Alabama Audubon
Coastal Conservation Programs
2021 Report

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The Alabama Coastal Bird Stewardship Program is a comprehensive conservation and research program focused on protecting shorebirds and their habitats along the Alabama Gulf Coast funded with Deepwater Horizon natural resource damage settlement funds provided by the Alabama Trustee Implementation Group. This project is further supported by the National Audubon Society through funding from the Alabama Department of Conservation and Natural Resources. Additional support was provided by the USFWS Northern Gulf Coastal Program.

Founded in 1946 as the Birmingham Audubon Society, Alabama Audubon has since grown to become the state's leading nonprofit promoting conservation and a greater knowledge of birds, their habitats, and the natural world. While we work closely with our partners at the National Audubon Society, we are an independent 501(c)(3) organization with staffed offices in Birmingham and on the Gulf Coast.

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Background

Alabama Audubon has been monitoring coastal bird populations and breeding success along the coast since the initiation of the Alabama Coastal Bird Stewardship Program in 2017. Prior to the start of the program, there was limited information and data available on the status of coastal bird populations in Alabama. The program was started in response to the BP oil spill in 2010 which had a disastrous effect on Gulf Coast ecosystems. Our Coastal Bird Stewardship Program consists of two main components including Beach Nesting Bird Monitoring and Audubon Coastal Bird Surveys. With the introduction of these components, we started to build a standardized way of collecting valuable data on several coastal bird species along our coast.

Our data collection is primarily focused on 11 species that are particularly susceptible to environmental changes. These species are referred to as our priority bird species, and we collect year-round data on their breeding and non-breeding activities. We also document habitat use for each species and monitor habitat changes observed throughout the breeding season. Alabama has ~600 miles of coastline, 60 miles of which borders the Gulf of Mexico and the remaining along coastal bays and rivers. These areas are vital for birds migrating to breeding or wintering grounds as well as our seasonal breeders and overwintering species.

Shorebird and seabird species are particularly vulnerable to environmental changes and are being challenged by climate change and anthropogenic activity. As the climate continues to warm, sea level rise will lead to more flooding events affecting the nesting success of several beach nesting species. In addition to sea level rise, climate change has the potential to increase the frequency and intensity of tropical weather, significantly impacting available habitat and nest success. Through our data collection we have documented how species are adapting to more anthropogenic related pressures such as habitat loss associated with coastal development. In response to the development of our shorelines, we observed least terns nesting on several gravel rooftops within the coastal region. Continued monitoring efforts are imperative to understanding how coastal birds are utilizing the coast of Alabama and to developing conservation strategies for these species.

Beach Nesting Bird Stewardship

During the 2021 breeding season, symbolic fencing was used to protect approximately 29.25 acres of beach and island habitat. Staff and volunteers conducted outreach and stewardship activities during Memorial Day and Fourth of July weekends in an effort to minimize disturbance to nests and colonies, as well as educate beachgoers about beach nesting birds. Staff and volunteers also participated in Alabama Coastal Birdfest. Audubon staff taught an Advanced Birding Workshop, led birding field trips with volunteers, and tabled at the Bird and Conservation Expo. Volunteers contributed a total of 52 hours to stewardship activities and 456 hours to Audubon Coastal Bird Surveys throughout the year.

Beach Nesting Bird Monitoring

For the 2021 breeding season, Alabama Audubon coastal staff included two full-time Coastal Biologists and one full-time Coastal Coordinator. Additionally, Orange Beach sites were monitored by a full time Coastal Stewardship Coordinator/Conservation Code Inspector, and volunteer Drew Haffenden monitored several sites on Dauphin Island consistently throughout the season. Volunteers contributed a total of 130 hours to beach nesting bird monitoring in 2021.

Study Area

Mobile County

Dauphin Island

One of Alabama's most historically important nesting sites along the coast is Dauphin Island. Dauphin Island is a barrier island ~22 km in length. Since the start of the Alabama Coastal Bird Stewardship Program (ALCBSP), we have been monitoring specific sections of the island known for breeding activity as well as looking for activity in more obscure locations. Sites that were regularly monitored on Dauphin Island this season included: Pelican Island, Public Beach West, Public Beach East, Dauphin Island West End, Katrina Cut, and Far West End (Figures 1 and 2).

Pelican Island

Pelican Island is a ~4 km long peninsula on the southern side of Dauphin Island located near the public pier (Figure 1). It consists primarily of open sand beach and dune habitat with a small section of marsh to the northeast. The southern tip of the peninsula is a tidal flat rich in marine invertebrates that tends to attract several species of shorebirds throughout the year. Historically, least terns have been observed nesting and staging on this stretch of peninsula. Snowy plover chicks and breeding adults have also been observed using the peninsula for refuge and foraging during the breeding season. This section of beach has moderate to low human presence, with more activity during summer months. Symbolic fencing is put up at the first signs of scraping and nest laying to minimize any potential human disturbance.

Public Beach West

Public Beach West is a 1.7 km long section of public beach just to the west of the start of Pelican Island (Figure 1). It consists of open sand beach and dune habitat, with some development to the north. One pair of snowy plovers has been documented utilizing dune habitat on this stretch for breeding activity and has successfully fledged a clutch. Human disturbance is generally moderate to high along this beach, especially during summer months. Symbolic fencing is used when necessary and individual signs are also placed in critical habitat being used by the birds throughout the fledging process.

Public Beach East

Public Beach East is a 2.8 km section of public beach on the eastern section of Dauphin Island (Figure 1). This site primarily consists of open sand beach and dune habitat and is backed by a maritime forest to the north. This location also has a campground access as well as a small residential area on the western edge. Human presence ranges from low to moderate with more activity observed during summer months. We documented our first breeding pair of snowy plovers with a nest at this location in the summer of 2020, when Covid-19 restrictions significantly reduced the amount of human activity on the beach. Federal shorebird nesting signs are placed near pathways leading from the beach to the campground to reduce foot traffic through dunes throughout the year.

Dauphin Island West End

Dauphin Island West End is 2 km in length and begins on the northern shore of Dauphin Island along the Mississippi Sound going west, then wraps around to the southern shore along the Gulf of Mexico (Figure 2). The northern section contains a thin sandy shoreline with salt marsh to one side and open bay on the other. The route crosses salt marsh on the southern shoreline, which consists of some open beach and vegetation to the north. This section has moderate human presence primarily focused on the easternmost shoreline along the gulf that dissipates westward. No solitary or colonial nesting activity was observed this season in this section.

Katrina Cut

Katrina Cut is the 2.4 km middle section of the west part of Dauphin Island that was cut through during hurricane Katrina in 2005 (Figure 2). This section is a renourished flat beach with little to no vegetation braced by a storm wall on the Mississippi Sound side. Three least tern breeding pairs showed interest in the location this season. This section of beach experiences low human disturbance with the majority of foot traffic along the gulf shore.

Far West End

Far West End is a ~11.8 km stretch of beach making up the western most end of Dauphin Island and starts just to the west of Katrina Cut (Figure 2). This section of Dauphin Island primarily consists of beach and dune habitat. Patches of marsh and dense shrub vegetation habitat make up

the area on the Mississippi Sound side to the west of the cut. The site has low to moderate human presence, with most occurring on the further western tip via boat landings.

Little Dauphin Island

Little Dauphin Island is a ~5 km long island that borders the Gulf of Mexico and is separated from Dauphin Island by an inlet (Figure 1). The island is managed and protected by Bon Secour National Wildlife Refuge and was periodically monitored by Alabama Audubon staff this season. The site is only accessible by boat and was broken into three sections by Hurricane Sally in the fall of 2020. The island is made up of sandy beaches with some sections of marsh and maritime forest on the southwest side that borders the inlet. Least tern breeding attempts were documented on the first section of the island this season. Little Dauphin Island is undeveloped and has little to no human presence; permission is required from the wildlife refuge to access the island.

Sound Side Beach

Sound Side Beach is located on the west end of Dauphin Island just to the east of Dauphin Island West End (Figure 2). The area is residential and highly developed. Houses border the Mississippi Sound and are located on sparsely vegetated, sandy lots. Permission from private landowners has to be granted to monitor any nesting activity that is observed. Least terns were documented with breeding attempts on one lot this season.

Lightning Point

Lightning Point is a recently completed restoration site located in Bayou La Batre where ~0.16 km² of marsh, tidal creeks, and upland forest has been created (Figure 3). We periodically monitored the accessible area for any priority bird breeding activity. This area is primarily composed of mud and intertidal flats, marsh, and tidal creeks. Least tern and American oystercatcher breeding activity was documented at this location this season. The area is restricted; however, it does experience some human disturbance as people have been observed fishing along the jetty wall.

Cat Island

Cat Island is ~ 0.01 km² and privately owned (Figure 3). The island consists primarily of an open sandy beach with oyster shell ridges and a small amount of shrub habitat in the center. Several colonial nesting species were observed nesting on the island this season including one of our high priority species, the black skimmer. We also observed one pair of American oystercatchers attempt to nest along the oyster shell ridge. This site has very little to no human presence and is only accessible by boat.

Coffee Island

Coffee Island (Isle aux Herbes) is ~1.5 km² and only the western side is accessible (Figure 3). A 0.7 km route that runs along this side of the island includes the majority of observed breeding activity by colonial and solitary nesting species. The shoreline consists mainly of oyster shell hash, providing perfect nesting habitat for American oystercatchers. The center portion of the route is lined by

shrub habitat where several species of wading birds have been observed nesting and roosting. In addition to the shrub and oyster shell hash, Coffee Island has a significant amount of marsh habitat. We were able to capture snapshots of breeding activity by American oystercatchers and black skimmers on the island this season around seafaring conditions. Coffee Island is only accessible by boat and experiences very little to no human disturbance.

Marsh Island

Marsh Island is ~0.2 km² and consists of marsh and mudflat habitat with some sections of sparsely vegetated sand (Figure 3). Marsh Island was part of a restoration project to restore 0.20 km² (50 acres) of saltmarsh habitat along the coast after the Deepwater Horizon oil spill. Dredge material and native plants were added on the northern section of the island and breakwaters were implemented on the southern side to prevent further erosion. Historically the island has provided breeding habitat for several colonial and solitary nesting species including some of our priority species. Due to the expansion of marsh habitat on the northern side it has become increasingly challenging to land on the island. We were only able to land on the island one time this season and did not observe any nesting activity of priority species. Observations and monitoring primarily occurred scoping from the boat when conditions were favorable. A laughing gull colony of significant size was documented breeding on Marsh Island this season and could have limited the space available for other colonial nesting species. This island is undeveloped and experiences little to no human disturbance throughout the year.

Tern Island

Tern Island (Sand Island) is ~0.06 km² and was once part of Pelican Island (Figure 1). Due to the lack of vegetation and constant exposure to coastal elements, the island is constantly subjected to over wash, erosion, and degradation. The open sandy beach and sparse vegetation appeals to many colonial nesting birds including least terns and black skimmers, which were documented nesting there in decent numbers this season. Tern Island is managed by the Alabama Department of Conservation and Natural Resources and public activity is discouraged during the breeding season. Federal and Alabama Audubon nesting signs are deployed around the perimeter of the island prior to nesting activity. Human disturbance ranges from low to high; highest on Memorial Day and Fourth of July holiday weekends when boaters often anchor along the shore.

Baldwin County

Beach Club Resort and Spa

Beach Club Resort and Spa has been utilized as a breeding location for a least tern colony each year since the coastal program began monitoring the site in 2018. The area in which the least terns nest is within an ~0.015 km² empty lot, consisting primarily of sand and short scrub grasses (Figure 4). Small ponds are scattered throughout the resort which are utilized by the terns for foraging. Due to the location of the lot within the resort, the colony experiences frequent disturbance from passing

vehicles and walkers. Symbolic fencing is set around sections of the lot each year prior to the arrival of the colony to dissuade people from walking through the lot.

Gulf State Park

Gulf State Park is a ~3.60 km stretch of beach located in Gulf Shores (Figure 5) and has beachfront and dune habitats. The state park has been used as a nesting site for species such as least terns, snowy plovers, common nighthawks, and killdeer. The site has medium to high human presence, especially throughout the summer months. The highest density of human presence occurs on the eastern and western most ends of the site, as the eastern end contains a pavilion and the western end has a lodge and fishing pier. Signs are up year-round on the site to dissuade visitors from entering the dunes, however symbolic fencing is used as needed during the breeding season to ensure minimal disturbance to nesting species.

Piggly Wiggly Rooftop

Least terns have attempted to nest on the rooftop of a Piggly Wiggly supermarket each year since monitoring of the site began in 2019. The building is located in Fairhope, ~2.5 km east of Mobile Bay (Figure 6). About 0.5 km to the southeast is a small pond, which is believed to be a foraging area for the colony. The site has an almost constant presence of laughing gulls and crows and is surrounded by commercial and residential buildings.

