Biodiversity Data Journal 4: e8728
doi: 10.3897/BDJ.4.e8728

General Article

Five Years Later: An Update on the Status of Collections of Endemic Gulf of Mexico Fishes Put at Risk by the 2010 Oil Spill

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Academic editor: Pavel Stoev

Received: 04 Apr 2016 | Accepted: 11 Aug 2016 | Published: 18 Aug 2016

Citation: Chakrabarty P, O'Neill G, Hardy B, Ballengee B (2016) Five Years Later: An Update on the Status of Collections of Endemic Gulf of Mexico Fishes Put at Risk by the 2010 Oil Spill. Biodiversity Data Journal 4: e8728. doi: 10.3897/BDJ.4.e8728

Abstract

Background

The 2010 Gulf of Mexico Oil Spill took place over 180,000 square kilometers during a 12-week period over five years ago; however, this event continues to influence the development and distribution of organisms in and around the region of the disaster. Here we examine fish species that may have been most affected by noting their past distribution in the region of the spill and examining data of known collecting events over the last 10 years (five years prior to the spill, five years post spill).

New information

We found that more than half of the endemic fish species of the Gulf (45 of 77)

Keywords

BP, Deepwater Horizon, Macondo, ichthyology, fish

Introduction

The 2010 Gulf of Mexico Oil Spill (also called the Deepwater Horizon/BP disaster/oil spill, or Macondo blowout among others) was the largest accidental spill of oil in history (Crone and Tolstoy 2010, Rabalais 2014). Coupled with the fact that it occurred in the deep sea (>1000 m depth) and with the coordinated release of more than a million gallons of dispersant, it is one of the greatest pollution events in history (Goodbody-Gringley et al. 2013). The long lasting effects of the spill are still not fully understood even five years after the event. There is considerable evidence that some species continue to be physically and developmentally challenged by the impact of the spill, particularly fishes (Whitehead et al. 2011; Incardona et al. 2014; Dubansky et al. 2013; Brette et al. 2014; Mager et al. 2014; Alloy et al. 2016). However, population studies of fishes remain poorly examined (Fodrie et al. 2014). Although, fisheries for commercial species are better studied, the ichthyofauna as a whole has received little attention. Chakrabarty et al. (2012) listed fish species in need of conservation concern based on their known distribution in relation to the historical surface position of the oil spill. Here we reexamine the distribution of all 77 known endemic Gulf fish species five years after the spill based on collection records (as a reminder endemic means in this context, species only found in the Gulf of Mexico). We compare these post-spill records with those from five years prior to the spill.

These collection records are obtained from natural history museum records of specimen collections. Museum collections are a vital source for biological records (Drew 2011; Rocha et al. 2014). They maintain a record of the world's biodiversity by keeping specimens recorded from a certain area and time allowing comparisons to be made across time and space. With these collections one can compare a changing fauna before and after a catastrophic event, such as an oil spill. The correct identification of specimens is also vital (Chakrabarty et al. 2013), as museum collections are maintained by taxonomists and the specimens and comparative material are at hand, the identifications from these collections are more trustworthy than those from ship records or other sources where specimens are discarded. Here we use these collection records to examine the affects of the 2010 Gulf of Mexico Oil Spill on the endemic fishes of the region.

Methods and Results

The occurrence records of the 77 endemic species of the Gulf of Mexico were tallied using The Global Biodiversity Information Facility and FishNet2 from October-December of 2015. Duplicate events from the two databases were deleted (duplicates were discovered if they had the same museum catalog numbers). A scatter plot graph was then created in Microsoft Excel showing collections five years prior to the 2010 Oil Spill and five years post spill. Only collections records from the Gulf of Mexico were counted (assuming for these endemics that records from outside the region are likely misidentifications).

Scatter plots of endemic fishes from the Gulf of Mexico are shown below with the “Number of Occurrence(s)” on the y-axis vs. the “Number of Years” on the x-axis. Species are listed in alphabetical order. Endemic species that have few or no collections records do not have a scatterplot but details about their last collecting events are presented. The scientific name is also presented followed by common name (when there is one) and family. Spill zone overlap information is from Chakrabarty et al. (2012). If the scientific name has changed in the past five years we show both the old and new names. Conservation information about “Resilience” is taken from FishBase (Froese and Pauly 2016). Resilience is based upon the time it takes to double the species population and are as follows: Very Low (minimum of 14 years to double population); Low (4.5-14 years to double population); Medium (1.4-4.4 years to double population); High (less than 15 months to double population).

1) *Alosa alabamae* - Alabama Shad – Clupeidae (1% range overlap with spill zone). Resilience: Medium (Fig. 1)

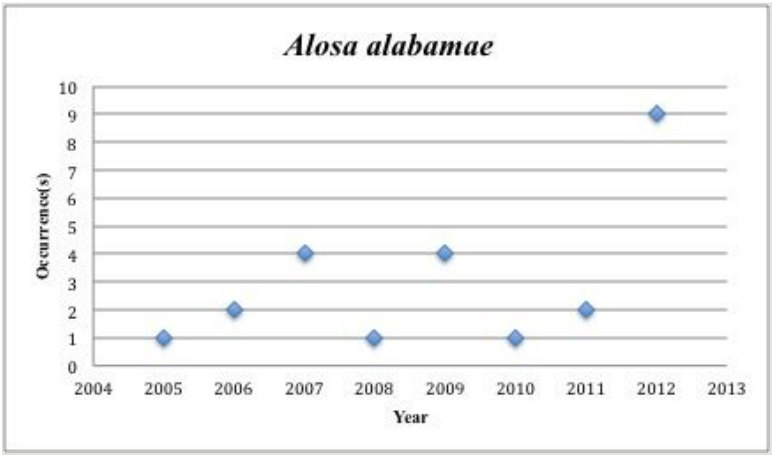

Figure 1.

Alosa alabamae

2) *Alosa chrysochloris* - Skipjack Shad – Clupeidae (2% range overlap with spill zone). Resilience: Medium (Fig. 2)

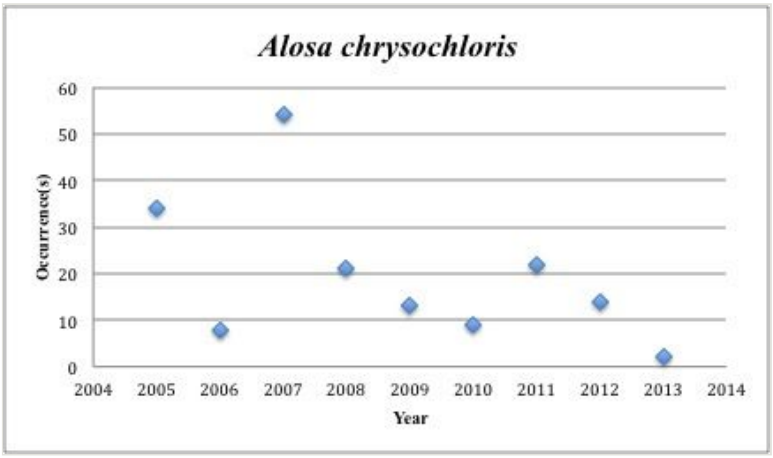

Figure 2.

Alosa chrysochloris

3) *Anacanthobatis folirostris* - Leaf-nose Leg Skate – Anacanthobatidae (79% range overlap with spill zone). Resilience: Low. – last time collected: 2004

4) *Atherinella schultzi* - Chimalapa Silverside – Atherinopsidae (No range overlap with spill zone). Resilience: High – collected once (2013) since 2005

5) *Atractosteus spatula* – Alligator Gar – Lepisosteidae (No range overlap with spill zone). Resilience: Very low (Fig. 3)

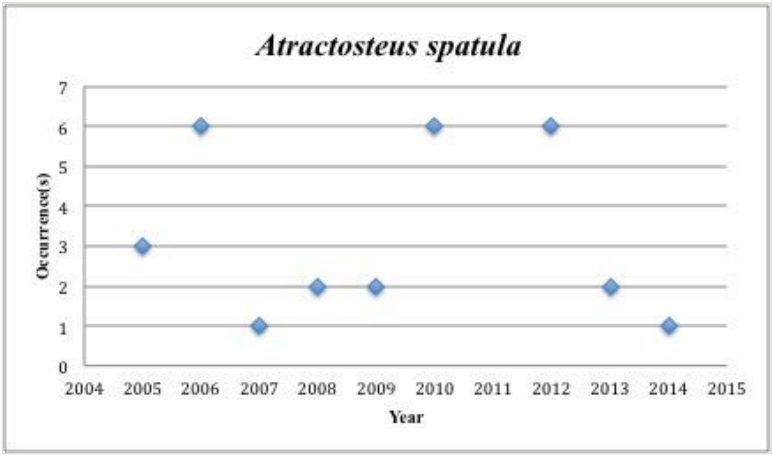

Figure 3.

