PALOS VERDES SHELF

Annual Angler Outreach Report

August 2024 – July 2025

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

AOP	Angler Outreach Program
BPSOS	Boat People SOS
CCHC	Chinese Christian Herald Crusades
CDFW	California Department of Fish and Wildlife
DBS&A	Daniel B. Stephens & Associates, Inc.
DDT	dichloro-diphenyl-trichloroethane
DNC	Do Not Consume
EPA	U.S. Environmental Protection Agency
FCEC	Fish Contamination Education Collaborative
ID	identification
PCBs	polychlorinated biphenyls
QR	quick response

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SUMMARY

The U.S. Environmental Protection Agency's Institutional Controls Program aims to protect Southern California residents from health risks associated with eating fish contaminated with polychlorinated biphenyls (PCBs) and dichloro-diphenyl-trichloroethane (DDT). The Fish Contamination Education Collaborative (FCEC), comprising federal and state agencies, local organizations, and community members, oversees this program. The FCEC conducts 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 white croaker and barred sand bass. This report evaluates the program's effectiveness from August 2024 to July 2025 and suggests improvements. Overall, the FCEC has effectively raised public awareness about safe fish consumption and contamination associated with the Palos Verdes Shelf Superfund Site.

During this period, the FCEC engaged with 14,108 individuals about local fish contamination: 8,213 anglers at nine piers, 3,111 community members at event booths, and 2,784 anglers through California Department of Fish and Wildlife (CDFW) enforcement activities. Outreach staff handed out tip cards summarizing information about the health risks of eating certain fish contaminated with DDT and PCBs. The outreach staff also transitioned to collecting angler outreach survey data with electronic forms, allowing for more accurate and streamlined data collection and reporting. Additionally, the FCEC redesigned the "Do Not Consume" (DNC) warning signs and posted the new signs at nine piers beginning in March 2025 to increase angler awareness of the most contaminated fish. Distribution of the redesigned tip cards began in December 2024. These efforts, along with increased media coverage of local DDT issues, contributed most to angler awareness, highlighting the importance of the pier outreach program in site risk reduction.

The Bait Shop Program maintained 36 active locations distributing FCEC materials to the public. Semiannual outreach events ensured that bait shops remained stocked with new tip cards and allowed the U.S. Environmental Protection Agency to identify suitable replacement bait shops as needed.

The FCEC participated in 13 local community events, prioritizing communities at increased risk of exposure. These events provided an opportunity to educate community members that do not participate directly in subsistence or sport fishing practices but may still consume fish caught from the Palos Verdes Shelf. Community events are particularly effective at reaching families and children due to the booth's fishing game and comic book distribution. In 2025, the FCEC replaced the magnets on the interactive fishing game fishing poles and replaced the fish in the games with redesigned and improved versions.

The FCEC included a quick response (QR) code on the updated DNC signs linking to the www.pvsfish.org website for educational resources and event information. Once on the website, people can learn about upcoming FCEC events as well as access the repository of public information and resources on contamination and risks. The website also provides a platform for the public to sign up to receive the semiannual newsletter. Tracking QR code visits

to the www.pvsfish.org website shows that QR code scans increased drastically following the installation of the DNC signs at the piers.

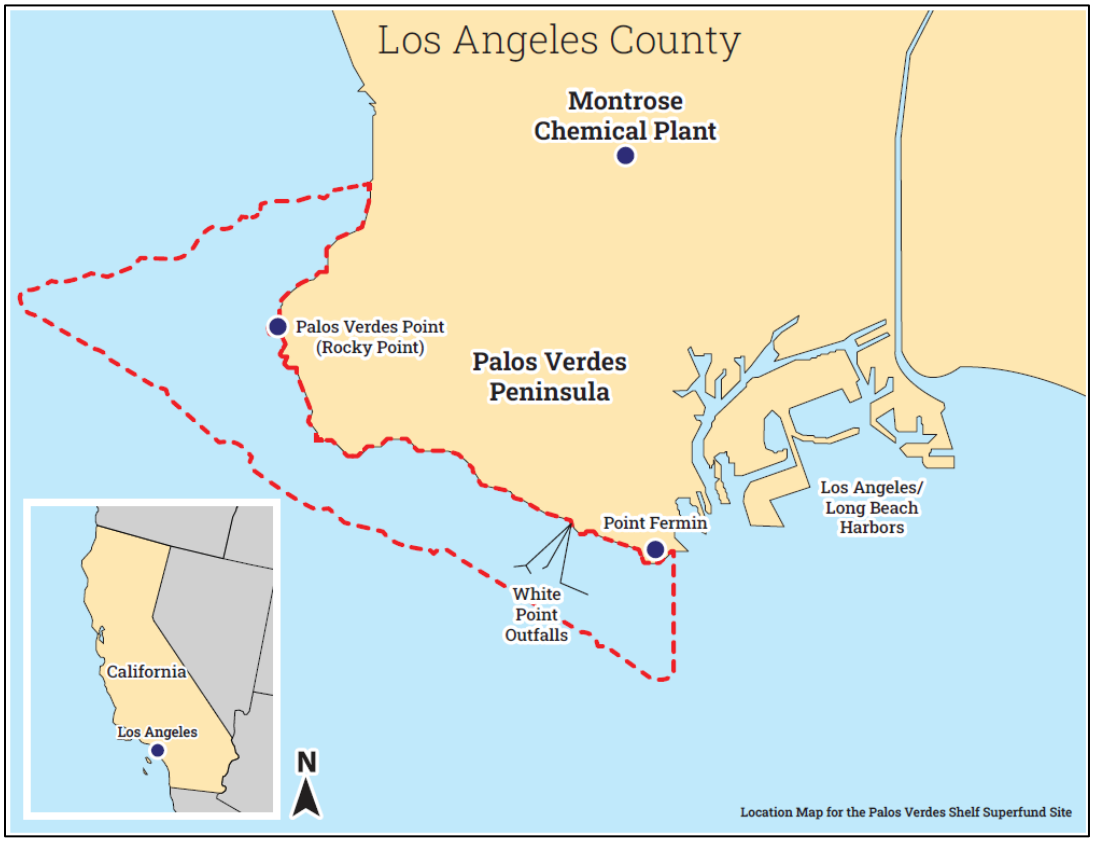
The semiannual FCEC partner meetings continue to be an important forum to provide updates on project activities, share ideas, and discuss program improvements. Overall, the FCEC has effectively worked to inform impacted communities about safe fish consumption practices and the health risks associated with eating contaminated fish from the Palos Verdes Shelf Superfund Site.

The methods and results of the 2024 – 2025 Angler Outreach reporting period are presented with evaluations and recommendations. Recommendations provide actions that may be taken to maintain or improve the effectiveness of the Angler Outreach Program.

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 polychlorinated biphenyls (PCBs) and dichloro-diphenyl-trichloroethane (DDT) from the inland Montrose Chemical plant and other industrial activities that discharged waste into the ocean through the Los Angeles County sanitation sewer outfall pipes from 1953 to 1971 (Figure 1). Today, about 34 square miles (88 square kilometers; about half the size of Catalina Island) of ocean sediments on the Palos Verdes Shelf are contaminated with these legacy pollutants. Although the contaminated sediment is too deep for direct human contact (40 to 200 meters; 130 to 650 feet), contaminants can build up in the food web, including in certain fish, which are caught and consumed by the public. The U.S. Environmental Protection Agency (EPA) conducted human health risk evaluations and determined that eating fish contaminated with PCBs and DDT presented the greatest potential for adverse human health effects.

Figure 1. Map of the Palos Verdes Shelf Study Area



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 Superfund Site is to minimize human exposure to PCBs and DDT by reducing 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 Fish Contamination Education Collaborative (FCEC) with representatives from federal, state, and local agencies; nongovernmental organizations; and community-based organizations to implement public outreach and education activities. In September 2009, the EPA selected an interim remedy for the Palos Verdes Shelf Superfund Site that included the continuation and strengthening of the Institutional Controls Program.

The Institutional Controls Program aims to minimize 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. The enforcement program is discussed in a separate document.

The Angler Outreach Program (AOP) engages anglers and members of the public who are at risk of exposure to fish contamination. The AOP gives the EPA an opportunity to distribute educational materials (e.g., tip cards, brochures, and comic books) that provide information and resources about contaminated fish species. This information encourages the public to make informed decisions about fish consumption and how to reduce their potential health risks if they consume local fish. In 2014, the EPA conducted the Palos Verdes Seafood Consumption Study to identify priority populations within the general fishing population of the Palos Verdes Shelf area who may be at the highest risk of exposure to contaminants based on the types and quantity of fish species consumed, including consideration of cooking methods.

PCBs and DDT pose a significant risk to public health; they 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 PCB levels can result in skin irritation, liver disease, and endocrine dysfunction. Exposure to elevated levels of DDT can negatively impact liver function and the nervous and endocrine systems. DDT exposure can also have negative impacts on 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 concentrations of DDT and PCBs in fish tissue have generally declined since the 1990s, concentrations in white croaker remain above the 2009 risk-based cleanup level.

This Annual AOP Report summarizes outreach conducted between August 2024 and July 2025 through the following activities:

- Angler outreach
- Bait shop outreach
- Electronic outreach
- Community event outreach
- FCEC partner meetings

2. OVERVIEW OF THE INSTITUTIONAL CONTROLS PROGRAM

The Institutional Controls Program aims to minimize human exposure to Palos Verdes Shelf Superfund Site contamination by educating impacted communities about safer fish consumption practices and the health risks associated with eating contaminated fish.

The total number of anglers and community members who receive outreach under the Institutional Controls Program is tracked as part of the FCEC's goal of reaching 11,600 anglers and community members annually. This goal includes the total number of anglers and other members of the public who receive outreach through the pier AOP and community event programs, as well as through FCEC enforcement efforts (completed by California Department of Fish and Wildlife [CDFW]), which are reported separately.

2.1 ANGLER OUTREACH

Local organizations and environmental consulting firms 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, referred to as the "Do Not Consume" (DNC) fish species. The DNC species include 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) and in the evening at two fishing piers (Venice Pier and Redondo Beach Pier).

Angler outreach objectives include educating anglers about fish contamination and local fish advisories, how to identify fish species, and how to prepare fish to reduce consumption of contaminants. While engaging with anglers, the outreach team records various data (described in Section 3.1). The EPA uses the FCEC data collected from anglers to evaluate the effectiveness of the AOP and Institutional Controls Program.

In addition to active angler outreach, the EPA posts DNC signs listing the five contaminated fish at various locations along the coast of Los Angeles (Figure 2). The EPA Institutional Controls Program currently includes 70 individual locations for DNC signs across 17 coastal areas and piers. Installation of the redesigned pier signs began in March 2025 at nine fishing piers. Sign installation is ongoing and will continue into 2026. More details about the DNC sign program are provided in the Palos Verdes Shelf Annual DNC Sign Summary Report, which can be found at https://www.pvsfish.org/resources/partner-documents.

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

2.2 BAIT SHOP OUTREACH

The FCEC supplies educational materials to angler retail stores 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, Chinese, and Vietnamese) 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 where 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 if they need more materials. The FCEC prioritizes outreach materials in bait shops located near popular fishing piers and in areas with high pier use by anglers as determined through angler zip code data analysis.

2.3 ELECTRONIC OUTREACH

The EPA, in collaboration with the FCEC, maintains the Palos Verdes Shelf Superfund Site institutional controls website (www.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, allowing people to request to receive the semiannual newsletter by email. Regular updates of the FCEC website include updating the event calendar, uploading new FCEC documents, distributing the newsletter, and responding to inquiries submitted through the "Contact" 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 prioritize educating communities impacted by the site. Outreach efforts at community events often focus on people who are less likely to be reached by pier outreach activities but are still potentially at risk of health effects if they consume contaminated fish caught by friends, family, or other community members.

Community outreach partners participate in up to 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 use the "Booth in a Box," which is a collection of display materials that provide the Palos Verdes Shelf contamination history and potential health risk information. The "Booth in a Box" contains tablecloths and table runners for a professional appearance, outreach materials such as tip cards and fish identification (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 safer to eat.

2.5 FISH CONTAMINATION EDUCATION COLLABORATIVE PARTNERS MEETING

The EPA hosts two FCEC meetings per year to provide updates on program activities. 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, 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

The FCEC outreach educators conducted angler outreach during the day at nine fishing piers between Santa Monica Pier and Seal Beach Pier and in the evening at Venice Pier and Redondo Beach Pier one day per week from 4 to 8 p.m. (Figure 2). Cabrillo Marine Aquarium conducted weekly daytime angler outreach at Cabrillo Pier and varied the day of the week and time of day based on staff schedules. DBS&A performed daytime pier angler outreach activities at eight piers (Santa Monica Pier, Venice Pier, Hermosa Beach Pier, Redondo Beach Pier, Rainbow Harbor, Pier J, Belmont Pier, and Seal Beach Pier). DBS&A typically conducted daytime angler outreach activities at various times between 10 a.m. and 4 p.m. three days per week, with variations in the day of the week and the time of day to allow assessment of angler activity trends and identify times of higher angler populations at the piers. Pier angler outreach was typically conducted once at each of the eight piers on a weekly basis, with some cancellations due to inclement weather/air quality or pier construction. DBS&A also conducted evening outreach once per week between 4 and 8 p.m. at Venice Pier and Redondo Beach Pier and varied the scheduled day of the week for evening outreach to allow assessment of angler activity trends in hopes of reaching different people.

Outreach was paused in January 2025 due to significant wildfires in Los Angeles County and generally resumed in February 2025. The exact dates of the pause varied depending on the outreach activity and the FCEC partner performing the activity. By March 2025, all angler outreach activities returned to normal schedules.

Generally, the outreach team focuses on approaching anglers who are actively fishing or coming and going to fishing areas with gear. Typical angler interactions begin with a casual greeting and introduction by outreach staff, followed by a request to perform outreach. 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 typically provide the angler with one or more FCEC tip cards and explain how anglers can reduce their risk by following local fish advisories and avoiding consumption of the five DNC fish. The outreach team may also highlight fish that are safer to eat and ways to cook fish that can reduce potential exposure. This year, staff also focused on improving individual recognition and building relationships with repeat anglers.

The FCEC outreach team collects angler data via either electronic or paper forms. For data results and reporting purposes, it is important to think of the angler outreach data as follows:

- “Angler” is a person or persons fishing or who have fishing gear at any of the nine piers to whom the FCEC members attempt to provide outreach education; a person or persons who are potentially catching and/or consuming fish caught in the Palos Verdes Shelf Institutional Controls Program area.

- “Outreach event” refers to the single trip to conduct outreach for the day/evening at the specific pier. Generally, multiple outreach events occur at different piers per

scheduled day. Outreach events are tracked by date to determine the schedule for daytime and evening outreach and levels of effort needed for each pier. For this reporting period, 563 outreach events were conducted across the nine piers.