City of Orange Beach

Alabama Point East

Alabama Point East is ~2.2 km long located on the east side of the Perdido Pass in Orange Beach and is part of Gulf State Park (Figure 7). It contains both beachfront and dune habitats and has been a nesting site for least terns since we began documenting breeding in 2018. This beach has a very high human presence, especially during the summer months. Symbolic fencing is set along the entire stretch of beach each year prior to the arrival of the terns in an effort to dissuade visitors from entering the dunes.

Alabama Point West

Alabama Point West is a small area of private beach ~0.01 km² located on the west side of the Perdido Pass in Orange Beach (Figure 7). Least tern colonies have been successful at this site in the past, however in recent years there has been an increase in coyote and feral cat presence which led to the failure of a colony in 2018. The terns have not attempted nesting at the site in the past three years due to the increased predator pressure, though we continue to monitor the site in the event that a colony does attempt to nest. Symbolic fencing was utilized at the site during 2018-2020, however due to conflicting private property easement privileges we were asked to remove the fencing in 2021.

No Fly Zone

The No Fly Zone consists of several residential private properties and vacant lots encompassing ~0.03 km² of beach and dune habitats (Figure 7). The site is surrounded to the east and west by large condos and has a very high human presence during summer months. Monitoring of the colony began in 2018, however least terns have been known to nest on the site for years before monitoring began. Symbolic fencing is set prior to the arrival of the terns each year with permission from the property owners to dissuade beach goers from entering the colony.

Shallow Lot

Shallow Lot is a privately owned empty lot consisting of a~0.03 km² of dune habitat (Figure 7). Least terns have been monitored nesting on the site since 2018, however they are known to have nested on the site in years prior as well. Staff were unable to enter the property to conduct surveys, so all monitoring was done from the beach and roadside. The site has a high human presence during summer months and beachgoers often walk through the lot to get onto the beach. We have reached out to the landowners for permission to set symbolic fencing around the colony, however it has been denied as development is set to begin soon.

Summer Salt

Summer Salt is a construction site encompassing ~0.03 km² and is composed primarily of sandy lots and paved roads (Figure 7). It is located 0.6 km north of the gulf and is surrounded to the north and south by wetlands. Work on the site was paused when least tern nests were first observed. Human presence at the location is low, with few cars using the paved roads. The lot will likely be fully constructed with over 60 residential homes before the 2022 breeding season.

Walker Island

Walker Island is in the Perdido Pass and is owned by the City of Orange Beach (Figure 7). The island encompasses ~0.02 km² and is composed primarily of sandy shorelines and thick vegetation in the center. This island is a sanctuary for many loafing birds as well as least terns that are part of the rooftop colonies in the area. This island does not allow the beaching of boats and is surrounded by seagrass beds. It is frequently washed over during storms and high tides, so it has not supported any active colonies and nesting attempts have not been successful.

Robinson Island

Robinson Island is in the Perdido Pass and is owned by the City of Orange Beach (Figure 7). The island encompasses ~0.04 km² and is composed of small areas of sandy beach all along the shore. The interior of the island is composed of a large marsh area with several different types of vegetation. This island supports a very large rookery of great blue herons on the north side. The rookery remains fenced all year long to prevent disturbance. This island has never had any successful nests, nor has it supported a colony since we began documenting least tern activity in 2018.

Bird Island

Bird Island is owned by the State of Alabama and encompasses ~0.04 km². It is composed primarily of sandy shorelines used for boating recreation. This island is the most southern island of the three islands located within the Lower Perdido Islands system (Figure 7). The center of the island is composed of thick vegetation with a few sandy areas. This area remains fenced off all year to prevent foot traffic. The last successful nesting attempt by least terns occurred in 2018.

Table 1. Study area sites and nesting species present at those sites during the 2021 breeding season.

Mobile County	Species
Pelican Island, Dauphin Island	Least tern, snowy plover
Public Beach West, Dauphin Island	Least tern, snowy plover
Public Beach East, Dauphin Island	n/a
West End, Dauphin Island	n/a
Katrina Cut, Dauphin Island	Least tern
Far West End, Dauphin Island	Least tern, snowy plover
Little Dauphin Island, Dauphin Island	Least tern
Sound Side Beach, Dauphin Island	Least tern
Cat Island, Portersville Bay	Black skimmer, American oystercatcher
Coffee Island, Porterville Bay	Black skimmer, American oystercatcher, reddish egret
Marsh Island, Portersville Bay	n/a
Tern Island, Portersville Bay	Least tern, black skimmer, American oystercatcher
Lightning Point, Coden	Least tern, American oystercatcher
Baldwin County	
Beach Club Resort and Spa, Fort Morgan	Least tern
Gulf State Park, Gulf Shores	Least tern, snowy plover
Piggly Wiggly, Fairhope	Least tern
Alabama Point, Orange Beach	Least tern, black skimmer
Alabama Point West, Orange Beach	Least tern
No Fly Zone, Orange Beach	Least tern
Shallow Lot, Orange Beach	Least tern
Summer Salt, Orange Beach	Least tern
Walker Island, Orange Beach	Least tern
Robinson Island, Orange Beach	Least tern
Bird Island, Orange Beach	Least tern

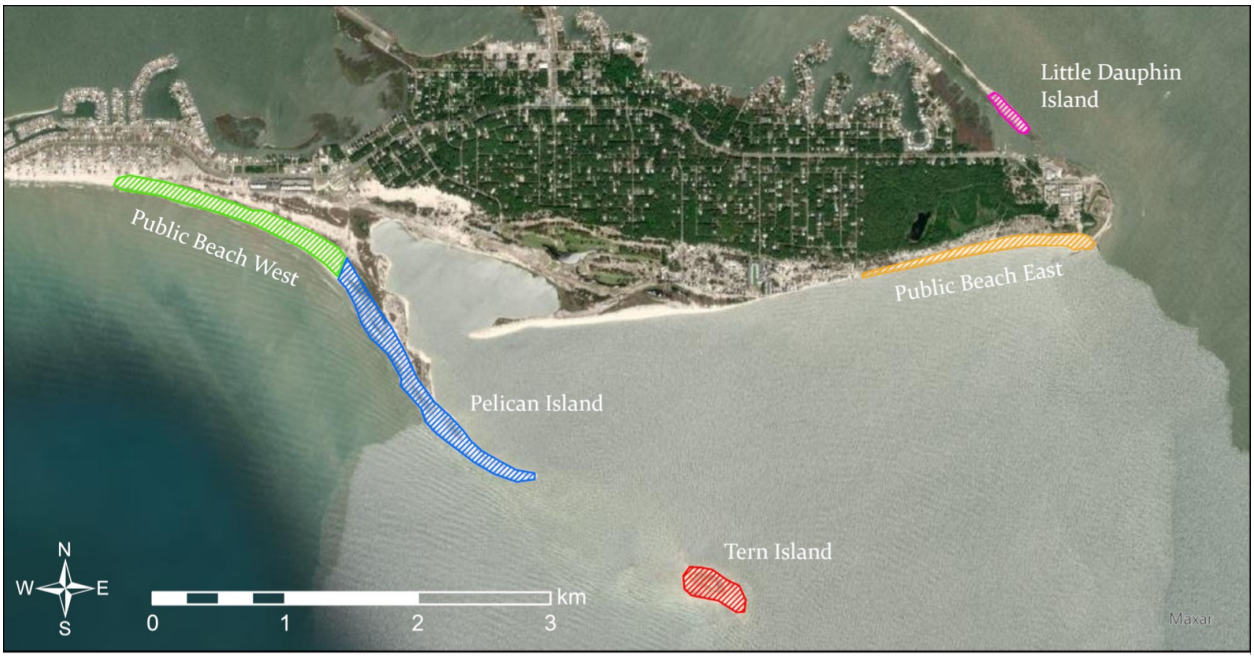

Figure 1. Dauphin Island eastern sites monitored during the 2021 breeding season.

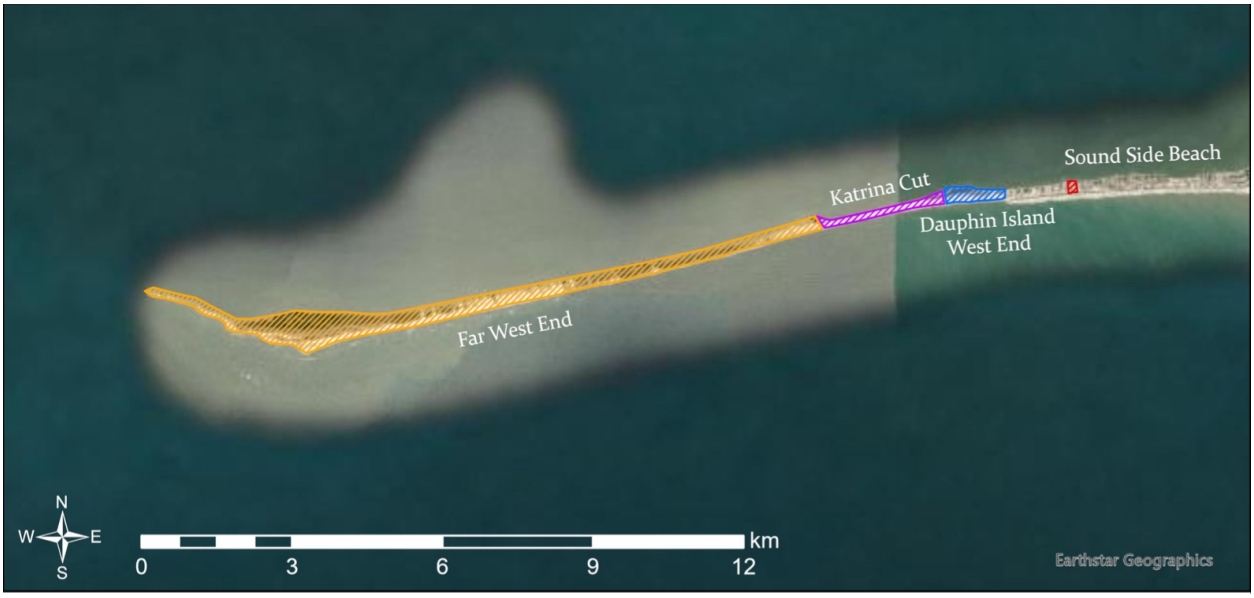

Figure 2. Dauphin Island western sites monitored during the 2021 breeding season.

Figure 3. Portersville Bay sites monitored during the 2021 breeding season.

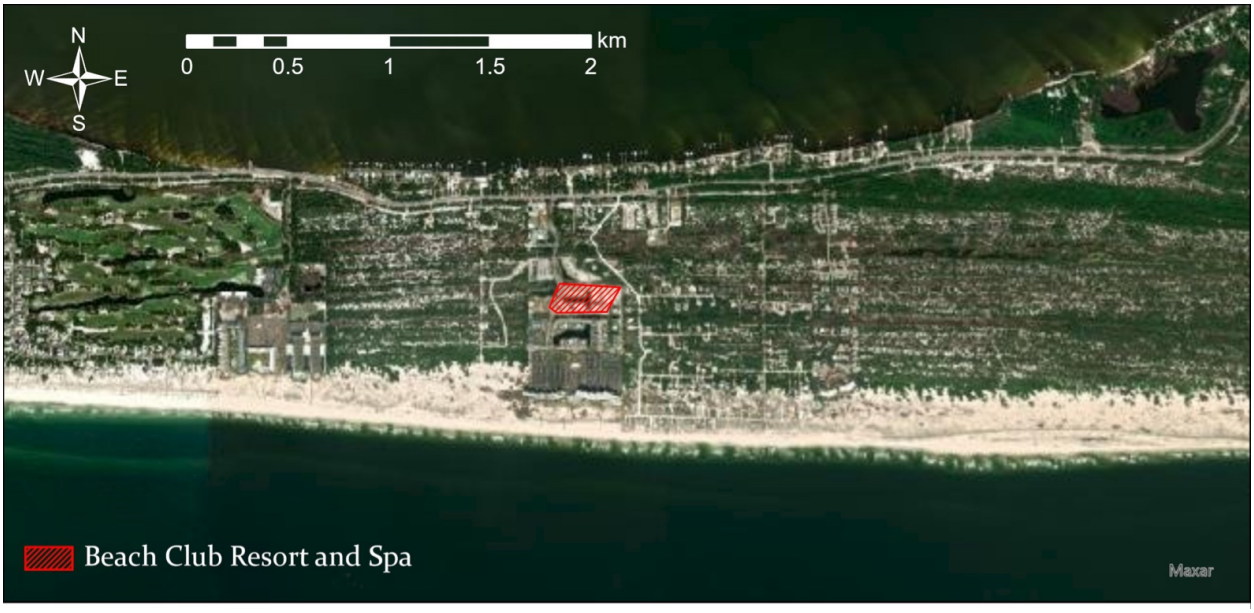

Figure 4. Location of the Beach Club Resort and Spa on Fort Morgan peninsula.

Figure 5. Gulf State Park sites monitored during the 2021 breeding season.

