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Appendix 1. Listing of common and scientific names of fishes and invertebrates captured during historical and 1992 bycatch studies. Common and scientific names follow standards set by the American Fisheries Society (Turgeon et al. 1988, Williams et al. 1988, Robins et al. 1991).

Listed alphabetically by scientific name:

Scientific Name	Common Name
<i>Acetes</i> spp.	Sergestid Shrimp
<i>Achirus lineatus</i>	Lined Sole
<i>Alpheus</i> spp.	Unidentified Snapping Shrimp
<i>Anadara ovalis</i>	Blood Ark
<i>Anchoa hepsetus</i>	Striped Anchovy
<i>Anchoa mitchilli</i>	Bay Anchovy
<i>Ancylopsetta quadrocellata</i>	Ocellated Flounder
<i>Archosargus probatocephalus</i>	Sheephead
<i>Arius felis</i>	Hardhead Catfish
<i>Astroscopus y-graecum</i>	Southern Stargazer
<i>Bagre marinus</i>	Gafftopsail Catfish
<i>Bairdiella chrysoura</i>	Silver Perch
<i>Balanus</i> spp.	Common Barnacle
<i>Beroe</i> spp.	Comb Jellyfish
<i>Brachidontes recurvus</i>	Bent Mussel
<i>Brevoortia gunteri</i>	Finescale Menhaden
<i>Brevoortia patronus</i>	Gulf Menhaden
<i>Brotula barbata</i>	Bearded Brotula
<i>Busycon perversum</i>	Perverse Whelk
<i>Callinectes sapidus</i>	Blue Crab
<i>Callinectes similis</i>	Lesser Blue Crab
<i>Caranx hippos</i>	Crevalle Jack
<i>Caranx latus</i>	Horse-Eye Jack
<i>Carcharhinus limbatus</i>	Blacktip Shark
<i>Centropristis philadelphia</i>	Rock Sea Bass
<i>Chaetodipterus faber</i>	Atlantic Spadefish
<i>Chaetodon ocellatus</i>	Spotfin Butterflyfish
<i>Chasmodes bosquianus</i>	Striped Blenny
<i>Chilomycterus schoepfi</i>	Striped Burrfish
<i>Chloroscombrus chrysurus</i>	Atlantic Bumper
<i>Chrysaora quinquecirrha</i>	Sea Nettle
<i>Citharichthys spilopterus</i>	Bay Whiff
<i>Clibanarius vittatus</i>	Thinstripe Hermit Crab
<i>Crassostrea virginica</i>	American Oyster
<i>Cynoscion arenarius</i>	Sand Seatrout
<i>Cynoscion nebulosus</i>	Spotted Seatrout
<i>Cynoscion nothus</i>	Silver Seatrout
<i>Cynoscion</i> spp.	Unidentified Seatrout
<i>Cyprinus carpio</i>	Common Carp
<i>Cyrtopleura costata</i>	Angelwing
<i>Dasyatis sabina</i>	Atlantic Stingray
Debris	Debris
<i>Dorosoma cepedianum</i>	Gizzard Shad
<i>Dorosoma petenense</i>	Threadfin Shad
<i>Elops saurus</i>	Ladyfish
<i>Etropus crossotus</i>	Fringed Flounder
<i>Eucinostomus argenteus</i>	Spotfin Mojarra
<i>Eucinostomus gula</i>	Silver Jenny
<i>Eucinostomus harengulus</i>	Tidewater Mojarra
<i>Eucinostomus melanopterus</i>	Flagfin Mojarra
<i>Eucinostomus</i> spp.	Unidentified Mojarra
<i>Eurypanopeus depressus</i>	Flatback Mud Crab
<i>Gobiesox strumosus</i>	Skilletfish
<i>Gobioides broussoneti</i>	Violet Goby
<i>Gobionellus boleosoma</i>	Darter Goby
<i>Gobionellus oceanicus</i>	Highfin Goby
<i>Harengula jaguana</i>	Scaled Sardine
<i>Hemicaranx amblyrhynchus</i>	Bluntnose Jack
<i>Hepatus epheliticus</i>	Calico Box Crab
<i>Hexapanopeus angustifrons</i>	Smooth Mud Crab
<i>Hypsoblennius ionthas</i>	Freckled Blenny
<i>Ictalurus furcatus</i>	Blue Catfish

Listed alphabetically by common name:

