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February 13, 2020

Evan Bloom
Acting Deputy Assistant Secretary
Bureau of Oceans and International Environmental and Scientific Affairs
United States Department of State
2201 C Street, NW
Washington, DC 20520-2758

Re: <u>Certification of Chinese Shrimp Trawling Industry Under Section 609</u>

Dear Deputy Assistant Secretary Bloom,

On behalf of the Southern Shrimp Alliance, I am writing to request that the U.S. Department of State ("State Department") re-evaluate the eligibility of China's commercial shrimp fishing fleet for certification under Section 609 of Public Law 101-162 (November 21, 1989). In support of this request, we are attaching two papers to this correspondence. The first, from our organization, discusses and provides an analysis of the history of the State Department's Section 609 certification of China, as well as information regarding the Chinese commercial shrimp fishery and sea turtle populations in China. The second, from Oceana, presents data from Global Fishing Watch regarding trawling activities in the South China Sea.

As explained in the attached paper from the Southern Shrimp Alliance, China has received certifications from the State Department under Section 609 of Public Law 101-162 since 1997. Initially, China's certification was based on that country's institution of a requirement of the use of turtle excluder devices on fishing gear that posed a threat of incidental capture of marine turtles. However, since 2000, the State Department has consistently certified China as a nation that "only harvest[s] shrimp using small boats with crews of less than five that use manual rather than mechanical means to retrieve nets, or catch shrimp [] using other methods that do not threaten sea turtles." This finding indicates that the State Department has affirmatively determined that China's commercial shrimp fishing industry utilizes fishing methods that do not threaten marine turtles.

Both of the attached papers provide evidence of a substantial and active commercial shrimp fleet operating in Chinese territorial waters in the South China Sea. Moreover, the evidence identified by the Southern Shrimp Alliance indicates that the Chinese commercial shrimp

fleet has extremely high levels of bycatch. A published academic study appended to our paper demonstrates that the Chinese fleet's use of beam trawls takes place in water as deep as 60 feet (18 meters) and involves large vessels of up to 70 feet in length (21 meters), with engines in excess of 300 kW, that carry as many as 20 trawl nets. These beam trawls are reported to have beams spanning between five and eight feet (1.7 to 2.4 meters) and net lengths of between 16 to 22 feet (5.0 to 6.8 meters). Another academic study surveyed fishing activities in the China Sea and found that four fishing methods were mainly used: (1) beam trawl gear; (2) twin trawling; (3) otter trawl gear; and (4) set-nets. Accordingly, that study evaluated the potential impact of beam trawling and otter trawling on subsea pipelines in the China Sea.

The regulations requiring turtle excluder devices for shrimp fishing activities promulgated by the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration (19 C.F.R. § 223.206) provide an exemption for certain beam trawl gear so long as "the frame is outfitted with rigid vertical bars, and if none of the spaces between the bars, or between the bars and the frame, exceeds 4 inches (10.2 cm)." There does not appear to be any requirement that Chinese shrimp beam trawlers utilize a frame meeting these specifications. Moreover, there is no exemption under the regulations for any type of otter trawls. As such, there does not appear to be a current basis for the conclusion that the Chinese shrimp fishing industry utilizes a fishing method to catch shrimp that does not threaten sea turtles.

As also explained in the attached paper from the Southern Shrimp Alliance, five of the seven species of sea turtles are found in Chinese waters. A review of available information indicates that all sea turtle species in China are in dire straits, with massive declines in nesting populations.

For these reasons, the large commercial shrimp fishing industry operating in the China Sea appears to pose a substantial threat to sea turtle populations in those waters. Accordingly, we believe that a review of the basis for China's certification is both necessary and timely.

Thank you for any consideration you may provide this request. I am available to address any questions you might have regarding this correspondence.