Figure 6. Location of the Piggly Wiggly in Fairhope, Alabama.

Figure 7. City of Orange Beach sites monitored during the 2021 breeding season.

Survey Methods

Monitoring efforts were focused on sites that supported breeding activity during the 2018, 2019, and 2020 nesting seasons in Baldwin and Mobile counties. Mainland sites with no breeding activity were surveyed a minimum of once per week, where sites with recorded breeding activity were surveyed twice per week. Nearshore island sites were surveyed approximately one-two times per month, as weather and boat availability allowed.

Solitary nesting surveys (i.e., snowy plover, American oystercatcher) began in early February in order to search for adult birds displaying breeding behavior. When breeding adults or active nests were observed, we recorded the following data: adult behavior, number of eggs or chicks, number and location of roving chicks, and active disturbances and/or predator tracks within 15 m of the nest. In the event of nest failure, the cause was determined through evidence observed in or around the nest site including predator tracks, eggshell fragments, or wrack lines. In instances where the cause could not be determined through evidence, the loss was recorded as unknown. Colonial nesting surveys (i.e., least tern, black skimmer, reddish egret) began in early April. Sites that had been previously utilized by nesting colonies were fenced prior to the colony's arrival. Data recorded during colonial surveys included: numbers of adult birds, breeding pairs, nests, chicks, fledglings, as well as active disturbances and/or predator tracks within 15 m of the colony. We categorized least tern chicks within a colony by age estimated in days, with the categories set at 1-5, 6-10, 11-15, and 16-20 days. Game cameras were deployed at two least tern colonies in an effort to capture evidence of disturbance or depredation. A total of 234 solitary and 386 colonial nesting surveys were conducted throughout the breeding season.

Snowy Plover

We monitored seven snowy plover nests during the 2021 breeding season, six on Dauphin Island and one at Gulf State Park (Figures 8 and 9). A nest was considered successful if at least one egg hatched, and chicks were considered successfully fledged at 30 days old or if observed making sustained flights. We observed two chicks approximately four days old near Public Beach West prior to locating the nest. Of the five snowy plover nests located on the Far West End of Dauphin Island, two had confirmed evidence of fox depredation. The other three nest fates were recorded unknown; however, fresh fox tracks were documented ~1 m from one of the empty scrapes. The nest that hatched at least one chick was suspected to have failed due to avian depredation as a volunteer reported an extremely territorial gull-billed tern near the location. Both this nest and the last nest to be recorded for the season on Far West End were located in an area subject to tidal flooding. The cause of abandonment for the nest located at the Gulf State Park is believed to be due to coyote presence, as tracks were observed within 2 m of the nest when it was first found. Overall productivity across all sites was 0.28 fledglings/pair (Table 2). This is consistent with the productivity of the past two years, with 0.33 fledglings/pair in 2019 and 0.25 fledglings/pair in 2020.

Table 2. Snowy Plover breeding season metrics in 2021

Site	Pairs	Total Nests	Failed Nests	Chicks	Fledglings
Gulf State Park	1	1	1	0	0
Public Beach West	1	1	0	2	2
Far West End	6	5	4	1	0

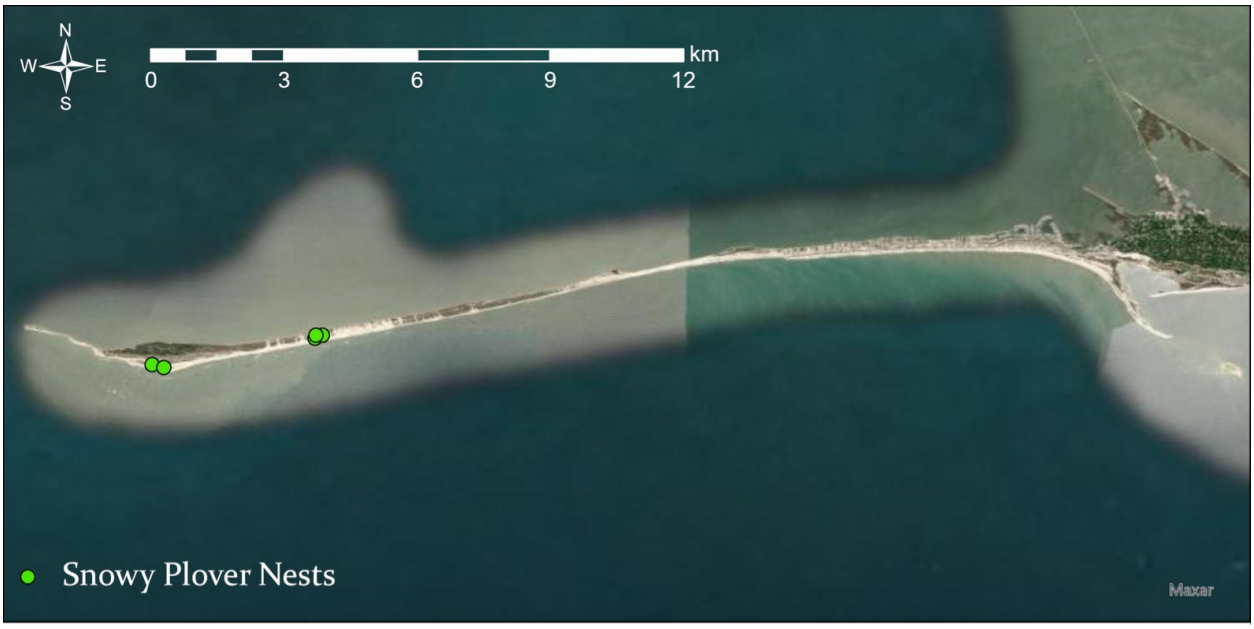

Figure 8. Snowy plover nest locations on Dauphin Island during the 2021 breeding season.

Figure 9. Snowy plover nest location in Baldwin County during the 2021 breeding season.

American Oystercatcher

Four American oystercatcher nests were monitored during the 2021 season; one nest each located on Coffee Island, Cat Island, Tern Island, and Lightning Point (Figure 10). The nest on Tern Island was found after hatching as three chicks ~14 days old were observed during the first survey on 07 May. The initiation date of the nest is estimated to be near the 24 of March. The fate of the nest located on Coffee Island was unknown. The nest was last observed on 12 April and an egg float was conducted to estimate the initiation date, at which time the eggs were estimated to be between ten and 18 days into incubation. A subsequent survey on 24 May failed to show any chicks, however the pair (one banded: UL: C0 LL: -- UR: C0 LR: metal) was observed displaying territorial behavior. Weather and boat availability prevented us from surveying the island again until 08 July, during which time a pair of unbanded adults was observed with a juvenile. The natal nest for this juvenile oystercatcher is unknown. Another pair was observed (one banded: UL: JT LL: -- UR: JT LR: metal) on Coffee Island displaying territorial behavior on 24 May, however no nests or chicks for this pair were found. Two chicks with a breeding pair were reported on the south-west side of the island around this time by Dr. Dindo with the Dauphin Island Sea Lab. The nest located on Cat Island is believed to have been lost due to over wash from Tropical Storm Claudette as the location was close to the high tide line and no nest or chicks were observed during subsequent surveys. The productivity across all sites throughout the year was 0.75 fledglings/pair (Table 3). This is a decrease from 2019's productivity, which was 1.0 fledglings/pair. Data could not be compared to the 2020 season as American oystercatcher nests were not monitored due to the lack of access to nearshore islands during Covid-19 restrictions.

Table 3. American oystercatcher breeding season metrics in 2021.

Site	Pairs	Total Nests	Failed Nests	Chicks	Fledglings
Cat Island	1	1	1	0	0
Coffee Island	2	1	0	2	Unknown
Tern Island	1	1	0	3	3
Lightning Point*	1	1	1	0	0

*Suspected nest due to territorial behavior of adults, however the nest was not accessible and could not be directly observed.

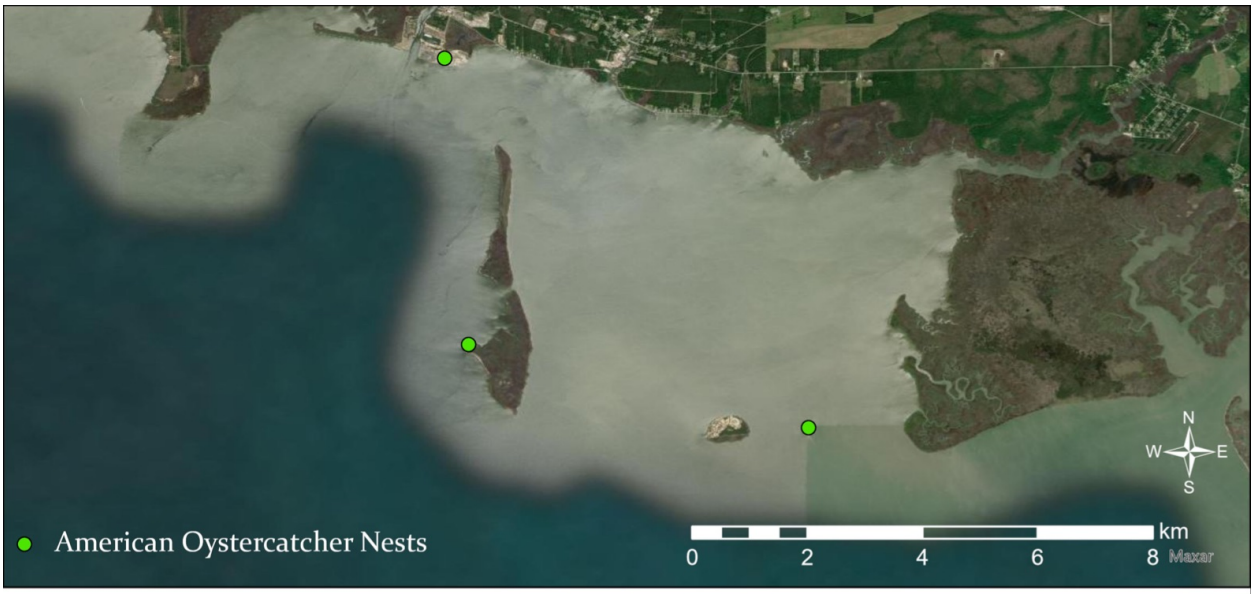

Figure 10. American oystercatcher nest locations during the 2021 breeding season, Mobile county. *Not including Tern Island nest as the nest itself was not observed.

Black Skimmer

Black skimmer colonies were monitored on three nearshore island sites during the 2021 breeding season: Cat Island, Coffee Island, and Tern Island (Figure 11). Colonies on each site successfully hatched and fledged chicks. The leading cause for nest and chick failure on all three sites was over wash due to high tides and storm surges. Unfortunately, due to weather conditions and boat availability, there were gaps in data where we could not access the sites for up to six weeks. These data gaps lead to low nest, chick, and fledgling counts. Overall productivity for the season is estimated at 0.10 fledglings/pair (Table 4). This is significantly lower than the previous two years where 2019 had a productivity of 0.32 fledglings/pair, and 2020 had 0.40 fledglings/pair. The 2020 data is only representative of nests that were located on the mainland and Little Dauphin Island, as the nearshore islands could not be monitored due to Covid-19 restrictions.

Table 4. Black skimmer breeding season metrics in 2021.

Site	Pairs	Total Nests	Failed Nests	Chicks	Fledglings
Cat Island	45	32	20	15	10
Coffee Island	100	124	77	47	8*
Tern Island	84	97	48	48	4*

*Fledgling counts are a low estimate. Only flight capable chicks that were observed by staff are included, however it is likely that chicks fledged and left the site between surveys.

Figure 11. Black skimmer colony locations during the 2021 breeding season, Mobile County.

Least Tern

Least tern colonies were monitored on 16 sites throughout Mobile and Baldwin Counties (Figures 12 and 13). Sites with nesting colonies included one nearshore island, one rooftop, and ten sites on the mainland. Causes for nest and chick loss throughout the season included avian and mammalian predation, human disturbance, and over wash. Approximately 220 nests were lost on Tern Island due to over wash from Tropical Storm Claudette, which brought high winds and storm surge to the Alabama coast on 19 June. Game cameras deployed on the Piggly Wiggly rooftop and at Beach Club Resort and Spa captured evidence of depredation from fish crows and coyotes, respectively. Colonies on Dauphin Island faced depredation from red foxes as a primary cause of nest failure, as fox tracks were observed at least tern nest sites.

Human disturbance was the leading cause of nest failure in colonies located at Orange Beach sites. Most of the sites have a very high human presence in the summer months, and least tern eggs were found having been stepped on and driven over. The colony located at Summer Salt faced

disturbance and predation from mammalian predators. Fox and cat tracks were observed at the site and deceased chicks were found with puncture wounds (Figures 14 and 15). This disturbance led to the abandonment of most of the colony.

The productivity across all sites was estimated at 0.11 fledglings/pair (note that at sites where there were more pairs than nests, we used the number of nests for productivity estimates; Table 5). This is lower than last year's productivity of 0.21 fledglings/pair but higher than the 0.02 fledglings/pair in 2019.