- "Outreach interactions" refers to the outreach efforts that result in robust data collection and can represent data for more than one person (adults/child, groups, etc.). Outreach interactions include anglers who were willing to speak, those unwilling to speak, and those unable to receive outreach due to language barriers. A form is completed for the anglers who do and do not agree to speak, and for those who cannot receive outreach due to language barriers. This form includes a field to record the total number of people present during the interaction. During this reporting period, 8,213 outreach interactions occurred. On average, 1.13 anglers were encountered during each interaction. For the purposes of this reporting, every reference to an angler refers to one outreach interaction.

- "Outreach encounters" refers to the total number of individual persons (anglers), including those who were willing to speak, those unwilling to speak, and those unable to receive outreach due to language barriers. Outreach encounters are calculated for each reporting period by summing the total number of anglers present during all interactions. The electronic forms transition allows the EPA to consistently collect data on how many individuals are reached during each interaction. Because this transition began at the end of the reporting period, data on encounters are not available for this report.

For the purposes of data analysis, one "form" represents various data for one angler interaction. The FCEC outreach team records the number of anglers (person or people) included in a single interaction on the form; therefore, the number of outreach encounters is greater than the number of outreach interactions (defined above).

The AOP outreach teams completed 8,213 angler outreach interactions across nine piers. As described above, one outreach interaction does not always represent data for one person (defined as an encounter); however, this is a limitation of the data collected until and prior to the implementation of the electronic forms and associated database. The AOP outreach teams began to use electronic forms at eight of the nine outreach piers in May 2025. A comprehensive database was developed from historical data entries (beginning March 2023) and is updated in real time as outreach teams submit new forms. In the future, angler encounter data will be more usable, but should not be numerically compared to angler interaction data.

During outreach interactions and encounters with anglers, the outreach team records any of the following data that are shared and can be accurately documented without assumptions:

- Whether the angler(s) agreed to speak with the outreach team

- Whether the angler(s) were adult(s) or child(ren), and how many of each received outreach

- Whether the angler(s) had been previously contacted by the outreach team (repeat or new)

- Whether the angler(s) were aware of the contamination, and if so, how they became aware of the contamination (i.e., DNC signs, tip card, outreach team, internet, community events, media, friends/family, or other/not specified)

- The language(s) spoken during the conversation

- The number of tip cards distributed and in which languages (English, Spanish, Chinese, and Vietnamese)

- The zip code in which the angler(s) lives

- The type and quantity of any fish caught or released

- The intent to consume any fish caught, share for consumption, or use as bait

While the goal is complete tracking of each metric during angler outreach, in some cases, not all data are provided during each angler interaction. The incomplete data may be due in part to angler hesitancy to answer all questions, a change in willingness to speak about specific things during outreach, or the person abruptly having to end outreach (gets a phone call, etc.). Therefore, complete data are not always obtained during every angler interaction. This year, outreach teams were able to work with data managers to refine the forms to track "unknown" responses in data sets and categorize them separately. Tracking "unknown" as a separate metric allows for improved data quality for important metrics in the following angler categories: agree/do not agree to speak/language barrier, aware/not aware, and new/repeat status.

This is the first reporting period in which data from all August 2023 through July 2025 angler interactions can be evaluated using the new electronic comprehensive database. The outreach-interaction data are evaluated by EPA and FCEC to determine the impact and effectiveness of the AOP. The FCEC monitors the effectiveness of angler outreach by tracking the percentage of new and repeat anglers who were aware or unaware of local fish contamination. The FCEC has improved data evaluation by using electronic form collection on what languages are spoken by anglers to determine if the available tip card translations (English, Spanish, Chinese, and Vietnamese) remain appropriate for the current angler community. Additionally, it allows for better documentation of when and where there are language barriers that prevent angler outreach.

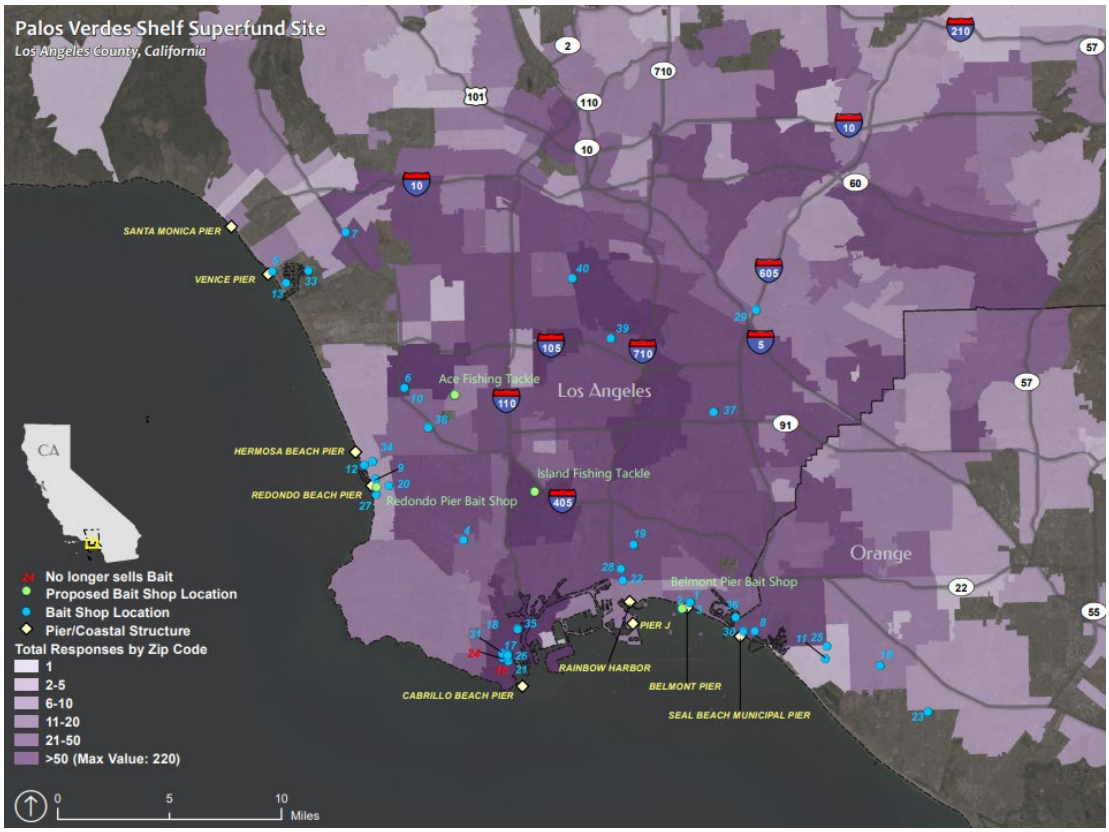
3.2 BAIT SHOP OUTREACH

Bait shop outreach was 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). The semiannual bait shop outreach was conducted in person in January and July 2025 and was performed by DBS&A. These outreach

activities included assessing bait shop inventories of FCEC outreach materials (tip cards in English, Spanish, Chinese, and Vietnamese), recording any need for tip card replacement, and collecting any other pertinent observations from bait shop representatives. Additionally, the FCEC contact email address (info@pvsfish.org) and website (www.pvsfish.org) were given to bait shops so that they could request additional materials or ask questions throughout the year.

During each visit, DBS&A collected the following data: the number of bait shops that closed and opened in each location, the number of bait shops that requested outreach materials, and the number of materials distributed in each language.

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



3.3 ELECTRONIC OUTREACH

Historically, the FCEC website has had low navigation rates. The EPA discontinued collecting browsing data in 2023, and navigation rates are no longer tracked from the website data. The EPA actively responds to inquiries submitted by the public through the www.pvsfish.org contact email and webpage. Additionally, the EPA provided regular updates to the www.pvsfish.org website and posted two newsletters and FCEC community events on the website. During this reporting period, the FCEC e-newsletter was redesigned using new software, and a QR code was added to outreach materials (including tip cards and DNC pier signs) to facilitate increased electronic outreach. Currently, the same code is used on all tip cards and all DNC signs.

However, the addition of the QR code to the DNC signs is directly associated with an increase in QR code scans because the timing of the installation of the new signs at the piers and the spikes in QR code scans align. This change, discussed in Section 4.4, reflects a significant improvement to electronic outreach, using an easily accessible, passive outreach source (DNC signs) to allow for self-guided and modern review of outreach information.

3.4 COMMUNITY EVENT OUTREACH

The FCEC aims to attend up to 20 community events per year. The FCEC participated in 13 local community events, and four scheduled events were canceled due to the Los Angeles wildfires and the associated health and safety or administrative uncertainty during that time.

During each of the 13 community events attended during this period, outreach partners set up the FCEC "Booth in a Box" and distributed informational materials while educating event attendees about fish contamination from the Palos Verdes Shelf. Event attendees were encouraged to sign up for the semiannual FCEC newsletter through the QR code. The QR code directed users to the www.pvsfish.org FCEC website where they can also find other outreach materials. Community outreach partners documented event information (e.g., date, time, location), the number of event attendees, the number of FCEC booth visitors, the number of outreach materials distributed, attendee impressions of the outreach materials, activities that drew the most interest, and observations made by outreach partners or community members who attended the event. The FCEC uses these data to determine the effectiveness of each community event and inform the EPA on which future events align with FCEC participation goals.

4. RESULTS

4.1 ANGLER OUTREACH

The following data were collected from 8,213 anglers: 7,273 anglers during daytime outreach and 940 anglers during evening outreach. Table 1 (daytime) and Table 2 (evening) summarize the total number of anglers reached by the outreach team per month and include interactions with people who were and were not willing to speak, as well as those who could not receive outreach due to a language barrier.

Table 1. Number of Daytime Angler Outreach Interactions per Month

Date	Santa Monica	Venice	Hermosa	Redondo Beach	Rainbow Harbor	Cabrillo	Pier J	Belmont	Seal Beach	Total
Aug-24	83	186	64	296	66	244	87	184	126	**1,336**
Sep-24	116	129	81	218	47	199	96	95	119	**1,100**
Oct-24	35	90	39	182	21	139	27	119	39	**691**
Nov-24	18	73	17	134	41	123	60	74	48	**588**
Dec-24	26	33	19	69	29	160	54	28	45	**463**
Jan-25	14	16	12	55	8	135	19	15	24	**298**
Feb-25	6	27	24	83	23	92	47	27	34	**363**
Mar-25	44	64	16	158	25	108	16	62	27	**520**
Apr-25	43	26	23	97	19	65	27	81	68	**449**
May-25	4	4	3	39	13	148	21	78	28	**338**
Jun-25	18	33	29	50	15	165	19	59	29	**417**
Jul-25	53	43	25	63	21	308	36	110	51	**710**
Pier Total	**460**	**724**	**352**	**1,444**	**328**	**1,886**	**509**	**932**	**638**	**7,273**

Table 2. Number of Evening Angler Outreach Interactions per Month

Date	Redondo Beach	Venice	Total
Aug-24	98	27	**125**
Sep-24	17	63	**80**
Oct-24	16	38	**54**
Nov-24	44	3	**47**
Dec-24	33	21	**54**
Jan-25	0	13	**13**
Feb-25	8	14	**22**
Mar-25	66	18	**84**
Apr-25	66	37	**103**
May-25	45	13	**58**
Jun-25	88	30	**118**
Jul-25	126	56	**182**
Pier Total	**607**	**333**	**940**

4.1.1 Number of Daytime Anglers Reached

The FCEC outreach educator team engaged with a total of 7,273 daytime anglers: 1,886 anglers were contacted by Cabrillo Marine Aquarium and 5,387 anglers were contacted by DBS&A from 1 August 2024, through 31 July 2025. The total number of daytime anglers contacted by the outreach teams is shown on Figure 4. In general, daytime angler activity was consistent with prior years, in which angler numbers increased in the spring and summer and declined in fall and winter.

The most popular pier for daytime fishing was Cabrillo Pier, making up 25.9 percent of the total daytime anglers approached during outreach. Redondo Beach Pier (19.9 percent) and Belmont Pier (12.8 percent) were also popular fishing piers for daytime anglers. Though Cabrillo Pier accounted for 25.9 percent of the anglers contacted during daytime outreach efforts, Cabrillo Pier has more frequent outreach than all other piers. Those differences in outreach event frequencies at Cabrillo Pier versus the other pier locations prevent a direct comparison to other pier locations. Rainbow Harbor continues to be the least popular pier for fishing, comprising 4.5 percent of the total anglers contacted during daytime outreach activities and Hermosa Pier comprises 4.8 percent of the total anglers contacted during daytime outreach activities. The total count of daytime anglers is recorded regardless of willingness to engage with the outreach team. Figure 4 data includes total attempted interactions during daytime outreach, both those who agreed and did not agree to speak with the outreach team.

Figure 4. Total Number of Attempted Daytime Angler Outreach Interactions per Month

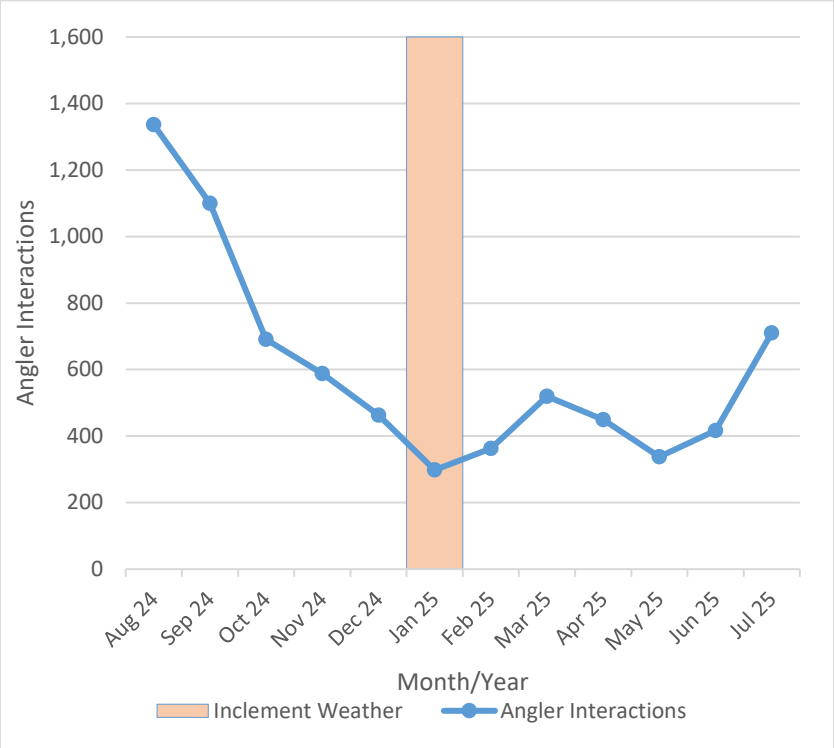


Table 3 summarizes the percentage of daytime anglers who were reportedly new or repeat anglers per pier. This calculation is based on the total number of daytime anglers (7,273) and includes those who were willing to speak as well as those who were unwilling to speak or otherwise did not provide these data.