Sincerely,

John Williams
Executive Director

cc: DS2031@state.gov
David Hogan, Deputy Director, Office of Marine Conservation, Bureau of Oceans and International Environmental and Scientific Affairs, U.S. Department of State
Joseph Fette, Section 609 Program Manager, Office of Marine Conservation, Bureau of Oceans and International Environmental and Scientific Affairs, U.S. Department of State

Southern Shrimp Alliance, *China's Section 609 Certification (Feb. 2020)*

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China's Section 609 Certification
(February 2020)

Executive Summary

Enacted in 1990, Section 609 of Public Law 101-162 was intended to level the playing field by prohibiting the importation of shrimp harvested in a manner that adversely impacted sea turtles. Section 609(b)(2) of Public Law 101-162 (Nov. 21, 1989) instructs that the ban on the importation of shrimp or products shall not apply if the U.S. Department of State ("State Department") determines and certifies to Congress each year that certain conditions are met by a particular country.

In 1997, China received a certification based on the State Department's finding that it was one of the countries that had "adopted programs to reduce the incidental capture of sea turtles in such fisheries comparable to the program in effect in the United States." The State Department explained its determination as follows:

> The Department did not previously certify China because the Chinese government had not required all commercial shrimp trawl vessels subject to its jurisdiction that operated in waters where there is a likelihood of intercepting sea turtles to use fishing gear that is not harmful to sea turtles at all times. The Department of State has determined that China has now instituted such a requirement, based on documentation that China has provided which includes their law requiring the use of turtle excluder devices on gear which poses a threat of incidental capture of sea turtles.

In 2000, the basis for China's certification changed. That year, the State Department's certification for the country was based on a determination that it was one of nine countries that "only harvest shrimp using small boats with crews of less than five that use manual rather than mechanical means to retrieve nets, or catch shrimp [] using other methods that do not threaten sea turtles. Use of such small-scale technology does not adversely affect sea turtles." No further explanation was given for the change in the State Department's approach to China. The State Department has renewed China's certification for the same reasons every year through 2019.

But China continues to operate a large shrimp beam trawl commercial fishery in the northern South China Sea with high levels of bycatch. One 2014 academic journal article explained:

> Shrimp populations in the northern South China Sea are currently exploited using a variety of fishing gear, including trawl, gillnet, and stow nets . . ., the shrimp beam trawl being preferable because it has the highest catch rates for shrimp. One shrimp beam trawler can carry several nets, and the largest boats (>300kW) can carry up to 20 nets . . . . It has been estimated that there were 600 shrimp beam trawlers (125 092.1 kW) operating in the coastal waters of Guangdong in 2013. Shrimp beam trawlers also operate in Guangxi and Hainan provinces. The number of shrimp beam trawlers operating in the northern South China Sea is thus very high. Such an intensive fishery can have a significant effect on the sustainable development of fisheries in the northern South China Sea.

The study noted that "[w]e documented a high level of by-catch in the shrimp beam trawl fisheries in the northern South China Sea. The poor selectivity of shrimp beam trawls, caused by the small codend mesh size, and the overlap of the fishery with multiple mostly juvenile marine species in the inshore fishing grounds likely exacerbate the by-catch problem." The researchers concluded that "[a]lthough there may be some variability in the ratio of by-catch to shrimp between regions and seasons, the survey data suggest that the problem of by-catch in shrimp beam trawl fisheries is substantial and not to be ignored." Further, a study published in 2015 regarding the impact of fishing activities on pipelines in the China Sea, was based on a survey that found evidence of both otter and beam trawling in those waters.

The State Department has recognized that sea turtle populations are found in Chinese territorial waters, announcing an agency sponsored "EcoPartnership" in 2015 between Sea Turtles 911 and Hainan Normal University to "track sea turtle migration, help restore habitats, and foster community involvement in sea turtle protection" in the South China Sea. A recent article in *China Daily* explained the dire circumstances of sea turtle populations in Chinese waters and summarized conservation efforts in the country:

> Of the seven species of sea turtles, five are found in Chinese waters. The primary active nesting sites in China are now in the remote Paracel Islands in the South China Sea. The Huidong Sea Turtle Nature Reserve in Guangdong had around 500 nesting turtles 70 years ago but by 2012 only counted 2 nesting turtles. . . .
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> In 2018, China issued a sea turtle conservation action plan to help restore the country's dwindling sea turtle population. Along with restoring habitat and combating illegal trade, a key feature of this plan is to build public awareness and initiative to protect sea turtles.