Common Name	Scientific Name
Alligator Gar	<i>Lepisosteus spatula</i>
American Oyster	<i>Crassostrea virginica</i>
Angelwing	<i>Cyrtopleura costata</i>
Atlantic Brief Squid	<i>Lolliguncula brevis</i>
Atlantic Bumper	<i>Chloroscombrus chrysurus</i>
Atlantic Croaker	<i>Micropogonias undulatus</i>
Atlantic Midshipman	<i>Porichthys plectrodon</i>
Atlantic Mud Crab	<i>Panopeus herbstii</i>
Atlantic Rangia	<i>Rangia cuneata</i>
Atlantic Sharpnose Shark	<i>Rhizoprionodon terraenovae</i>
Atlantic Spadefish	<i>Chaetodipterus faber</i>
Atlantic Stingray	<i>Dasyatis sabina</i>
Atlantic Thread Herring	<i>Ophisthonema oglinum</i>
Atlantic Threadfin	<i>Polydactylus octonemus</i>
Banded Drum	<i>Larimus fasciatus</i>
Bay Anchovy	<i>Anchoa mitchilli</i>
Bay Whiff	<i>Citharichthys spilopterus</i>
Bearded Brotula	<i>Brotula barbata</i>
Bent Mussel	<i>Brachidontes recurvus</i>
Bighead Searobin	<i>Prionotus tribulus</i>
Black Drum	<i>Pogonias cromis</i>
Blackcheek Tonguefish	<i>Symphurus plagiusa</i>
Blacktip Shark	<i>Carcharhinus limbatus</i>
Blackwing Searobin	<i>Prionotus rubio</i>
Blood Ark	<i>Anadara ovalis</i>
Blotched Swimming Crab	<i>Portunus spinimanus</i>
Blue Catfish	<i>Ictalurus furcatus</i>
Blue Crab	<i>Callinectes sapidus</i>
Bluefish	<i>Pomatomus saltatrix</i>
Bluespotted Searobin	<i>Prionotus roseus</i>
Bluntnose Jack	<i>Hemicaranx amblyrhynchus</i>
Brackish Grass Shrimp	<i>Palaemonetes intermedius</i>
Brown Rangia	<i>Rangia flexuosa</i>
Brown Shrimp	<i>Penaeus aztecus</i>
Butterfish	<i>Peprilus</i> spp.
Calico Box Crab	<i>Hepatus epheliticus</i>
Cannonball Jellyfish	<i>Stomolophus meleagris</i>
Chain Pipefish	<i>Syngnathus louisianae</i>
Clearnose Skate	<i>Raja eglanteria</i>
Clown Goby	<i>Microgobius gulosus</i>
Comb Jellyfish	<i>Beroe</i> spp.
Common Barnacle	<i>Balanus</i> spp.
Common Carp	<i>Cyprinus carpio</i>
Cownose Ray	<i>Rhinoptera bonasus</i>
Crevalle Jack	<i>Caranx hippos</i>
Cutlassfish	<i>Trichiurus lepturus</i>
Daggerblade Grass Shrimp	<i>Palaemonetes pugio</i>
Darter Goby	<i>Gobionellus boleosoma</i>
Debris	Debris
Dimpled Hermit Crab	<i>Pagurus impressus</i>
Dwarf Herring	<i>Jenkinsia lamprotaenia</i>
Finescale Menhaden	<i>Brevoortia gunteri</i>
Flagfin Mojarra	<i>Eucinostomus melanopterus</i>
Flatback Mud Crab	<i>Eurypanopeus depressus</i>
Flatclaw Hermit Crab	<i>Pagurus pollicaris</i>
Florida Pompano	<i>Trachinotus carolinus</i>
Florida Rocksnail	<i>Thais haemostoma</i>
Florida Stone Crab	<i>Menippe mercenaria</i>
Freckled Blenny	<i>Hypsoblennius ionthas</i>
Fringed Flounder	<i>Etropus crossotus</i>
Gafftopsail Catfish	<i>Bagre marinus</i>
Gizzard Shad	<i>Dorosoma cepedianum</i>

Appendix 1 (continued):

Listed alphabetically by scientific name:

Scientific Name	Common Name
<i>Ischadium recurvum</i>	Hooked Mussel
<i>Jenkinsia lamprotaenia</i>	Dwarf Herring
<i>Lagodon rhomboides</i>	Pinfish
<i>Larimus fasciatus</i>	Banded Drum
<i>Latreutes parvulus</i>	Sargassum Shrimp
<i>Leiostomus xanthurus</i>	Spot
<i>Lepisosteus oculatus</i>	Spotted Gar
<i>Lepisosteus spatula</i>	Alligator Gar
<i>Libinia dubia</i>	Longnose Spider Crab
<i>Libinia emarginata</i>	Portly Spider Crab
<i>Lobotes surinamensis</i>	Tripletail
<i>Lolliguncula brevis</i>	Atlantic Brief Squid
<i>Lutjanus griseus</i>	Gray Snapper
<i>Lutjanus synagris</i>	Lane Snapper
<i>Lysmata wurdemanni</i>	Peppermint Shrimp
<i>Macrobrachium ohione</i>	Ohio Shrimp
<i>Membras martinica</i>	Rough Silverside
<i>Menidia beryllina</i>	Inland Silverside
<i>Menippe mercenaria</i>	Florida Stone Crab
<i>Menticirrhus americanus</i>	Southern Kingfish
<i>Menticirrhus littoralis</i>	Gulf Kingfish
<i>Microgobius gulosus</i>	Clown Goby
<i>Micropogonias undulatus</i>	Atlantic Croaker
<i>Monacanthus hispidus</i>	Planehead Filefish
<i>Monacanthus setifer</i>	Pygmy Filefish
<i>Mugil cephalus</i>	Striped Mullet
<i>Mugil curema</i>	White Mullet
<i>Neopanopeus texanus</i>	Mud Crab
<i>Neverita duplicata</i>	Shark Eye Mollusk
<i>Oligoplites saurus</i>	Leatherjack
<i>Ophichthus gomesi</i>	Shrimp Eel
<i>Ophichthus spp.</i>	Unidentified Shrimp Eel
<i>Ophisthionema oglinum</i>	Atlantic Thread Herring
<i>Opsanus beta</i>	Gulf Toadfish
<i>Orthopristis chrysoptera</i>	Pigfish
<i>Pagurus impressus</i>	Dimpled Hermit Crab
<i>Pagurus pollicaris</i>	Flatclaw Hermit Crab
<i>Pagurus spp.</i>	Pagurid Hermit Crab
<i>Palaemonetes intermedius</i>	Brackish Grass Shrimp
<i>Palaemonetes pugio</i>	Daggerblade Grass Shrimp
<i>Palaemonetes spp.</i>	Unidentified Grass Shrimp
<i>Palaemonetes vulgaris</i>	Marsh Grass Shrimp
<i>Panopeus bermudensis</i>	Strongtooth Mud Crab
<i>Panopeus herbstii</i>	Atlantic Mud Crab
<i>Panopeus spp.</i>	Xanthid Mud Crab
<i>Paralichthys lethostigma</i>	Southern Flounder
<i>Parasitic Isopod</i>	Unidentified Parasitic Isopod
<i>Penaeus aztecus</i>	Brown Shrimp
<i>Penaeus duorarum</i>	Pink Shrimp
<i>Penaeus setiferus</i>	White Shrimp
<i>Penaeus spp.</i>	Unidentified Penaeid Shrimp
<i>Peprilus alepidotus</i>	Harvestfish
<i>Peprilus burti</i>	Gulf Butterfish
<i>Peprilus spp.</i>	Butterfish
<i>Petrolisthes armatus</i>	Green Porcelain Crab
<i>Phalacrocorax spp.</i>	Unidentified Cormorant
<i>Pogonias cromis</i>	Black Drum
<i>Polinices duplicatus</i>	Moon Snail
<i>Polydactylus octonemus</i>	Atlantic Threadfin
<i>Pomatomus saltatrix</i>	Bluefish
<i>Porichthys plectrodon</i>	Atlantic Midshipman
<i>Portunus gibbesii</i>	Iridescent Swimming Crab
<i>Portunus spinimanus</i>	Blotched Swimming Crab
<i>Portunus spp.</i>	Unidentified Portunid Crab