Atractosteus spatula

6) *Bollmannia communis* – Ragged Goby – Gobiidae (41% range overlap with spill zone). Resilience: High (Fig. 4)

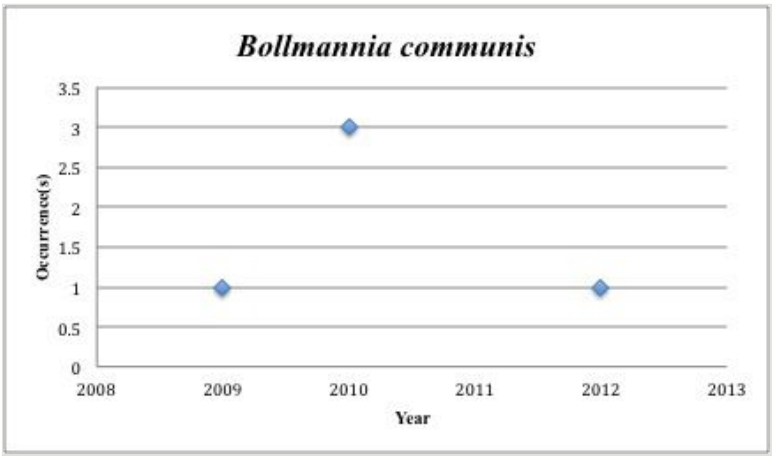

Figure 4.

Bollmannia communis

7) *Bollmannia eigenmanni* – Shelf Goby – Gobiidae (64% range overlap with spill zone). Resilience: Medium – last time collected: 1988

8) *Brevoortia gunteri* – Finescale Menhaden – Clupeidae (2% range overlap with spill zone). Resilience: Medium (Fig. 5)

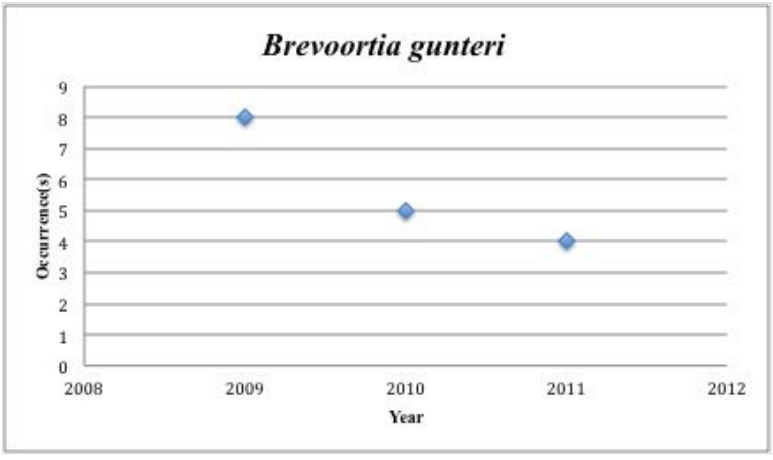

Figure 5.

Brevoortia gunteri

9) *Brevoortia patronus* – Gulf Menhaden – Clupeidae (11% range overlap with spill zone). Resilience: Medium (Fig. 6)

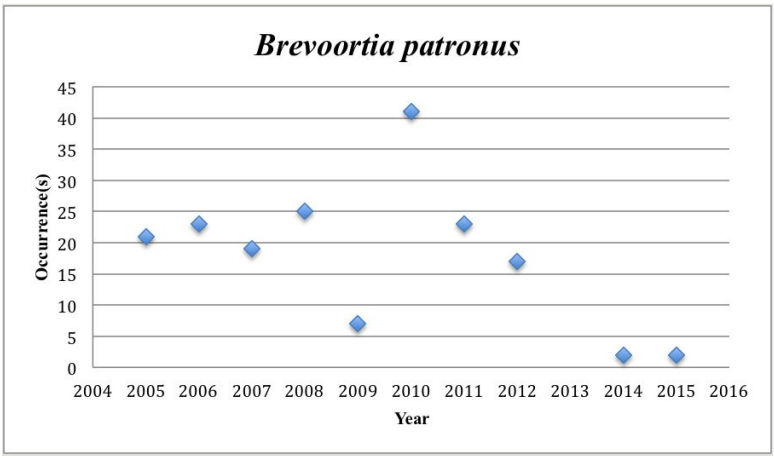

Figure 6.

Brevoortia patronus

10) *Calamus arctifrons* – Grass Porgy – Sparidae (No range overlap with spill zone). Resilience: Medium (Fig. 7)

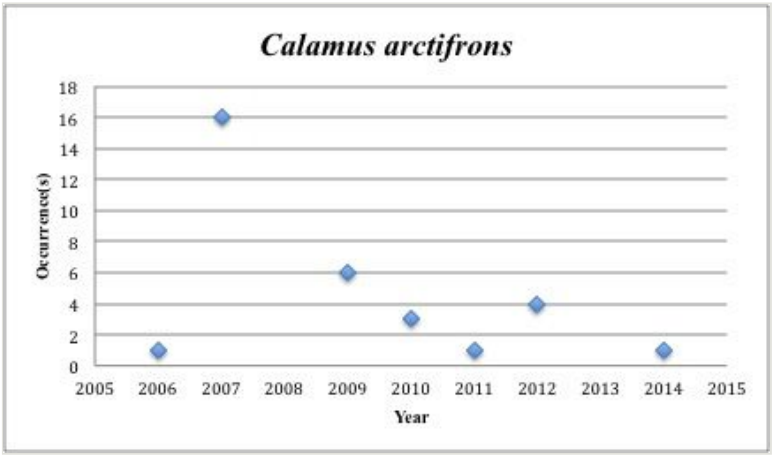

Figure 7.

Calamus arctifrons

11) *Calamus campechanus* – Campeche Porgy – Sparidae (No range overlap with spill zone). Resilience: Medium – last time collected: 1987

12) *Chasmodes longimaxilla* – Stretchjaw Blenny – Blenniidae (No range overlap with spill zone). Resilience: High – last time collected: 1983

13) *Chriolepis benthonis* – Deepwater Goby – Gobiidae (No range overlap with spill zone). Resilience: High – last time collected: 1953

14) *Chriolepis vespa* – Wasp Goby – Gobiidae (No range overlap with spill zone). Resilience: High – last time collected: 1970

15) *Citharichthys abbotti* – Veracruz Whiff – Paralichthyidae (No range overlap with spill zone). Resilience: High – last time collected: 2001

16) *Coryphaenoides mexicanus* – Mexican Grenadier – Macrouridae (54% range overlap with spill zone). Resilience: Medium (Fig. 8)

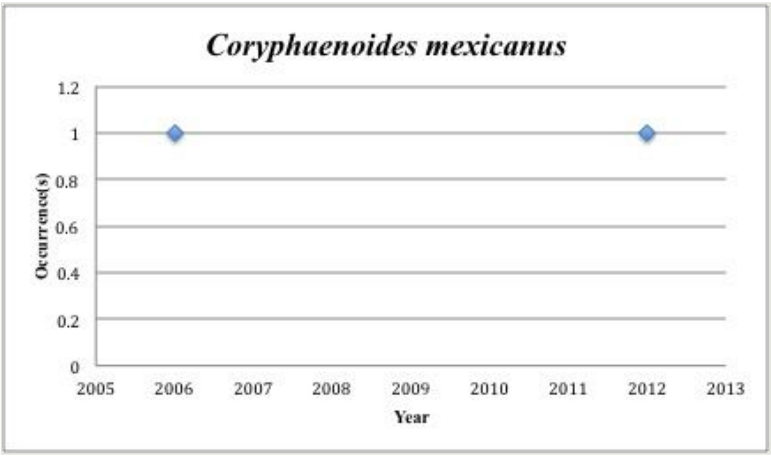

Figure 8.