The existence of a large shrimp beam and otter trawl fleet with high rates of bycatch operating in waters that are also home to sea turtle populations that are rapidly declining appears to be inconsistent with the State Department's repeated Section 609(b)(2)(C) certifications for the Chinese shrimp fishing fleet since 2000. While there may be a basis for these certifications, this basis does not appear to have been previously articulated. It is therefore unclear whether the State Department's certification process has accounted for the potential adverse impacts of the shrimp beam and otter trawl fishery operating in the northern South China Sea in its evaluation of Chinese shrimp harvesting activities.

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China's Section 609 Certification
(February 2020)

I. INTRODUCTION

The U.S. shrimp industry has long been subject to restrictions on its operations intended to mitigate any adverse impacts on sea turtle populations. Through these regulations, the U.S. shrimp industry has become an integral partner interested in the rebuilding of sea turtle populations, if only to limit further restraints on the industry. The restrictions imposed by the federal government on shrimp trawling operations, however, apply only to vessels operating in U.S. territorial waters and within the country's Exclusive Economic Zone. This means that shrimp industries operating outside of U.S. waters may not be subject to similar restraints and may have substantial adverse impacts on sea turtle populations, but compete in the U.S. market for sales of shrimp against the domestic industry. In these circumstances, U.S. shrimp fishermen are harmed both by having to compete with lower-priced wild-caught shrimp available in the market and by the significant undermining of recovery efforts for sea turtle populations worldwide.

Enacted in 1990, Section 609 of Public Law 101-162 was intended to level the playing field by prohibiting the importation of shrimp harvested in a manner that adversely impacted sea turtle populations. Responsibility for administration of law is vested with the U.S. Department of State ("State Department"). While the U.S. shrimp industry has not generally been involved in the certification process, the certification of China's shrimp fishery since 2000 appears to be unwarranted.

II. BACKGROUND ON SECTION 609 OF PUBLIC LAW 101-162 AND ITS IMPORTANCE TO THE U.S. SHRIMP INDUSTRY

In response to a request for comments regarding a proposed amendment to the National Marine Fisheries Service's (NMFS) turtle excluder device (TED) regulations, shrimpers argued that they were unfairly "bearing the majority of the burden for the recovery of sea turtles."[1] The

[1] *Endangered and Threatened Wildlife; Sea Turtle Conservation Requirements*, 68 Fed. Reg. 8,456, 8,457 (National Oceanic and Atmospheric Administration Feb. 21, 2003).

agency, in turn, explained that the federal government took seriously its responsibility to deny market access to shrimp harvested abroad in a way that harmed sea turtles:

> NMFS has been actively engaged with the Department of State (DOS) in enforcing section 609 of Public Law 101–162, since it was enacted in 1990. Nations with shrimp fisheries in the Atlantic, Pacific and Indian Oceans, the Caribbean Sea, and the Gulf of Mexico have faced trade restrictions on their commercially harvested shrimp exports to the United States. In most cases, these embargoes remained in place until the national government implemented a sea turtle protection program comparable in effectiveness to that of the United States. Embargoes on wild caught shrimp from nations with ineffective enforcement regimes have also been enacted. NMFS and DOS visit participating countries regularly to observe the performance of the foreign TED programs and ensure that certifications made pursuant to section 609 are based on the best information available.

Accordingly, U.S. shrimp fishermen were assured that NMFS and the State Department would use access to the U.S. market as leverage to improve and enhance the protection of sea turtles from any adverse impacts of shrimp trawling in foreign waters, similar to the obligations imposed upon the U.S. shrimp industry.