Table 5. Least tern breeding season metrics for 2021.

Site	Pairs	Total Nests	Failed Nests	Chicks	Fledglings
Beach Club Resort and Spa	50	49	14	38	20
Alabama Point East	86	56	8*	31	28
Alabama Point West	1	0	0	0	0
No Fly Zone	50	74	18	27	12
Shallow Lot	37	35	9	13	0
Summer Salt	90	94	55*	6	0
Gulf State Park	8	6	6	0	0
Piggly Wiggly Rooftop	5	7	7	0	0
Far West End	3	0	0	0	0
Pelican Island	22	3	3	0	0
Public Beach West	1	0	0	0	0
Sound Side Beach	3	2	2	0	0
Katrina Cut	3	1	1	0	0
Lightning Point	15	6	6	0	0
Little Dauphin Island	4	0	0	0	0
Tern Island	300	227	227	0	0

*Failed nest numbers may be higher as nests in the colony had unknown fates.

Figure 12. Least tern colony locations during the 2021 breeding season, Baldwin County.

Figure 13. Least tern colony locations during the 2021 breeding season, Mobile County.

Figure 14. Least tern chicks found with puncture wounds at Summer Salt on 03 August 2021.

Figure 15. Raccoon and cat tracks observed at Summer Salt.

Reddish Egret

We documented two reddish egret pairs exhibiting breeding activity on Coffee Island during the 2021 breeding season. The first pair was observed building a nest on 06 April on the northwestern side of the island in an inaccessible area of shrub. The second pair produced a chick that was observed on 08 July in a nest located among several other nesting heron and egret species along the surveyed route (Figure 16). No other breeding activity was documented throughout the season however, two juveniles were observed foraging on Tern Island and Pelican Island the second week of August.

Figure 16. Reddish egret nest/chick location on Coffee Island.

Predation and Disturbance

Predation was a significant cause of nest failure for the 2021 breeding season in both Mobile and Baldwin Counties. We deployed one of the game cameras at the Beach Club least tern colony from 05 May to 02 August. Two instances of a coyote within the colony were captured by the game camera, both resulting in predation of chicks and nests. The first coyote disturbance to the colony occurred on 16 July and resulted in an estimated loss of 11 nests and four chicks (Figure 17). The second occurred on 24 July and resulted in an estimated loss of three nests and three chicks (Figure 18). At the end of the breeding season when no nests or chicks remained, the site was searched for evidence of abandoned or failed nests. Six eggs were observed with no evidence of predation. The cause of failure for the six eggs is unknown.

We also deployed a game camera at the Piggly Wiggly rooftop colony from 29 April until 23 June after nesting activity had ceased. Evidence of depredation by fish crows was caught via the game camera, along with the presence of laughing gulls within the colony (Figures 19 and 20). Figure 21 shows at least four fish crows were present during the depredation event.

Figure 17. Game camera photo of a coyote in the Beach Club least tern colony during the early morning of 16 July 2021.

Figure 18. Game camera photo of a coyote in the Beach Club least tern colony during the early morning of 24 July 2021.

Figure 19. Game camera photo of a fish crow depredating a least tern nest on the Piggly Wiggly rooftop on 17 June 2021.

Figure 20. Game camera photo of a laughing gull within the Piggly Wiggly least tern colony on 18 June 2021.

Figure 21. Came camera photo of four fish crows within the Piggly Wiggly least tern colony on 17 June 2021.

Predator Surveys

Standardized predator surveys were conducted at various locations throughout Mobile and Baldwin County this breeding season in hopes to better understand predator activity along the Alabama Coast. To determine where the survey would occur, random numbers were generated using the average number of minutes it takes to complete the survey for the specific site. This random number was then used as the minutes passed to then conduct the circle survey. Once the random location was determined, coastal biologists would record all predator and human tracks within the 10 m diameter from the predetermined point. Ghost crab tracks and holes are denoted as GHCR-T, GHCR-H, respectively. Other data points that were recorded included: substrate type (packed sand, loose sand, soft mud, hard mud, shell hash), ground saturation (dry, moist, saturated, puddled), and the beach zone (forebeach, backbeach, foredunes, interdunes, backdunes, tidal flat/salt flat). Observers also noted any recent wind and rain within 24 hours of the conducted survey.

Mobile County Sites

Predator circle surveys were conducted for the following locations on Dauphin Island: Public Beach West, Public Beach East, Pelican Island, Dauphin Island West End, Katrina Cut, and the Far West End. One circle survey was conducted during each site visit at these locations except for the Far West End, where three surveys were conducted. Circle surveys were also conducted on Little Dauphin Island when the island was accessible.

15 circle surveys were conducted at Public Beach West of which the majority occurred within the forebeach (Figure 22). Evidence of humans and ghost crabs were observed in each section surveyed whereas no fox tracks were observed. Snowy plover nest, PBWE 101, was located along Public Beach West, however we are unable to correlate any predator circle surveys to that location as it was observed after chicks had hatched. 10 of the 11 circle surveys that were conducted at Public Beach East were in the forebeach (Figure 23). The other survey fell within the foredunes. Human and ghost crab tracks were observed in both sections. Fox and gull tracks were documented in the forebeach section.

Circle surveys randomly occurred within the forebeach, foredunes, and interdunes on Pelican Island (Figure 24). Ghost crab presence was documented in all sections surveyed whereas fox tracks were only observed in the forebeach and foredunes. Human tracks were noted in both the foredunes and interdunes. All sections on Dauphin Island West End were randomly selected for surveys this breeding season (Figure 25). Fox and ghost crab tracks were documented within all the beach sections. Human tracks were observed in the forebeach, foredunes, and interdunes. A total of 11 surveys were conducted on Katrina Cut where nine occurred in forebeach and two occurred in the foredunes (Figure 26). Fox and ghost crab activity were documented in both zones and human presence occurred in the forebeach. An unsuccessful least tern nest was found in the foredune section of Katrina Cut on 02 June. On this same day a circle survey was conducted within 3 m of the nest location which included evidence of fox and ghost crab presence.

A total of 47 predator surveys were conducted on the Far West End of Dauphin Island. All sections had ghost crabs, and four of the five beach zones documented fox presence (Figure 27). Two circle surveys conducted on 09 June were approximately 200 m from the location of nest FAWE 103. The substrate in both locations was packed, saturated sand as a result of recent rain and could have influenced documented predator activity. Circle #1 was conducted in the interdunes and contained one set of fox tracks and two GHCR-H. Circle #2 was conducted in the backdunes and contained eight GHCR-H. Fox depredation of nest FAWE 103 was later documented on 15 June when the observer noted fox tracks on and leading to an empty nest. Circle surveys that were conducted on 15 June were over 3 km from the empty scrape.

We suspected that nest FAWE 104 was a renest of the pair that produced nest FAWE 103. Of the three circle surveys conducted on 24 June, circle #2 was the closest to the inactive nest location. This circle was randomly conducted at the empty nest location. The substrate recorded for the location was loose, moist sand and no weather interference was observed. Circle #2 was conducted in the interdunes and contained six sets of fox tracks, three sets of GHCR-T, and four GHCR-H. The other circles were conducted over 2 km from the nesting location. Fox depredation of nest FAWE 104 was concluded by observed fox tracks on the empty nest and leading to a broken egg with recently spilled yolk.

This breeding season coastal biologists monitored a section of Little Dauphin Island where colonial nesting species such as least terns and black skimmers have attempted to nest historically. This section of the island does not fit the typical beach profile exhibited by other locations. The area surveyed primarily consisted of open beach, building in elevation towards the middle. Therefore, the only habitat type available to be sampled was the forebeach (Figure 28). Location points within this section were randomly selected using the same methodology.

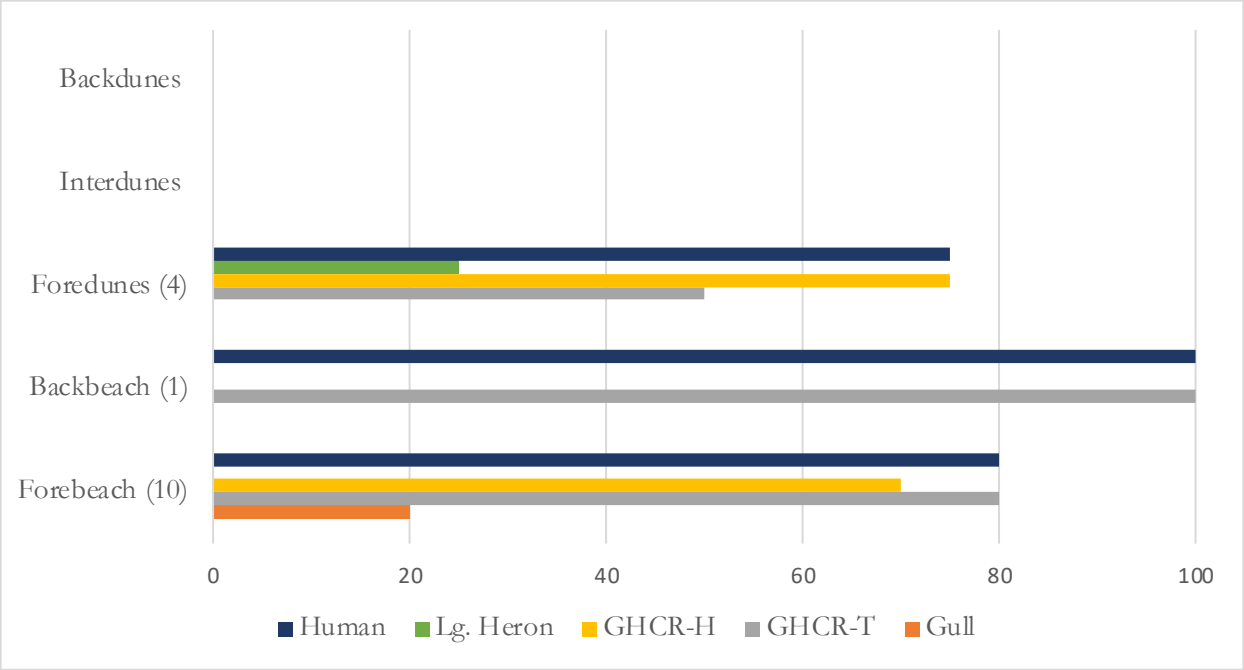

Figure 22. Percentages of high priority predator presence documented on Public Beach West. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

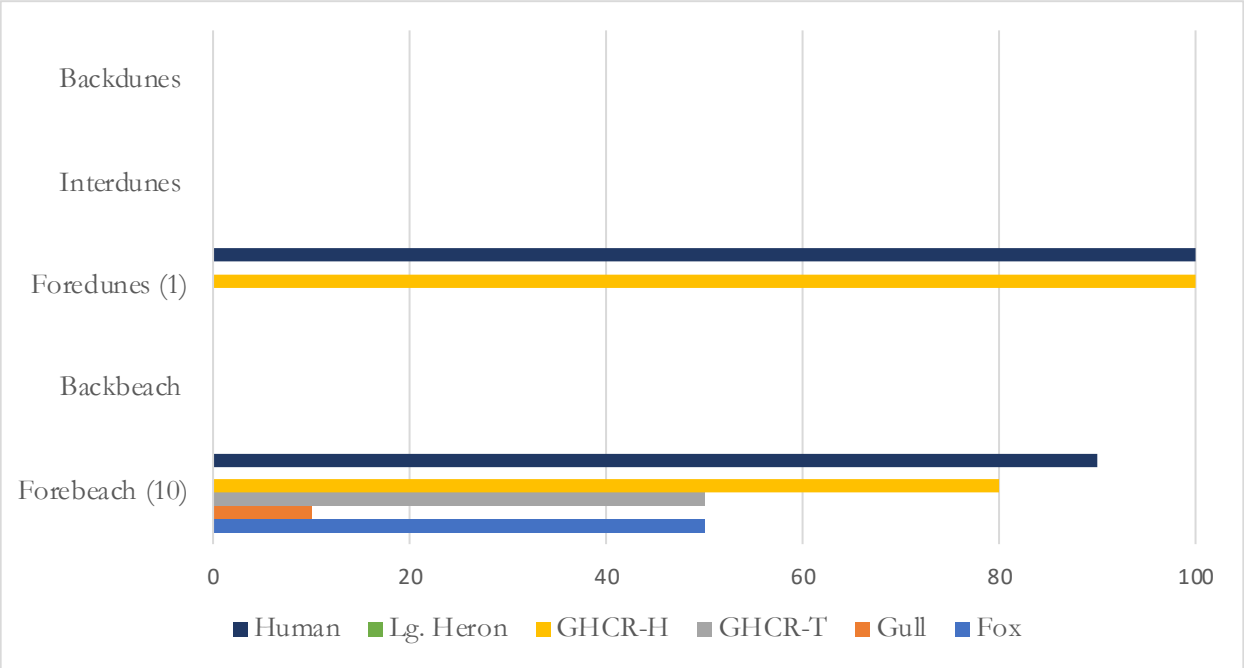

Figure 23. Percentages of high priority predator presence documented on Public Beach East. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