Listed alphabetically by common name:

Scientific Name	Common Name
<i>Lutjanus griseus</i>	Gray Snapper
<i>Petrolisthes armatus</i>	Green Porcelain Crab
<i>Sphyaena guachancho</i>	Guaguanche
<i>Peprilus burti</i>	Gulf Butterfish
<i>Menticirrhus littoralis</i>	Gulf Kingfish
<i>Brevoortia patronus</i>	Gulf Menhaden
<i>Urosalpinx perrugata</i>	Gulf Oyster Drill
<i>Opsanus beta</i>	Gulf Toadfish
<i>Arius felis</i>	Hardhead Catfish
<i>Rhithropanopeus harrisi</i>	Harris Mud Crab
<i>Peprilus alepidotus</i>	Harvestfish
<i>Gobionellus oceanicus</i>	Highfin Goby
<i>Trinectes maculatus</i>	Hogchoker
<i>Ischadium recurvum</i>	Hooked Mussel
<i>Caranx latus</i>	Horse-Eye Jack
<i>Menidia beryllina</i>	Inland Silverside
<i>Synodus foetens</i>	Inshore Lizardfish
<i>Portunus gibbesii</i>	Iridescent Swimming Crab
<i>Elops saurus</i>	Ladyfish
<i>Lutjanus synagris</i>	Lane Snapper
<i>Sphoeroides parvus</i>	Least Puffer
<i>Oligoplites saurus</i>	Leatherjack
<i>Callinectes similis</i>	Lesser Blue Crab
<i>Scyonia dorsalis</i>	Lesser Rock Shrimp
<i>Achirus lineatus</i>	Lined Sole
<i>Libinia dubia</i>	Longnose Spider Crab
<i>Selene vomer</i>	Lookdown
<i>Squilla empusa</i>	Mantis Shrimp
<i>Palaemonetes vulgaris</i>	Marsh Grass Shrimp
<i>Polinices duplicatus</i>	Moon Snail
<i>Selene setapinnis</i>	Moonfish
<i>Neopanopeus texanus</i>	Mud Crab
<i>Ancylopsis quadrolata</i>	Ocellated Flounder
<i>Macrobrachium ohione</i>	Ohio Shrimp
<i>Pagurus spp.</i>	Pagurid Hermit Crab
<i>Lysmata wurdemanni</i>	Peppermint Shrimp
<i>Busycon perversum</i>	Perverse Whelk
<i>Orthopristis chrysoptera</i>	Pigfish
<i>Lagodon rhomboides</i>	Pinfish
<i>Penaeus duorarum</i>	Pink Shrimp
<i>Monacanthus hispidus</i>	Planehead Filefish
<i>Libinia emarginata</i>	Portly Spider Crab
<i>Tagelus divisus</i>	Purplish Tagelus
<i>Monacanthus setifer</i>	Pygmy Filefish
<i>Sciaenops ocellatus</i>	Red Drum
<i>Centropristis philadelphica</i>	Rock Sea Bass
<i>Membras martinica</i>	Rough Silverside
<i>Trachypenaeus similis</i>	Roughback Shrimp
<i>Cynoscion arenarius</i>	Sand Seatrout
<i>Sargassum spp.</i>	Sargassum Seaweed
<i>Latreutes parvulus</i>	Sargassum Shrimp
<i>Harengula jaguana</i>	Scaled Sardine
<i>Sphyrna lewini</i>	Scalloped Hammerhead
<i>Chrysaora quinquecirrha</i>	Sea Nettle
<i>Xiphopenaeus kroyeri</i>	Seabob
<i>Acetes spp.</i>	Sergestid Shrimp
<i>Neverita duplicata</i>	Shark Eye Mollusk
<i>Arcosargus probatocephalus</i>	Sheephead
<i>Ophichthus gomesi</i>	Shrimp Eel
<i>Eucinostomus gula</i>	Silver Jenny
<i>Bairdiella chrysoura</i>	Silver Perch
<i>Cynoscion nothus</i>	Silver Seatrout
<i>Gobiosox strumosus</i>	Skilletfish
<i>Hexapanopeus angustifrons</i>	Smooth Mud Crab