Section 609(b)(2) of Public Law 101-162 (Nov. 21, 1989) instructs that the ban on the importation of shrimp or products from shrimp harvested with commercial fishing technologies which may affect adversely sea turtles shall not apply if the President determines and certifies to Congress each year that one of the following two conditions is met by a particular country:

1. The government of the harvesting nation has provided documentary evidence of the adoption of a regulatory program governing the incidental taking of sea turtles that is comparable to that of the United States and the average rate of incidental taking by the vessels of the harvesting nation is comparable to the average rate of incidental taking of sea turtles by United States vessels; or

2. The particular fishing environment of the harvesting nation does not pose a threat of the incidental taking of such sea turtles in the course of harvesting.

The President, in turn, delegated authority to the Secretary of State to make certifications pursuant to Section 609.[2]

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[2] *See Memorandum of December 19, 1990*, 56 Fed. Reg. 357 (Jan. 4, 1991).

For the purposes of the State Department's analysis, the relevant species of sea turtles are: loggerhead (*Caretta caretta*); Kemp's ridley (*Lepidochelys kempi*); green (*Chelonia mydas*); leatherback (*Dermochelys coriacea*); and hawksbill (*Eretmochelys imbricata*).[3]

After initially applying Section 609 only to certain nations in the wider Caribbean/western Atlantic region, the State Department determined that, beginning in May 1, 1996, this provision would be applied on a world-wide basis.[4] The agency initially determined that import prohibitions would not be applied to:

1. shrimp harvested in an aquaculture facility, provided that the shrimp spent at least 30 days in ponds prior to being harvested;

2. shrimp harvested by commercial shrimp trawl vessels using TEDs comparable in effectiveness to those used in the United States;

3. shrimp harvested exclusively by means that do not involve the retrieval of fishing nets by mechanical devices or by vessels using gear that would not require TEDs if operated in the United States; and

4. species of shrimp, such as the pandalid species, harvested in areas in which sea turtles do not occur.[5]

In 1999, the State Department amended the last category from excluding certain species of shrimp to a more general provision of "[s]hrimp harvested in any other manner or under any other circumstances that the Department of State may determine, following consultation with NMFS, does not pose a threat of the incidental taking of sea turtles."[6]

In certifying a nation, the State Department may issue a certification without requiring further action if any one of the following three conditions existed:

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[3] *Revised Guidelines for the Implementation of Section 609 of Public Law 101-162 Relating to the Protection of Sea Turtles in Shrimp Trawl Fishing Operations*, 64 Fed. Reg. 36,946 (Dep't State July 8, 1999).

[4] *See Revised Notice of Guidelines for Determining Comparability of Foreign Programs for the Protection of Turtles in Shrimp Trawl Fishing Operations*, 61 Fed. Reg. 17,342, 17,343 (Dep't State Apr. 19, 1996).

[5] *See id. See also Revised Notice of Guidelines for Determining Comparability of Foreign Programs for the Protection of Sea Turtles in Shrimp Trawl Fishing Operations*, 63 Fed. Reg. 46,094, 46,096 (Dep't State Aug. 28, 1998).

[6] *Revised Guidelines for the Implementation of Section 609 of Public Law 101-162 Relating to the Protection of Sea Turtles in Shrimp Trawl Fishing Operations*, 64 Fed. Reg. 39,946, 36,949 (Dep't State July 8, 1999).