Coryphaenoides mexicanus

17) *Coryphopterus punctipectophorus* – Spotted Goby – Gobiidae (No range overlap with spill zone). Resilience: High – last time collected: 1982

18) *Ctenogobius claytonii* – Mexican Goby – Gobiidae (No range overlap with spill zone). Resilience: High – collected once (2005) since 2005

19) *Cynoscion arenarius* – Sand Weakfish – Sciaenidae (12% range overlap with spill zone). Resilience: Medium (Fig. 9)

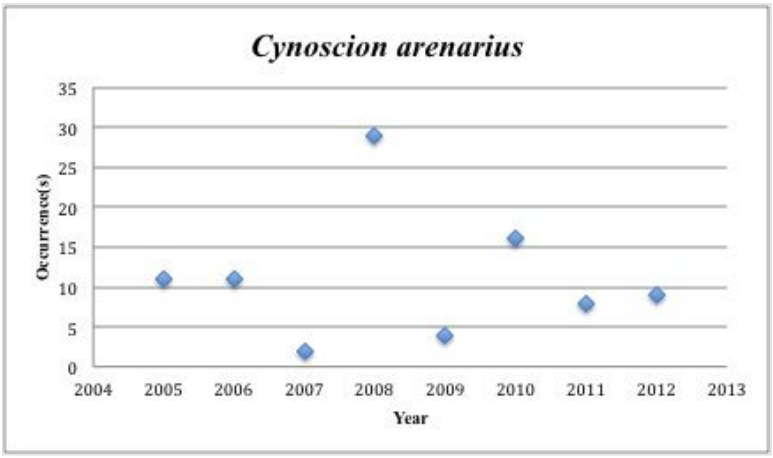

Figure 9.

Cynoscion arenarius

20) *Dipturus olseni* – Spreadfin Skate – Rajidae (29% range overlap with spill zone). Resilience: Low – collected twice (2005) since 2005

21) *Dipturus oregoni* – Hooktail Skate – Rajidae (80% range overlap with spill zone). Resilience: Low – last time collected: 1987

22) *Eptatretus minor* – Hagfish – Myxinidae (23% range overlap with spill zone). Resilience: Low – collected twice (2005) since 2005

23) *Eptatretus springeri* – Gulf hagfish – Myxinidae (54% range overlap with spill zone). Resilience: Low – collected once (2010) since 2005

24) *Etmopterus schultzi* – Fringefin Lanternshark – Etmopteridae (90% range overlap with spill zone). Resilience: Low – collected five times (2006) since 2005

25) *Eustomias leptobolus* – Stomiidae (40% range overlap with spill zone). Resilience: High – last time collected: 1960

26) *Exechodontes daidaleus* – Zoarcidae (No range overlap with spill zone). Resilience: High – last time collected: 1989

27) *Floridichthys carpio* – Goldspotted killifish – Cyprinodontidae (No range overlap with spill zone). Resilience: High (Fig. 10)

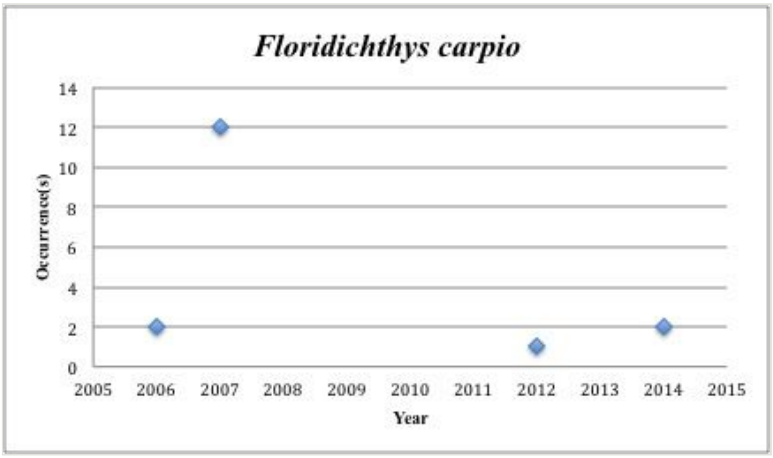

Figure 10.

Floridichthys carpio

28) *Fundulus grandis* – Gulf Killifish – Fundulidae (13% range overlap with spill zone). Resilience: High (Fig. 11)

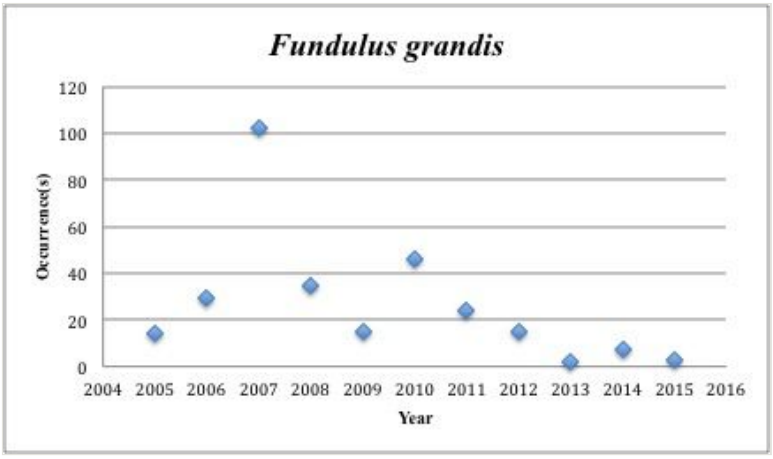

Figure 11.

Fundulus grandis

29) *Fundulus jenkinsi* – Saltmarsh Topminnow – Fundulidae (4% range overlap with spill zone). Resilience: High (Fig. 12)

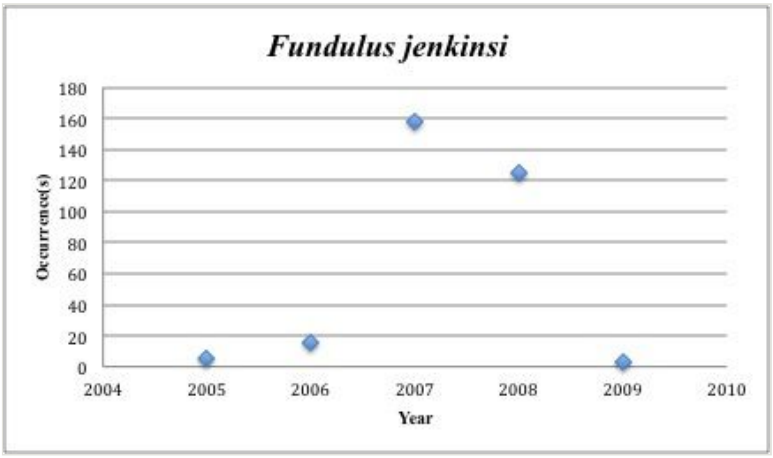

Figure 12.

Fundulus jenkinsi

30) *Fundulus persimilis* – Yucatán Killifish – Fundulidae (No range overlap with spill zone). Resilience: High – collected twice in 2005

31) *Fundulus pulvereus* – Bayou Killifish – Fundulidae (18% range overlap with spill zone). Resilience: High (Fig. 13)

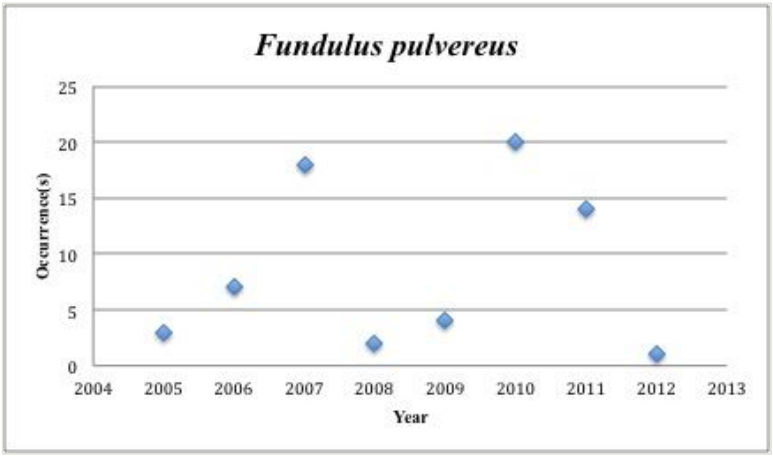

Figure 13.