Appendix 1 (continued):

Listed alphabetically by scientific name:

Scientific Name	Common Name
<i>Prionotus roseus</i>	Bluespotted Searobin
<i>Prionotus rubio</i>	Blackwing Searobin
<i>Prionotus tribulus</i>	Bighead Searobin
<i>Raja eglanteria</i>	Clearnose Skate
<i>Rangia cuneata</i>	Atlantic Rangia
<i>Rangia flexuosa</i>	Brown Rangia
<i>Rhinoptera bonasus</i>	Cownose Ray
<i>Rhithropanopeus harrisi</i>	Harris Mud Crab
<i>Rhizoprionodon terraenovae</i>	Atlantic Sharpnose Shark
<i>Sargassum spp.</i>	Sargassum Seaweed
<i>Sciaenops ocellatus</i>	Red Drum
<i>Scomberomorus maculatus</i>	Spanish Mackerel
<i>Scorpaena calcarata</i>	Smoothhead Scorpionfish
<i>Selene setapinnis</i>	Moonfish
<i>Selene vomer</i>	Lookdown
<i>Sicyonia dorsalis</i>	Lesser Rock Shrimp
<i>Sphoeroides parvus</i>	Least Puffer
<i>Sphyrna guachancho</i>	Guaguanche
<i>Sphyrna lewini</i>	Scalloped Hammerhead
<i>Squilla empusa</i>	Mantis Shrimp
<i>Stellifer lanceolatus</i>	Star Drum
<i>Stomolophus meleagris</i>	Cannonball Jellyfish
<i>Symphurus plagiusa</i>	Blackcheek Tonguefish
<i>Syngnathus louisianae</i>	Chain Pipefish
<i>Synodus foetens</i>	Inshore Lizardfish
<i>Tagelus divinus</i>	Purplish Tagelus
<i>Tagelus plebeius</i>	Stout Tagelus
<i>Thais haemostoma</i>	Florida Rocksnail
<i>Thalassia testudinum</i>	Turtle Grass
<i>Trachypenaeus similis</i>	Roughback Shrimp
<i>Trachinotus carolinus</i>	Florida Pompano
<i>Trichiurus lepturus</i>	Cutlassfish
<i>Trinectes maculatus</i>	Hogchoker
<i>Urophycis floridana</i>	Southern Hake
<i>Urosalpinx perrugata</i>	Gulf Oyster Drill
<i>Xiphopenaeus kroyeri</i>	Seabob

Listed alphabetically by common name:

Scientific Name	Common Name
<i>Scorpaena calcarata</i>	Smoothhead Scorpionfish
<i>Paralichthys lethostigma</i>	Southern Flounder
<i>Urophycis floridana</i>	Southern Hake
<i>Menticirrhus americanus</i>	Southern Kingfish
<i>Astroscopus y-graecum</i>	Southern Stargazer
<i>Scomberomorus maculatus</i>	Spanish Mackerel
<i>Leiostomus xanthurus</i>	Spot
<i>Chaetodon ocellatus</i>	Spotfin Butterflyfish
<i>Eucinostomus argenteus</i>	Spotfin Mojarra
<i>Lepisosteus oculatus</i>	Spotted Gar
<i>Cynoscion nebulosus</i>	Spotted Seatrout
<i>Stellifer lanceolatus</i>	Star Drum
<i>Tagelus plebeius</i>	Stout Tagelus
<i>Anchoa hepsetus</i>	Striped Anchovy
<i>Chasmodes bosquianus</i>	Striped Blenny
<i>Chilomycterus schoepfi</i>	Striped Burrfish
<i>Mugil cephalus</i>	Striped Mullet
<i>Panopeus bermudensis</i>	Strongtooth Mud Crab
<i>Clibanarius vittatus</i>	Thinstripe Hermit Crab
<i>Dorosoma petenense</i>	Threadfin Shad
<i>Eucinostomus harengulus</i>	Tidewater Mojarra
<i>Lobotes surinamensis</i>	Tripletail
<i>Thalassia testudinum</i>	Turtle Grass
<i>Phalacrocorax spp.</i>	Unidentified Cormorant
<i>Palaemonetes spp.</i>	Unidentified Grass Shrimp
<i>Eucinostomus spp.</i>	Unidentified Mojarra
<i>Parasitic Isopod</i>	Unidentified Parasitic Isopod
<i>Penaeus spp.</i>	Unidentified Penaeid Shrimp
<i>Portunus spp.</i>	Unidentified Portunid Crab
<i>Cynoscion spp.</i>	Unidentified Seatrout
<i>Ophichthus spp.</i>	Unidentified Shrimp Eel
<i>Alpheus spp.</i>	Unidentified Snapping Shrimp
<i>Gobioides broussoneti</i>	Violet Goby
<i>Mugil curema</i>	White Mullet
<i>Penaeus setiferus</i>	White Shrimp
<i>Panopeus spp.</i>	Xanthid Mud Crab

Appendix 2

Overview of Texas Shrimp Fishery Regulations

The annual commercial harvest of shrimp from Galveston Bay, Texas, averaged about 3.5 million pounds for the period 1982-89 (NMFS unpublished data). This includes a 1.4 million pound average harvest of brown shrimp, with peak production during May-July, and a 2.1 million pound average of white shrimp, with peak production during August-November. Brown shrimp landings include <10% pink shrimp which are not separated from brown shrimp by fishermen or processors. During an average year, about 97% of the shrimp caught in the bay are taken during May-November. The remaining 3% of the commercial table shrimp are taken as incidental catch by the live bait shrimp fishery during December-April. Shrimp effort, measured in days fished, follows the trend for catch. Over the past eight years, an average of about 6400 days of effort have been expended annually in Galveston Bay. TPWD fishing regulations affect this pattern.