1. the harvesting nation was without any relevant species of sea turtles occurring in waters subject to its jurisdiction;

2. the harvesting nation's shrimp fishery harvests shrimp exclusively by means that do not pose a threat to sea turtles (*e.g.* any nation that harvests shrimp exclusively by artisanal means); or

3. the harvesting nation's commercial shrimp trawling operations take place exclusively in waters subject to its jurisdiction in which sea turtles do not occur.[7]

If none of those conditions exist, the State Department will only issue an annual certification "if the government of that nation has provided documentary evidence of the adoption of a regulatory program governing the incidental taking of sea turtles in the course of commercial shrimp trawl harvesting that is comparable to that of the United States and if the average take rate of that incidental taking by vessels of the harvesting nation is comparable to the average take rate of incidental taking of sea turtles by United States vessels in the course of such harvesting."[8]

As a practical matter, shrimp and products from shrimp imported from a certified nation need be accompanied by a State Department form that is certified by the exporter only.[9] An example of a completed version of the current version of the form – *Shrimp Exporter's/Importer's Declaration* (DS-2031) – accompanying the import of shrimp from China is attached as **Appendix A**.[10] As shown, shrimp and shrimp products imported from China to the

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[7] *See Revised Notice of Guidelines for Determining Comparability of Foreign Programs for the Protection of Turtles in Shrimp Trawl Fishing Operations*, 61 Fed. Reg. 17,342, 17,343 (Dep't State Apr. 19, 1996); *Revised Notice of Guidelines for Determining Comparability of Foreign Programs for the Protection of Sea Turtles in Shrimp Trawl Fishing Operations*, 63 Fed. Reg. 46,094, 46,096 (Dep't State Aug. 28, 1998); and *Revised Guidelines for the Implementation of Section 609 of Public Law 101-162 Relating to the Protection of Sea Turtles in Shrimp Trawl Fishing Operations*, 64 Fed. Reg. 39,946, 36,950 (Dep't State July 8, 1999).

[8] *See Revised Notice of Guidelines for Determining Comparability of Foreign Programs for the Protection of Turtles in Shrimp Trawl Fishing Operations*, 61 Fed. Reg. 17,342, 17,343-17,344 (Dep't State Apr. 19, 1996); and *Revised Notice of Guidelines for Determining Comparability of Foreign Programs for the Protection of Sea Turtles in Shrimp Trawl Fishing Operations*, 63 Fed. Reg. 46,094, 46,096 (Dep't State Aug. 28, 1998). *See also Revised Guidelines for the Implementation of Section 609 of Public Law 101-162 Relating to the Protection of Sea Turtles in Shrimp Trawl Fishing Operations*, 64 Fed. Reg. 39,946, 36,950 (Dep't State July 8, 1999).

[9] *See Revised Notice of Guidelines for Determining Comparability of Foreign Programs for the Protection of Sea Turtles in Shrimp Trawl Fishing Operations*, 63 Fed. Reg. 46,094, 46,095 (Dep't State Aug. 28, 1998).

[10] This document is on the public record of an antidumping duty administrative review currently being conducted by the U.S. Department of Commerce. *See* Letter from deKieffer &

United States are indicated as being "Harvested in the waters of a nation currently certified pursuant to Section 609 of P.L. 101-162" and include a certification only from the exporter. In contrast, imports of shrimp and shrimp products from uncertified nations must be accompanied by a State Department form that is certified by "both the exporter and a government official in the harvesting nation . . ."[11]

III. CHINA'S CERTIFICATION UNDER SECTION 609 DOES NOT APPEAR TO BE WARRANTED

In its most recent annual certification of shrimp-harvesting nations, the State Department's Bureau of Oceans and International Environmental and Scientific Affairs indicated that on April 23, 2019 the acting Under Secretary certified 13 nations as having sea turtle protection programs similar to the United States.[12] Further, the acting Under Secretary certified another 26 nations (and one economy) as having fishing environments that do not pose a danger to sea turtles. Sixteen of the 26 have shrimp grounds in cold waters where the risk of incidental takings of sea turtles was negligible.[13]

The remaining ten nations (Bahamas, Belize, China, the Dominican Republic, Fiji, Jamaica, Oman, Peru, Sri Lanka, and Venezuela) and Hong Kong were determined to "only harvest shrimp using small boats with crews of less than five that use manual rather than mechanical means to retrieve nets or catch shrimp using other methods that do not threaten sea turtles. Use of such small-scale technology does not adversely affect sea turtles."

