anglers spoke English and 1.2 percent of anglers spoke Chinese. During the previous reporting year, English was the dominant language spoken (99.5 percent). The remaining 0.5 percent of non-English speakers provided zip codes in Los Angeles County.

Table 9. Languages Spoken during Pier Angler Outreach

County	English		Spanish		Chinese	
	Day	Evening	Day	Evening	Day	Evening
Los Angeles	95.3%	96.3%	3.3%	0%	1.4%	3.7%
Orange	96.0%	100%	2.0%	0%	2.0%	0%
Riverside	89.1%	0%	0%	0%	10.9%	0%
San Bernardino	100%	0%	0%	0%	0%	0%
Other	93.9%	100%	6.1%	0%	0%	0%
Average	**94.9%**	**98.8%**	**2.3%**	**0%**	**2.8%**	**1.2%**

4.2 FISH SPECIES REPORTED DURING ANGLER OUTREACH

The outreach team collected data on the types and quantity of fish caught by anglers (Table 10). Mackerel (1,479 recorded), sardine (1,973 recorded), and jacksmelt (421 recorded) were the most frequently caught fish species. These three fish species are listed on the new tip card design that will be released in 2024 as examples of fish that are safer to eat. Fish that are included on the "Do Not Consume" list were also recorded during outreach activities, as follows: white croaker (80 recorded), barred sand bass (27 recorded), black croaker (2 recorded), topsmelt (189 recorded), and barracuda (0 recorded). Based on data presented in Table 10, the incidence of fish included on the "Do Not Consume" list are caught less often than fish listed as safer to eat when consumed in recommended servings per week and appropriate serving sizes.

Table 10. Fish Species and Number Caught by Anglers Interviewed during Pier Outreach

Fish Listed as "Do Not Consume"			
Topsmelt	189	Black Croaker	2
White Croaker	80	Barracuda	0
Barred Sand Bass	27		
Fish Identified as Safer to Eat			
Sardine	1,973	Sargo	27
Mackerel	1,479	Shovel Nose Guitarfish	21
Jacksmelt	421	Yellowfin Croaker	16
Corbina	45	Kelp/Calico Bass	11
Halibut	30	Rockfish	10
All Other Documented Fish Species			
Surf Perch	94	Scorpionfish	3
Bonito	55	Black Perch	2
Crab	42	Salema	2
Ray	22	Sea Star	2
Queenfish	8	Lizard Fish	2
Opaleye	5	Leopard Shark	1
Octopus	4	Thresher Shark	1
Spotted Sea Bass	3	White Seabass	1

4.3 BAIT SHOP OUTREACH

In August 2022, DBS&A performed bait shop outreach at 37 bait shops and retail locations and distributed additional FCEC outreach materials to nine shops. A total of 450 English, 450 Spanish, 175 Chinese, and 175 Vietnamese tip cards were distributed to the following nine bait shops:

- 7-Eleven
- ARCO/ampm
- Bay Market
- Charkbait
- Fishermen's Hardware
- Mahi Tackle-Sport Fishing Supplies
- West Marine (1)
- West Marine (2)
- West Marine (3)

Prior to the May 2023 bait shop outreach, the EPA added the following two new bait shop locations to the program, bringing the total number of bait shops in the program up to 39 locations:

- Chaeil Fishing Tackle USA, Inc. in Hawthorne, California
- Sav-On Tackle in Santa Fe Springs, California

In May 2023, DBS&A conducted in-person outreach to 39 bait shops. During this outreach, it was determined that three locations had either closed, stopped selling bait, or were redundant addresses on the list. After removing these three closed or redundant locations, there are now 36 active participants in the bait shop program. While conducting the May 2023 outreach, 32 of the 36 bait shops requested additional FCEC educational outreach materials. A total of 1,100 English, 850 Spanish, 138 Chinese, and 125 Vietnamese tip cards were distributed to the following 32 bait shops:

- 7 Eleven
- ABC Fine Wine
- ARCO AM/PM
- Baja Fish Gear
- Best Bait and Tackle
- Big 5 Sporting Goods
- Catalina Liquor & Deli
- Charkbait
- Dawn to Dusk Liquor
- Del Rey Landing
- El Don Liquor Store
- Family Deli and Grocery
- Fishermen's Hardware
- Gaffey Liquor
- Hello Liquor
- Jimmy Caivo Bait & Tackle
- Liquor Depot
- M&P Liquor
- Magnolia Liquor Jr. Market / Supreme Liquor
- Mr. C's Liquor
- Pacific Edge Bait and Tackle
- Pacific Wilderness
- Redondo Food Mart
- Rosa's Liquor Market
- Seal Beach Liquor Store
- Stanley's Liquor Jr. Market
- West Beach Liquor Store
- West Marine (1)
- West Marine (3)
- West Marine (4)
- Chaeil Fishing Tackle USA Inc.
- Sav-On Tackle

Currently, there are 36 bait shops and retail locations that participate in the program (Figure 3). A combined total of 1,550 English, 1,300 Spanish, 313 Chinese, and 300 Vietnamese tip cards were distributed to the bait shops during the August 2022 and May 2023 outreach activities.

4.4 ELECTRONIC OUTREACH

Electronic outreach is the least effective means of reaching the public, and the FCEC paused data collection on site users and browsing. Electronic outreach efforts consist of website maintenance and newsletter distribution.