Across all piers, 57.4 percent of daytime anglers who agreed to speak with the outreach team (5,895 anglers) were new contacts, and 42.5 percent of daytime anglers were repeat contacts. The remaining 0.1 percent of daytime anglers (who otherwise agreed to speak) declined to or did not provide this type of information. As shown in Table 3, the proportion of new anglers was highest at Seal Beach Pier (69.3 percent) and lowest at Santa Monica Pier (48.0 percent). Though there are differences in outreach frequency at Cabrillo Pier compared to other piers, the proportion of new anglers versus repeat anglers likely was not impacted by this difference because the proportion is calculated as a percentage of total anglers at individual pier locations. Santa Monica Pier had the highest relative proportion of repeat anglers (48.6 percent), while Seal Beach Pier had the lowest proportion of repeat anglers (28.5 percent).

During this reporting period, the AOP team conducted outreach at various times each week to better understand the relationship between weekday and outreach effectiveness. Figure 5 shows that the weekend outreach times reach more anglers.

Figure 5. Anglers across Days of the Week (August 2024 – July 2025)

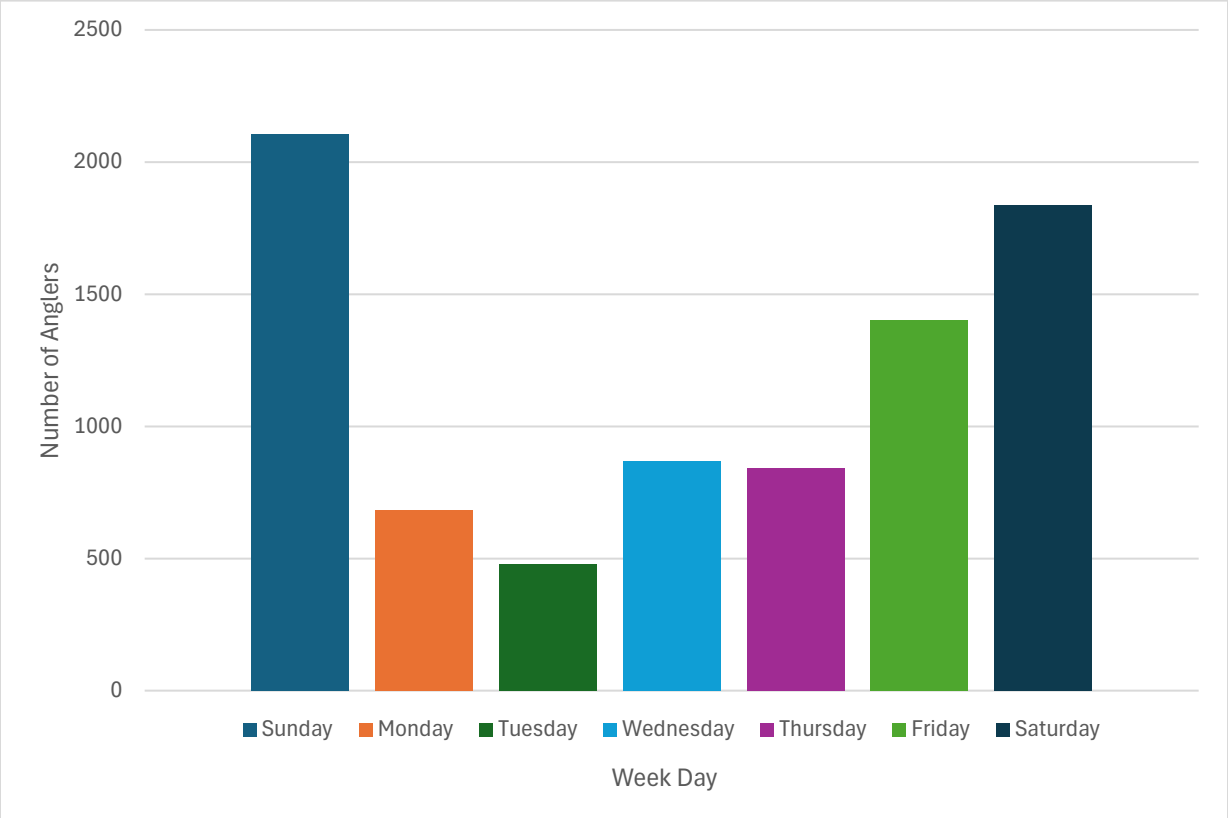


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Table 3. Percent of New and Repeat Anglers during Daytime Outreach

Date	Belmont		Cabrillo		Hermosa		Pier J		Rainbow Harbor		Redondo Beach		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-24	47.8	52.2	61.3	38.7	55.6	44.4	48.1	51.9	47.1	52.9	60.4	39.1	61.4	38.6	75.5	24.5	53.3	46.7	**56.7**	**43.2**
Sep-24	27.3	72.7	37.6	62.4	47.3	50.0	46.2	53.8	45.2	54.8	37.4	62.6	28.7	71.3	61.4	37.7	65.1	34.9	**44.0**	**55.6**
Oct-24	71.2	27.9	58.8	41.2	55.9	44.1	34.6	65.4	66.7	33.3	56.2	43.8	40.6	59.4	82.4	17.6	64.3	35.7	**59.0**	**40.9**
Nov-24	60.6	39.4	59.7	40.3	23.1	76.9	64.9	35.1	45.7	54.3	54.6	45.4	44.4	55.6	76.1	23.9	81.5	18.5	**56.7**	**43.3**
Dec-24	44.0	56.0	50.8	49.2	66.7	33.3	66.7	33.3	84.6	15.4	55.2	44.8	83.3	16.7	54.3	45.7	67.7	32.3	**63.7**	**36.3**
Jan-25	86.7	13.3	56.5	43.5	58.3	41.7	66.7	33.3	100.0	0.0	65.5	34.5	60.0	40.0	52.4	47.6	56.3	43.8	**66.9**	**33.1**
Feb-25	75.0	25.0	73.0	27.0	52.2	47.8	64.4	35.6	91.3	8.7	52.5	47.5	50.0	50.0	75.0	25.0	61.5	38.5	**66.1**	**33.9**
Mar-25	50.8	49.2	74.7	25.3	53.3	46.7	26.7	73.3	58.3	41.7	60.5	39.5	47.1	52.9	50.0	50.0	61.3	38.7	**53.6**	**46.4**
Apr-25	58.1	41.9	47.8	52.2	52.2	47.8	53.8	46.2	56.3	43.8	65.6	34.4	67.6	32.4	71.2	28.8	32.0	68.0	**56.1**	**43.9**
May-25	60.3	33.3	55.1	44.9	0.0	100.0	57.1	23.8	61.5	30.8	51.3	35.9	25.0	50.0	82.1	3.6	25.0	75.0	**46.4**	**44.1**
Jun-25	49.2	35.6	45.7	54.3	44.8	44.8	57.9	26.3	66.7	33.3	60.0	30.0	55.6	22.2	65.5	24.1	39.4	51.5	**53.9**	**35.8**
Jul-25	45.4	41.7	44.5	24.0	41.7	33.3	63.9	33.3	71.4	19.0	38.7	50.0	49.1	35.8	74.5	15.7	25.0	60.0	**50.5**	**34.8**
Pier Average	**53.0**	**43.6**	**52.9**	**39.6**	**50.0**	**46.6**	**54.8**	**43.6**	**61.0**	**38.0**	**54.4**	**44.1**	**48.0**	**48.6**	**69.3**	**28.5**	**57.8**	**40.8**	**55.7**	**41.5**

Note:
Pier-specific and average values are in percentages. The percentage of new and repeat anglers is calculated from total amount of daytime anglers. The values represent the percentage of daytime anglers at each pier that have not had a previous outreach interaction (New) versus anglers who have had a previous outreach interaction (Repeat) out of the total number of daytime anglers at each pier.

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4.1.2 Daytime Angler Awareness of Fish Contamination

Table 4 shows the percentages of daytime anglers who reported being aware of local fish contamination. Across the nine piers, 56.4 percent of anglers reported awareness of local fish contamination. This represents a decrease from the previous reporting period, when 58.9 percent of daytime anglers reported awareness of local fish contamination. Anglers fishing at Santa Monica Pier had the highest awareness rate of any pier with 60.9 percent reported awareness. Angler awareness was lowest at Seal Beach Pier, with just 46.7 percent reported awareness. The percentage of anglers aware is based off the subset of daytime angler interactions with angler(s) who agreed to speak to AOP outreach personnel (5,895 interactions).

Table 4. Percent of Daytime Anglers Reporting Awareness of Fish Contamination

Date	Pier[1]									Monthly Average
	Belmont	Cabrillo	Hermosa	Pier J	Rainbow Harbor	Redondo Beach	Santa Monica	Seal Beach	Venice	
Aug-24	65.6	57.1	55.6	71.1	78.4	58.2	52.6	50.9	53.3	**60.3**
Sep-24	88.6	72.6	61.2	70.5	63.4	73.2	79.2	43.8	51.9	**67.2**
Oct-24	44.1	48.2	52.9	69.2	55.6	55.9	65.6	44.1	40.0	**52.9**
Nov-24	50.7	46.3	69.2	49.1	71.4	62.9	61.1	39.1	38.5	**54.3**
Dec-24	68.0	68.3	38.9	39.2	53.8	53.4	22.2	65.7	51.6	**51.3**
Jan-25	13.3	55.1	58.3	55.6	0.0	49.1	60.0	76.2	50.0	**46.4**
Feb-25	33.3	42.9	65.2	51.1	34.8	55.9	50.0	34.4	42.3	**45.5**
Mar-25	59.3	26.7	66.7	73.3	41.7	47.6	58.8	61.5	50.0	**54.0**
Apr-25	64.9	80.4	52.2	57.7	68.8	45.8	47.1	34.8	80.0	**59.1**
May-25	58.9	64.0	100.0	29.4	50.0	69.7	100.0	33.3	100.0	**67.3**
Jun-25	50.0	54.3	61.5	50.0	46.7	53.3	57.1	34.6	73.3	**53.4**
Jul-25	63.5	46.0	55.6	51.4	63.2	66.7	54.5	56.5	76.5	**59.3**
Pier Average	**59.8**	**55.0**	**58.2**	**57.9**	**58.7**	**58.2**	**60.9**	**46.7**	**52.7**	**56.4**

Note:
[1] Pier-specific and average values are provided as percentages. The values represent the number of anglers at each pier who reported awareness of fish contamination divided by the total number of daytime anglers at the pier(s) who agreed to speak to the outreach team.

Among new daytime anglers willing to speak to the outreach team, 24.2 percent of anglers reported awareness of fish contamination. The remaining 75.8 percent of these anglers either reported being unaware or did not provide this information. Among repeat daytime anglers, more than 99 percent reported awareness, and less than 0.4 percent reported being unaware of fish contamination issues.

4.1.3 Sources of Daytime Angler Awareness

To identify the most effective outreach strategies, outreach teams asked anglers how they originally learned about local fish contamination (i.e., DNC signs, tip card, outreach team, internet, community events, media, friends/family, or other/not specified). Table 5 summarizes the categories of information sources that contributed to anglers' awareness of the contamination by the percentage of anglers who attributed awareness to each outreach

source. The pier outreach teams were the most frequently cited source of information about fish contamination, with 74.3 percent of anglers (new and repeat) attributing their awareness of fish contamination to the pier outreach teams during this reporting period. Among new anglers reportedly aware of contamination, the pier signage program (DNC signs) was the most reported source of awareness. For all anglers, the pier outreach team was commonly cited as a source of angler awareness (14.2 percent), as well as media (5.8 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 tip cards during their outreach activities. Tip cards are also distributed through designated local bait shop locations and community events. This is reviewed in more detail in the discussion and recommendations on data quality associated with reported angler awareness (Section 5.1.2).

Table 5. Sources of Daytime Angler Awareness

Pier	Pier Outreach Team	Pier Signage	Media	Family/ Friends	Other/Not Specific	Tip Card	Internet	Bait Shop
Belmont	73.7	14.4	5.3	2.7	1.0	0.8	1.6	0.4
Cabrillo	76.6	11.6	10.7	0.0	0.5	0.0	0.6	0.0
Hermosa	75.4	13.4	3.9	2.2	1.1	2.2	1.7	0.0
Pier J	75.7	13.5	3.7	1.5	3.0	0.4	1.9	0.4
Rainbow Harbor	65.3	19.2	6.6	2.4	2.4	4.2	0.0	0.0
Redondo Beach	75.1	15.0	4.0	1.3	0.9	2.1	1.6	0.0
Santa Monica	79.5	12.5	2.7	1.8	1.8	0.9	0.9	0.0
Seal Beach	60.5	22.6	6.4	4.5	3.0	1.5	0.8	0.8
Venice	79.9	9.7	5.0	1.3	1.9	1.6	0.6	0.0
Percentage (Total Sources)	**74.3**	**14.2**	**5.8**	**1.7**	**1.4**	**1.3**	**1.1**	**0.2**

Note:
Source values are in percentages. The values represent the percentage of anglers at each pier who became aware of contamination from each outreach source material.

Anglers reported lower awareness from tip cards than in previous years, dropping from 15.5 percent in the previous reporting period (August 2023 to July 2024) to 1.3 percent this reporting period (July 2024 through May 2025). During the current reporting period, there was a substantial increase in the number of anglers reporting the outreach team as an awareness source, from 31 percent in the previous reporting period to 74.3 percent this period. Sources that did not contribute as much to angler awareness include the following: media (5.8 percent), friends/family (1.7 percent), tip cards (1.3 percent), the internet (1.1 percent), bait shops (0.2 percent), and community events (0.0 percent). Additionally, not all anglers who reported awareness reported the source of their awareness and are included as “other/not specified” (1.4 percent).

During this reporting period, anglers reported awareness from DNC signage less often than the previous period (14.2 percent this period versus 31.0 percent last period). For most of the current reporting period, fewer signs were present than in previous years, likely leading to the decrease in anglers reporting pier signs as their source of awareness from prior years. This proportion is anticipated to increase with the installation of the new DNC pier signs.

4.1.4 Number of Evening Anglers Reached

A total of 940 evening anglers were contacted at Venice Pier and Redondo Beach Pier, whereas the last reporting period reached 1,635 anglers. This suggests an overall decrease in evening angler populations at Venice Pier and Redondo Beach Pier. This decrease is consistent with the overall decrease in anglers contacted from the previous reporting period. Seasonal fluctuations in angler activity show decreased activity (daytime and evening) in the winter months. The Los Angeles area saw heavy wind and poor air quality during January 2025, with several outreach attempts having no anglers at the pier. Additionally, the devastating wildfires in January 2025 and the continued community effects in February 2025 and tsunami warnings in July 2025 may have contributed to fewer anglers overall. Generally, angler populations during the unimpacted months appeared consistent with previous reporting periods, showing expected seasonal fluctuations, where the angler population decreased from August through December 2024 and increased from January to July 2025. These trends are consistent with the daytime outreach fluctuations reported earlier.