In 1997, three of the nations currently certified based on a finding that they only harvest shrimp through small-scale technology that does not adversely affect sea turtles (Belize, China, and Venezuela) received certifications based on the State Department's finding that these countries had "adopted programs to reduce the incidental capture of sea turtles in such fisheries comparable to the program in effect in the United States."[14] Explaining its certification decision with regard to China, the State Department reported:

Horgan PLLC to the U.S. Department of Commerce, Case No. A-570-893 at Exhibit SC-4 (Jan. 9, 2020) (Public Version).

[11] *Revised Notice of Guidelines for Determining Comparability of Foreign Programs for the Protection of Sea Turtles in Shrimp Trawl Fishing Operations*, 63 Fed. Reg. 46,094, 46,095 (Dep't State Aug. 28, 1998).

[12] *Notice of Annual Certification of Shrimp-Harvesting Nations*, 84 Fed. Reg. 39,047 (Dep't State Aug. 8, 2019) (certifying Colombia, Costa Rica, Ecuador, El Salvador, Gabon, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Nigeria, Panama, and Suriname).

[13] *Id.* (Argentina, Belgium, Canada, Chile, Denmark, Finland, Germany, Iceland, Ireland, the Netherlands, New Zealand, Norway, Russia, Sweden, the United Kingdom, and Uruguay).

[14] *Certifications Pursuant to Section 609 of Public Law 101-162*, 62 Fed. Reg. 29,759 (Dep't State June 2, 1997).

> The Department did not previously certify China because the Chinese government had not required all commercial shrimp trawl vessels subject to its jurisdiction that operated in waters where there is a likelihood of intercepting sea turtles to use fishing gear that is not harmful to sea turtles at all times. The Department of State has determined that China has now instituted such a requirement, based on documentation that China has provided which includes their law requiring the use of turtle excluder devices on gear which poses a threat of incidental capture of sea turtles. The Department of State, therefore, was able to certify to Congress that China has met the standards of Section 609 of Public Law 101-162.[15]

However, in 2000, the basis for China's certification changed. That year, the State Department's certification for the country was based on a determination that it was one of nine countries that "only harvest shrimp using small boats with crews of less than five that use manual rather than mechanical means to retrieve nets, or catch shrimp [] using other methods that do not threaten sea turtles. Use of such small-scale technology does not adversely affect sea turtles."[16] Belize and Venezuela, on the other hand, were certified "on the basis that their sea turtle protection program is comparable to the United States . . ."[17] No further explanation was given for the change in the State Department's approach to China. The State Department repeated these findings in 2002.[18]

In 2003, however, while Belize and China retained their respective certifications for the same reasons as provided in 2000 and 2002, Venezuela was no longer listed as a certified nation under any criteria.[19] Those findings were maintained in 2004,[20] but in January 2005, the State Department announced that it had once again certified Venezuela on December 21, 2004 "on the basis that its sea turtle protection program is comparable to that of the United States."[21] For the next five years, the State Department continued to issue certifications for Belize and Venezuela

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15 *Shrimp Import Certifications Pursuant to Section 609 of Public Law 101-162*, 62 Fed. Reg. 4,826 (Dep't State Jan. 31, 1997).

16 *Certifications Pursuant to Section 609 of Public Law 101-162*, 65 Fed. Reg. 25,785, 25,786 (Dep't State May 3, 2000).

17 *Id.* at 25,785.

18 *See Certifications Pursuant to Section 609 of Public Law 101-162; Relating to the Protection of Sea Turtles in Shrimp Travel [sic] Fishing Operations*, 67 Fed. Reg. 32,078, 32,079 (Dep't State May 13, 2002).

19 *See Certifications Pursuant to Section 609 of Public Law 101-162*, 68 Fed. Reg. 24,784, 24,785 (Dep't State May 8, 2003).

20 *See Certifications Pursuant to Section 609 of Public Law 101-162*, 69 Fed. Reg. 26,916 (Dep't State May 14, 2004).