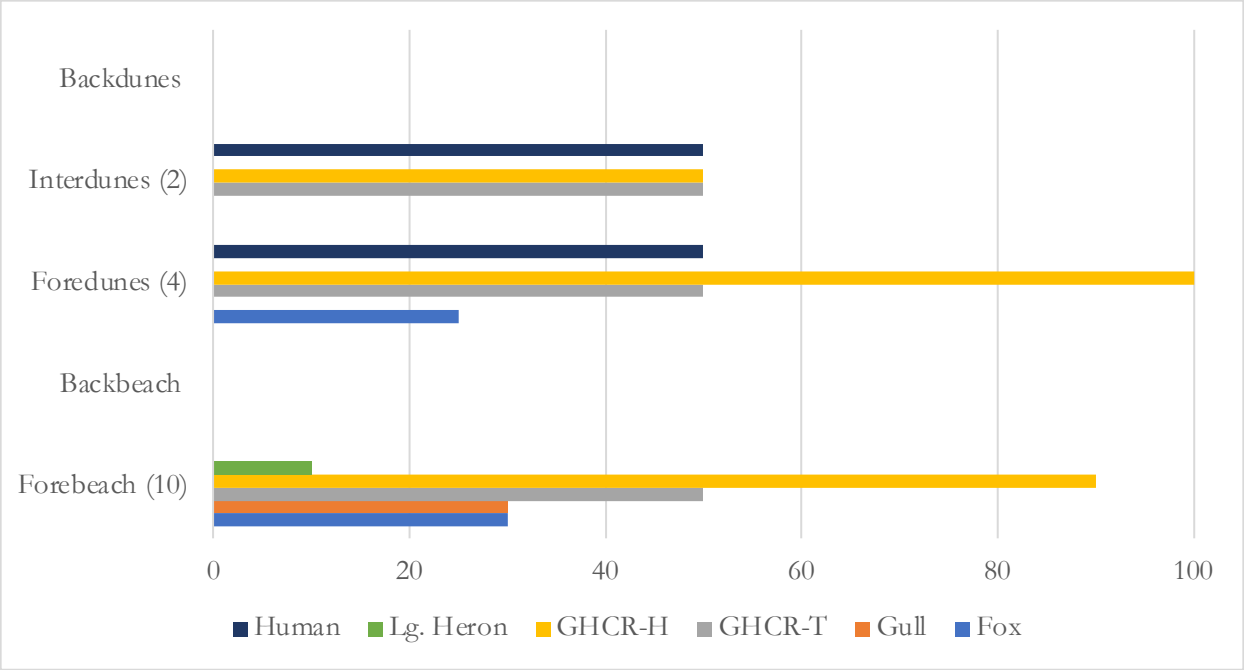

Figure 24. Percentages of high priority predator presence documented on Pelican Island. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

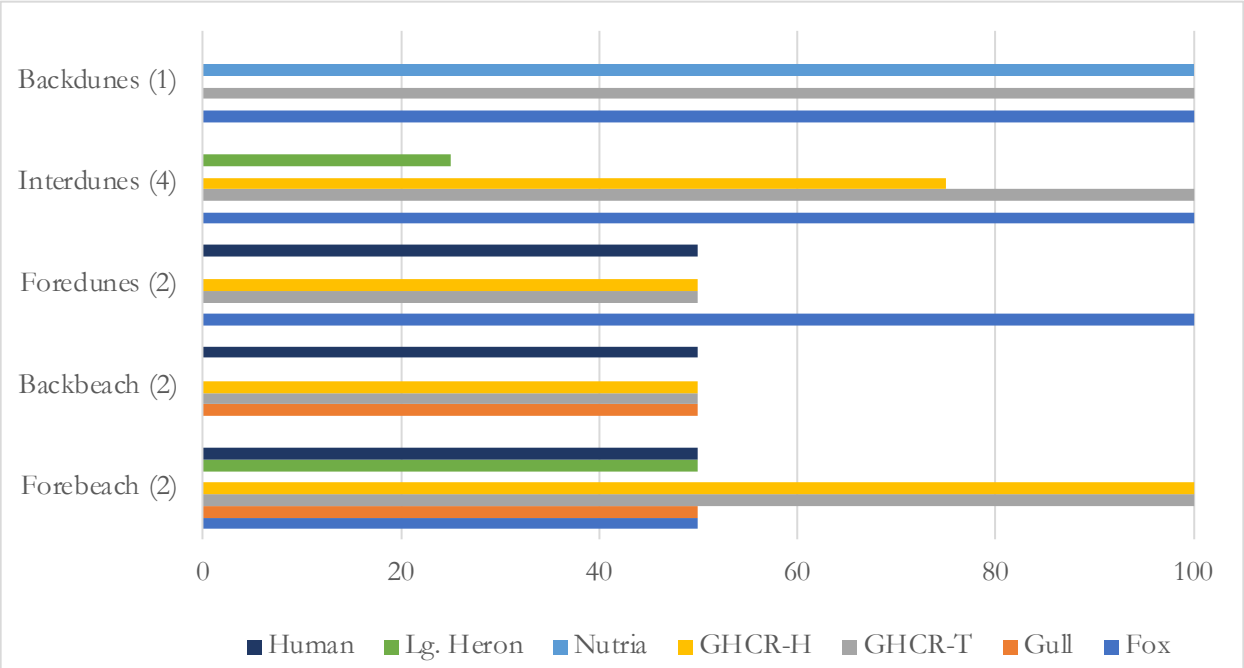

Figure 25. Percentages of high priority predator presence documented on Dauphin Island West End. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

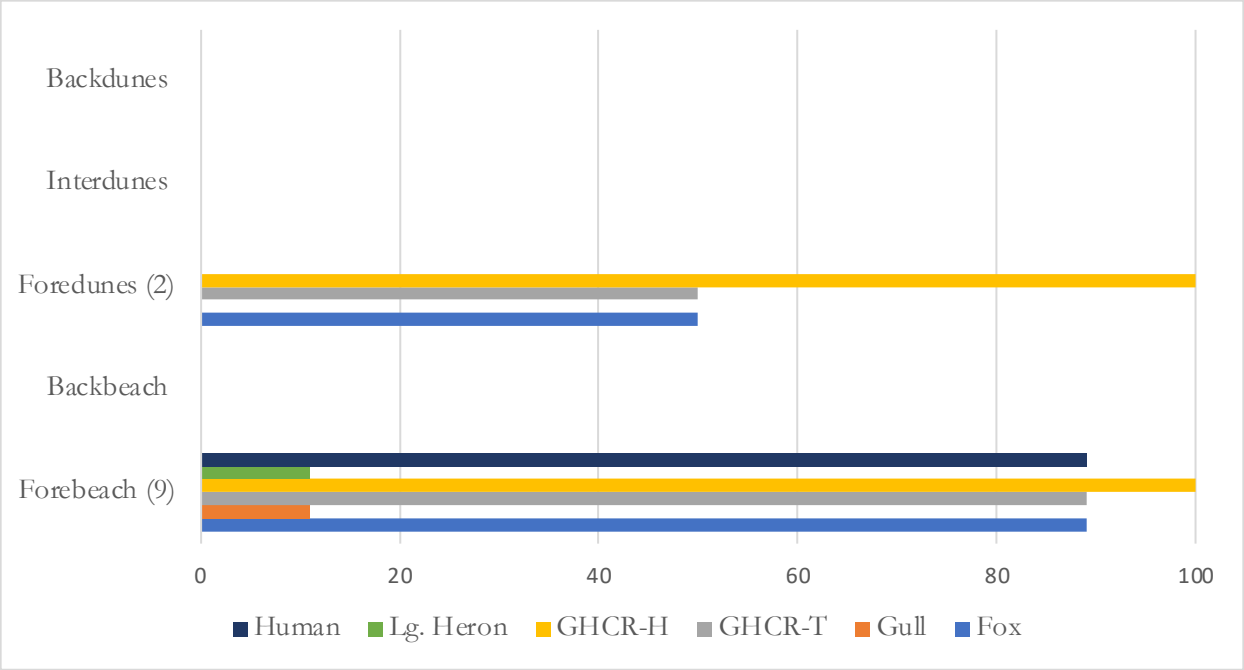

Figure 26. Percentages of high priority predator presence documented on Katrina Cut. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

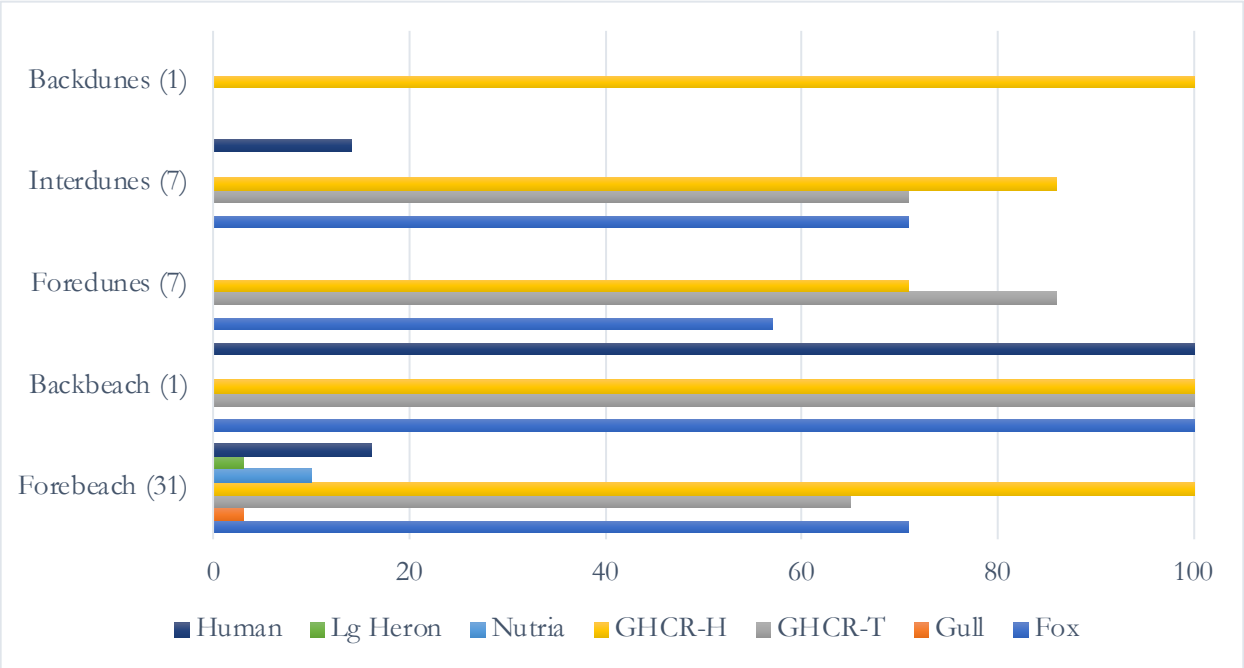

Figure 27. Percentages of high priority predator presence documented on Far West End. Numbers next to the beach zone are the total number circle surveys conducted at the site.

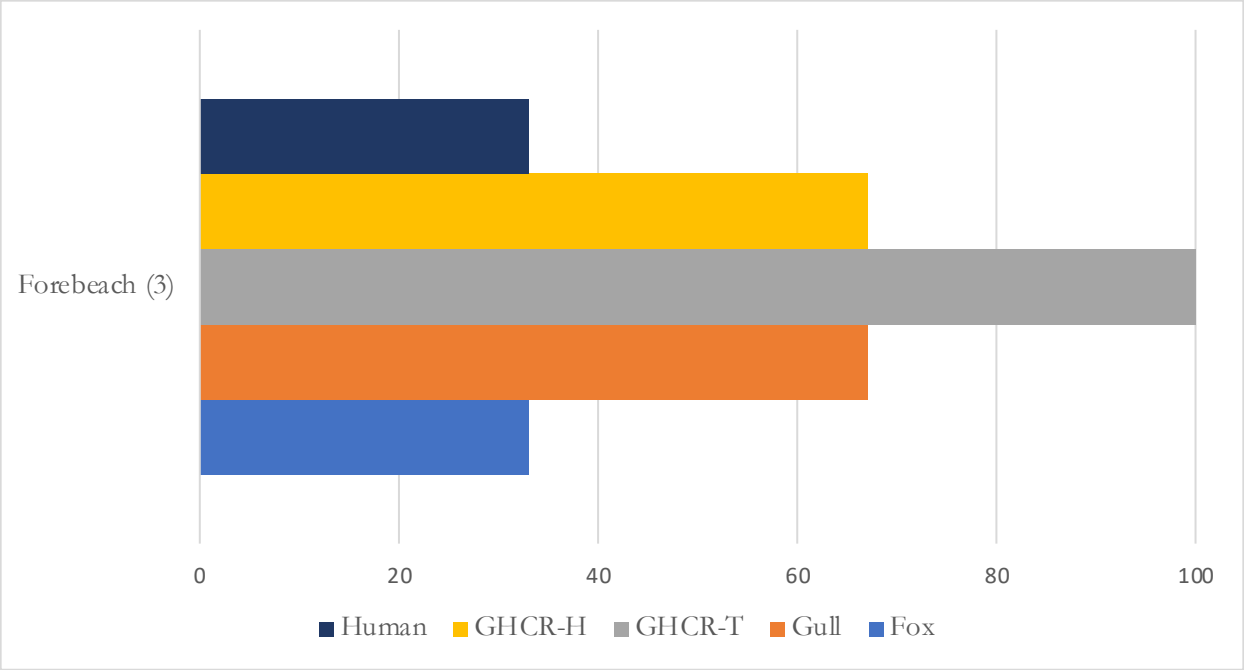

Figure 28. Percentages of high priority predator presence documented on Little Dauphin Island. Numbers next to the beach zone are the total number of circle surveys conducted at the site.