Table 6 summarizes the percentage of evening anglers who were new or repeat contacts per pier. This percentage is based on the total number of evening anglers (940) and includes those who were willing to speak as well as those who were unwilling to speak or who otherwise did not provide these data. On average, 49 percent of evening anglers were new contacts and 45 percent were repeat contacts (Table 6). The proportion of new or repeat anglers is calculated as a percent of total evening anglers at individual pier locations. These percentages are similar to the 2022 to 2023 and 2023 to 2024 reporting years, with this period reporting a higher percentage of repeat evening anglers (41.0 percent this period versus 37.1 percent in 2023 to 2024). Although there was a higher percent of repeat evening anglers than previous periods, note that 2024 to 2025 had a lower overall percentage of repeat anglers for combined evening and daytime (35.4 percent this period versus 46.5 percent in 2023 to 2024).

Table 6. Percent of New and Repeat Anglers during Evening Outreach

Date	Redondo Beach		Venice		Monthly Average	
	New	Repeat	New	Repeat	New	Repeat
Aug-24	48.1	51.9	50.0	50.0	49.1	50.9
Sep-24	41.2	58.8	24.1	74.1	32.7	66.5
Oct-24	73.3	26.7	52.9	47.1	63.1	36.9
Nov-24	45.2	54.8	66.7	33.3	56.0	44.0
Dec-24	51.9	48.1	47.4	52.6	49.6	50.4
Jan-25	0.0	0.0	40.0	60.0	20.0	30.0
Feb-25	50.0	50.0	66.7	33.3	58.3	41.7
Mar-25	50.0	50.0	61.1	38.9	55.6	44.4
Apr-25	59.6	40.4	61.3	38.7	60.5	39.5
May-25	51.1	40.0	46.2	30.8	48.6	35.4
Jun-25	48.9	37.5	50.0	30.0	49.4	33.8
Jul-25	50.0	35.7	53.7	35.2	51.9	35.4
Yearly Average	**50.7**	**43.2**	**48.0**	**46.7**	**49.4**	**44.9**

Note:
Pier values are in percentages. The percentages of new and repeat anglers will not add up to 100 percent, as a small proportion of contacted anglers declined engagement or otherwise did not provide this information.

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, 57.0 percent of anglers reported being aware of local fish contamination. This is an increase from the previous reporting year, in which 51.9 percent of the anglers contacted reported awareness of fish contamination.

Table 7. Percent of Evening Anglers that Reported Awareness of Fish Contamination

Date	Redondo Beach	Venice	Monthly Average
Aug-24	61.5	60.0	60.8
Sep-24	58.8	77.2	68.0
Oct-24	40.0	50.0	45.0
Nov-24	69.0	50.0	59.5
Dec-24	59.3	78.9	69.1
Jan-25	0.0	90.0	45.0
Feb-25	50.0	33.3	41.7
Mar-25	60.3	38.9	49.6
Apr-25	40.4	48.4	44.4
May-25	63.4	60.0	61.7
Jun-25	50.7	41.7	46.2
Jul-25	53.7	54.2	53.9
Pier Average	**55.7**	**58.2**	**57.0**

Note:
Pier and average values are in percentages. The values represent the percentage of anglers at each pier who reported awareness of the fish contamination divided by the total number of evening anglers who were willing to speak to the outreach team at the pier(s).

About 18.4 percent of new evening anglers reported awareness of fish contamination issues. The remaining 81.6 percent of these anglers either reported being unaware or did not provide this information. By contrast, 99.5 percent of repeat anglers reported awareness.

4.1.6 Sources of Evening Angler Awareness

Table 8 provides a summary of the sources of information leading to evening-angler awareness of local fish contamination. The pier outreach teams (83.3 percent) and the pier signage (DNC signs; 11.4 percent) continue to be the most effective sources of information for increasing angler awareness of fish contamination. Tip cards (0.9 percent) were less often attributed to evening angler awareness than in previous reporting periods. However, since the outreach teams typically hand out tip cards during outreach activities, tip cards are associated with the outreach teams. This association may impact angler response reporting between these two sources. When evaluating tip cards and outreach teams as possible overlapping awareness sources, the combined total awareness reported for tip cards and outreach teams in the previous reporting period was 49.3 percent compared to 84.2 percent during the current period. Other sources reported were the media (2.7 percent), the internet (0.9 percent), family/friends (0.4 percent), and other/not specified (0.4 percent). These results differ from the previous reporting period, in which pier signage contributed the most to angler awareness.

Table 8. Sources of Evening Angler Awareness

Pier	Pier Outreach Team	Pier Signage	Media	Tip card	Family/Friends	Internet	Other/Not Specified
Redondo Beach	82.3	11.8	3.5	1.0	0.7	0.0	0.7
Venice	85.0	10.6	1.3	0.6	0.0	2.5	0.0
Percentage (Total Average Sources)	**83.3**	**11.4**	**2.7**	**0.9**	**0.4**	**0.9**	**0.4**

Note:
Source values are in percentages. The values represent the percentage of anglers at each pier who reported awareness of contamination from each outreach source material.

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. Not every angler was willing to provide their zip code data; therefore, not every angler is represented in the data analysis. During this reporting period, 50.8 percent of daytime anglers (3,692 out of 7,273 anglers) and 48.5 percent of evening anglers (456 out of 940 anglers) provided their zip codes. The total number of daytime and evening anglers included anglers who were willing to speak and also those who were not willing to speak; there were also several instances in which anglers who were unwilling to speak to the outreach team about other topics or had a language barrier, and were still able and willing to provide their zip codes to the outreach team.

Figures 6 and 7 depict the geographical distributions and frequencies of residential zip codes reported by both daytime and evening anglers across the nine AOP piers. The most frequently reported zip codes for daytime anglers were San Pedro 90731 (336 anglers), Los Angeles 90001 (127 anglers), and Lakewood 90712 (118 anglers), all in south Los Angeles County.

Four additional zip codes had 50 or more anglers, all of which were in Los Angeles County. The most frequently reported zip codes for evening anglers were Los Angeles 90001 (32 anglers) and Los Angeles 90291 (12 anglers). Two additional zip codes in Los Angeles County had 11 and 10 anglers, respectively.

Figure 6. Geographic Distribution of Daytime Anglers per Zip Code

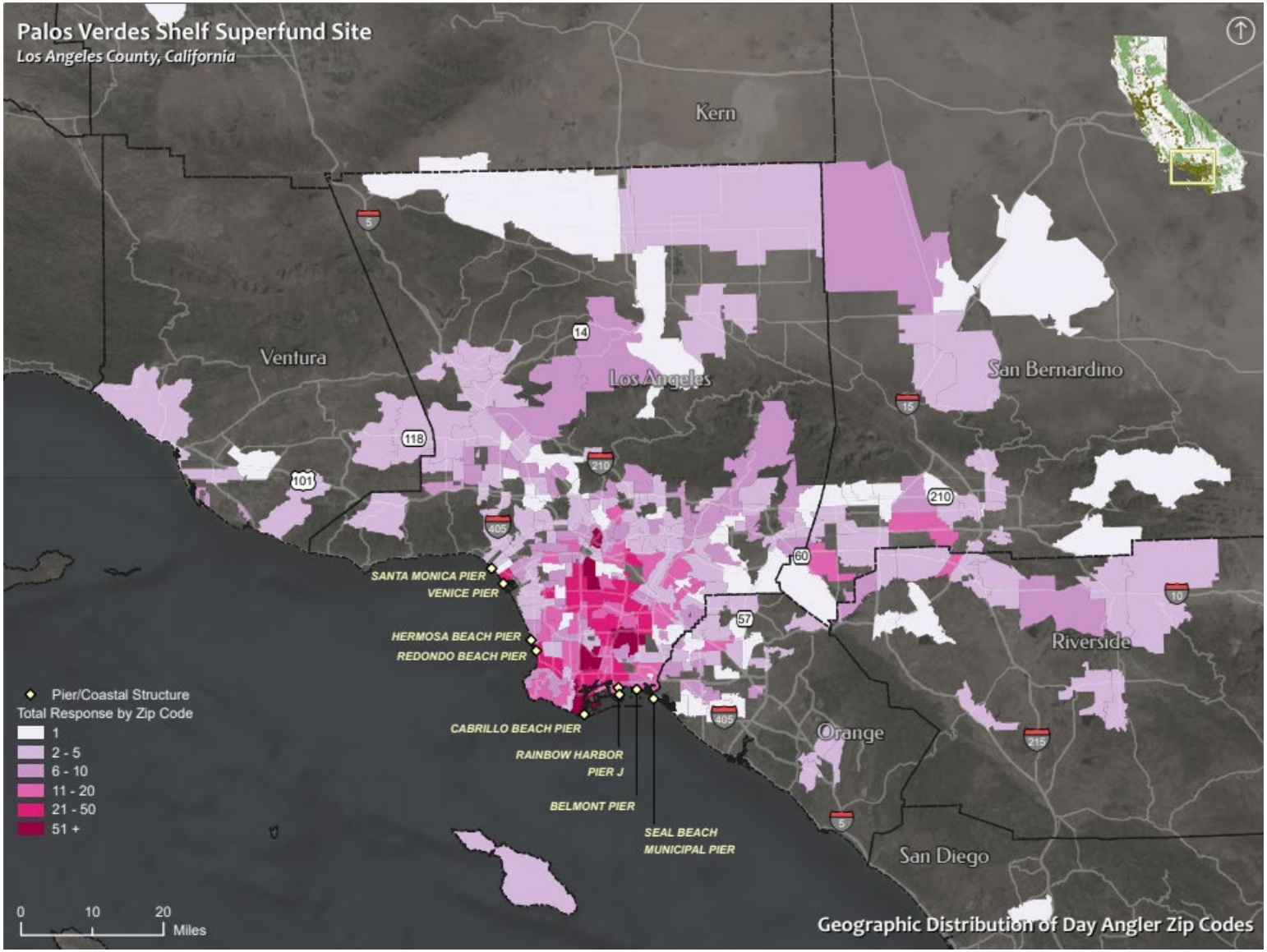
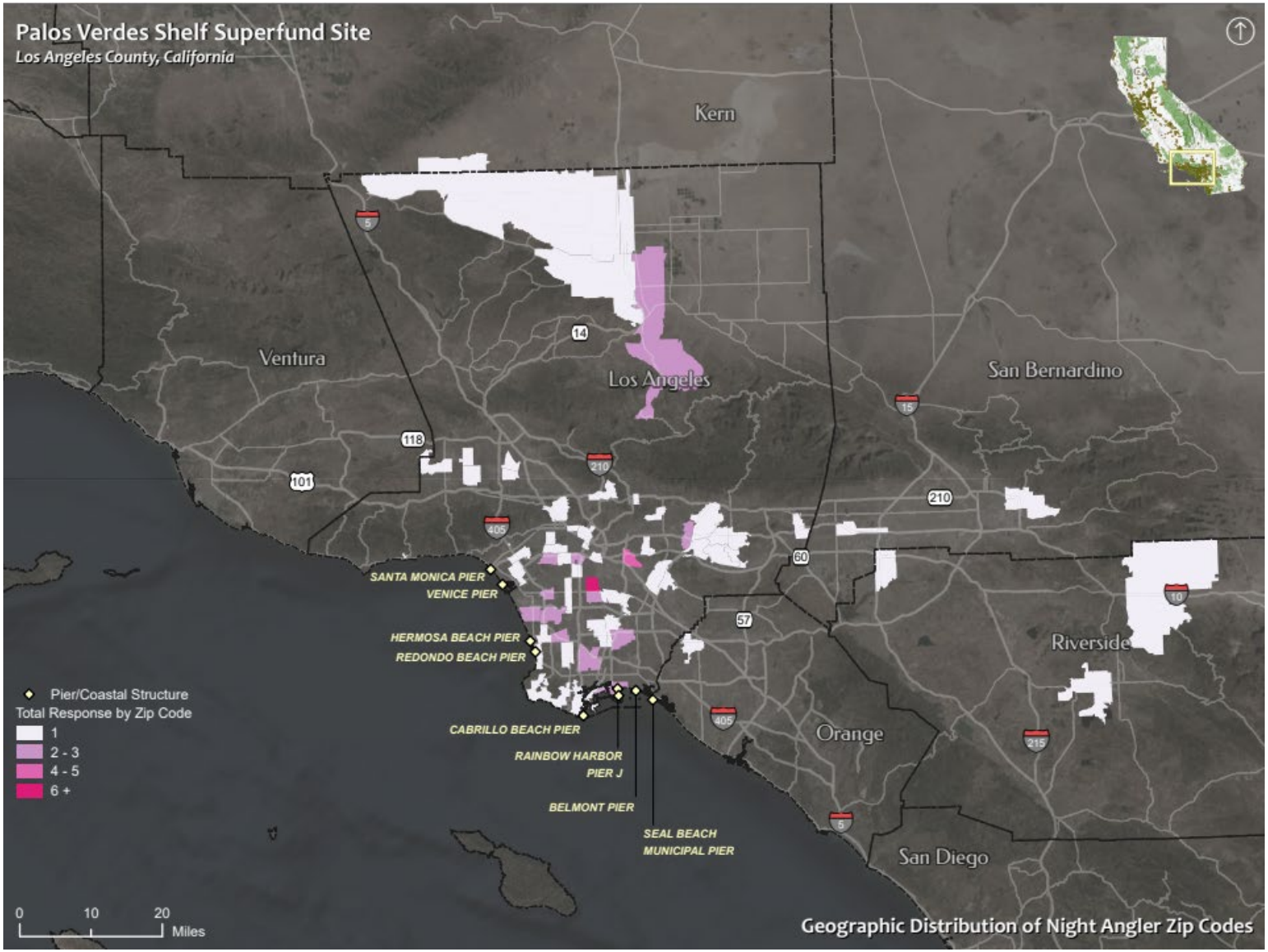


Figure 7. Geographic Distribution of Evening Anglers per Zip Code



In addition to zip code data, the AOP team recorded which languages anglers used/read/spoke during daytime and evening outreach events during each interaction. Across all outreach efforts and all nine piers, the AOP team recorded English (6,406 anglers), Spanish (292 anglers), Chinese (23 anglers), Vietnamese (1 angler), Russian (4 anglers), Tagalog (4 anglers), Arabic (2 anglers), Japanese (1 angler), Korean (1 angler), and Ukrainian (2 anglers). Languages were recorded based on angler-provided information or their request for tip cards in languages other than English.