Two different commercial shrimp efforts occur within Galveston Bay: commercial bay shrimping and commercial bait shrimp. The bay shrimping activity targets shrimp that will be sold to seafood dealers for human consumption. Bait shrimping targets shrimp that will be sold as live fishing bait. However, some of the shrimp taken by bait shrimping activities are sold to seafood dealers, who in turn sell them to the public for consumption. As much as 3% of the shrimp sold by seafood dealers comes from the bait shrimp fishery.

The bait shrimp fishery operates throughout the year, catering to the bait needs of recreational fishermen. Individuals shrimping with a bait license may harvest a maximum daily catch of 200 pounds, one-half of which must be kept alive, except during August 16-November 15. Only one main trawl, with a maximum width of 54 ft., may be used from the boat. Mesh size of the net may not be less than 6.5 inches in length between the two most widely separated knots in any consecutive series of five stretched meshes. Unlike the bay fishery, the bait fishery is not restricted by any type of seasonal closure. Fishing may occur throughout the year from 30 minutes before sunrise to 30 minutes after sunset, except during the spring open season (May 15-July 15) when all shrimp trawling operations must terminate by 2:00 pm. Fishing is allowed in all major bays (upper Galveston Bay, Trinity Bay, East Bay, lower Galveston Bay and certain areas of West Bay) and bait bays (Intracoastal waterways, Chocolate Bay and those portions of West Bay excluded from major bay status) within the Galveston Bay complex.

The commercial bay fishery is managed with seasonal closures and gear restrictions set by TPWD. During the spring open season (May 15-July 15), shrimpers harvesting with a bay license may trawl with one main net no wider than 54 ft. In addition, mesh size may not be less than 6.5 inches in length between the two most widely separated knots in any consecutive series of five stretched meshes. Fishermen are limited to a daily catch of 600 pounds and are permitted to shrimp only from 30 minutes before sunrise until 2:00 pm. Fishing is only allowed in the major bays of the Galveston Bay complex. These restrictions ensure that a sufficient number of shrimp are able to migrate offshore for reproduction. During the fall open

season (August 15-December 15), fishing may occur from 30 minutes before sunrise to 30 minutes after sunset. From August 15 to October 31, when shrimpers outside the bay mostly harvest white shrimp, bay shrimpers may harvest an unlimited amount of shrimp. However, they are restricted by a size limit of 50 heads-on shrimp per pound. From November 1 to December 15, no size limit is imposed on shrimp harvested in the bays. During the entire fall season, bay shrimpers are permitted to use on main net with a maximum total width, including doors, of 95 ft., and a mesh size not less than 8.75 inches long between the two most widely separated knots in any consecutive series of five stretched meshes. These regulations enable the inshore shrimpers to target the larger and more valuable white shrimp which remain predominantly in the bays and nearshore Gulf waters. Thus, shrimp with a commercial bay license is prohibited during the one month closure between spring and fall seasons and during the five month closure between fall and spring seasons. The use of TED's (turtle excluder devices) was mandated in 1992 by NMFS for commercial trawlers operating in inshore (estuarine waters). Certain exemptions for TED use apply to some vessels which limit net size and/or tow time.

Many shrimpers hold both bay and bait licenses to take advantage of the more lenient regulations of the bait license during the seasonal closures, as well as the larger poundage allotment afforded by the bay license during the open seasons. Thus, the percentage of shrimpers holding a bait license in conjunction with either a Gulf of bay license increased from 28% in 1981 to 41% in 1987 (source: TPWD license files for 1981 and 1987).

Appendix 3

Sample Data Sheets and Instructions for Observers

BYCATCH STATION SHEET

DATE
 MO DY YR

DATA SHEET PAGE ____ OF ____ PAGES

VESEL (1) GEAR SPECIFICATIONS (2):
 TYPE LENGTH MESH SIZE TOW NO.

TEMPERATURES (° C)
 SURFACE BOTTOM AIR

START TIME HH MM START LATITUDE DD MM MM START LONGITUDE DD MM MM START DEPTH

VESEL SPEED (KNOTS) SALINITY (PPT) SURFACE BOTTOM SUBSAMPLE IDENTIFICATION NO.

LORAN #'S →

END TIME HH MM END LATITUDE DD MM MM END LONGITUDE DD MM MM END DEPTH

TOTAL WT. OF NET WITH CATCH (LBS.) TOTAL WT. OF NET W/O CATCH (LBS.) TOTAL CATCH WEIGHT (LBS.)