Fundulus pulvereus

32) *Fundulus xenicus* (formerly *Adinia xenica*) – Diamond Killifish – Fundulidae (13% range overlap with spill zone). Resilience: Low (Fig. 14)

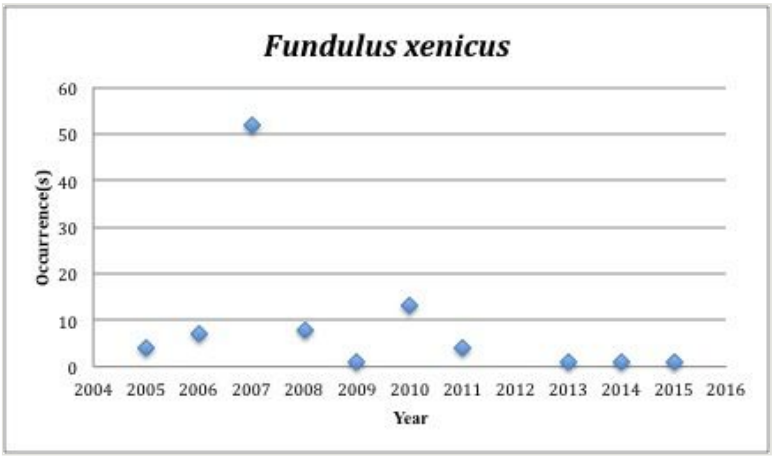

Figure 14.

Fundulus xenicus

33) *Gambusia yucatana* – Yucatan Mosquitofish – Poeciliidae (No range overlap with spill zone). Resilience: High (Fig. 15)

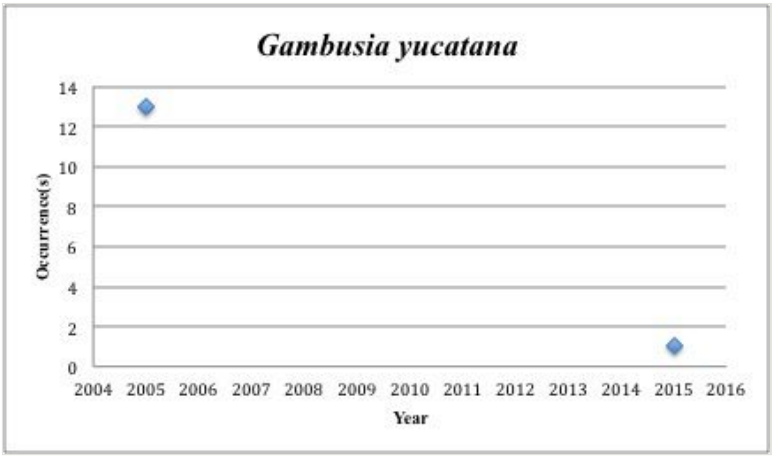

Figure 15.

Gambusia yucatana

34) *Gobiosoma longipala* – Twoscale Goby – Gobiidae (No range overlap with spill zone). Resilience: High – collected 2 times (2012) since 2005

35) *Gordiichthys ergodes* – Irksone Eel – Ophichthidae (No range overlap with spill zone). Resilience: Medium (Fig. 16)

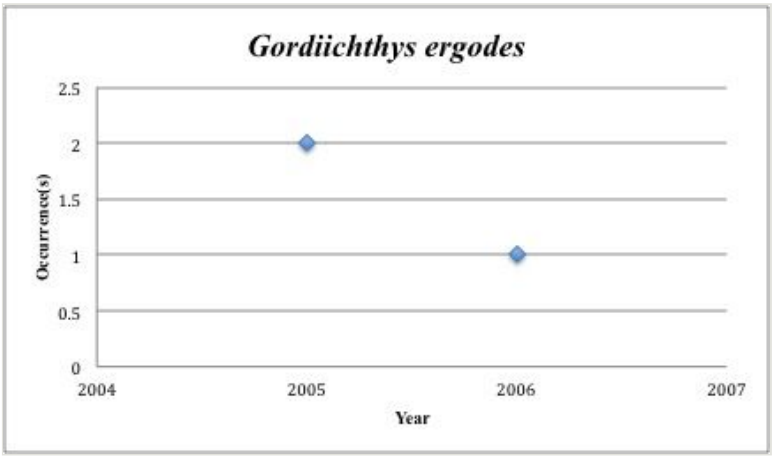

Figure 16.

Gordiichthys ergodes

36) *Gordiichthys leibyi* – String Eel – Ophichthidae (No range overlap with spill zone). Resilience: Medium – last time collected: 2004

37) *Gunterichthys longipenis* – Gold Brotula – Bythitidae (88% range overlap with spill zone). Resilience: Low – last time collected: 2002

38) *Gymnachirus texae* – Gulf of Mexico Fringed Sole – Achiridae (16% range overlap with spill zone). Resilience: High – collected once (2012) since 2005

39) *Halichoeres burekae* – Mardi Gras Wrasse – Labridae (No range overlap with spill zone). Resilience: High – collected twice (2006) since 2005

40) *Halieutichthys intermedius* – Louisiana Pancake Batfish – Ogcocephalidae (68% range overlap with spill zone). Resilience: High – collected five times (2010) since 2005

41) *Heteroconger luteolus* – Yellow Garden Eel – Congridae (No range overlap with spill zone). Resilience: Medium – last time collected: 2004

42) *Hyperoglyphe bythites* – Black Driftfish – Centrolophidae (82% range overlap with spill zone). Resilience: Medium – collected once (2008) since 2005

43) *Hypleurochilus caudovittatus* – Zebratail Blenny – Blenniidae (Insufficient data) Resilience: High – last time collected: 2004

44) *Hypleurochilus multifilis* – Featherduster Blenny – Blenniidae (25% range overlap with spill zone). Resilience: High – last time collected: 2001

45) *Ijimaia antillarum* – Ateleopodidae (8% range overlap with spill zone). Resilience: Unknown – last time collected: 2004

46) *Jordanella floridae* – Flagfish – Cyprinodontidae (No range overlap with spill zone). Resilience: Low (Fig. 17)

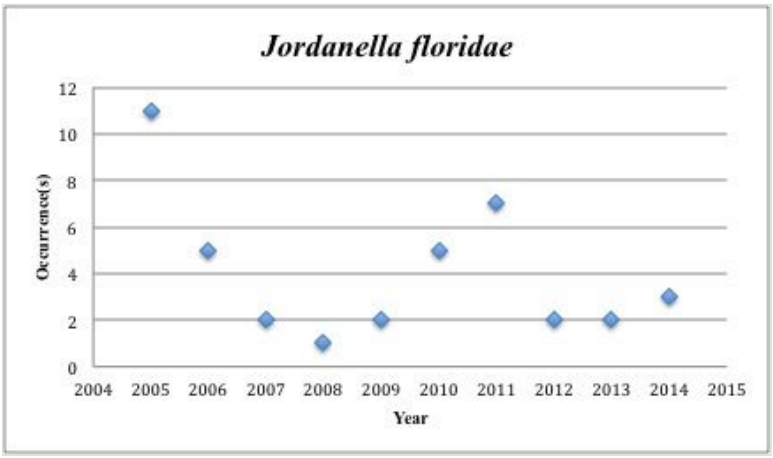

Figure 17.