Language data are typically collected for anglers willing, unwilling, or unable to speak to the outreach team. Eleven anglers were unable to effectively speak to outreach staff due to a language barrier. The data set in Table 9 includes the language distribution of anglers at each pier who were able to and willing to provide this data and includes responses for English, Spanish, Chinese, and Vietnamese. Note that not every angler was able to or willing to provide their language data; therefore, not every angler is represented in the language distribution analysis. Across all piers during daytime events, 77.4 percent of anglers spoke English, 3.6 percent spoke Spanish, 0.3 percent spoke Chinese, and less than 0.01 percent of anglers encountered spoke Vietnamese. During evening outreach at Venice Pier and Redondo Beach Pier, 82.9 percent of anglers spoke English, 3.3 percent spoke Spanish, and 0.2 percent spoke Chinese. There were no recorded Vietnamese responses during evening outreach.

Table 9. Languages Spoken during Pier Angler Outreach – by Pier

Pier	Daytime				Evening		
	English	Spanish	Chinese	Vietnamese	English	Spanish	Chinese
Belmont	86.4	2.6	0.1	0.0			
Cabrillo	58.3	5.4	0.4	0.0			
Hermosa	84.7	2.3	0.0	0.3			
Pier J	91.9	1.0	0.4	0.0			
Rainbow Harbor	87.8	1.2	1.5	0.0			
Redondo Beach	82.8	2.0	0.0	0.0	84.3	2.0	0.2
Santa Monica	74.3	6.1	0.7	0.0			
Seal Beach	89.3	1.1	0.3	0.0			
Venice	77.6	7.6	0.0	0.0	80.2	5.7	0.3
Language Totals	**77.4**	**3.6**	**0.3**	**0.0**	**82.9**	**3.3**	**0.2**

Note:
Source values are in percentages. The percentages may not add up to 100 percent because a small portion of anglers reported a language other than English, Spanish, Chinese, or Vietnamese (specifically Russian, Arabic, Japanese, Korean, Tagalog, and Ukrainian).

4.2 FISH SPECIES REPORTED DURING ANGLER OUTREACH

The outreach team also collected data on the types and quantity of fish caught by anglers (Table 10). Not all species included are technically categorized as “fish” (e.g., octopus, crab, sea star). Fish included on the DNC list recorded during outreach activities include white croaker (74 recorded), barred sand bass (48 recorded), topsmelt (151 recorded), black croaker (2 recorded), and barracuda (5 recorded). Table 10 summarizes the fish caught by anglers interviewed during pier outreach.

Table 10. Fish Species and Number Caught by Anglers as Observed or Reported during Outreach

Fish Listed as "Do Not Consume"			
Topsmelt	151	Barracuda	5
White Croaker	74	Black Croaker	2
Barred Sand Bass	48		
Fish Identified as Safer to Eat			
Mackerel	102	Halibut	11
Sardine	53	Rockfish	2
Jacksmelt	15	Yellowfin Croaker	16
Kelp/Calico Bass	6	Shovelnose Guitarfish	3
Sargo	3	Corbina	5
Other Documented Catch			
Bat Ray	1	Leopard Shark	1
Surfperch	14	Opaleye	6
Scorpionfish	1	Black Perch	2
Herring	4	Thresher Shark	1
Bonito	6	Perch	0
Sea Star	7	Octopus unidentified	2
Crab unidentified	0	White Seabass	1
Salema	0	Not specified	23
Ray unidentified	5	Halibut	11
Lizard Fish	5	Mullet	1
Queenfish	5	Sand Bass	1
Shark unidentified	1	Spotfin Croaker	2
Stingray	2	Thornback Ray	2
Walleye	1		

4.3 BAIT SHOP OUTREACH

In January and July 2025, DBS&A conducted outreach at bait shops and retail locations, distributing additional FCEC outreach materials to up to 40 shops. There are currently 36 shops participating in the bait shop program. Table 11 summarizes the distribution of outreach materials during January and July 2025 outreach efforts. During this reporting period, the FCEC distributed a total of 2,450 English, 2,350 Spanish, 1,525 Chinese, and 1,030 Vietnamese tip cards. Of the 40 listed bait shops, four discontinued the sale of bait and other fishing supplies during this reporting period:

- Mr. C's Liquor in San Pedro, California (January 2025)
- Family Deli and Grocery in San Pedro, California (January 2025)
- El Don Liquor Store (July 2025), received materials in January 2025
- West Beach Liquor Store (July 2025), received materials in January 2025

Table 11. Bait Shop Distribution – January and July 2025

Store Name	Number of Distributed Tip Cards			
	English	Spanish	Chinese	Vietnamese
7-Eleven (2)	75	75	50	35
ABC Fine Wine	75	75	50	35
Andy's Sports & Tackle Supply	75	75	50	35
ARCO AM/PM	50	50	0	0
Baja Fishing Tackle (formerly Baja Fish Gear)	75	75	50	35
Bay Market	75	75	50	35
Best Bait and Tackle	50	50	50	35
Big 5 Sporting Goods (Culver City)	75	75	50	35
Big 5 Sporting Goods (Huntington Park)	75	75	50	35
Big Fish Bait & Tackle	75	75	50	35
Catalina Liquor & Deli	75	75	50	35
Chaeil Fishing Tackle USA, Inc.	25	25	25	10
Charkbait	75	25	25	10
Dawn to Dusk Liquor	75	75	50	35
Del Rey Landing	50	50	25	25
El Don Liquor Store	25	25	0	0
Family Deli and Grocery	25	25	25	10
Fisherman's Supplies	50	50	25	25
Fishermen's Hardware	75	75	50	35
Gaffey Liquor	75	75	50	35
Hello Liquor	50	50	25	10
Jimmy Caivo Bait & Tackle	50	50	25	25
Liquor Depot	50	25	25	10
M&P Liquor	75	75	25	10
Magnolia Liquor Jr. Market/Supreme Liquor	50	50	25	25
Mahi Tackle-Sport Fishing Supplies	75	75	50	35
Mr. C's Liquor	0	0	0	0
Pacific Edge Bait and Tackle	75	75	50	35
Pacific Wilderness	75	75	25	10
Redondo Food Mart	75	75	50	35
Rosa's Liquor Market	50	50	50	35
Sav-On Tackle	50	50	50	35
Seal Beach Liquor Store	50	25	25	10
Stanley's Liquor Jr. Market	75	75	50	35
West Beach Liquor Store	25	25	25	10
West Marine (1)	75	75	50	35
West Marine (2)	75	75	50	35
West Marine (3)	75	75	50	35
West Marine (4)	75	75	50	35
Young's Tackle	75	75	50	35

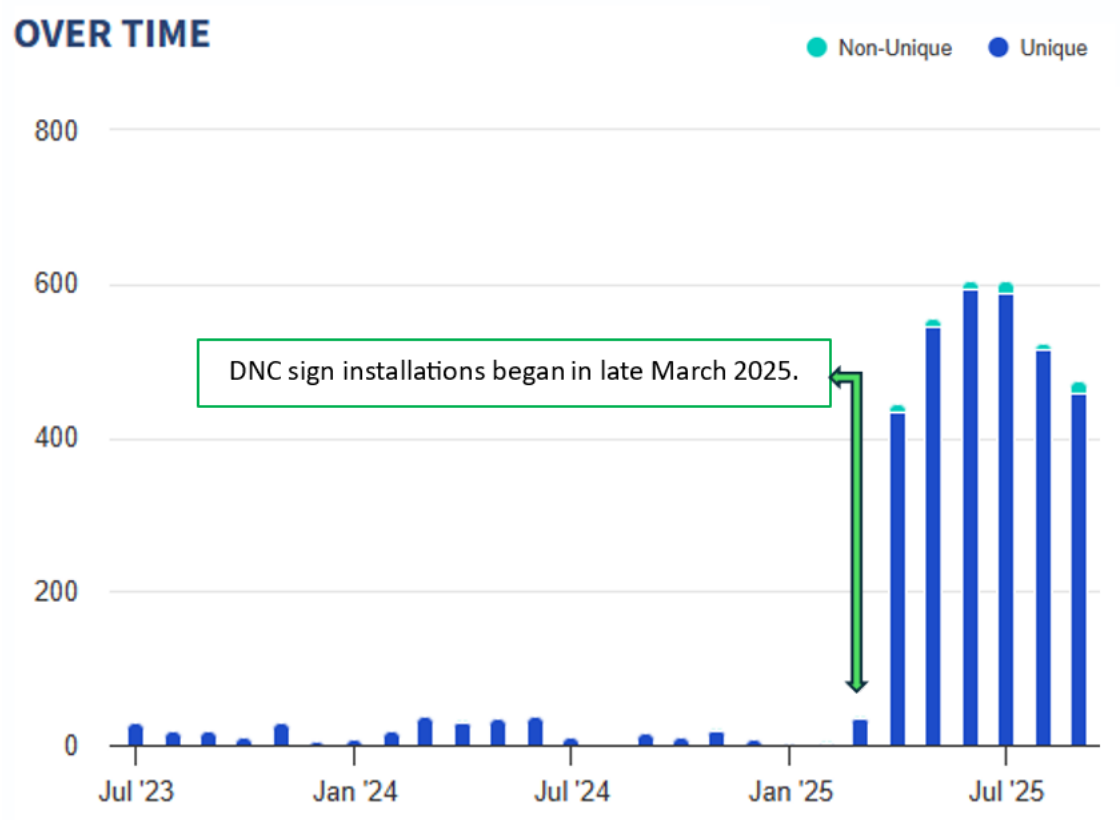
4.4 ELECTRONIC OUTREACH

The website serves as a public repository of FCEC documents, outreach materials, and electronic newsletters. Electronic outreach efforts consist of website maintenance, newsletter mailing list management, and newsletter distribution. During this reporting period, new software was used to redesign the format of the newsletter. In May 2025, the EPA distributed

the redesigned electronic newsletter to 69 people through email, including 12 members of the public who signed up on the www.pvsfish.org website and 57 members of FCEC partner organizations or the EPA. While the number of community members who signed up for the newsletter is low, the number of recipients may increase now that a QR code linked to the newsletter sign-up sheet is regularly displayed at community events, and a QR code has been added to the newly redesigned DNC pier signs.

DNC signs are the second most reported source of angler awareness, and the updated version of the signs contributes to electronic outreach opportunities. The newly designed DNC signs have a QR code on them that directs people to the website, where they can access information about the Palos Verdes Shelf contamination and risk reduction and sign up for the newsletter. The QR code is the same across all signs and other outreach materials (tip cards and booths), so it is not possible to analyze where the scans occurred (which pier or event). However, a notable increase in scans of the QR code is directly associated with the timing of installation of new DNC pier signs. Figure 8 shows QR code scans over time from July 2023 to July 2025, with the increase in QR code scans immediately following installation of the new DNC signs in late March 2025. It further provides a breakout of unique or non-unique (repeat) scans by the same device (e.g., an individual cell phone), highlighting that some people use this electronic outreach option as a reference more than once.

Figure 8. QR Code Scans by Month



4.5 COMMUNITY OUTREACH EVENTS

Table 12 provides a summary of community outreach events, outreach material distributions for events attended during this reporting year, and the estimated number of people who visited the FCEC outreach booth at each event.

The FCEC participated in 13 local community events during this period. An additional four events were scheduled but could not be attended due to the Los Angeles wildfires and associated evacuations in early 2025. BPSOS attended four events, CCHC attended two events, and DBS&A attended seven events. Community outreach focused on events dedicated to families and children, environmental education, and geographic areas with identified at-risk communities. In total, an estimated 44,650 people attended the 13 local community events in which FCEC outreach booths were set up, with an estimated 3,111 people visiting the FCEC outreach booths. Outreach staff distributed 1,011 tip cards, 299 informational brochures, 1,058 "What's the Catch" children's comic books, 1,000 fish ID cards, and 11 "What's the Catch" curriculum guides. The 3,111 people who visited the booths and received outreach are counted toward the Institutional Controls Program goal of reaching 11,600 people every year.

BPSOS distributed 367 informational outreach materials during four events, including 100 tip cards, 27 brochures, 145 comic books, and 95 fish ID cards, but no curriculum guides. Except for the tip cards, most outreach materials distributed were in English. All the comic books and fish ID cards distributed were in English. Of the 100 tip cards distributed, 65 percent were in Vietnamese, and 35 percent were in English.

CCHC distributed 250 informational outreach materials during two events, including 174 tip cards, 24 brochures, 25 comic books, 25 fish ID cards, and 2 curriculum guides. Most outreach materials distributed were in Chinese. Of the 174 tip cards distributed, 66.1 percent were in Chinese, 28.7 percent were in English, 2.9 percent were in Vietnamese, and 2.3 percent were in Spanish. Of the 24 brochures distributed, 58.3 percent were in Chinese and 41.7 percent were in English. Of the 25 comic books distributed, 84 percent were in English and 16 percent were in Spanish. Of the 25 fish ID cards distributed, 48 percent were in English, 44 percent were in Chinese, and 8 percent were in Spanish. The curriculum guides are available in English only.

DBS&A distributed 2,762 informational outreach materials during seven events, including 737 tip cards, 248 brochures, 888 comic books, 880 fish ID cards, and 9 curriculum guides. Most outreach materials distributed were in English. Of the 737 tip cards distributed, 74.4 percent were in English, 19.1 percent were in Spanish, 4.6 percent were in Chinese, and 1.9 percent were in Vietnamese. Of the 248 brochures distributed, 74.4 percent were in English, 19.0 percent were in Spanish, 5.0 percent were in Chinese, and 4.8 percent were in Vietnamese. Of the 888 comic books distributed, 78.0 percent were in English, 18.6 percent were in Spanish, and 3.4 percent were in Chinese. Additional outreach materials distributed included 880 fish ID cards, with 82.5 percent in English, 13.1 percent in Spanish, and 4.4 percent in Chinese. Nine English curriculum guides were given to educators interested in implementing lessons about local fish contamination.

The EPA also worked with local vendors on various improvements to the “Booth in a Box” fishing game. In June 2025, redesigned fishing game materials were delivered to DBS&A, including 50 new fish, magnet replacements, and in July 2025, an improved and protective magnet sack was also provided to reduce breakage of the magnets on the fishing poles. The redesigned fishing materials can be seen in Figure 9.