4.5 COMMUNITY OUTREACH EVENTS

The FCEC participated in 11 local community events. BPSOS attended five events with themes dedicated to the Vietnamese community, CCHC attended three events with themes dedicated to the Chinese community, and DBS&A attended three events with themes dedicated to children, environmental education, and the Hispanic community. In total, an estimated 34,000 people attended the events. Outreach staff distributed 2,549 tip cards, 2,388 brochures, 533 comic books, 2,304 fish ID cards, and 5 curriculum guides. The FCEC booth sign-in sheets recorded a total of 1,182 attendees' contact information. Table 11 provides the summary of community outreach events and outreach material distributions for events attended during this reporting year.

Although FCEC outreach materials were distributed at all events that BPSOS attended, tracking of distribution numbers are not available for Garden Grove National Night Out and Public Health-Abrazar Community events because this data was not recorded at these events. This issue has been addressed, and outreach material distribution is to be tracked at all future events. Outreach material distribution was recorded for the other three events staffed by BPSOS, with a total of 218 tip cards and 77 FCEC brochures distributed at those events. Inconsistent recording of outreach material distribution has prevented further breakdown of outreach material distributed by language. Improved tracking of outreach event data is important to support future analyses and will be a focus during events in the next reporting year.

CCHC distributed 6,145 informational outreach materials during three events, including 2,010 informational brochures, 2,160 tip cards, and 1,975 fish identification cards. Most outreach materials distributed were in Chinese. Of the 2,160 tip cards distributed, 82.2 percent were in Chinese and 17.8 percent were in English. Of the 2,010 informational brochures distributed, 80.7 percent were in Chinese and 19.3 percent were in English. All 1,975 fish identification cards were in English.

DBS&A distributed 1,339 informational outreach materials during three events, including 171 tip cards, 533 "What's the Catch" comic books, 5 "What's the Catch" curriculum guides, 301 informational pamphlets, and 329 fish identification cards. Most outreach materials distributed were in English. Of the 171 tip cards distributed, 85.4 percent were in English, 12.3 percent were in Spanish, and 2.3 percent were in Chinese. Of the 533 "What's the Catch" children's comic books distributed, 84.9 percent were in English, 13.5 percent were in Spanish, and 1.6 percent were in Chinese. Additional outreach materials distributed included 329 fish identification cards, with 73.2 percent in English, 20.4 percent in Spanish, and 6.4 percent in Chinese. Five curriculum guides were given to educators interested in implementing lessons about local fish contamination.

Table 11. Outreach Materials Distributed at Community Events

Event	Community Outreach Partner	Date(s)	Approximate Number of Attendees	Distributed Outreach Materials					Sign In
				Tip Cards	Brochures	Comic Books	Fish ID Cards	Curriculum Guide	Signatures
City of Garden Grove National Night Out	BPSOS	2 August 2022	300	NR	0	NR	0	0	78
City of Westminster Back-to-School Vaccination Event and Resource Fair	BPSOS	24 September 2022	500	21	0	0	0	0	0
California Department of Public Health-Abrazar Incorporated Community Event	BPSOS	18 November 2022	200	NR	0	NR	0	0	78
Spring of H.O.P.E. (Health, Opportunity, Progress, Equality) Free Community Health Fair	BPSOS	17 March 2023	400	120	0	0	0	0	0
Senator Umberg's Biannual Community Health and Resource Fair	BPSOS	8 July 2023	200	77	77	0	0	0	77
Chinese Christian Herald Crusades Asian Fall Festival	CCHC	8-9 October 2022	10,000	1100	950	0	950	0	448
2023 San Gabriel Lunar New Year Festival	CCHC	4 February 2023	8,000	700	700	0	700	0	386
Chinese Christian Herald Crusades Annual Walkthrough and Carnival	CCHC	15 April 2023	700-800	360	360	0	325	0	115
Deane Dana Friendship Regional Park and Nature Center A Day in Nature Festival	DBS&A	13 August 2022	500	18	18	16	44	2	0
Baja Splash Cultural Festival	DBS&A	24-25 September 2022	13,600	84	137	249	162	3	0
Aquarium of the Pacific Annual International Children's Festival	DBS&A	18-19 March 2023	300	69	146	268	123	0	0
Total	**--**	**--**	**34,000**	**2,549**	**2,388**	**533**	**2,304**	**5**	**1,182**

Notes:
NR = Not Recorded
FCEC = Fish Contamination Education Collaborative
BPSOS = Boat People SOS
CCHC = Chinese Christian Herald Crusades
DBS&A = Daniel B. Stephens & Associates, Inc.

5. DISCUSSION AND RECOMMENDATIONS

5.1 ANGLER OUTREACH

During the COVID-19 pandemic, outreach activities at all nine piers were halted from March 2020 to May 2021. In June 2021, outreach activities resumed at seven of the piers. However, it was not until September 2021 that outreach activities at Cabrillo Pier and Venice Pier resumed. As a result, Figures 9–14 for the reporting period of August 2020 to July 2021 reflect only outreach activities conducted in June and July 2021. The data for Cabrillo Pier and Venice Pier during the 2020–2021 reporting period show a gap in Figures 11–14 due to the lack of outreach activities until the subsequent reporting period of August 2021 to July 2022.