Jordanella floridae

47) *Jordanella pulchra* (previously *Garmanella pulchra*) – Yucatán flagfish – Cyprinodontidae (No range overlap with spill zone). Resilience: High – collected 10 times (2005) since 2005

48) *Lepisosteus oculatus* – Spotted Gar – Lepisosteidae (0.2% range overlap with spill zone). Resilience: Medium (Fig. 18)

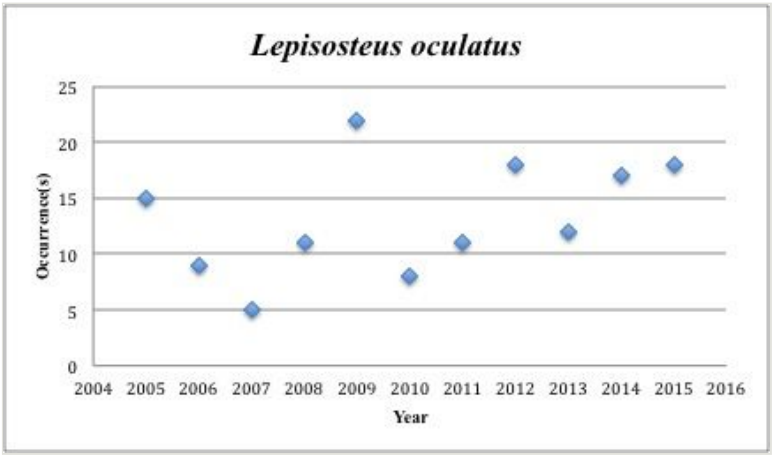

Figure 18.

Lepisosteus oculatus

49) *Leucoraja lentiginosa* – Freckled Skate – Rajidae (53% range overlap with spill zone). Resilience: Low – collected once (2012) since 2005

50) *Lupinoblennius nicholsi* – Highfin Blenny – Blenniidae (No range overlap with spill zone). Resilience: High – last time collected: 2000

51) *Lycenchelys bullisi* – Zoarcidae (50% range overlap with spill zone). Resilience: Medium – last time collected: 1999

52) *Menidia clarkhubbsi* – Texas Silverside – Atherinopsidae (No range overlap with spill zone). Resilience: High – last time collected: 2000

53) *Menidia colei* –Golden Silverside – Atherinopsidae (No range overlap with spill zone). Resilience: High – collected 29 times (2005) since 2005

54) *Menidia conchorum* – Key Silverside – Atherinopsidae (No range overlap with spill zone). Resilience: High – last time collected: 1978

55) *Microdesmus lanceolatus* – Lancetail Wormfish – Microdesmidae (43% range overlap with spill zone). Resilience: High – last time collected: 1980

56) *Monopenchelys acuta* – Redface Moray – Muraenidae (No range overlap with spill zone). Resilience: High (Fig. 19)

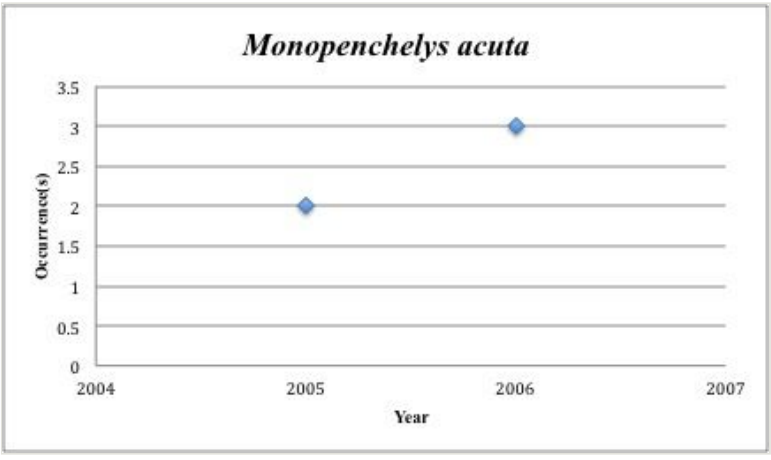

Figure 19.

Monopenchelys acuta

57) *Mustelus sinusmexicanus* – Gulf Smooth-hound – Triakidae (43% range overlap with spill zone). Resilience: Low (Fig. 20)

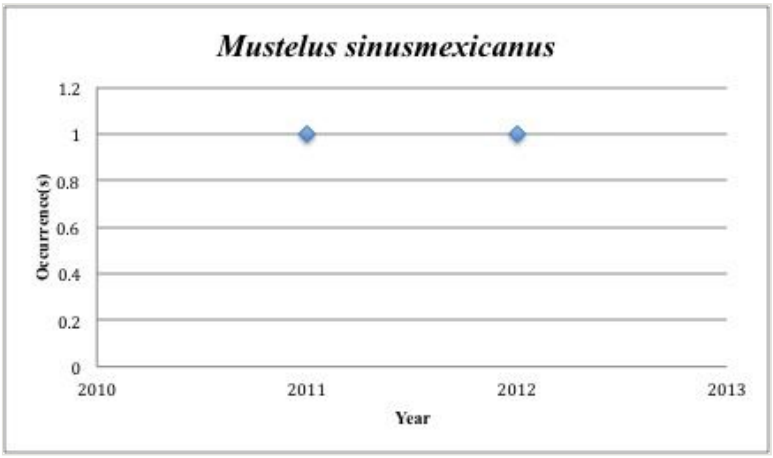

Figure 20.

Mustelus sinusmexicanus

58) *Neoopisthopterus cubanus* – Cuban Longfin Herring – Pristigasteridae (Insufficient data). Resilience: High – last time collected: N/A

59) *Ogcocephalus pantostictus* – Spotted Batfish –Ogcocephalidae (3% range overlap with spill zone). Resilience: Low (Fig. 21)

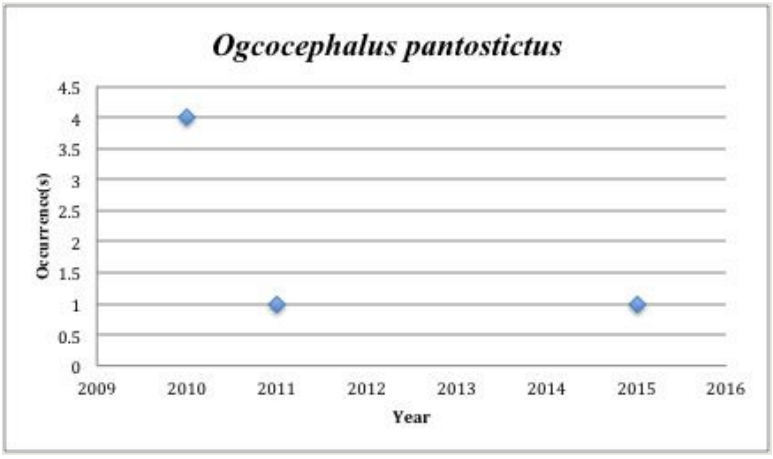

Figure 21.

Ogcocephalus pantostictus

60) *Ogilbia cayorum* – Key Brotula – Bythitidae (No range overlap with spill zone). Resilience: Low (Fig. 22)

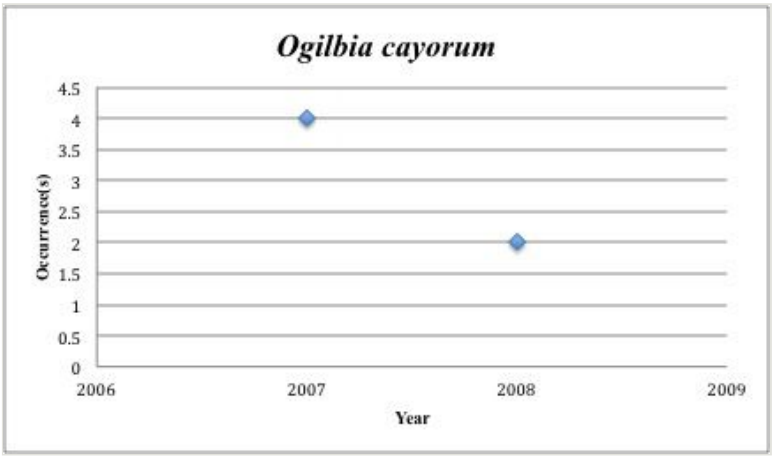

Figure 22.