Figure 9. Fishing Game Materials Redesigned in 2025

Table 12. Outreach Materials Distributed at Community Events

Event	Community Outreach Partner	Event Date	Outreach Booth Attendees	Distributed FCEC Outreach Materials				
				Tip Cards	Brochures	Comic Books	Fish ID Cards	Curriculum Guide
City of Garden Grove – National Night Out	BPSOS	8/6/2024	77	30	12	25	10	0
12th Annual Central-West County Health Expo	BPSOS	9/7/2024	29	15	15	0	15	0
LA County Parks and Rec – A Day in Nature	DBS&A	9/7/2024	50	25	25	24	25	0
23rd Annual Baja Splash	DBS&A	9/21/2024-9/22/2024	700	250	120	165	194	9
Nhan Hoa Annual Health and Wellness Fair	BPSOS	10/5/2024	145	50	0	90	70	--
Clinton Corner Family Campus Annual Community Resources and Health Fair	BPSOS	10/9/2024	50	5	0	30	0	--
Cabrillo Aquarium Whale Fiesta	DBS&A	2/2/2025	290	73	5	76	87	0
Aquarium of the Pacific (Marilyn Padilla) Noche de Estrellas	DBS&A	3/21/2025	110	40	10	85	80	0
Aquarium of the Pacific (Chelsea Coleman) Children's Festival	DBS&A	3/29/2025-3/30/2025	600	138	30	206	179	0
2025 CCHC Walkathon	CCHC	4/26/2025	80	65	6	6	6	0
Aquarium of the Pacific (Teen Climate Council) Earth Day	DBS&A	4/26/2025-4/27/2025	620	133	47	222	218	0
2025 City of Alhambra Eco Fair	CCHC	4/27/2025	150	109	18	19	19	2
Cabrillo Aquarium World Ocean Day	DBS&A	6/7/2025	210	78	11	110	97	--
Total	**13 Events**		**3,111**	**1,011**	**299**	**1,058**	**1,000**	**11**

Notes:
-- = These materials were not distributed at the event.
FCEC = Fish Contamination Education Collaborative
ID = identification
BPSOS = Boat People SOS
CCHC = Chinese Christian Herald Crusades
DBS&A = Daniel B. Stephens & Associates, Inc.

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5. CONCLUSIONS AND RECOMMENDATIONS

The FCEC successfully educated 14,108 individuals during this reporting period, surpassing the annual goal of reaching 11,600 people. This achievement includes outreach to 8,213 anglers at piers, engagement with 3,111 community members at FCEC booths, and contact with 2,784 anglers through CDFW enforcement activities.

5.1 ANGLER OUTREACH

5.1.1 Program Oversight

The Palos Verdes Shelf human health risk assessment determined that eating fish contaminated with PCBs and DDT presents the greatest risk to human health. The primary goal of the AOP is to minimize the consumption of contaminated fish. Sections 5.1.1 through 5.1.6 discuss various aspects of the angler outreach conducted during this reporting period, and Section 5.1.7 provides recommendations for program improvements. The EPA is committed to improving and strengthening the AOP to meet the objectives of the institutional controls selected in the 2009 Interim Record of Decision.

The EPA conducts non-routine field oversight of outreach activities and provides feedback to the outreach teams. These opportunities allow for the timely identification and resolution of data quality issues and promote the improvement of angler outreach activities. Performing angler outreach oversight as an important part of data quality assurance ensures that outreach activities are effective and their implementation supports the goals of the Institutional Controls Program.

5.1.2 2021 to 2025 Comparisons

This report uses angler interactions to represent outreach activities. At the end of the 2024 to 2025 reporting period, the transition to electronic forms allowed the EPA to collect consistent data for the number of anglers encountered during each interaction. Data from past years only included interactions, without detailing how many anglers there were per interaction. Angler encounters should be included in future reporting; however, the data should not be compared to previous reporting periods, which are based on angler interactions.

The percentage of repeat anglers increased compared to the 2023 to 2024 period, although the total number of anglers decreased from 9,699 (2023 to 2024) to 8,213 (current period; Figure 10). Many local anglers frequently fish from the piers and have interacted with FCEC outreach staff multiple times. Given the high awareness levels among repeat anglers, outreach teams should focus on strengthening existing professional relationships. Introducing new conversation topics can enhance anglers' understanding of risk reduction by ensuring they correctly identify fish species and by discussing preparation techniques that reduce exposure.

5.1.3 Data Quality and Electronic Forms Transition

In May 2025, DBS&A outreach personnel began using electronic forms during pier outreach. FCEC managers ensured all outreach staff had access to revised and standardized data entry forms compatible with a 2023 to 2025 comprehensive database. These changes allow for more consistent collection of angler responses and streamline data management and reporting. The transition to e-forms and the development of a comprehensive ArcGIS database have enhanced data analysis capabilities. For example, the Angler Outreach Dashboard supports data presentation in Section 5.1.5 by providing real-time visual representations of collected angler data. This dashboard allows the EPA to examine outreach data in real time and facilitates the incorporation of additional survey options and refinement of the angler interaction form. The dashboard provides an accessible data-visualization tool that has made reporting and presenting angler outreach data more efficient and with improved data quality.

5.1.4 Outreach to Daytime and Evening Anglers

The outreach program is essential for raising awareness about local fish contamination from the Palos Verdes Shelf Superfund Site. During this reporting period, the AOP recorded 8,213 anglers (7,273 daytime anglers and 940 evening anglers). Of these interactions, 1,510 anglers declined to participate (18.4 percent), including 31 anglers who could not participate due to a language barrier. Conversely, 6,703 anglers agreed to participate in outreach (81.6 percent).

This period saw 3,818 new anglers: 3,390 during daytime outreach and 428 during evening outreach (Figures 10 and 11). New anglers accounted for approximately 46.5 percent of the total number of anglers who agreed to participate. Among those reporting contamination awareness, new anglers most frequently cited the AOP outreach team as their source of information. Combined data from daytime and evening outreach indicate that 3,765 anglers (both new and repeat) were aware of contamination, representing 45.8 percent of total anglers during all pier outreach activities during this reporting period.

Figure 10. Number of Daytime Anglers during Pier Outreach (2022–2025)

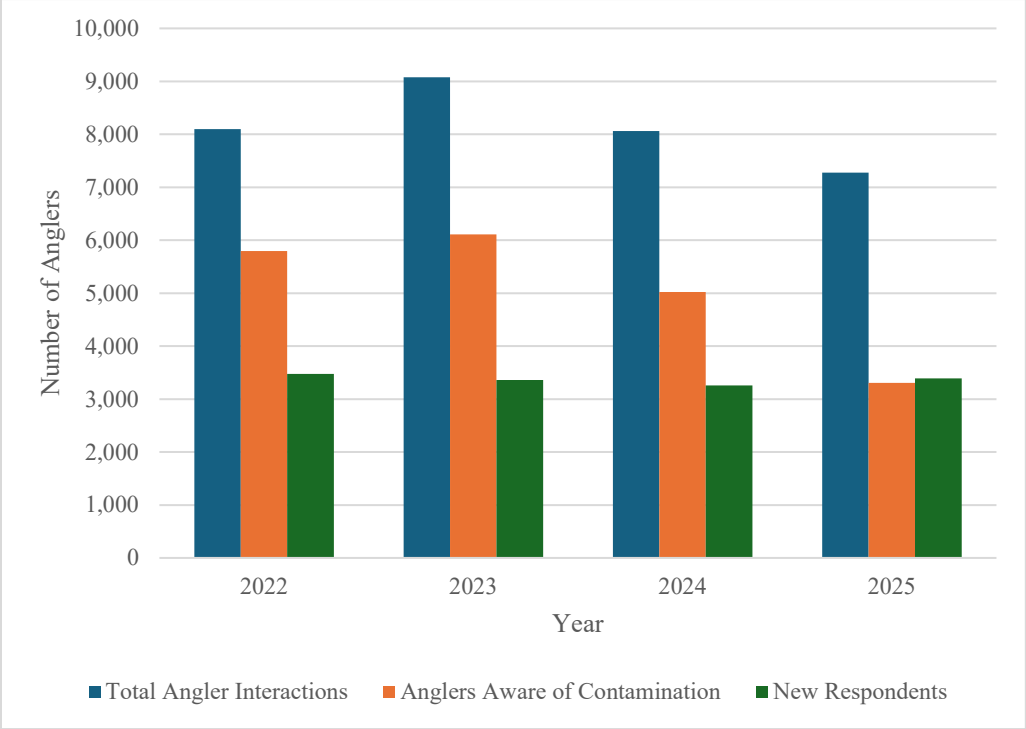
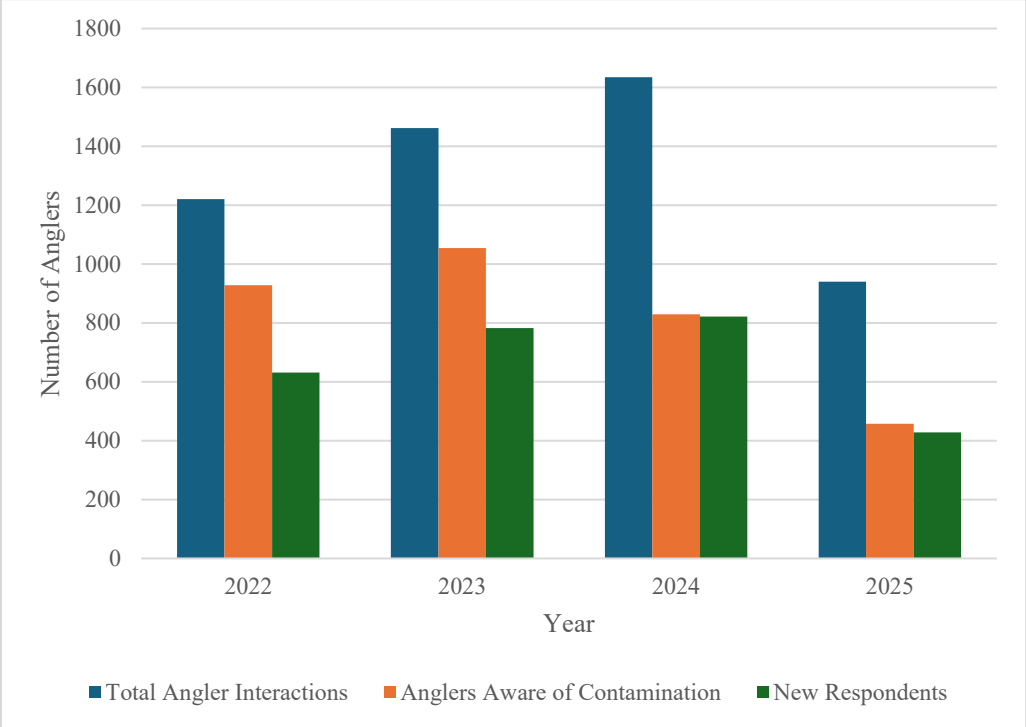


Figure 11. Number of Evening Anglers during Pier Outreach (2022–2025)



5.1.5 Angler Awareness

The AOP aims to increase awareness of local fish contamination and fish advisories so that anglers can make informed decisions about the fish that they eat. Continued pier outreach is crucial to ensure that both new and repeat anglers at affected locations understand the health risks associated with eating contaminated fish. Outreach should include discussions of risk reduction through species selection and safer preparation methods, which outreach educators are well-equipped to provide. Information collected from anglers also helps the EPA assess and refine the Palos Verdes Shelf Institutional Controls Program to protect human health while long-term remedies are evaluated. These data track important variables impacting the program, such as fishing trends, languages spoken, and popular fish species caught.

Outreach data indicate a decline in the catch and retention of white croaker by pier anglers compared to the 2023 to 2024 period, suggesting increased awareness of the health risks associated with consuming this species. However, the enforcement data (detailed in a separate report) reveal occasional non-compliance with white croaker, with 125 white croaker confiscated during this period. Because enforcement primarily targets the white croaker ban, pier outreach should emphasize the health risks of consuming white croaker and the other DNC fish species.

Outreach staff at the Belmont Pier and Redondo Beach Pier consistently engage the most anglers each year; only Cabrillo Pier is visited more frequently (Figure 12). Due to the higher frequency of outreach at Cabrillo Pier, comparisons with other locations may be skewed, suggesting a separate evaluation of zip code data from Cabrillo compared to other piers could be beneficial.

Figure 13 illustrates the percentage of daytime anglers aware of fish contamination at each pier from 2022 to 2025. Cabrillo Pier shows a lower awareness rate, possibly due to an influx of new anglers. Conversely, Rainbow Harbor Pier and Hermosa Beach Pier tend to engage fewer anglers each year but maintain high awareness levels across the nine pier locations.

Figure 12. Number of Daytime Anglers per Pier (2022–2025)