Baldwin County Sites

Predator circle surveys were conducted on twelve sites in Baldwin County, two located in Gulf Shores and eight in Orange Beach. The Gulf Shores sites included Gulf State Park East (GSPE) and Gulf State Park West (GSPW). Orange Beach sites included five mainland routes; Alabama Point, Alabama Point West, Shallow Lot, No Fly Zone, Summer Salt, and three islands; Robinson, Bird, and Walker Islands.

The practice of beach raking is a regular occurrence at the Gulf State Park and most mainland Orange Beach sites. Data collected from surveys conducted in the forebeach and backbeach sections could be an underrepresentation of predator activity. 60% of the circle surveys conducted on GSPE and 42% conducted on GSPW were in the forebeach or backbeach zones. 100% of the circle surveys conducted on Alabama Point East, Alabama Point West, and Shallow Lot were in the backbeach zone, where raking occurs two days per week for the duration of the nesting season (01 March through 30 September). These areas are raked once per week outside of the nesting season (01 October through 28 February).

49 predator circle surveys were conducted on GSPE with a majority being completed on the forebeach (Figure 29). Evidence of coyote tracks, ghost crab tracks, and ghost crab holes were documented in each beach zone. Human footprints were recorded in all zones except for backdunes, however they were most prevalent in the forebeach and backbeach sections. Five

predator surveys were conducted in the interdunes within 85 m of nest GSP 301, however only one of the surveys was conducted while the nest was active. This survey was approximately 65 m from the nest and contained four sets of coyote tracks. Of the four surveys that were conducted while the nest was not active, all contained ghost crab holes, two contained coyote tracks, and one contained ghost crab tracks.

12 predator circle surveys were conducted on GSPW with most completed on the forebeach and interdunes (Figure 30). No circle surveys were conducted on the back beach or backdunes. Ghost crab holes and tracks were recorded on all three beach zones where surveys took place. Human footprints were documented on all forebeach surveys, and coyote tracks were recorded on the forebeach and interdune surveys.

17 predator circle surveys were conducted on Alabama Point East all of which landed on the back beach (Figure 31). Human footprints, large heron tracks, ghost crab holes and tracks, and gull tracks were recorded in all surveys. Two predator circle surveys were conducted on Alabama Point West with both landing on the back beach (Figure 32). Human footprints, large heron tracks, and gull tracks were recorded in both surveys.

We conducted predator circle surveys on three island sites in Orange Beach: Bird Island, Robinson Island, and Walker Island. Beach nesting bird surveys of each site were conducted primarily on the outskirts of the islands, thus all randomized predator surveys landed on the forebeach (Figures 33-35). Human footprints, large heron tracks, and gull tracks were documented on all three islands, while ghost crab holes and tracks were recorded only on Bird Island.

Four predator circle surveys were conducted on the No Fly Zone, two on the back beach and two in the foredunes (Figure 36). Human footprints were recorded in all surveys, and ghost crab holes and tracks were observed in both beach zones. Five predator circle surveys were conducted on Shallow Lot in Orange Beach. The property is privately owned, and staff were not permitted to enter the foredune, interdune, or backdunes. Thus, all nesting surveys were conducted from the forebeach and backbeach, with all predator circle surveys landing on the backbeach (Figure 37). Human footprints, ghost crab tracks, and gull tracks were documented in each circle survey. One predator circle survey was conducted at Summer Salt. The site consists primarily of sand and gravel lots and paved roads and does not fit the typical beach profile exhibited by other sites. We documented coyote, racoon, gull, and human tracks.

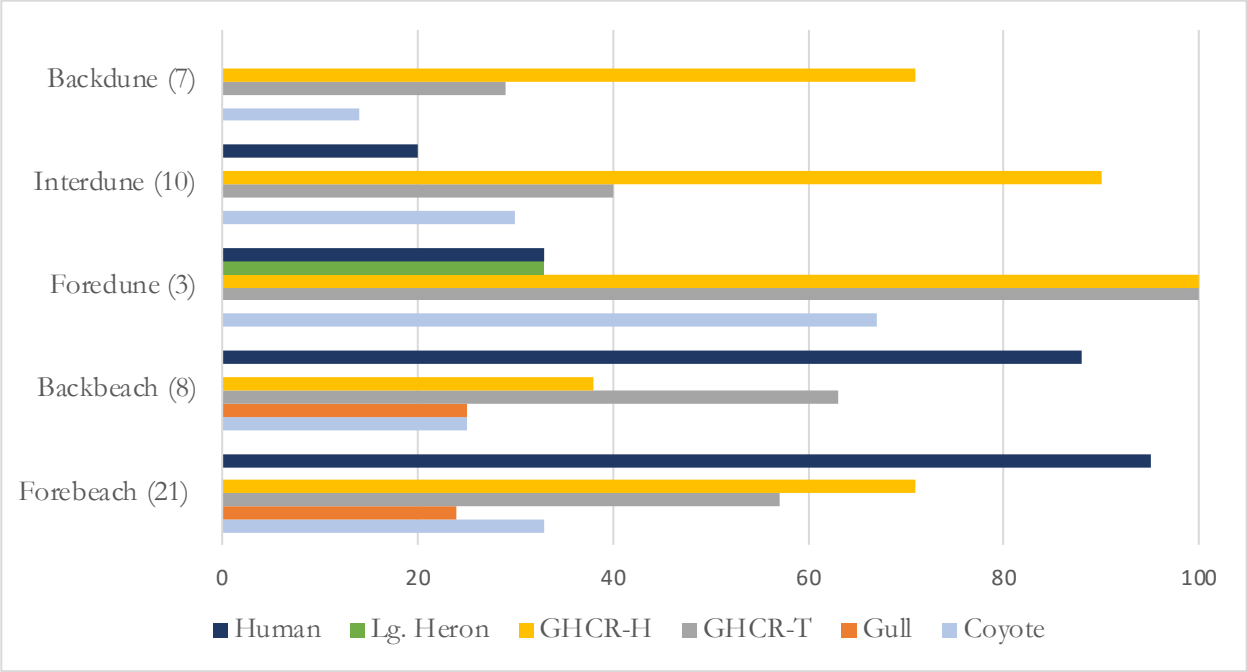

Figure 29. Percentages of high priority predator presence documented on the eastern section of Gulf State Park East. Numbers next to the beach zone are the total number circle surveys conducted at the site.

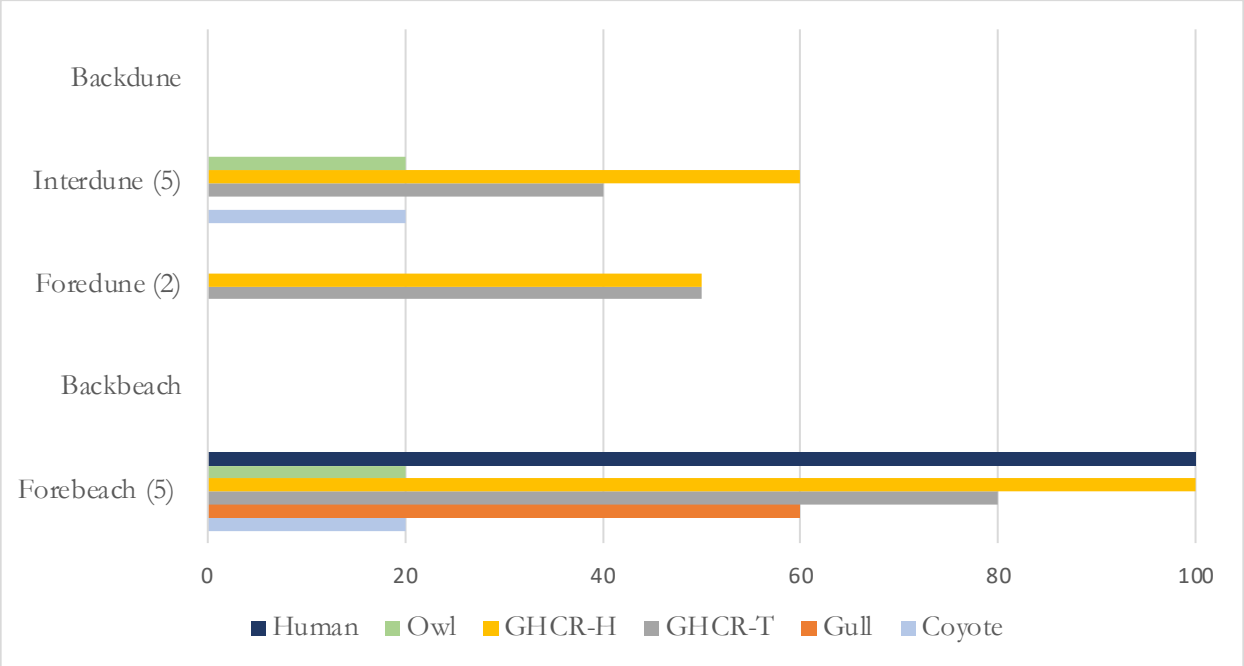

Figure 30. Percentages of high priority predator presence documented on the western section of Gulf State Park West. Numbers next to the beach zone are the total number circle surveys conducted at the site.

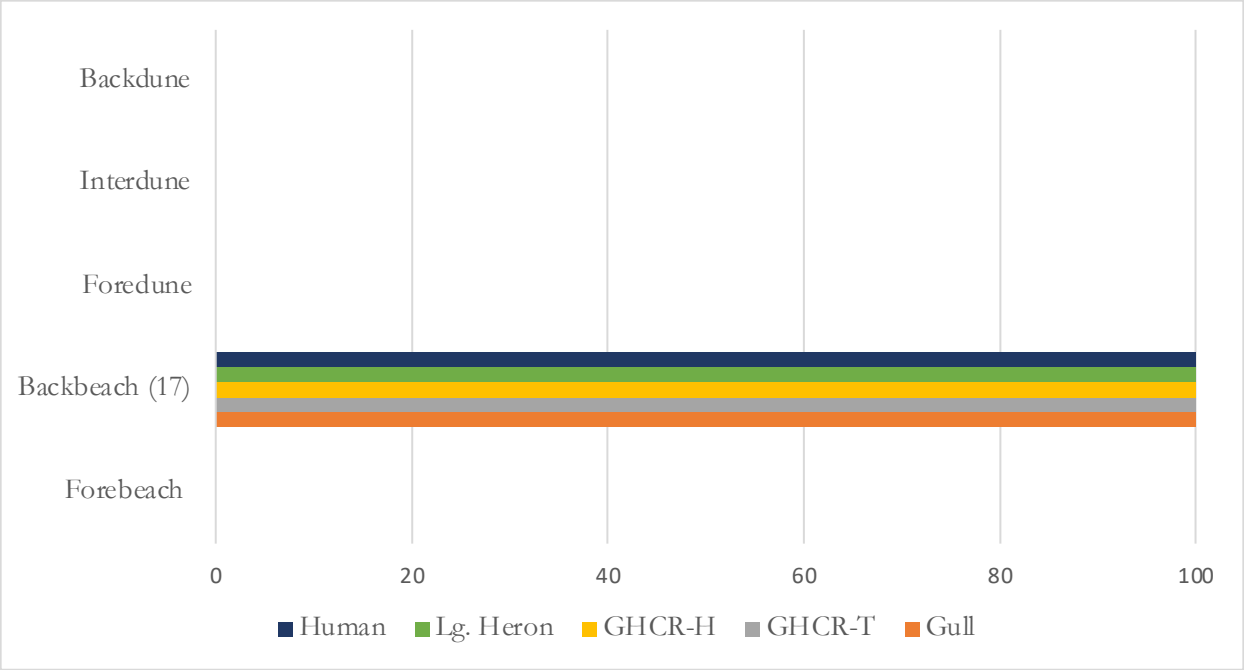

Figure 31. Percentages of high priority predator presence documented on Alabama Point East. Numbers next to the beach zone are the total number circle surveys conducted at the site.