Angler activity continues to rebound from COVID-19 pandemic lows in 2021 but remains below pre-COVID-19 pandemic levels (Figure 9). Many residents regularly fish from the piers and have been contacted by FCEC outreach staff. The angler outreach program fell short of the goal of reaching 11,600 anglers annually; however, this goal was established based on historical performance reporting, and it is recommended that this goal be reassessed in the aftermath of the COVID-19 pandemic using more recent data. In total, the angler outreach program contacted nearly 11,000 active anglers during the reporting year and successfully increased awareness of local fish contamination from the Palos Verdes Shelf Superfund Site. However, the data suggest that pier fishing is gaining popularity and that the number of new anglers has increased since the COVID-19 pandemic (Figures 9 and 10). Of the new anglers contacted, only 8.3 percent were aware of the fish contamination. Continued pier outreach activities are needed to ensure that new anglers coming to the piers to fish are aware of fish contamination that may pose risks to their health. The information collected from anglers also helps the EPA assess and improve the Palos Verdes Shelf institutional controls program to protect human health while long-term remedies are evaluated. These data are used to track important variables that may impact the success of the program (e.g., trends in fishing activities, languages spoken, and popular fish species caught).

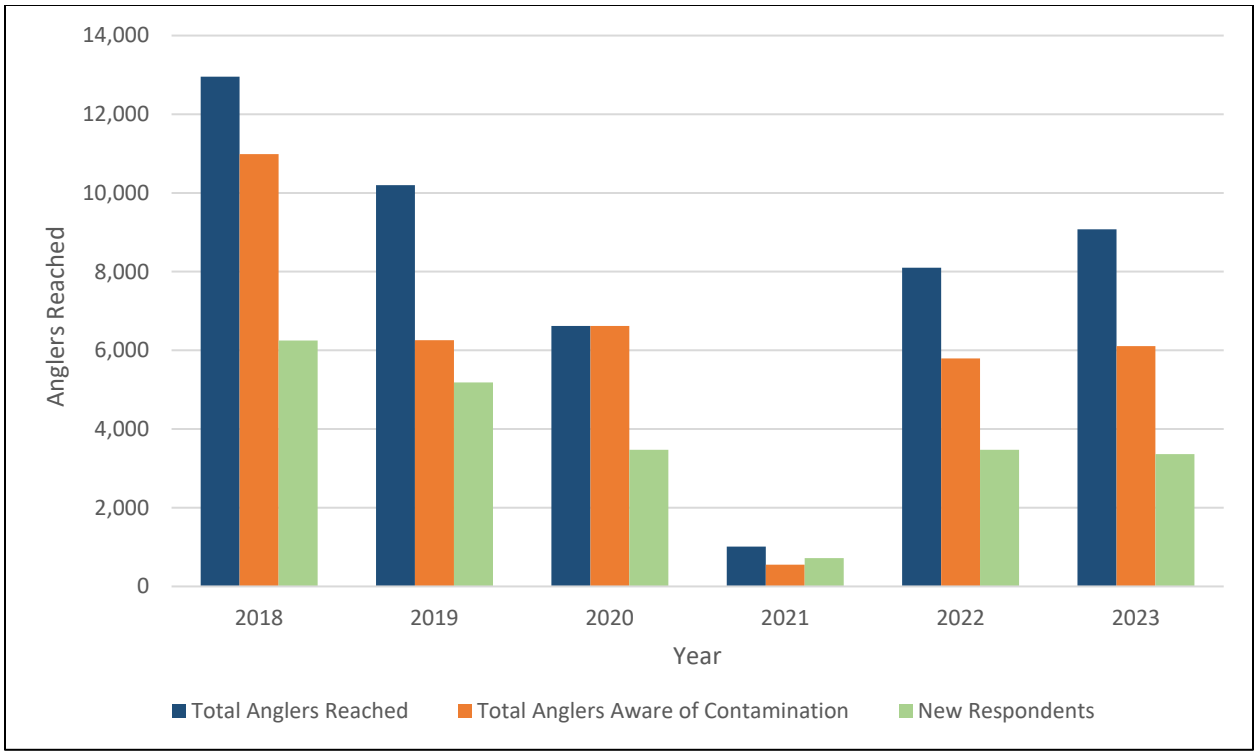

Figure 9. Number of Day Anglers Contacted during Pier Outreach (2018–2023)