Ogilbia cayorum

61) *Oneirodes bradburyae* – Oneirodidae (100% range overlap with spill zone). Resilience: High – last time collected: 1954

62) *Ophichthus omorgmus* – Dotted Snake Eel – Ophichthidae (Insufficient data). Resilience: Medium – last time collected: 1999

63) *Ophichthus rex* – King Snake Eel – Ophichthidae (82% range overlap with spill zone). Resilience: Very low – collected once (2009) since 2005

64) *Opsanus pardus* – Leopard Toadfish – Batrachoididae (38% range overlap with spill zone). Resilience: Low (Fig. 23)

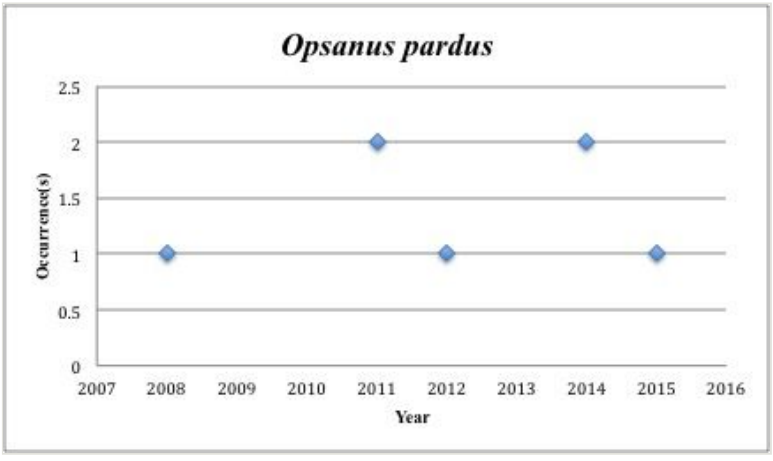

Figure 23.

Opsanus pardus

65) *Parasaccogaster rhamphidognatha* (previously *Saccogaster rhamphidognatha*) – (100% range overlap with spill zone). Resilience: High – last time collected: N/A

66) *Parmaturus campechiensis* – Campeche Catshark – Pentanchidae (Insufficient data). Resilience: Low – last time collected: 1970

67) *Prionotus longispinosus* – Bigeye Sea Robin – Triglidae (50% range overlap with spill zone). Resilience: Medium (Fig. 24)

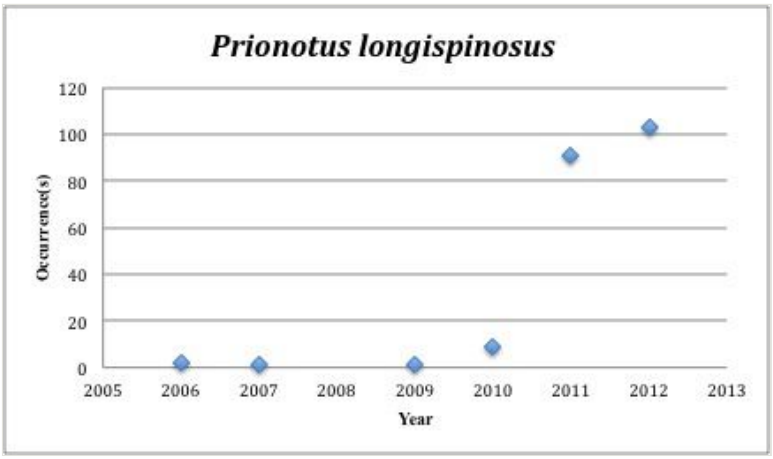

Figure 24.

Prionotus longispinosus

68) *Prionotus martis* – Gulf of Mexico Barred Sea Robin – Triglidae (5% range overlap with spill zone). Resilience: High (Fig. 25)

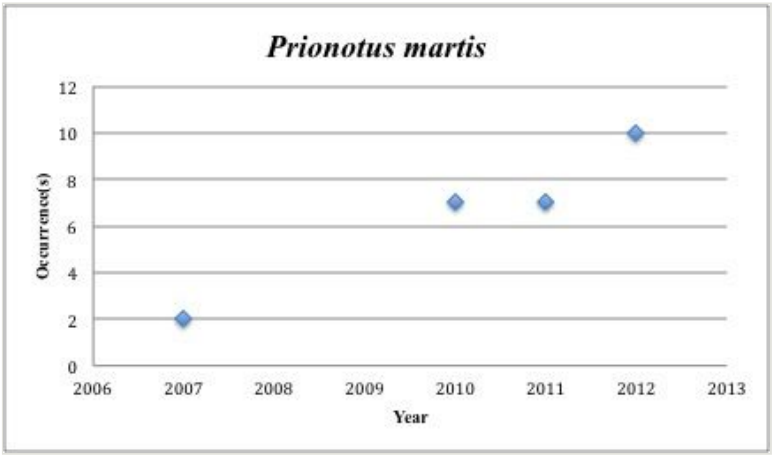

Figure 25.

Prionotus martis

69) *Prionotus paralatus* – Mexican Sea Robin – Triglidae (Insufficient data). Resilience: High (Fig. 26)

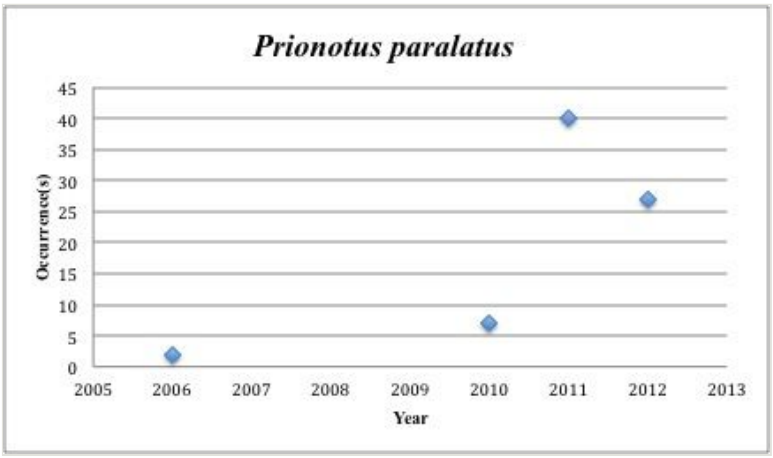

Figure 26.

Prionotus paralatus

70) *Raja texana* – Roundel Skate – Rajidae (11% range overlap with spill zone). Resilience: Low (Fig. 27)

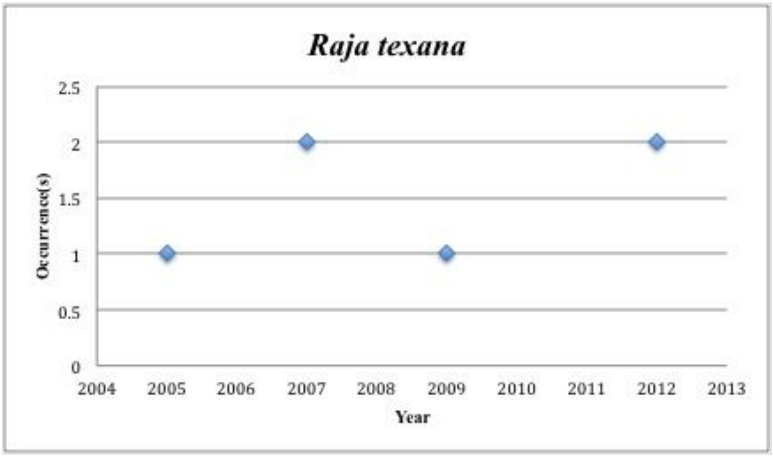

Figure 27.

Raja texana

71) *Sanopus reticulates* – Reticulate toadfish – Batrachoididae (Insufficient data). Resilience: Medium – last time collected: 1977

72) *Sphoeroides parvus* – Least Puffer – Tetraodontidae (Insufficient data). Resilience: High (Fig. 28)

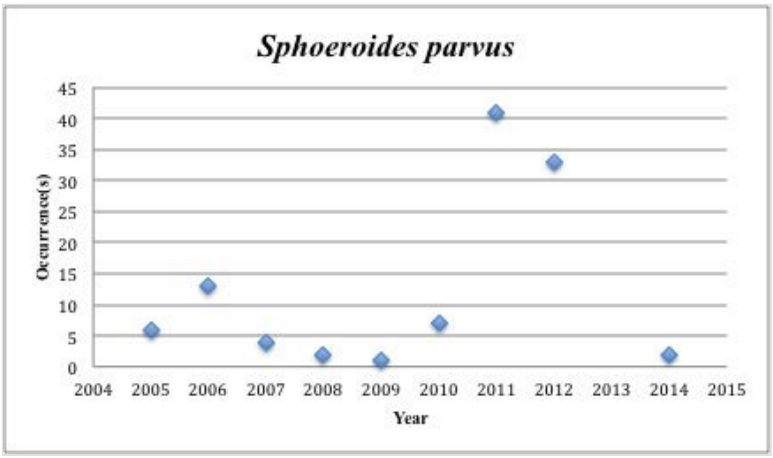

Figure 28.