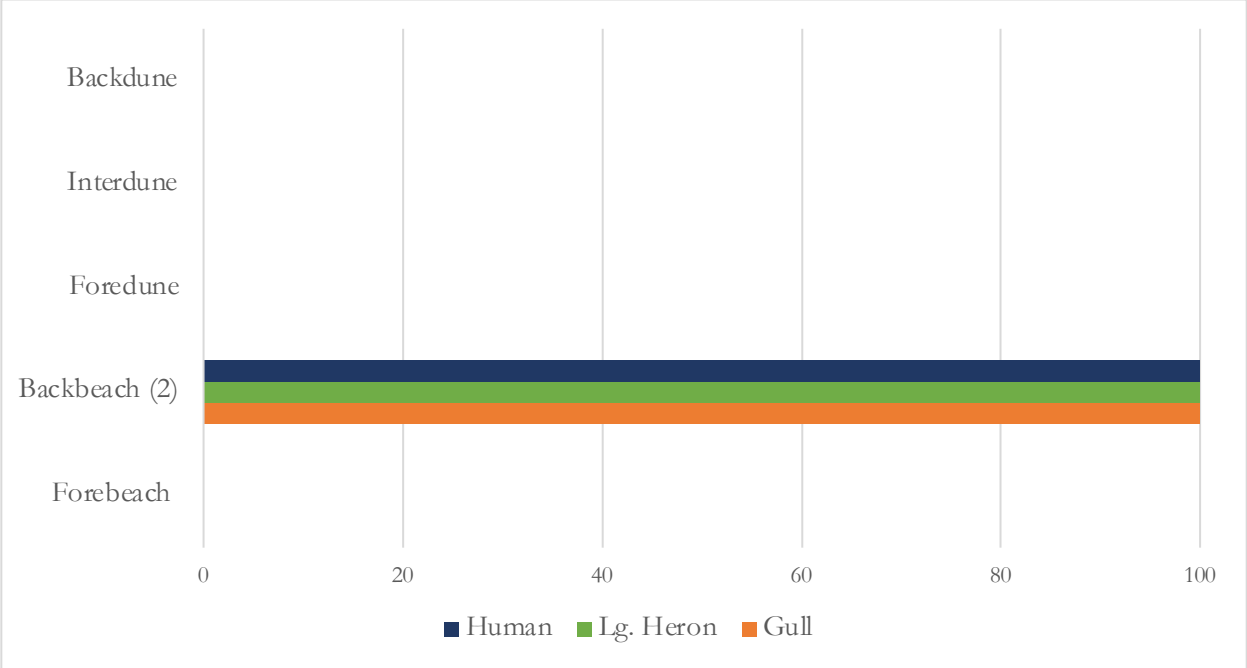

Figure 32. Percentages of high priority predator presence documented on Alabama Point West. Numbers indicated next to the beach zone represent the total number circle surveys conducted at the site.

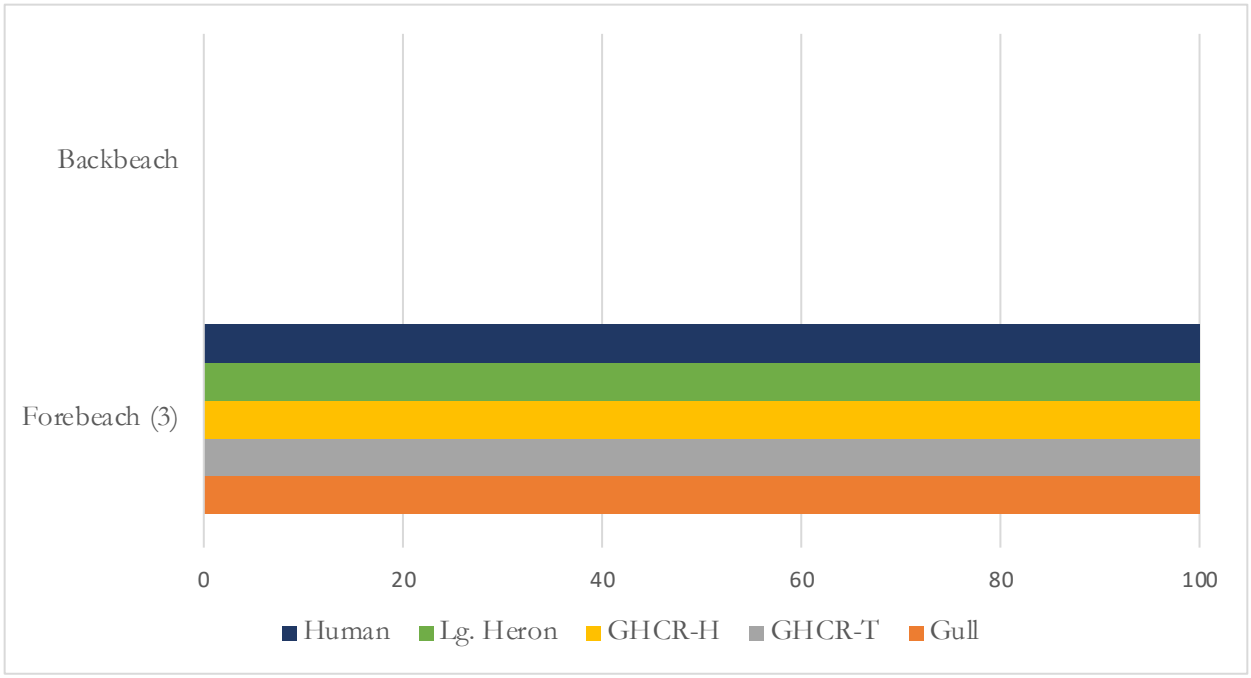

Figure 33. Percentages of high priority predator presence documented on Bird Island. Numbers next to the beach zone are the total number circle surveys conducted at the site.

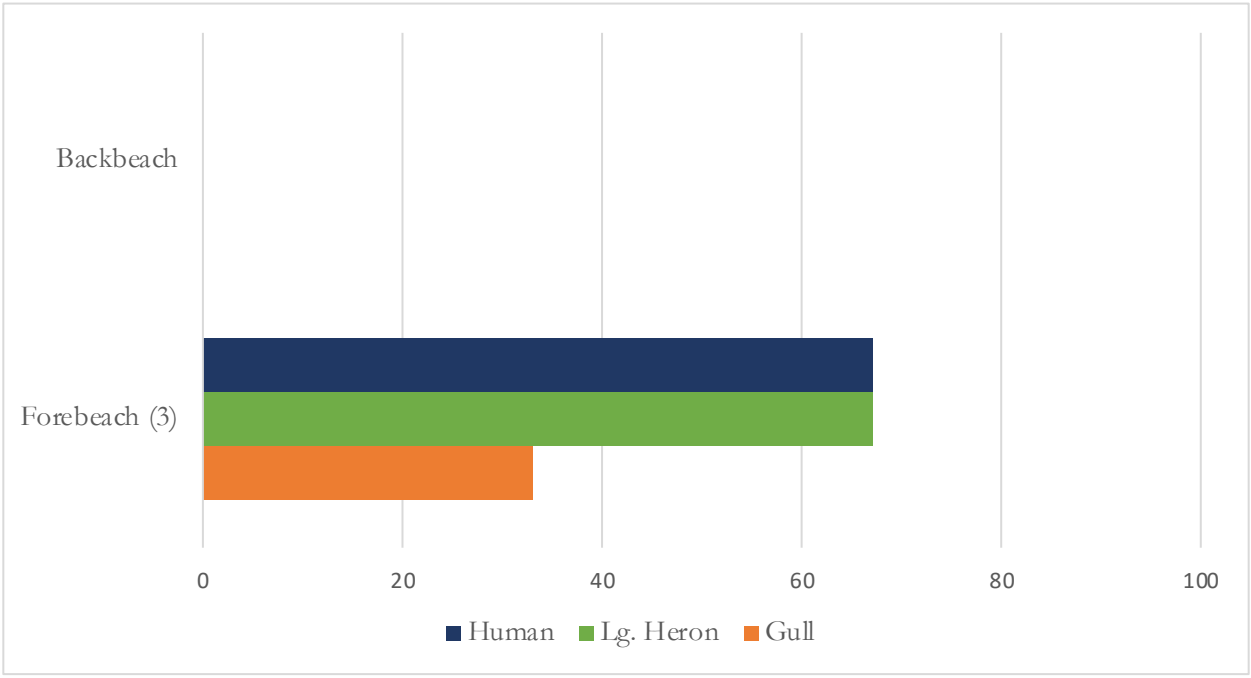

Figure 34. Percentages of high priority predator presence documented on Robinson Island. Numbers next to the beach zone are the total number circle surveys conducted at the site.

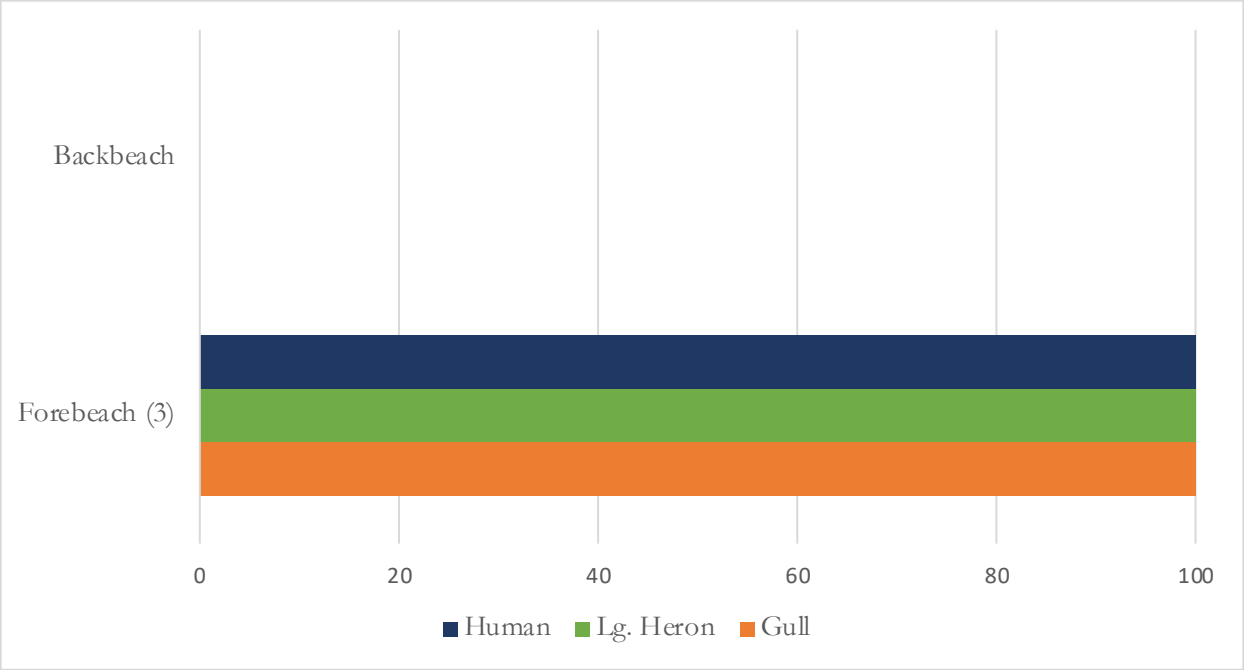

Figure 35. Percentages of high priority predator presence documented on Walker Island. Numbers next to the beach zone are the total number circle surveys conducted at the site.

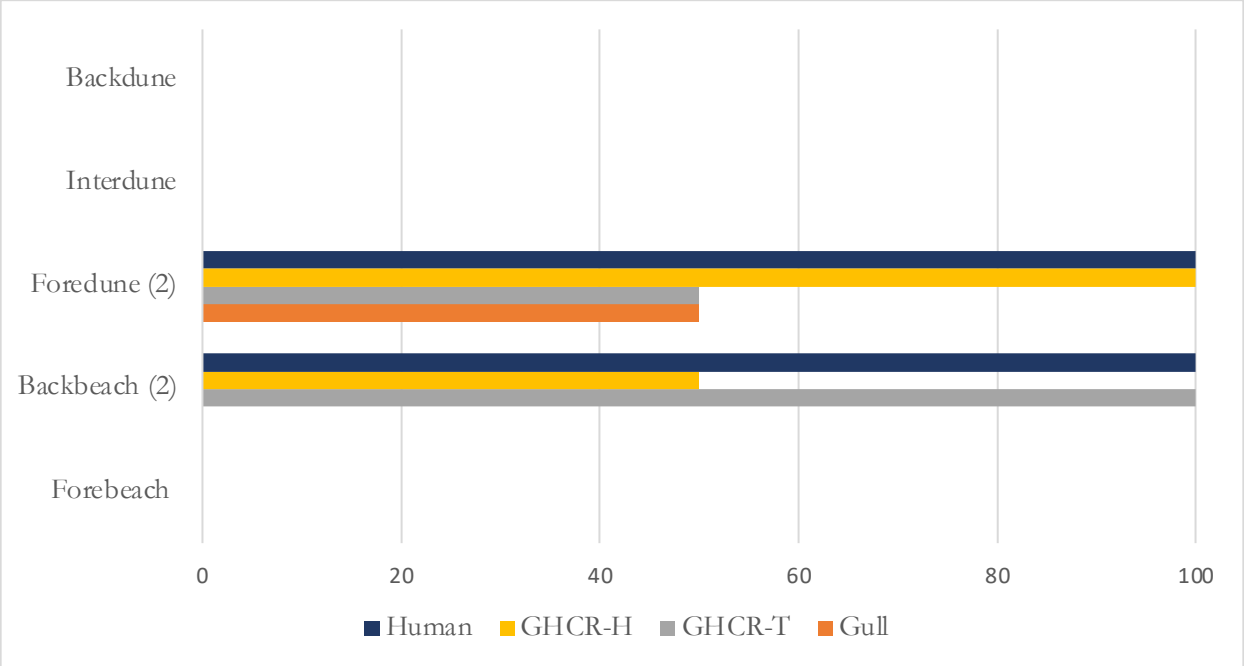

Figure 36. Percentages of high priority predator presence documented on No Fly Zone. Numbers next to the beach zone are the total number circle surveys conducted at the site.