LORAN #'S → TOTAL SUBSAMPLE WEIGHT (LBS.) →

FILL IN FOR SPECIES NOT RETURNED TO LAB FOR PROCESSING

(Additional Space On Back)

IDENT. GROUP (3)	GENUS	SPECIES	TOTAL WEIGHT (POUNDS)	TOTAL LENGTH (MM)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
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20				

CODES:

- (1). VESSEL PREFIX: TR = TRINITY BAY, UG = UPPER / EAST GALVESTON BAYS, LW = LOWER / WEST BAYS
- (2). GEAR SPECS: PROVIDE ACCURATE DESCRIPTION OF GEAR TYPE, HEADROPE LENGTH, AND MESH SIZE.
- (3). IDENTIFICATION GROUP F = FINFISH, C = CRUSTACEAN, I = INVERTEBRATES (Other Than Crustacea), D = DEBRIS / TRASH O = OTHER (DESCRIBE)

COMMENTS (Use Back If Necessary) BEAUFORT SEA CONDITIONS WATER COLOR CODE GEAR OPERATIONS CODE

VESSEL CAPTAIN SIGNATURE: _____

OBSERVER: _____

Field Procedures for Observers

1. Obtain subsample identification numbers for current day's trip from Eduardo Martinez or Dennis Emiliani. Record details of sampling trip in logbook, from beginning to end.
2. Upon arrival on vessel and while in route to trawl stations, set up gear in preparation for obtaining catch subsamples. This includes setting up the hanging scales, preparing identification labels for the subsample bags, recording vessel and gear specification data on station sheets, etc.
3. At the start of the trawl tow, record time, position and depth on by-catch station sheets (see instructions for filling by-catch station for additional information). **Enter all data on the by-catch station sheets as they are measured; do not wait to fill in the data fields later!**
4. During the tow, record vessel speed and comments regarding sea conditions, water color, net operations and type of tow (circular, zig-zag, etc). There is additional room for comments on the back of the data sheet; use the logbook provided if necessary.
5. At the end of a tow, during haulback, record time, position and depth on the by-catch station sheet. Obtain a surface water sample to measure and record salinity and temperature. If possible, obtain a bottom water sample for additional temperature/salinity measurements.
6. When the trawl cod end is placed on deck, measure and record the total net weight with the catch inside. This should be done by attaching the trawl cod end to the hanging spring scales. Upon removing the catch, re-weigh the net and record data on by-catch station sheets. Total catch weights are obtained by subtracting the net weight from the total weight of each tow.
7. Obtain a subsample of by-catch: When working aboard shrimp vessels, a subsample of ~25 lbs. will be taken from the net for analysis. The subsample should be representative of the total catch. Use a shovel to mix the catch before removing the subsample. [Note: On a live bait boat, mix the catch contents in the sorting box before removing subsample with a dip net, insuring that the subsample is a well-mixed sample of the total catch]. If needed, remove, measure and weigh any large species from the catch before taking a subsample. Anything removed from the total catch (fish, trash, etc.) before the subsample is taken must be recorded on the data sheet. Use back of data sheet or additional sheets if necessary. See list provided for scientific and common names of selected species. Place the subsample in a sample bag. Each subsample bag must contain an internal and external identification tag that has the following information on it:
 - A. Date (Month, Day, Year)
 - B. Vessel Name (with prefix code)
 - C. Tow #
 - D. Subsample ID # (assigned prior to sampling trip)
 - E. Subsample weight (lbs.)

8. Once the subsample is obtained, place the subsample on ice and return to the laboratory for processing. Complete recording any pertinent comments on the by-catch station sheet or logbook. Assist the vessel captain with sorting the remainder of the catch.

Note: If a live sea turtle is captured in the net, it is imperative that it be brought back to the NMFS laboratory. Attempt to resuscitate unconscious sea turtles. Do not return any sea turtles to the water, regardless of apparent health condition. Radio back to laboratory for assistance or directions if necessary. Record incidence on sea turtle sightings form. Identify and record capture of dead or decomposing sea turtles. Every time you see a turtle, even if you do not catch it, fill out a turtle sighting form.

9. Upon returning to the laboratory: If processing of samples cannot be initiated immediately, place the samples in chest freezer for storage and later processing. Log all samples placed in freezer storage and submit data sheets to Eduardo Martinez or Dennis Emiliani. Wash/clean gear and place in storage areas. Remember to record all information related to the sampling trip in your logbook

ADDITIONAL INSTRUCTIONS FOR COMPLETING THE BY-CATCH STATION SHEET

DATE - Enter date of trip (MMDDYY).

PAGE #'s - Always record the number of pages associated with each tow/subsample, even if just one page (i.e., page 1 of 1, page 3 of 5 pages, etc.)

VESSEL - Use the codes on the bottom of the By-catch Station Sheet to fill in the vessel prefix. The vessel prefix denotes the area within Galveston Bay in which the shrimp boat is based. Provide the vessel code name in the rest of the space provided.

GEAR SPECIFICATIONS - There are 3 field related to gear specifications. These include gear type, length and mesh size. Limitations are specified by fishing regulations set forth by the Texas Parks & Wildlife Dept. and gear types and sizes may vary with different fishing seasons throughout a calendar year. Data for gear specifications must be recorded at least once during each sampling trip. Net length should be measured along the headrope from leading tip of door to leading tip of door. Also record the twine size in the comments section at the bottom of the data sheet.

TOW NUMBER - The tow number has a field width of 3. Tow numbers are recorded in the order that they are taken for each sampling day (i.e., 1,2,3, etc).

TEMPERATURES - Measure surface and bottom water temperature at least once daily or for each tow if possible. Record air temperature during each tow. If dramatic change in climatic conditions exist (i.e., onset of cold front), re-measure and record parameters. Water samples can also be used for measurement of salinity.

START TIME - Enter military time (0000-2359), HHMM, for the start of a tow (dog-off time).

START LATITUDE & LONGITUDE OR LORAN NUMBERS - Enter position occupied at start time in degrees, minutes, and hundredths of minutes, observing implied decimals and entering trailing zeros. LORAN #'s may substituted for lat./lon. readings. If no position coordinates are available from vessel, use Global Positioning System (GPS) locators provided by lab to determine lat./lon. readings.