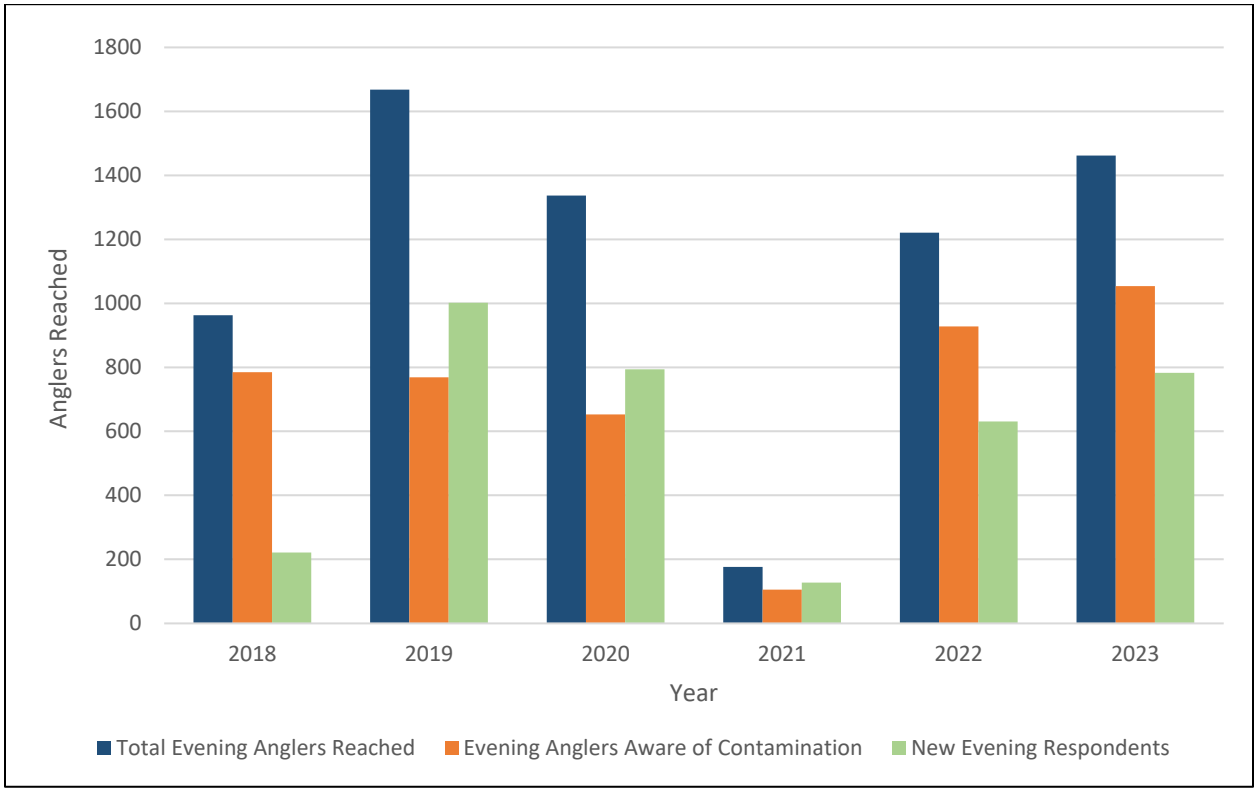

Figure 10. Number of Evening Anglers Contacted during Pier Outreach (2018–2023)

Outreach staff at Belmont Pier and Redondo Beach Pier consistently reach the most anglers each year (Figure 11). While Figure 11 shows the annual number of anglers reached at Cabrillo Pier, this data cannot be directly compared to the other pier locations, as angler outreach efforts occur approximately twice as frequently at Cabrillo Pier. Figure 12 presents the percentage of anglers aware of fish contamination for the 2018–2023 period. Overall, average angler awareness at the piers, excluding Cabrillo Pier, reached higher levels in 2023 than it has since 2019. The declining percentage of anglers at Cabrillo Pier who were aware of the fish contamination may be due to an increase in new anglers visiting the pier. Currently, day outreach at Belmont and Redondo Piers is typically conducted on weekends while outreach at Cabrillo Pier is conducted on weekdays. Program efforts may benefit from conducting outreach on different days and times of the week to engage with different angler populations and raise awareness at those locations. Rainbow Harbor and Hermosa Beach Piers typically reach the fewest anglers each year, with awareness typically recorded among the highest across the nine pier locations. It is recommended that the FCEC consider reallocating outreach efforts at Rainbow Harbor to piers that are more popular with anglers.