Sphoeroides parvus

73) *Sphoeroides spengleri* – Bandtail Puffer – Tetraodontidae (.4% range overlap with spill zone). Resilience: High (Fig. 29)

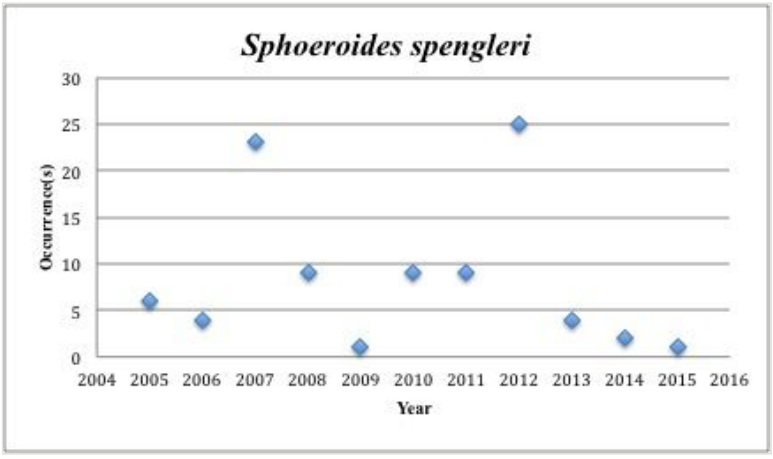

Figure 29.

Sphoeroides spengleri

74) *Stemonosudis bullisi* – Paralepididae (Insufficient data). Resilience: High – last time collected: 1960

75) *Syngnathus affinis* – Texas Pipefish – Syngnathidae (No range overlap with spill zone). Resilience: High – last time collected: 1983

76) *Trichopsetta ventralis* – Sash Flounder – Bothidae (31% range overlap with spill zone). Resilience: Medium (Fig. 30)

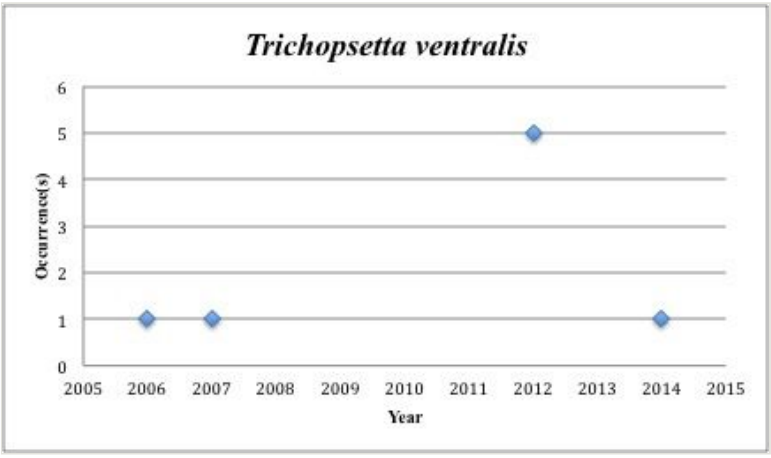

Figure 30.

Trichopsetta ventralis

77) *Varicus marilynae* – Orangebelly Goby – Gobiidae (No range overlap with spill zone). Resilience: High – last time observed: 1974

Discussion

The continued influence of an oil spill that occurred more than five years ago on the Gulf of Mexico is evident (Incardona et al. 2014; Alloy et al. 2016; Schaefer et al. 2015); however, data about population status, or even tangible proof of the continued existence of many of the Gulf's endemic fish species, is lacking. More than half (45) of the 77 endemic species from the Gulf of Mexico have not been officially collected since the 2010 spill. Of these, nine species have not been collected since before 1980, eight species have not been collected since the 1980s, and two not since the 1990s. Although there is a focus on fisheries data for commercially important species post-spill, the endemic species examined here are among the Gulf species we know the least about. Even with the data presented here our study of collections records must be viewed as a small glimpse into the true effects of the spill. Collections records are not a true estimate of population dynamics; however, in the case of rare and poorly studied species (as is the case with these endemics) – it is our best estimate.

The species we should perhaps be most concerned for are the 14 that have collection records in the five years before the spill, but lack records post-spill (2010-2015). Among these are *Fundulus jenkinsi* collected 306x, *Menidia colei* (29x), *Jordanella pulchra* (10x), *Ogilbia cayorum* (6x), and *Etmopterus schultzi* and *Monopenchelys acuta* both collected 5x. *Gambusia yucatana* was collected 14x in the last 10 years, and all but one of those was pre-spill.

Other species appear to be more common post-spill, with most of the collections occuring in the last five years (rather than the 2005-2010 period): *Trichopsetta ventralis* (6 of 8 collections post-2010), *Sphoeroides parvus* (83 of 109), *Prionotus longispinous* (203 of 206), *Prionotus paralatus* (74 of 76), *Opsanus pardus* (6 of 7), *Ogcocephalus pantostictus* (6 of 6), *Gobiosoma longipala* (2 of 2). It should be noted that all the collections of *Halieutichthys intermedius* are post-spill because this species was described in 2012 (Ho et al. 2012) and most museums have not updated their records for this species. Some of the species that had higher collections numbers post spill may have been influenced by the closing of fisheries during and after the immediate period of the oil spill (Schaefer et al. 2015). Although not directly targeted for fisheries these species may have increased in number because they were not collected as by-catch when fishing was closed. Also the increased interest in collecting and studying Gulf species post spill may have increased efforts to identify and catalogue these species. We also note here that the collections efforts pre- and post-spill were likely not equal. We therefore cannot do a statistical sampling comparison based on collecting effort.

There are some notable trends among and within groups as well. Of the six eels in the study (Elopomorpha Families: Ophichthidae, Muraenidae, Congridae) only one species, *Ophichthus rex* had a high percentage of its range in the region of the spill (82%) and it has been collected once since the spill. However, eel species in general are very rare in collections, and little or no data about any of the endemic eels from the Gulf of Mexico is known (9 total collection records, all post spill).

Of the seven cartilaginous fishes (Elasmobranchii Families: Anacanthobatidae, Rajidae, Etmopteridae, Triakidae) most had a high proportion of their range in the area of the spill zone but most have post-spill collections. The exception being the rare *Anacanthobatis folirostris*, which has no collection records since 2004. These elasmobranchs all have low resiliency, with populations doubling time between 4.5-14 years (Froese and Pauly 2016). Most members of the small but diverse members of gobies (Gobioidei) and blennies (Blennioidei) lack sufficient information (in being collected mostly before 2005), as is the case for most of the ten coral associated endemic Gulf species (Table 1). Inshore brackish fishes such as those in the families Lepisosteidae, Clupeidae, Atherinopsidae, Fundulidae, Poeciliidae, and Cyprinodontidae, were mainly out of the area of the immediate spill (i.e., little overlap with the region of the spill as initially measured) and are among the most collected species among Gulf endemics (Table 1). However, although the collections may be high, the documented developmental impairment of near shore species points to the fact that even these species are not out of harms way (Dubansky et al. 2013). Additionally,

the influence of the oil slick at the surface on pelagic larvae and in the deep-sea on individuals that are rarely seen will never be completely known (Fodrie and Heck 2011).

Table 1.

Summary of species occurrence records (based on GBIF and FishNET2), and habitat types (from McEachran 2009; Chakrabarty et al. 2012). Taxa that were deemed ‘‘Species of Greatest Concern’’ by Chakrabarty et al. (2012) are in bold. These species had 35% of their historical occurrence records in the region of the oil spill.