START DEPTH - Enter starting depth to nearest tenth; specify whether fathoms, meters or feet.

VESSEL SPEED - Enter speed of vessel (in knots) during tow period, observing 1 implied decimal point.

SALINITY - Enter salinity of surface and bottom water samples at least once daily and with each tow if possible.

SUBSAMPLE IDENTIFICATION NUMBER - Enter subsample identification number. These are designated for consecutive tows (samples) prior to the sampling trip. The subsample ID numbers must include the same prefix assigned to vessel category which designates fishing area.

END TIME - Enter as for start time (fishing tows end at start of haulback).

END LATITUDE & LONGITUDE - Enter position occupied at end time. Use LORAN #'s if lat./lon readings not available.

END DEPTH - Enter end depth to nearest tenth; specify whether fathoms, meters or feet.

TOTAL WEIGHT OF NET WITH CATCH - Enter total weight of net and catch (in pounds) after haulback (prior to opening cod end).

TOTAL WEIGHT OF NET WITHOUT CATCH - Enter weight of net only (in pounds) after catch has been removed. Do this at least once per day, but preferably after each tow.

TOTAL CATCH WEIGHT- Enter total catch weight (in pounds) obtained by subtraction of trawl weight from total weight of trawl and catch.

TOTAL SUBSAMPLE WEIGHT - Enter weight of subsample (in pounds) taken from catch; this should be standardized to obtain a maximum of 25 pounds if present in the total catch.

IDENTIFICATION GROUP - Enter identification code for any items/species too large to include in the subsample. These may include large finfish, sharks, or debris items such as sargassum, 5-gal buckets, 55-gal. drums, etc. Codes are listed on the bottom of the By-catch Station Sheets (i.e., F = finfish, C = crustacean, etc.) Additional space available on back of data sheet.

GENUS AND SPECIES - Locate organisms on pre-printed species list. Enter genus and species names or a description of debris items. Additional space available on back of data sheet.

TOTAL WEIGHT AND LENGTH - If sampled, enter total weight (in pounds) and total length (in mm) of species. Enter weights only for debris items; data for debris items are extremely important because they are part of the total catch weight. Add trailing zeroes if needed. Additional space available on back of data sheet.

COMMENTS - Enter pertinent comments or observations. These may include:

- whether or not vessel captain uses a salt box to cull by-catch
- approximate size of shrimp being discarded from catch (total length in mm)
- a subjective estimate of the percentage of finfish by-catch that survive upon being discarded into the bay.
- whether environmental data are taken at beginning or end of a tow,
- tow description, operations codes (circular, zig-zag, etc.)
- distinguishable landmarks near start or end of tow
- climatic conditions (rain, heavy clouds, strong winds)
- sea conditions (see below for Beaufort Sea Conditions, water color codes, etc.)
- unusual catches/conditions (marine mammals, large concentrations of algae, seagrass, debris or jellyfish, oiled/polluted water, tow near marshes or land masses, etc.)

Additional space for comments is available on back of data sheet.

VESSEL CAPTAIN SIGNATURE - It is recommended that the vessel captain sign the by-catch station sheet to verify the date and location of samples collected.

RECORDER - Enter name of person(s) completing the form.

DATA CODES:

BEAUFORT SEA CONDITIONS

<u>Sea Condition</u>	<u>Description</u>
0	Wind speed under 1 knot; sea like mirror
1	Wind speed 1-3 knots; ripples with appearance of scales; no foam crests.
2	Wind 4-6 knots; small wavelets; crests of glassy appearance; not breaking.
3	Wind speed 7-10 knots; large wavelets; crests begin to break; scattered whitecaps.
4	Wind speed 11-16 knots; small waves

- 5** Wind speed 17-21 knots; many whitecaps, some spray.
- 6** Wind speed 22-27 knots; larger waves forming; whitecaps everywhere; more spray.
- 7** Wind speed 28-33 knots; sea heaps up; white foam from breaking waves begins to be blown into streaks.
- 8** Wind speed 34-40 knots; moderately high waves of greater length; edges of crests begin to break into spindrift; foam is blown in well-marked streaks.
- 9** Wind speed 41-47 knots; high waves; sea begins to roll; dense streaks of foam; spray may reduce visibility.

WATER COLOR CODES

- B** = Blue or clear
- G** = Green
- T** = Blue green
- Y** = Yellow
- M** = Muddy or brown

OPERATION CODES

- A** = Nets not spread; typically doors are flipped or doors hung together so net could not spread.
- B** = Gear bogged; the net has picked up a quantity of sand or mud such that the net can not be easily towed.
- C** = Bag choked; the catch in the net is prevented from getting into the bag by something (grass, sticks, etc.) clogging net or by the twisting of the lazy-line.
- D** = Gear not digging; the net is fishing off the bottom due to insufficient weight.
- E** = Twisted warp or line; the cables composing the bridle get twisted (from passing over blocks which occasionally must be removed before continuing to fish). Use this code if catch was affected.
- F** = Gear fouled; the gear has become entangled in itself. Typically this involves the webbing and some object like afloat or chains.
- G** = Bag untied; bag of net not tied when dragging net.
- H** = Rough weather; if the weather is so bad fishing is stopped, then the previous tow should receive this code if the rough conditions affected the catch.
- I** = Torn webbing or lost net; usually results from hanging the net and tearing it loose. The net comes back with large tears if at all. Do not use this code if there are only a few broken meshes. Continue using this code until net is repaired or replaced.