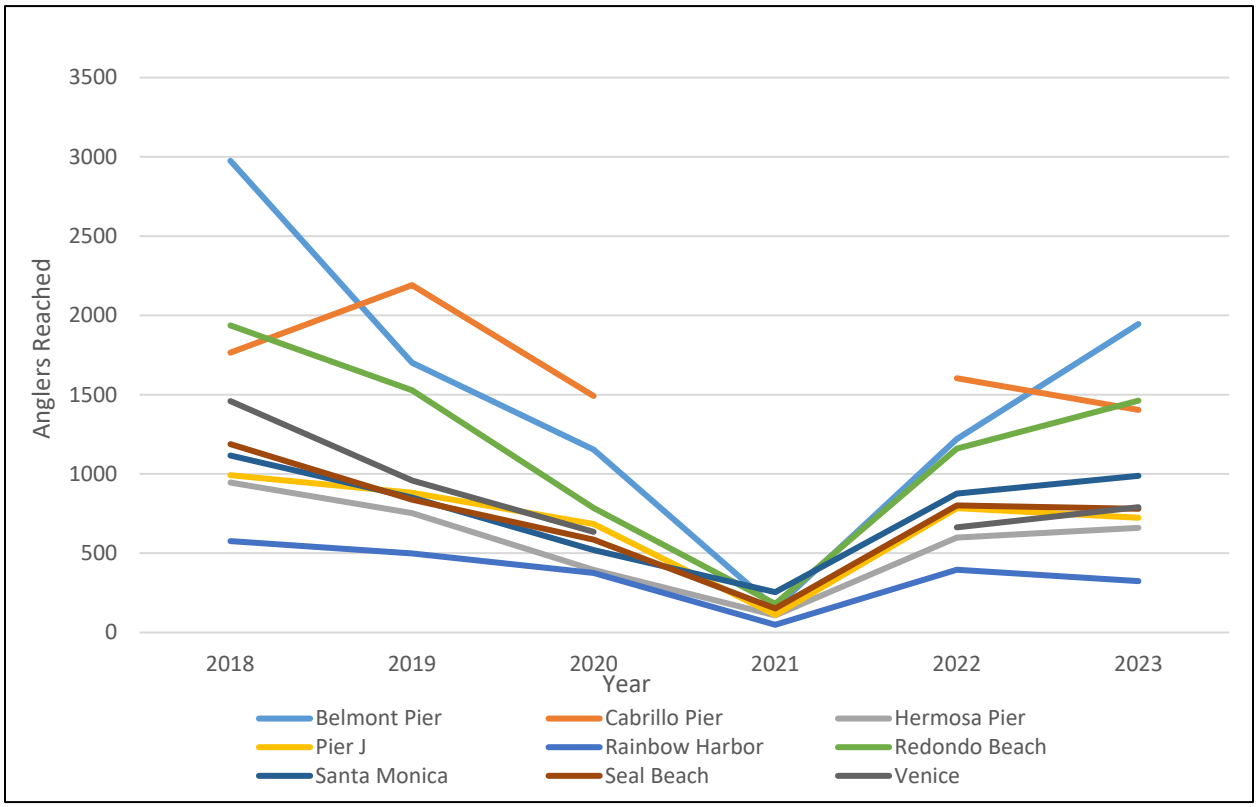

Figure 11. Number of Day Anglers Contacted per Pier (2018–2023)[6]

[6] Direct comparison of Cabrillo Pier data is not possible due to the frequency of outreach activities varying at this location. See Section 3.1 for explanation of differing outreach schedules.

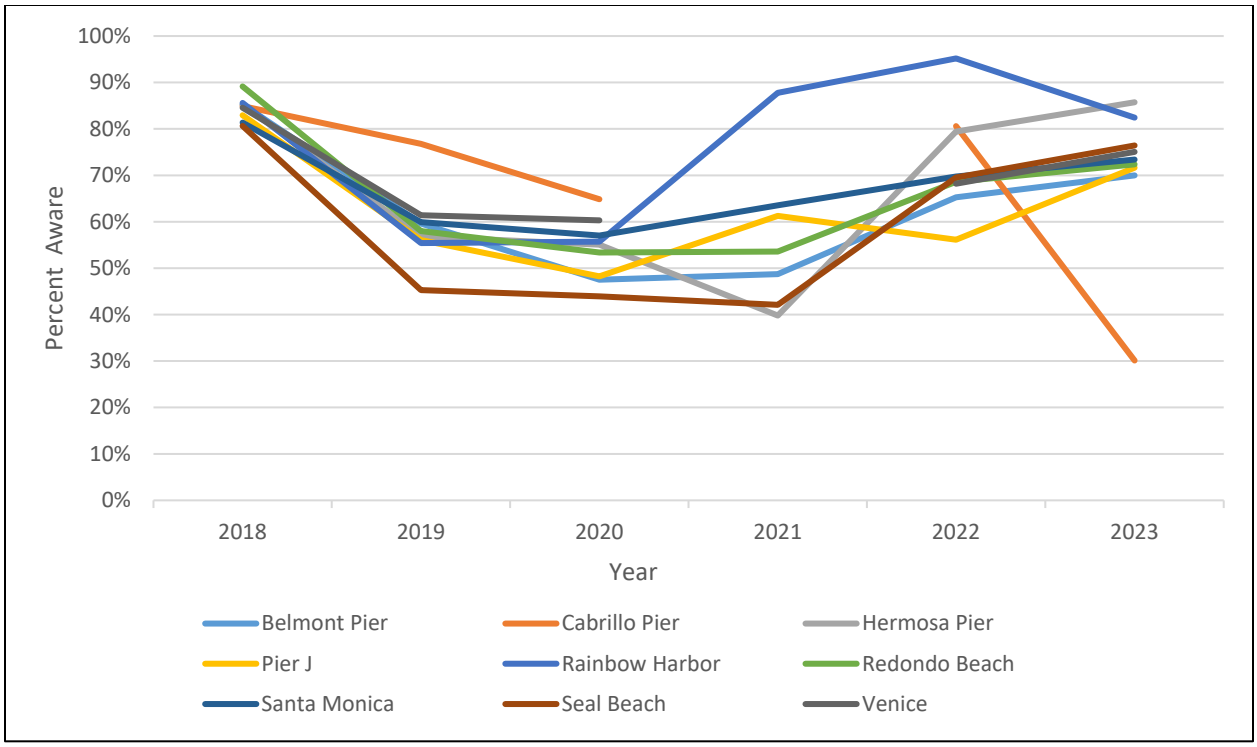

Figure 12. Percentage of Anglers Aware of Fish Contamination per Pier (2018–2023)

Results show that evening outreach reaches different angler communities and is an important component to educating anglers about local fish contamination. Unlike day outreach, the numbers of evening anglers contacted have returned to pre-COVID-19 pandemic levels at both Redondo Beach and Venice Piers (Figure 13). Evening angler awareness levels have also returned to pre-COVID-19 pandemic levels at these two piers (Figure 14). It is recommended that the FCEC continue evening outreach at both piers. Additionally, the FCEC may consider expanding evening outreach to include a second evening during the week or an additional pier to connect with different angler populations.