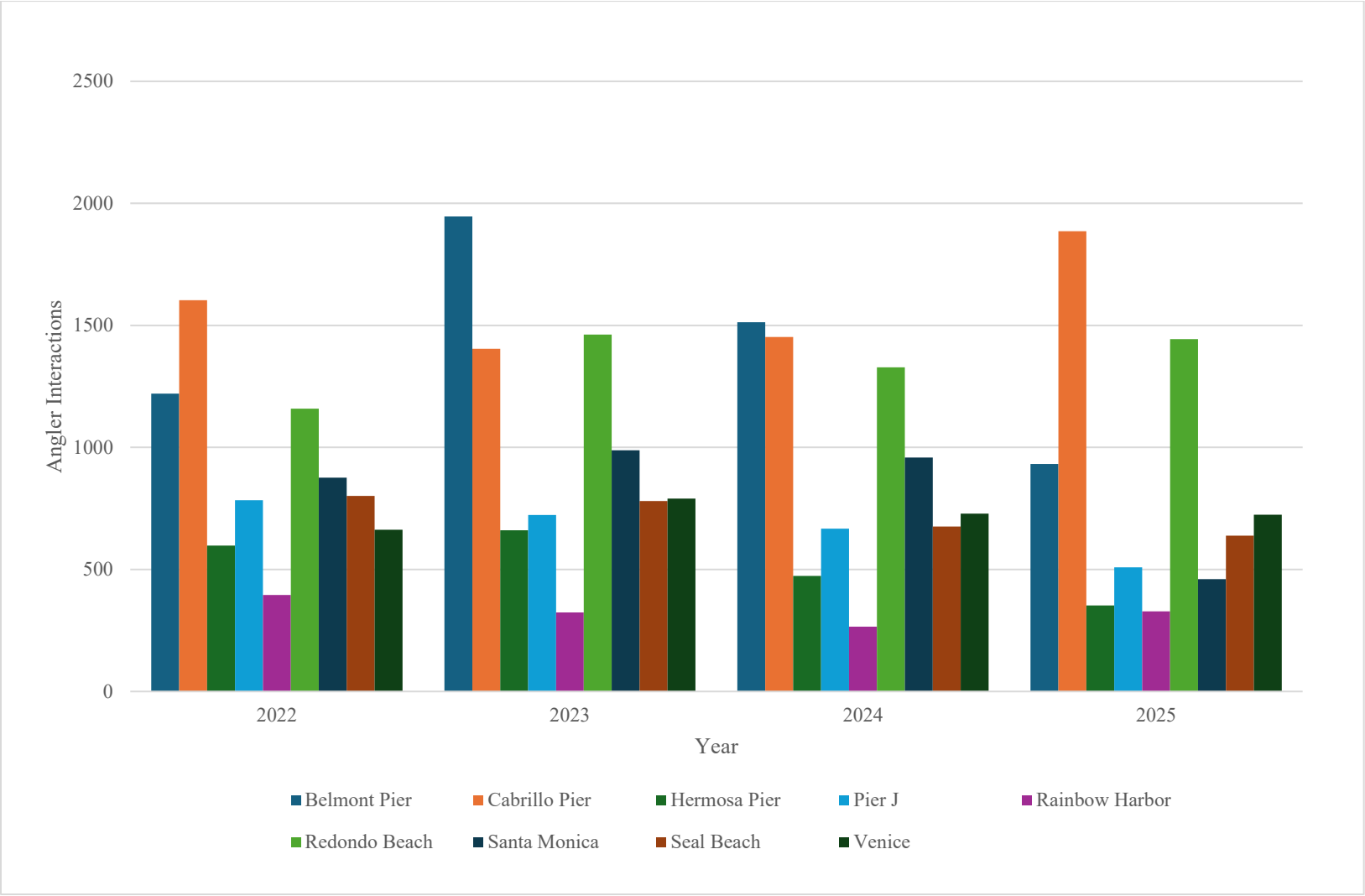
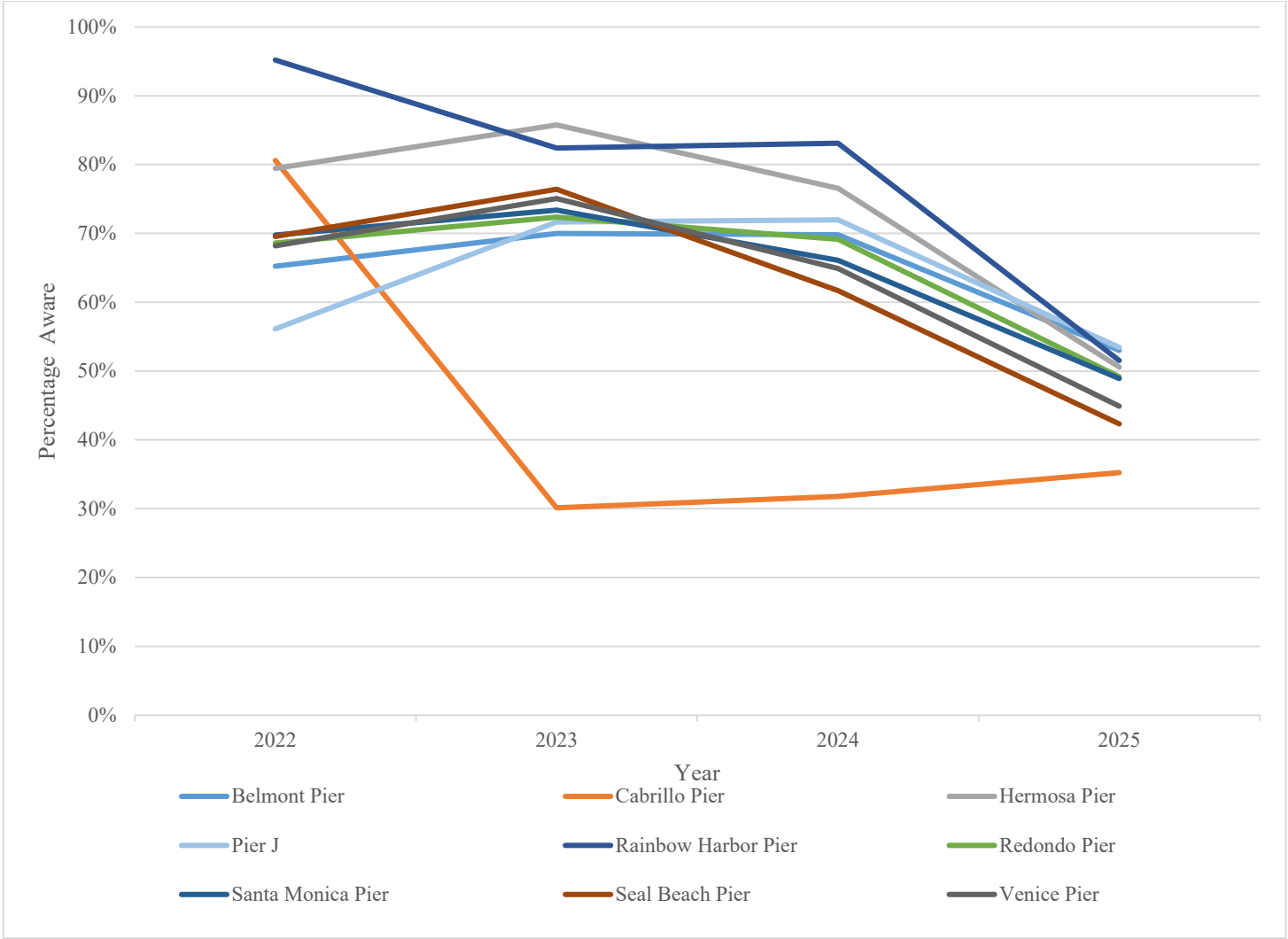


Figure 13. Percentage of Daytime Anglers Aware of Fish Contamination per Pier (2022–2025)



Results indicate that evening outreach effectively engages different angler communities and plays a vital role in educating anglers about local fish contamination. While the number of anglers contacted during evening outreach increased from 2022 to 2024 (Figure 14), there was a decline from 2024 to 2025. Additionally, evening angler awareness levels have decreased since the 2022 reporting period (Figure 15). Overall, the proportion of new and unaware anglers during evening outreach is higher than during daytime outreach. The FCEC should continue evening outreach at both Venice Pier and Redondo Beach Pier, focusing on increasing awareness about fish contamination risks and ensuring DNC signage is prominently displayed. Furthermore, the FCEC may consider expanding evening outreach to increase evening-angler awareness.

Figure 14. Number of Evening Anglers per Pier (2022–2025)

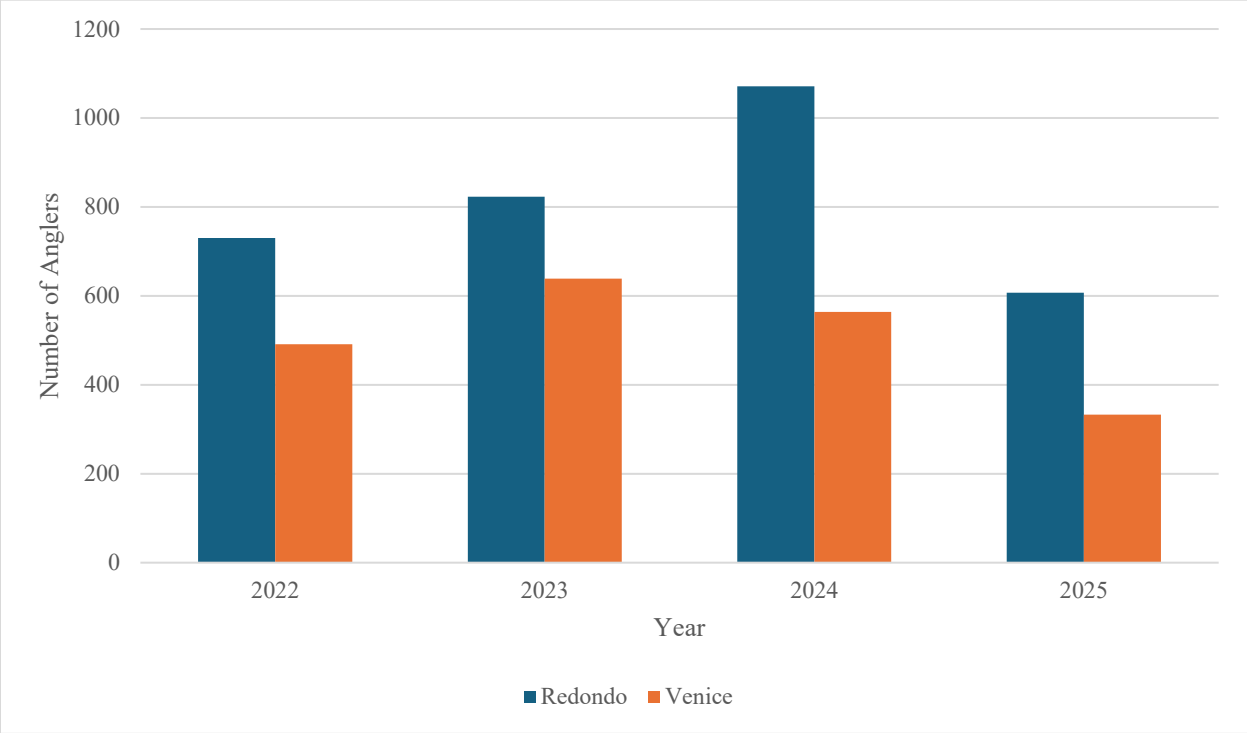
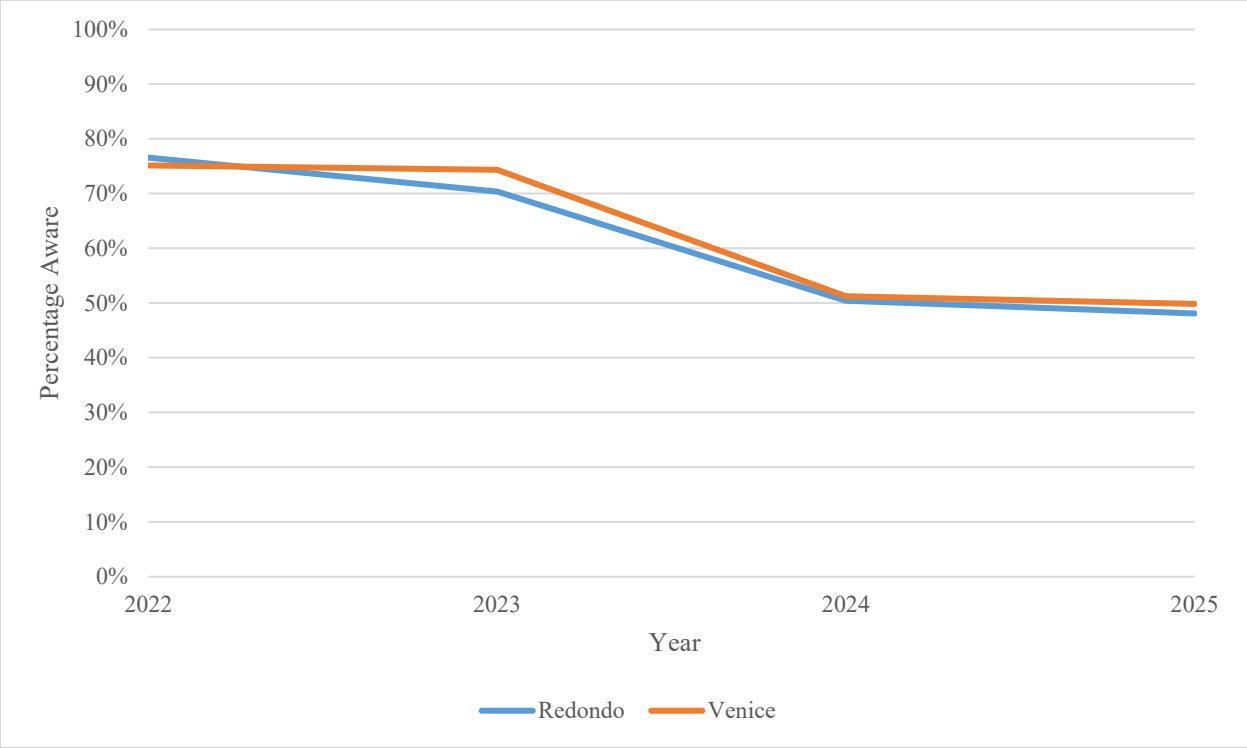


Figure 15. Percentage of Evening Anglers Aware of Fish Contamination per Pier (2022–2025)



5.1.6 Fish Species and Angler Intent – ArcGIS Pro Dashboard Applications

The Angler Outreach Dashboard, introduced in Section 5.1.3, was established in 2025 following the adoption of electronic forms. Historical outreach data from July 2023 to May 2025 were converted and uploaded into the database, which now feeds into the dashboard. This tool provides a quick visual summary of outreach data, as demonstrated in Figures 16 and 17, and enables the EPA and the FCEC to make informed decisions. Figure 16 illustrates the dashboard's ability to filter data by pier to evaluate which pier has the most documented catches of white croaker (Pier J) and the most overall DNC species caught (Cabrillo Pier). Note that these data are only available from May 2025 onward and do not include historical records.

A new question on the electronic form captures data previously unavailable to FCEC partners regarding angler's intent to consume their catch. Early revisions of this ensured that Cabrillo and DBS&A could collect comparable data using different forms and methods. Beginning in May 2025, this "intent" information began to be collected across all piers, with comprehensive annual data expected in the fourth quarter of 2025 and for the next reporting period (2025 to 2026).