Species: **Scientific name**	**Family**	**Occurrences: 2010-present**	**Occurrences**: **2005-present**	**Habitat**
Alosa alabamae	Clupeidae	12	24	Bay and Near Shore, Anadromous, Neritic
Alosa chrysochloris	Clupeidae	47	177	Bay and Near Shore, Anadromous, Neritic
Anacanthobatis folirostris	**Anacanthobatidae**	**0**	**0**	**Slope**
Atherinella schultzi	Atherinopsidae	1	1	Bay and Near Shore, Estuarine
Atractosteus spatula	Lepisosteidae	15	29	Bay and Near Shore, Neritic, Estuarine
Bollmannia communis	**Gobiidae**	**4**	**5**	**Demersal, Soft Substrates**
Bollmannia eigenmanni	**Gobiidae**	**0**	**0**	**Demersal**
Brevoortia gunteri	Clupeidae	9	17	Bay and Near Shore, Neritic, Estuarine
Brevoortia patronus	Clupeidae	85	180	Bay and Near Shore, Neritic, Estuarine
Calamus arctifrons	Sparidae	9	32	Demersal, Seagrass
Calamus campechanus	Sparidae	0	0	Demersal
Chasmodes longimaxilla	Blenniidae	0	0	Demersal, Coral Reef
	Gobiidae	0	0	Demersal
	Gobiidae	0	0	Demersal
Citharichthys abbotti	Paralichthyidae	0	0	Demersal, Soft Substrates
Coryphaenoides mexicanus	**Macrouridae**	**2**	**2**	**Benthopelagic, Slope, Abyssal**
Coryphopterus punctipectophorus	Gobiidae	0	0	Demersal, Coral Reef
Ctenogobius claytonii	Gobiidae	0	1	Demersal, Bay and Near Shore, Estuarine

Cynoscion arenarius	Sciaenidae	33	90	Demersal, Beach and Shoreline, Soft Substrates
Dipturus olseni	Rajidae	0	2	Demersal, Slope
	Rajidae	**0**	**0**	**Slope**
Eptatretus minor	Myxinidae	0	2	Slope, Soft Substrates, Burrower
Eptatretus springeri	**Myxinidae**	**1**	**1**	**Slope, Soft Substrates, Burrower**
	Etmopteridae	**0**	**5**	**Slope**
Eustomias leptobolus	**Stomiidae**	**0**	**0**	**Mesopelagic**
Exechodontes daidaleus	Zoarcidae	0	0	Benthic, Slope
Floridichthys carpio	Cyprinodontidae	3	17	Bay and Near Shore, Estuarine, Seagrass
Fundulus grandis	Fundulidae	97	292	Bay and Near Shore, Estuarine, Seagrass
Fundulus jenkinsi	Fundulidae	0	306	Bay and Near Shore, Estuarine
Fundulus persimilis	Fundulidae	0	2	Bay and Near Shore, Estuarine
Fundulus pulvereus	Fundulidae	35	69	Bay and Near Shore, Estuarine
Fundulus xenicus	Fundulidae	20	92	Bay and Near Shore, Estuarine
Gambusia yucatana	Poeciliidae	1	14	Bay and Near Shore, Estuarine
Gobiosoma longipala	Gobiidae	2	2	Demersal, Soft Substrates
Gordiichthys ergodes	Ophichthidae	0	3	Demersal, Burrower, Soft Substrates
Gordiichthys leibyi	Ophichthidae	0	0	Demersal, Soft Substrates, Burrower
Gunterichthys longipenis	**Bythitidae**	**0**	**0**	**Demersal, Bay and Near Shore, Burrower**
Gymnachirus texae	Achiridae	1	1	Demersal, Soft Substrates
Halichoeres burekae	Labridae	0	2	Coral Reef
Halieutichthys intermedius	**Ogcocephalidae**	**5**	**5**	**Benthic, Soft Substrates**
Heteroconger luteolus	Congridae	0	0	Demersal
Hyperoglyphe bythites	**Centrolophidae**	**0**	**1**	**Benthopelagic**
Hypleurochilus caudovittatus	Blenniidae	0	0	Demersal, Soft Substrates

Hypleurochilus multifilis	Blenniidae	0	0	Demersal, Coral Reef
Ijimaia antillarum	Ateleopodidae	0	0	Benthic, Slope
Jordanella floridae	Cyprinodontidae	19	40	Bay and Near Shore, Estuarine, Seagrass,
Jordanella pulchra	Cyprinodontidae	0	10	Bay and Near Shore, Estuarine
Lepisosteus oculatus	Lepisosteidae	84	146	Neritic, Bay and Near Shore, Estuarine
Leucoraja lentiginosa	**Rajidae**	**1**	**1**	**Demersal, Slope**
Lupinoblennius nicholsi	Blenniidae	0	0	Demersal
Lycenchelys bullisi	**Zoarcidae**	0	0	**Benthic, Slope**
Menidia clarkhubbsi	Atherinopsidae	0	0	Bay and Near Shore, Estuarine
Menidia colei	Atherinopsidae	0	29	Bay and Near Shore, Estuarine
Menidia conchorum	Atherinopsidae	0	0	Bay and Near Shore, Coral Reef
Microdesmus lanceolatus	**Microdesmidae**	0	0	**Demersal, Bay and Near Shore, Burrower**
Monopenchelys acuta	Muraenidae	0	5	Demersal, Coral Reef
Mustelus sinusmexicanus	**Triakidae**	**2**	**0**	**Soft Substrates**
Neoopisthopterus cubanus	Clupeidae	0	0	Neritic, Bay and Near Shore, Beach and Shoreline, Estuarine
Ogcocephalus pantostictus	Ogcocephalidae	6	6	Demersal
Ogilbia cayorum	Bythitidae	0	6	Demersal, Hard Substrate
Oneirodes bradburyae	**Oneirodidae**	0	0	**Bathypelagic**
Ophichthus omorgmus	Ophichthidae	0	0	Benthic, Slope, Soft Substrates
Ophichthus rex	**Ophichthidae**	**0**	**1**	**Demersal, Soft Substrates, Burrower**
Opsanus pardus	**Batrachoididae**	**6**	**7**	**Demersal, Hard Substrates**
Parasaccogaster rhamphidognatha	**Bythitidae**	0	0	**Benthic, Slope, Soft Substrates**
Parmaturus campechiensis	Scyliorhinidae	0	0	Slope, Soft Substrates
Prionotus longispinosus	**Triglidae**	**203**	**207**	**Demersal, Soft Substrates**
Prionotus martis	Triglidae	24	26	Demersal

Prionotus paralatus	Triglidae	74	76	Demersal, Benthic, Slope
Raja texana	Rajidae	2	6	Demersal
Sanopus reticulatus	Batrachoididae	0	0	Coastal Surface and Epipelagic, Demersal
Sphoeroides parvus	Tetraodontidae	83	109	Demersal, Bay and Near Shore
Sphoeroides spengleri	Tetraodontidae	50	93	Demersal, Coral Reef, Seagrass
Stemonosudis bullisi	Paralepididae	0	0	Mesopelagic
Syngnathus affinis	Syngnathidae	0	0	Benthopelagic, Bay and Near Shore, Seagrass
Trichopsetta ventralis	Bothidae	6	8	Demersal, Benthic, Soft Substrates
Varicus marilynae	Gobiidae	0	0	Demersal

More than quarter of the Gulf of Mexico endemic fish species (20) had greater than 35% of their historical records in the area of the spill zone (Chakrabarty et al. 2012; those in bold text in Table 1). These species were identified by Chakrabarty et al. (2012) as being in the highest potential impact category. Of these species half (10 species) still lack any collection records post spill. We note that both GBIF and FishNET are not perfect records of all collecting events or even all museum collections. Also we note that these databases are dynamic and change on a near daily basis as museum records are uploaded and updated. For that reason the data in this paper should be taken as a snapshot of the information available at this time. It is clear more work needs to be done to find and potentially protect these endemic taxa. Future work will include citizen science projects by the authors (see Acknowledgements) and others, that will target Gulf endemics and add data, museum records, and increase community awareness. We hope this study helps focus conservation efforts on those species that lack the most information, or that have not been collected post-spill.

Acknowledgements

We thank the National Academies Keck Futures Initiative for funding to BB and PC - Crude Life: A Citizen Art and Science Investigation of Gulf of Mexico Biodiversity after the Deepwater Horizon Oil Spill.

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