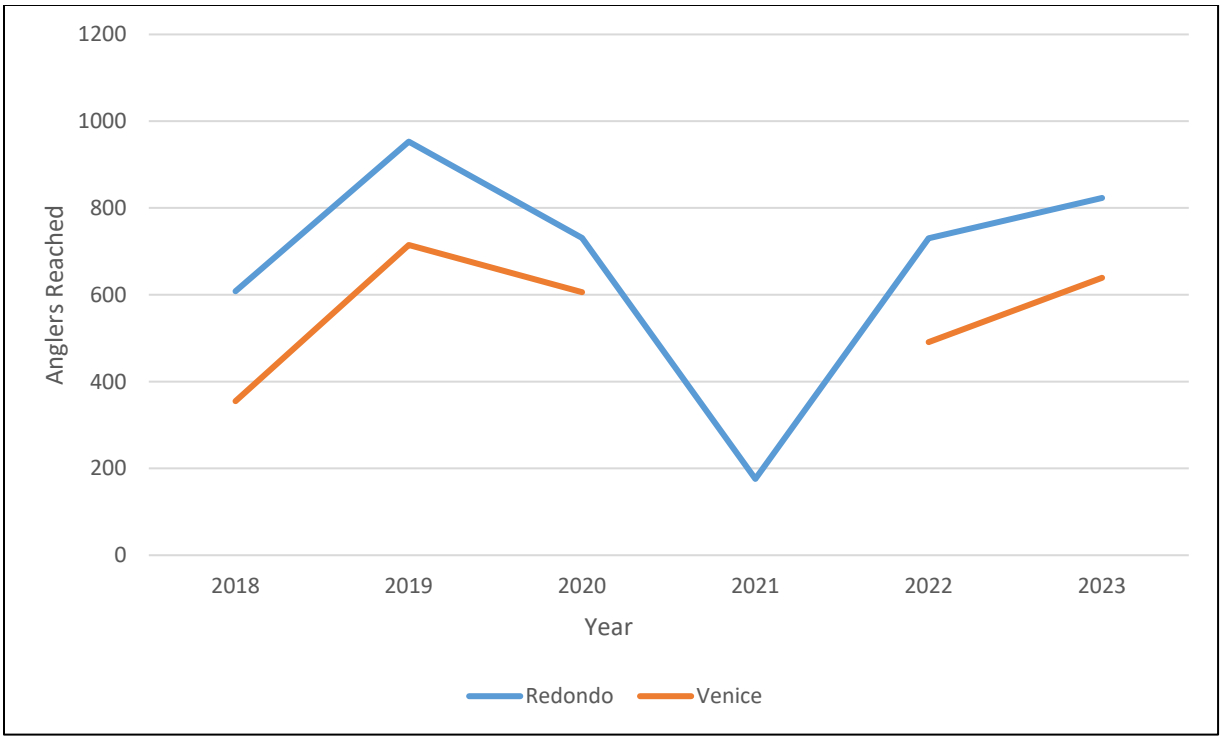

Figure 13. Number of Evening Anglers Contacted per Pier (2018–2023)