- J** = Dumped catch; tow was made but catch was discarded, perhaps because of too much trash, fish, sponge. Give reason in Comments.
- K** = No pick up; tow made but net not dumped on deck because nets are brought up, boat changes location and nets are towed more before decking.
- L** = Hung up; untimely termination of a tow by a hang. Specify trawl(s) which were hung and caused lost time in Comments.
- M** = Bags dumped together and catches not separated.
- N** = Net did not fish; no apparent cause.
- O** = Gear fouled on object. Net may be towed but performance is affected. Give specifics in Comments.
- P** = No measurement taken of shrimp or total catch.
- Q** = Cable breaks and net lost. Describe in Comments.
- R** = Net caught in wheel.
- S** = Tickler chain fouled or tangled.
- T** = Other problems (describe).
- Z** = Successful tow.

BYCATCH SAMPLE PROCESSING SHEET

PAGE ____ OF ____ PAGES

PROCESSING DATE
MO DY YR

--	--	--

SUBSAMPLE IDENTIFICATION NO.

--

SAMPLING DATE
MO DY YR

--	--	--

VESSEL (1)

--

TOW NO.

--

TOTAL SUBSAMPLE WEIGHT (LBS)

--

IDENT. GROUP (1)	GENUS	SPECIES	TOT. NUM. (2)	TOTAL WEIGHT (GRAMS)	TOTAL LENGTH (MM)	COMMENT CODE
1				.		
2				.		
3				.		
4				.		
5				.		
6				.		
7				.		
8				.		
9				.		
10				.		
11				.		
12				.		
13				.		
14				.		
15				.		
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38				.		
39				.		
40				.		

* - Obtain sampling information from bycatch station sheets.

** - Record comments for individual species on back of data sheet in order (i.e., comment code 2 would be 2nd comment on back of this form).

(1). IDENTIFICATION GROUP: F = FINFISH, C = CRUSTACEAN, I = INVERTEBRATES (Other Than Crustacea), D = DEBRIS/TRASH O = OTHER (describe)

(2). RECORD TOTAL NUMBER OF ORGANISMS ONLY WHEN OBTAINING GROUP WEIGHTS (i.e., 25 Shrimp, Hardheads, etc.)

SAMPLE PROCESSED BY: _____

Laboratory Procedures for Processing By-catch

1. Remove sample from freezer storage and thaw. Transcribe the data from the sample identification label onto the sample processing sheet.
2. Identify and sort the organisms in the subsample according to genus/species.
3. Up to to 25 organisms per species group will be individually processed. If there are more than 25 organisms in the subsample for any particular species group, randomly select 25 and process them individually. Measure individuals to the nearest mm and weigh to the nearest 0.1 grams. Record data on the by-catch sample processing sheet when not using the electronic measuring device. Use total length (TL) for finfish and shrimp, carapace width (CW) for crabs and gape length or shell length for molluscs. If total length is not available for finfish, use standard length (SL); be sure to note use of standard length on the sample processing sheet. Enumerate the remainder of animals in each species group, and process them collectively by obtaining a size range (min.-max. size) and total weight (in grams).
4. To include comments/remarks for individual entries on a by-catch processing sheet, enter the comment code in the appropriate column and record comments on the back of the data sheet.
5. Place processed items in a disposable bag (along with sample identification labels) and return them to freezer storage until they can be disposed of.
6. Submit data sheets to Eduardo Martinez or Dennis Emiliani.

DATE - Enter date of sample processing (MMDDYY).

PAGE #'s - Always record the number of pages associated with each tow/subsample even if just one page (i.e., page 1 of 1, page 3 of 5 pages, etc.). Staple all sheets from individual subsamples together.

SAMPLE INFORMATION - Remove the sample identification tag from the bag and transcribe the sample information on the tag onto the By-catch Sample Processing Sheet. If there are several data sheets for each sample, record only the processing date and sample identification number on successive sheets and staple all processing sheets. Each sheet must contain the information regarding:

SAMPLING DATE
VESSEL NAME (WITH PREFIX)
TOW NUMBER
TOTAL SUBSAMPLE WEIGHT (Kg)

IDENTIFICATION GROUP - Enter identification code for any items/species too large to include in the subsample. These may include large finfish, sharks, or debris items such as sargassum, 5-gal buckets, 55-gal. drums, etc. Codes are listed on the bottom of the By-catch Station Sheets (i.e., F = finfish, C = crustacean, etc.) .

GENUS AND SPECIES - Locate organisms on pre-printed species list. Enter genus and species names.

TOTAL NUMBER - If measuring the total weight for a group of organisms, record the number of organisms in the group. Enter a 1 for individual length-weight measurements.

TOTAL WEIGHT AND LENGTH - If sampled, enter total weight (in grams) and total length (in mm) of species. If using a combined weight for a group of organisms, enter the size range in the total length category. Enter weights only for debris items; data for debris items are extremely important because they are part of the total catch weight. Add trailing zeroes if needed.

COMMENT CODE - If comments are necessary for any organism/item in the subsample, notations are written on the back of the data sheet and referenced on the front in the comment code box. For example, if you wish to include a comment for a particular fish measured, enter a 1 in the comment code box. On the back of the data sheet, the first recorded comment is associated with the fish that has a 1 in the comment code box. Comments continue in succession (i.e., comment code 4 = 4th comment on back of data sheet, etc.)

SAMPLE PROCESSED BY - Name or initials of person processing the subsample must be included at the bottom of each data sheet. If more than one person is processing the sample, each must initialize the sheet.