Figure 16. "Do Not Consume" Fish Species Caught per Pier (May 2025–July 2025)

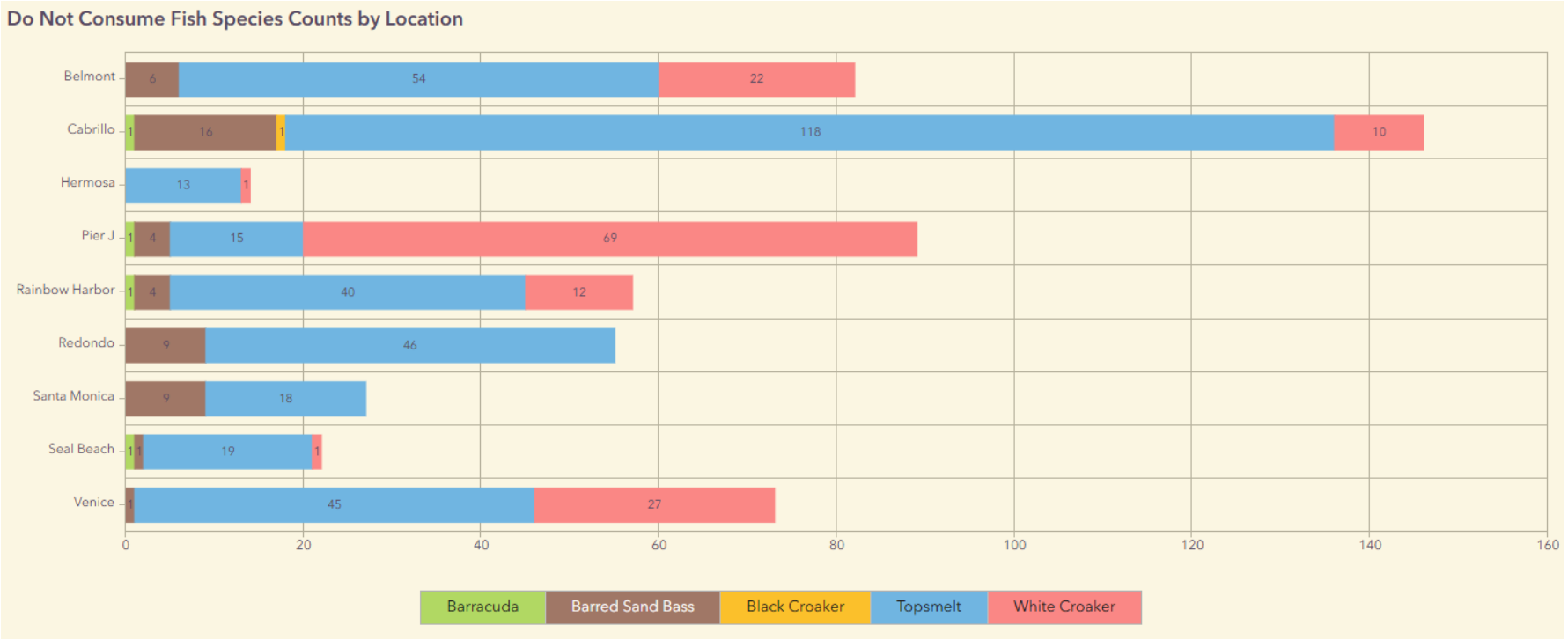


Figure 17. Angler Intent (May 2025–July 2025)

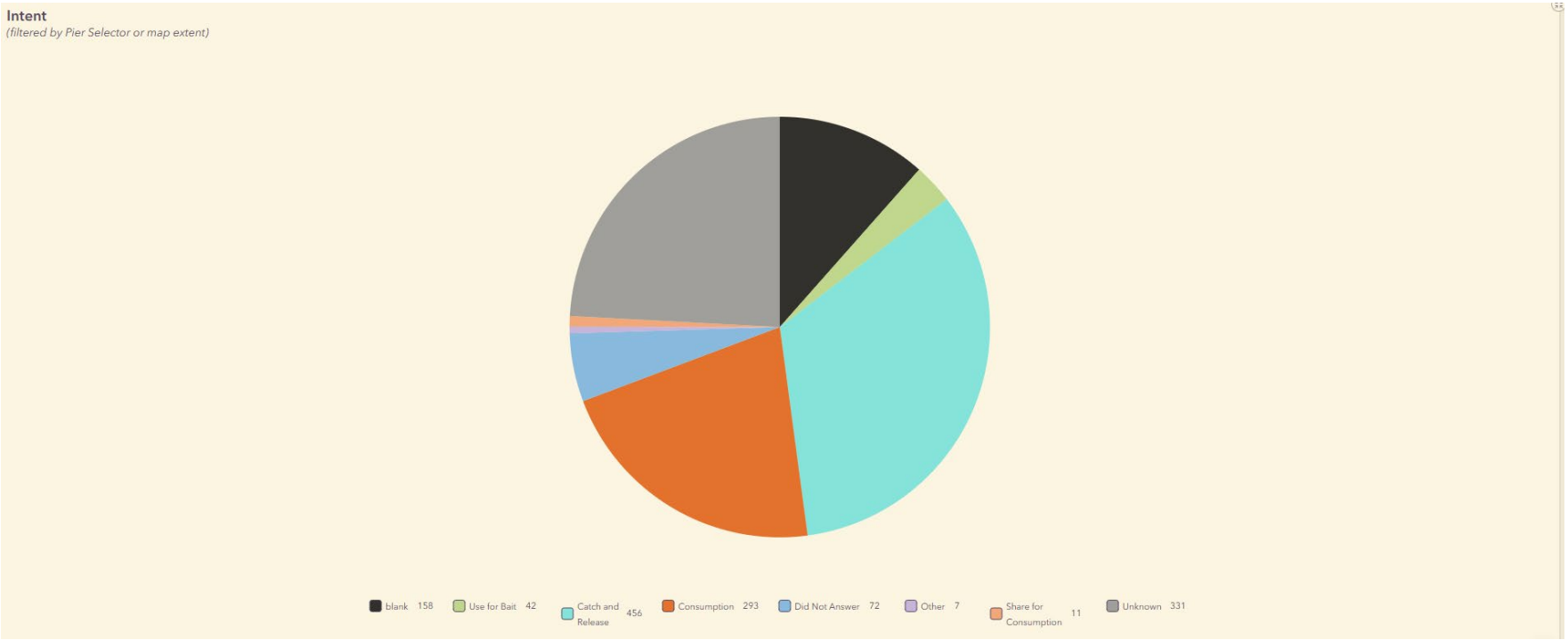


Figure 17 shows that anglers report an intent to consume their catch roughly 25 percent of the time. Users can evaluate this subset of data for each pier to determine where the highest intent to consume fish is reported. The "other" category in Figure 17 represents non-consumption intent.

These examples demonstrate how the EPA and the FCEC can utilize the Angler Outreach Dashboard throughout the year to assess which piers have anglers reporting the highest intent to consume locally caught fish. These data can guide decisions on adjusting outreach efforts at specific locations and serve as conversation topics to strengthen rapport with anglers. Maintaining this database with a visual dashboard is the most effective and efficient method for managing the institutional controls outreach program.

5.1.7 Angler Outreach Materials

In 2025, the primary languages spoken by anglers were English, Spanish, Chinese, and Vietnamese. English dominated both daytime and evening angler outreach. Spanish-speaking anglers were present at lower proportions than in the previous period, while Chinese-speaking anglers maintained consistent proportions. Vietnamese-speaking anglers were observed during daytime outreach, a change from previous periods, but not during evening outreach, consistent with past observations. These data suggest that current outreach material translations are effective at reaching pier anglers. Monitoring angler language trends will help understand shifts in languages and prevent gaps in outreach due to language barriers.

The zip code analyses highlight at-risk community members who may be exposed to contamination through the fish brought home by anglers, even if they do not fish themselves. Most anglers originate from local communities in south Los Angeles County (Figures 6 and 7). Daytime anglers tend to travel from inland areas further from the coast, while evening anglers are primarily from Los Angeles County. These data provide insights into communities that could benefit from fish contamination education and improved outreach. Specifically, zip code data helps identify areas to focus on for community events and bait shop outreach. The FCEC should continue to collect these data to inform these and other areas of the Institutional Controls Program.

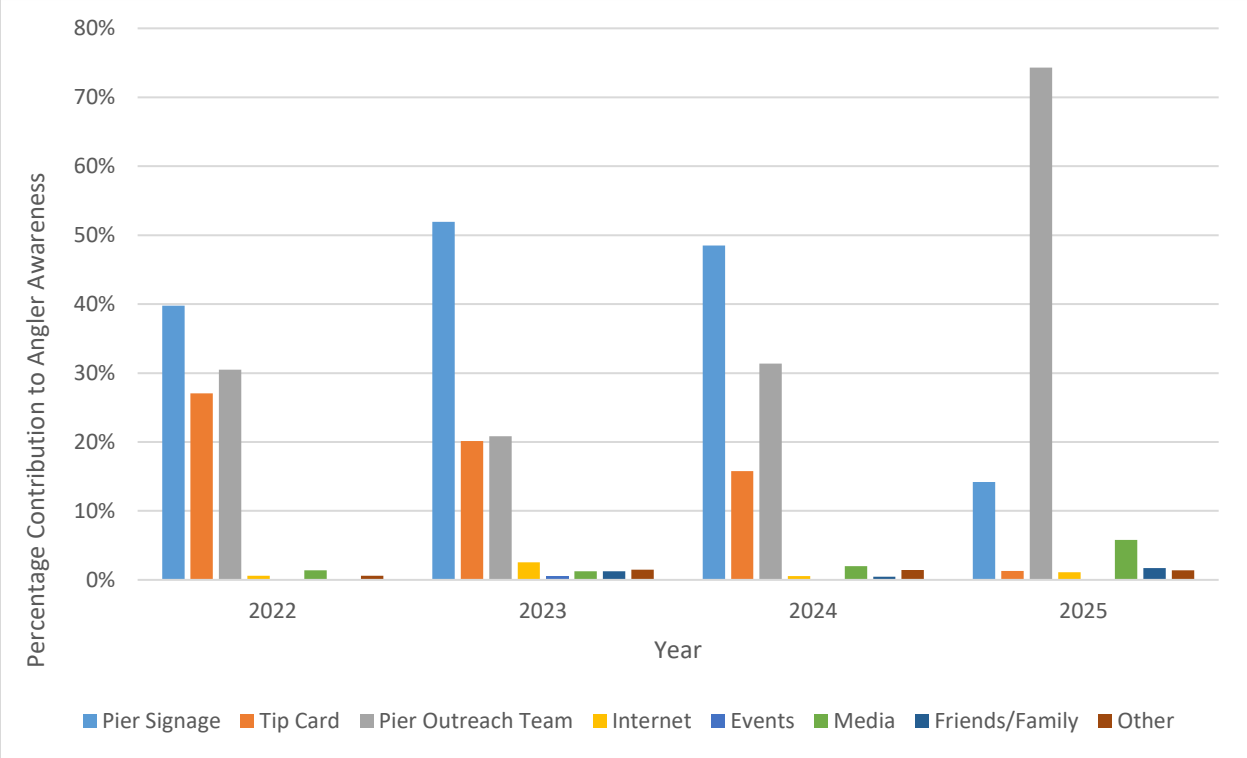
The outreach team, DNC warning signage, and media were most effective at increasing awareness among pier anglers of fish contamination from the Palos Verdes Shelf. As noted in Section 4.1.3, the distribution of tip cards by the outreach team makes it difficult to independently assess the impact of each source. However, the strong correlation suggests that active outreach efforts have significantly boosted awareness, and tip cards remain an important part of outreach efforts.

The FCEC began distributing the newly designed tip card and completed Phase 1 of the new DNC sign installations during the current reporting period. The updated tip cards provide information on PCBs and DDT, highlight safer fish options based on commonly caught local species, and offer guidance on reducing exposure through cooking methods and by eating only skinless fillets. Both the tip cards and signs include a QR code linking to more information online at www.pvsfish.org.

Recommendations from the Fall 2025 FCEC meeting will determine whether paper versions of less frequently used outreach materials (brochures and curriculum guides) should continue or if electronic versions suffice. Transitioning to digital formats and reducing printed materials may not impact program effectiveness if online access is available.

Figure 18 summarizes the annual percentage of anglers who learned about fish contamination from each outreach source for reporting periods ending in 2022, 2023, 2024, and 2025. Historically, anglers most frequently attributed their awareness to the DNC signage program, with the FCEC pier outreach team as the second most common source. However, the current period shows a shift, with the outreach team now cited as the primary source, followed by DNC signs and increased media influence.

Figure 18. Sources of Information that Contributed to Angler Awareness of Fish Contamination (2022–2025)



5.1.8 Pier Angler Outreach Schedule

As discussed in Section 4.1, the pier outreach schedule varied weekly to engage anglers at different times of day across outreach locations. Anglers were present at all piers every day of the week, year-round. While weekends were typically the busiest, limiting outreach to weekends is not recommended because different anglers are present throughout the week and may not adhere to traditional weekend schedules.

5.2 BAIT SHOP OUTREACH

Bait shop outreach events took place in January 2025 and July 2025 and successfully restocked shops with FCEC educational materials. During these events, most bait shops requested additional tip cards in various languages, demonstrating that distributing outreach materials through local bait shops is an effective way to disseminate educational materials to local fishing communities. Following the July 2025 outreach efforts, 36 shops remained active participants in the FCEC outreach program. To meet the goal of having 40 active bait shops, the following replacements are recommended:

- Redondo Pier Bait Shop
- Belmont Pier Bait Shop
- Island Fishing Tackle in Carson, California
- Ace Fishing Tackle in Gardena, California

5.3 ELECTRONIC OUTREACH

Electronic outreach primarily involved distributing the semiannual e-newsletter to FCEC partners and referring people to the www.pvsfish.org website during angler and community outreach events. It is recommended that the FCEC continue to update the www.pvsfish.org website, especially because new outreach materials now include a QR code that connects the public directly to the site and its resources. Establishing the www.pvsfish.org website as an extension of the outreach materials can promote education and awareness efforts. Updates to the website should include format and layout improvements to the homepage to provide clear access to FCEC resources.

5.4 COMMUNITY EVENT OUTREACH

Community events continue to be an effective means of reaching at-risk community members. Outreach partners actively seek events where the FCEC can disseminate important information about fish contamination to affected communities. The EPA uses zip code analyses to guide decisions on community outreach events, focusing on events located near fishing communities. Although community events are less influential among pier anglers, they provide opportunities to educate those who may not fish but still consume fish caught from the Palos Verdes Shelf. Community outreach partners should collaborate with other organizations to diversify events and reach more anglers and their families in the Los Angeles area.

The “What’s the Catch” children’s comic book and the fishing game activity have successfully attracted families and children to the FCEC booths. In this reporting period, the EPA worked with local vendors to improve the fishing game. In June 2025, redesigned materials, including 48 new fish, were added to the booths, and the fishing pole magnet was improved for functionality and safety. Future updates to the “Booth in a Box” content and messaging should be considered, as some materials appear outdated.

Engaging with district educators could effectively raise awareness about local fish contamination among children and increase the visibility of the FCEC program. The EPA and the

FCEC should explore opportunities to connect with the Los Angeles County Unified School District to utilize the FCEC curriculum guide. Additionally, the FCEC should consider collaborating with the school district to include the FCEC QR code for online materials and the FCEC's semiannual newsletter in their school district communications to the public (e.g., school district newsletters).

Previously, staff from the Aquarium of the Pacific in Long Beach and Los Angeles Zoo expressed interest in collaborating with the FCEC to produce permanent displays about Palos Verdes Shelf fish contamination. These potential avenues for expanding community outreach should be evaluated by the FCEC and EPA in future meetings.

5.5 FISH CONTAMINATION EDUCATION COLLABORATIVE PARTNERS MEETINGS

The most recent FCEC meeting was held on 25 May 2025 and was attended by 28 partners representing the EPA, state and local agencies, nonprofit organizations, and local community groups. Topics included EPA program updates, updates on pier angler outreach activities, community outreach events, enforcement activities, discussions regarding outreach material redesign efforts, installation of new pier signs, and programmatic disruptions due to the 2025 Los Angeles wildfires. The continued use of a hybrid format allows FCEC partners to participate in these semiannual meetings. The EPA recommends maintaining this hybrid approach while encouraging in-person attendance when possible to enhance collaboration among the stakeholders.

End Document