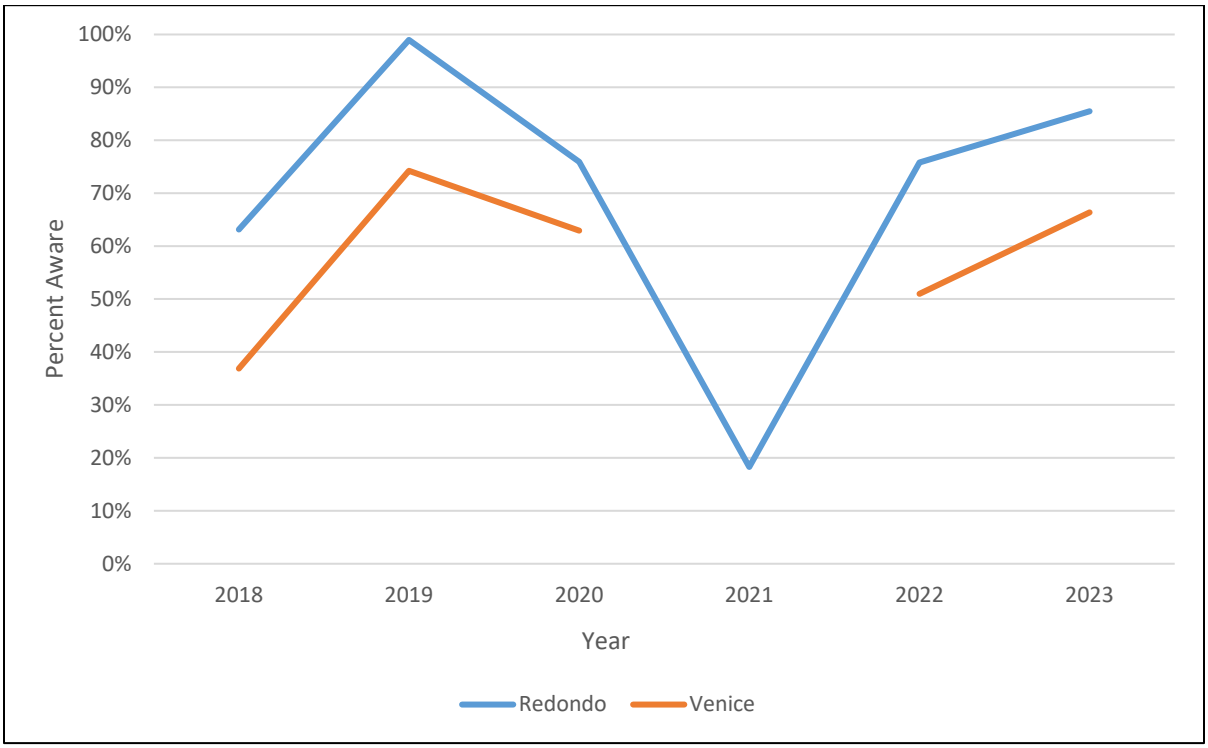

Figure 14. Percentage of Evening Anglers Aware of Fish Contamination per Pier (2018–2023)

The most common languages spoken by anglers were English, Spanish, and Chinese, which is consistent with previous years. English was the primary language spoken during both day and evening angler outreach. Spanish-speaking anglers were observed during daytime outreach activities but were not observed during evening outreach activities. Chinese speakers were observed during both daytime and evening outreach activities. The percent of Spanish and Chinese speakers increased slightly compared to the previous year, while the percent of English speakers decreased slightly. The number of evening Chinese speakers has fluctuated from roughly 1.5 percent to 8 percent since 2018, with no reported Spanish speakers during evening outreach activities since 2020. This contrasts with the results of the pilot evening angler program in 2017, which reported more Spanish-speaking anglers than Chinese-speaking anglers. Continued monitoring of angler languages in future reporting years is recommended to better understand this trend.

The data collected on angler languages are limited to information gathered through bilingual outreach staff and tip cards translated into Spanish, Chinese, and Vietnamese. These results do not indicate if the English responders speak only English or if they are bi- or multi-lingual. While the data indicate that most anglers spoke English, it is possible that bi- and multi-lingual respondents may not have been recorded. For instance, Heal the Bay and Cabrillo have recorded data on Vietnamese respondents since 2017. In 2017, the Vietnamese respondents were recorded as speaking both English and Vietnamese, so it is possible that in more recent years, these Vietnamese respondents have been categorized as English-speaking only. It is recommended that the FCEC track the number of bi- and multi-lingual anglers by asking anglers to provide their primary and alternative languages.

The zip code analyses highlight communities that may be more vulnerable to contamination through the consumption of fish with elevated levels of PCBs and DDT. The data show that most anglers are coming from local communities in south Los Angeles County (Figures 7 and 8). The spatial distribution for day anglers differed from that of evening anglers, with more day anglers traveling from inland communities further from the coast. Nearly all anglers fishing in the evening were from Los Angeles County. Huntington Park 90255 was frequently reported for both day and evening anglers. According to 2020 U.S. Census data, 97 percent of people living in Huntington Park identify as Hispanic or Latino. Overall, the angler zip code data provide important inferences about communities that may be more vulnerable to fish contamination. These data help identify areas to target for community events and bait shop outreach to educate people that may be eating contaminated fish. It is recommended that the FCEC continue to collect these data to inform other areas of the institutional controls program.

The incidence of anglers catching fish species included on the “Do Not Consume” list has been documented and indicates that “Do Not Consume” fish species are being caught less often than fish species that are known to be safer to eat when consumed in recommended servings per week with appropriate portioning. These data will be included in future reports and will help the EPA to track if anglers are keeping more or less “Do Not Consume” fish species. Tracking of fish species being caught will support the goal of encouraging behavior changes to reduce human exposure to PCBs and DDT and with continued outreach efforts.

The “Do Not Consume” fish pier signage, FCEC tip cards, and outreach team were most effective at increasing pier angler awareness of fish contamination from Palos Verdes Shelf. As noted in Section 4.1.3, the tip cards and outreach team are closely connected, as the outreach teams consistently distributed the tip cards during their activities. This close relationship makes it challenging to assess anglers' awareness due to these sources independently, as inquiring about them may bias the responses. However, the strong correlation between the two sources suggests that active angler outreach efforts have led to higher overall awareness. Continued angler outreach at the fishing piers is recommended.

The FCEC is in the process of designing a new tip card through a collaborative effort that incorporates feedback from local anglers. The new tip card is scheduled to be completed in 2024 and includes new information about PCBs and DDT, safer fish to eat based on common fish species caught by local anglers, and ways to reduce potential exposure through different cooking methods and by eating only the skinless fillet. Additionally, the new tip card will include a QR code for easier navigation to more information. Updates to other outreach materials, including the pier signs, are planned for 2025. The goal of redesigning and updating these materials is to ensure that the public can easily access information about fish contamination and resources to stay informed about FCEC activities. Ultimately, this will improve outreach efforts and angler awareness of fish contamination.