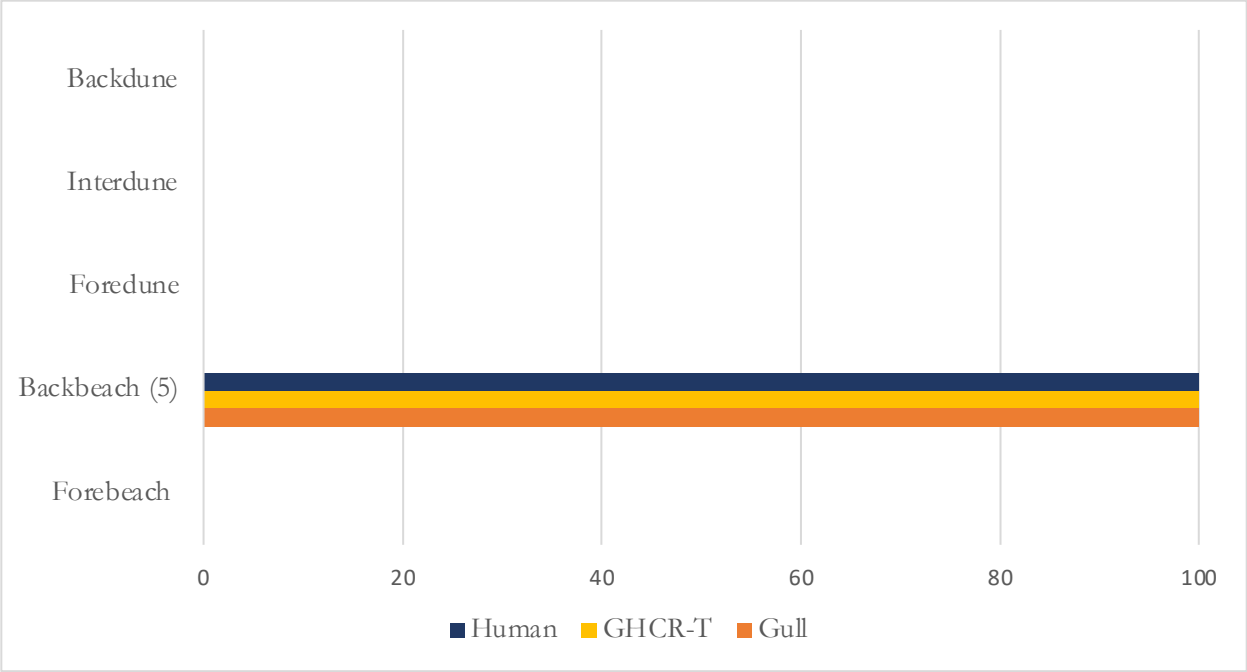

Figure 37. Percentages of high priority predator presence documented on Shallow Lot. Numbers next to the beach zone are the total number circle surveys conducted at the site.

Audubon Coastal Bird Surveys

Alabama Audubon staff and volunteers conduct standardized abundance surveys every fall, winter, and spring. The fall and spring surveys consist of six pulses each, taking place August-October and March-May, respectively. Winter surveys include three pulses from January to February. Surveys are conducted in 10 to 14-day intervals.

A total of 17 routes were included in the Audubon Coastal Bird Surveys during the Spring and Winter 2021 pulses, and 16 during the Fall pulse (Figure 38). Two survey routes were discontinued this year due to difficulties accessing the sites. Marsh Island, located in Portersville Bay, was not surveyed during 2021 as we were unable to disembark onto the island. Little Dauphin Island was removed as a route during the Fall survey season. The ~5 km island was split into three sections by Hurricane Sally, which made landfall in Alabama in September 2020. The cuts through the island made the northern section inaccessible, and surveys conducted on the southern sections proved to be impractical.

A total of 96 different species were documented during winter 2021 ACBS along the various routes in Baldwin and Mobile Counties. This included 44 species of landbirds, 16 shorebird species, 11 waterfowl species, 9 gull/tern species, 8 species of wading birds, 7 raptor species, and one pelagic

species. In terms of species richness for winter 2021 ACBS, Bayfront Park had the highest average number of species detected (31.00 ± 10.42) for the routes located in Baldwin County, whereas Little Dauphin Island had the highest average (28.00 ± 0.00) among routes located in Mobile County (Table 6).

138 different species were documented during the Spring 2021 ACBS surveys among various routes in both counties. This included 67 species of landbirds, 28 shorebird species, 14 wading bird species, 12 gull/tern species, 8 raptor species, 8 waterfowl species, and one pelagic species. Sites with the highest average number of species recorded for the spring surveys included Bayfront Park (41.66 ± 5.21) and Little Dauphin Island (26.50 ± 4.71) (Table 6).

A total of 140 different species were documented during the Fall 2021 ACBS surveys among the various routes in both counties. This included 66 species of landbirds, 25 shorebird species, 15 wading bird species, 13 gull/tern species, 10 raptor species, 9 species of waterfowl, and 2 pelagic species. Sites with the highest average number of species recorded for the fall surveys included Bayfront Park (40.16 ± 4.66) and Pelican Island (28.00 ± 3.40) (Table 6).

Table 6. Species richness values from 2021 ACBS surveys for routes surveyed in Mobile and Baldwin Counties.

Mobile County	**Winter 2021**	**Spring 2021**	**Fall 2021**
Cat Island	12.00 ± 1.00	12.00 ± 0.00	10.40 ± 2.70
Coffee Island	10.00 ± 0.00	23.00 ± 0.00	23.80 ± 3.63
Dauphin Island West End	10.66 ± 2.49	14.4 ± 5.31	13.80 ± 4.65
Far West End	9.33 ± 1.24	18.16 ± 3.33	26.20 ± 6.22
Little Dauphin Island*	28.00 ± 0.00	26.50 ± 4.71	n/a
Marsh Island*	n/a	n/a	n/a
Pelican Bay	26.33 ± 1.69	16.83 ± 7.03	24.66 ± 3.82
Pelican Island	19.66 ± 1.69	25.83 ± 1.86	28.00 ± 3.40
Public Beach East	13.33 ± 1.88	19.83 ± 1.77	12.33 ± 2.94
Public Beach West	8.33 ± 1.69	14.33 ± 2.05	13.33 ± 6.77
Baldwin County	**Winter 2021**	**Spring 2021**	**Fall 2021**
Alabama Point	9.33 ± 2.49	9.00 ± 1.00	8.50 ± 2.07
Bayfront Park	31.00 ± 10.42	41.66 ± 5.21	40.16 ± 4.66
Bon Secour NWR- Fort Morgan	16.33 ± 1.24	21.00 ± 3.36	24.20 ± 5.76
Bon Secour NWR- Perdue Unit	13.50 ± 6.50	22.66 ± 7.34	18.50 ± 6.65
Fairhope Public Beach	28.33 ± 3.39	28.83 ± 4.45	25.66 ± 7.28
Gulf State Park	10.66 ± 1.69	17.33 ± 2.62	15.83 ± 4.30
May Day Park	26.33 ± 2.05	32.50 ± 1.38	25.16 ±3.97
Orange Beach	11.33 ± 1.69	11.33 ± 1.24	8.50 ± 0.54

*ACBS surveys were not conducted on Marsh Island this year. Additionally, no fall surveys were conducted on Little Dauphin Island.

Figure 38. Locations of current and discontinued ACBS routes during 2021 in Alabama.

Priority Birds

Through Audubon Coastal Bird Surveys and beach-nesting bird monitoring, Alabama Audubon staff and volunteers are present on the coast year-round. This allows for valuable data to be collected showing how priority species utilize coastal habitats throughout the year. The 11 priority bird species were split into two groups; Tier 1 species included the American oystercatcher, black skimmer, piping plover, reddish egret, red knot, short-billed dowitcher, snowy plover, and Wilson's plover. The GPS location, time, and behavior were recorded for each observation of a Tier 1 species, with exception to observations of breeding birds during summer. If multiple individuals of a species were observed in the same location, they were recorded as one observation. For example, American oystercatchers were observed 61 times with 112 birds recorded (this number does not represent 112 individual birds, as birds can be recounted during subsequent surveys. It is simply the total number of oystercatchers counted), with the maximum number of oystercatchers observed together in one location as six. From 01 January - 31 October, staff and volunteers recorded 631 observations of Tier 1 species (Table 7). Tier 2 species included the brown pelican, least tern, and sanderling. Observations for these species were recorded only through the Audubon Coastal Bird Surveys. Each survey where the species was recorded counted as one observation (Table 8).

Table 7. Observations of Tier 1 priority species recorded from 01 January - 31 October.

Species	# of Observations	Total Count	Max Individuals/Observation
American oystercatcher	61	112	6
Black skimmer	122	1,349	230
Piping plover	94	163	7
Reddish egret	99	139	6
Red knot	37	165	20
Short-billed Dowitcher	62	806	80
Snowy plover	147	307	11
Wilson's plover	9	10	2

Table 8. Observations of Tier 2 priority species recorded from 01 January - 31 October.

Species	# of Observations	Total Count	Max Individuals/Survey
Brown pelican	214	12,313	2,500
Least tern	54	656	69
Sanderling	170	5,332	230

Banded Bird Resights

We banded two birds during the 2021 season: an American oystercatcher and a snowy plover. The American oystercatcher was banded on Coffee Island in Portersville Bay on 03 April (Figure 39). The sex of the bird is unknown and it was given the band combination (UL: JT LL: -- UR: JT LR: metal). The snowy plover was banded on the Perdue Unit of the Bon Secour National Wildlife Refuge on 28 April with support and permission from the refuge (Figure 40). The bird was an adult male and given the band combination (UL: Yellow LL: Black UR: Light Blue LR: Yellow).

From January 01- October 31, staff and volunteers recorded 202 banded bird resights of 42 individuals (Table 9).

Figure 39. Staff banding American oystercatcher "JT" on Coffee Island on 03 April 2021.

Figure 40. Staff banding snowy plover Y/K:b/Y on Bon Secour National Wildlife Refuge Perdue Unit on 28 April 2021.

Table 9. Banded bird resights from 01 January - 31 October.

Species	Resights	Individuals
Snowy plover	134	25
Piping plover	56	12
American oystercatcher	6	2
Least tern	2	1
Red Knot	1	1
Wilson's plover	1	1

Appendix I.

Common and scientific names of species mentioned in this document.

Avian	
American Oystercatcher	*Haematopus palliatus*
Black Skimmer	*Rynchops niger*
Brown Pelican	*Pelecanus occidentalis*
Common Nighthawk	*Chordeiles minor*
Egret sp.	*Pelecaniformes sp.*
Fish Crow	*Corvus ossifragus*
Gull-billed Tern	*Gelochelidon nilotica*
Great Blue Heron	*Ardea herodias*
Gull sp.	*Charadriiformes sp.*
Heron sp.	*Pelecaniformes sp.*
Killdeer	*Charadrius vociferus*
Laughing Gull	*Leucophaeus atricilla*
Least Tern	*Sternula antillarum*
Piping Plover	*Charadrius melodus*
Reddish Egret	*Egretta rufescens*
Red Knot	*Calidris canutus*
Sanderling	*Calidris alba*
Short-billed Dowitcher	*Limnodromus griseus*
Snowy Plover	*Charadrius nivosus*
Wilson's Plover	*Charadrius wilsonia*
Mammals	
Domestic Cat	*Felis catus*
Coyote	*Canis latrans*
Nutria	*Myocastor coypus*
Red Fox	*Vulpes vulpes*
Raccoon	*Procyon lotor*
Other	
Atlantic Ghost Crab	*Ocypode quadrata*