While the goal is 100 percent tracking of each metric during angler interactions, in some cases not all data were provided by each angler. The incomplete recording of data is due in part to angler hesitancy to answer all questions and is difficult to overcome; however, in some cases it is likely that outreach staff were unable to record all answers due to the ongoing conversation. Data gaps need to be minimized during angler interactions to improve the completeness of analyses. Additional training of outreach personnel is recommended to improve angler interaction, build rapport and reduce hesitancy, and increase data collection completeness. Additionally, some consideration of standard awareness source questions and how they are posed to anglers could avoid biases and differences among outreach staff. For example, sources of awareness were substantially different between data collected by the Cabrillo outreach team compared to the Heal the Bay outreach team. Cabrillo attributed 62 percent of angler awareness to the outreach team while Heal the Bay on average attributed 19 percent to the outreach team (Table 5). Conversely, Cabrillo attributed 14 percent of awareness to the pier signs while Heal the Bay on average attributed 59 percent to the pier signs (Table 5). These differences may be due to pier differences or may reflect different outreach team approaches to phrasing questions or inadvertently leading answers. Providing outreach personnel with engagement training may reduce the potential for introducing bias by providing clear messaging and outreach question format.

5.2 BAIT SHOP OUTREACH

Two bait shop outreach events were conducted during this reporting year: one in August 2022 and one in May 2023. These outreach events successfully restocked the bait shops and retail locations, listed in Section 4.3, that requested additional FCEC educational outreach materials.

Additionally, the EPA established two new locations for outreach to replace the shops that closed or discontinued the sale of bait since the August 2022 outreach event. Currently, there are 36 bait shops participating in the program, and several other locations have expressed an interest in participating. These potential locations are currently under consideration based on their physical location with respect to program goals and angler populations as established through zip code analyses. It is recommended that the FCEC expand outreach to reach the goal of 40 bait shops total. Overall, the identification and tracking of bait shop turnover continues to be effective.

5.3 ELECTRONIC OUTREACH

Electronic outreach was limited to the distribution of the semi-annual e-newsletter to FCEC partners and referrals to the pvsfish.org website during angler and community outreach events. It is recommended that the FCEC continue to update the pvsfish.org website, especially as QR codes are added to new outreach materials that will connect the public to the website. Establishing the pvsfish.org website as an extension of the outreach materials provided to the community may promote education and awareness efforts. Additionally, re-establishing a mailing list of individuals interested in receiving the e-newsletter should be pursued, updated, and promoted at outreach events.

5.4 COMMUNITY EVENT OUTREACH

Community events remain an effective way to reach the target community members but do not directly inform anglers. Outreach partners are actively researching events that would increase the efficacy of the FCEC outreach program and provide important information about fish contamination to impacted communities. The EPA utilizes the zip code analyses to help inform decisions and approvals of community outreach events based on event locations relative to known higher angler populations. Despite community events being one of the less influential awareness sources among pier anglers, community events provide an opportunity for outreach to target communities that may not participate directly in subsistence or sport fishing practices but may be consuming fish from the Palos Verdes Shelf. It is recommended that community outreach partners continue to collaborate with other community organizations to diversify events and reach more anglers and their families in the Los Angeles area, including children and Spanish, Chinese, Vietnamese, and African American communities. Additionally, the outreach program may benefit from events aimed towards the angling community, such as sportfishing and boat shows.

Community partners continue to display sign-in sheets at community events; however, the content of the sign-in sheets varies by outreach partners. Some of the sign-in sheets allow attendees to indicate whether they are aware of the PCBs/DDT fish contamination advisories and the awareness source(s) (signs, tip card, community event, outreach team, internet, media, friend/family, other), while other sign-in sheets are used to request attendee name, zip code, and email. The handwritten sign-in sheets can be difficult to decipher, and outreach staff report that most attendees are not interested in filling out the sign-in sheets. It is recommended that the FCEC replace the current sign-in sheets with a QR code that allows event attendees to sign

up for the semi-annual newsletter online and also connects them with the pvsfish.org website for more information about the Palos Verdes Shelf Superfund Site.

The "What's the Catch" children's comic book and the fishing game activity have been successful at attracting families to the FCEC booth. It is recommended that the FCEC restore and replace fishing game components. Additionally, the Booth in a Box displays that are used at community outreach events should be standardized to present the same materials at each event. The Booth in a Box setups also require repair and replacement of broken, worn, or missing components. The FCEC may consider updating the FCEC Booth in a Box materials alongside updates to the display content.

Fewer educational curriculum guides were distributed to educators during this reporting year than in previous years. Connecting with educators may be an effective way to educate children about local fish contamination to help increase the visibility of the FCEC program. In 2022, staff from the Aquarium of the Pacific in Long Beach and Los Angeles County Zoo expressed interest in collaborating with the FCEC to produce permanent displays about Palos Verdes Shelf fish contamination. Additionally, a Los Angeles Parks superintendent expressed interest in having the FCEC participate in more children's educational events. It is recommended that the FCEC consider these options for expanding outreach.

5.5 FISH CONTAMINATION EDUCATION COLLABORATIVE PARTNERS MEETINGS

The most recent FCEC meeting was held on 3 May 2023 and was attended by 29 individuals representing the EPA, state and local agencies, non-profit organizations, and local community groups. Topics included updates on pier angler outreach activities, community outreach events, enforcement activities, and discussions regarding post-COVID-19 pandemic outreach goals. The hybrid format allows more FCEC partners to attend regular meetings. It is recommended to continue hosting hybrid FCEC events while encouraging in-person attendance when possible to maximize collaboration among the stakeholders.