21 *See Certifications Pursuant to Section 609 of Public Law 101-162*, 70 Fed. Reg. 2,205 (Dep't State Jan. 12, 2005).

pursuant to Section 609(b)(2)(A) and (B) (programs comparable to those of the United States) and for China pursuant to Section 609(b)(2)(C) (pose no threat of incidental taking of sea turtles).[22]

In 2010, the basis for certification for Venezuela was changed from Section 609(b)(2)(A) and (B) to Section 609(b)(2)(C). However, in contrast to when the certification type changed for China, the State Department explained the basis for the switch, reporting that "[i]n March 2008, the Government of Venezuela passed a law banning industrial shrimp trawling in its waters. The ban remains in effect. As a result, the Department has certified Venezuela as a nation whose fishing environment does not pose a threat of the incidental taking of sea turtles."[23] The certifications for Belize and China were continued on the same basis.[24]

The next year, in 2011, the basis for certification for Belize also changed from Section 609(b)(2)(A) and (B) to Section 609(b)(2)(C). Again, unlike with China, the State Department explained the basis for the switch, reporting that "[e]ffective December 31, 2010, the Government of Belize passed a law banning all forms of trawling in its waters, including its exclusive economic zone. The ban remains in effect. As a result, the Department has certified Belize as a nation whose fishing environment does not pose a threat of the incidental taking of sea turtles."[25] The certifications for China and Venezuela were continued on the same basis as the certifications granted in 2010.[26]

From 2011 until 2019, the certifications for Belize, China, and Venezuela were all issued pursuant to Section 609(b)(2)(C) with no further discussion of the basis for these continuing certifications.[27] Accordingly, a review of the history of certification determinations made by the

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22 *See Certifications Pursuant to Section 609 of Public Law 101-162*, 70 Fed. Reg. 25,156 (Dep't State May 12, 2005); *Certifications Pursuant to Section 609 of Public Law 101-162*, 71 Fed. Reg. 29,705, 29,706 (Dep't State May 23, 2006); *Certifications Pursuant to Section 609 of Public Law 101-162*, 72 Fed. Reg. 28,753, 28,754 (Dep't State May 22, 2007); *Certifications Pursuant to Section 609 of Public Law 101-162*, 73 Fed. Reg. 29,549 (Dep't State May 21, 2008); and *Certifications Pursuant to Section 609 of Public Law 101-162*, 74 Fed. Reg. 21,048, 21,049 (Dep't State May 6, 2009).

23 *Certifications Pursuant to Section 609 of Public Law 101-162*, 75 Fed. Reg. 27,855 (Dep't State May 18, 2010).

24 *See id.*

25 *Certifications Pursuant to Public Law that 12 Nations Have Adopted Programs to Reduce the Incidental Capture of Sea Turtles in Their Shrimp Fisheries*, 76 Fed. Reg. 32,010 (Dep't State June 2, 2011).

26 *Compare id.* with *Certifications Pursuant to Section 609 of Public Law 101-162*, 75 Fed. Reg. 27,855 (Dep't State May 18, 2010).

27 *See Programs to Reduce Incidental Capture of Sea Turtles in Shrimp Fisheries; Certifications Pursuant to Public Law 101-162*, 77 Fed. Reg. 31,062 (Dep't State May 24, 2012); *Certifications Pursuant to Section 609 of Public Law 101-162*, 78 Fed. Reg. 45,285

State Department fails to provide the basis for the Section 609(b)(2)(C) certifications granted to China since 2000.

The State Department appears to recognize that sea turtle populations are found in Chinese territorial waters and in 2015 announced an agency sponsored "EcoPartnership" between Sea Turtles 911, a non-governmental organization committed to protecting sea turtles in the South China Sea,[28] and Hainan Normal University to "track sea turtle migration, help restore habitats, and foster community involvement in sea turtle protection."[29] In a summary of an international workshop on the mitigation of sea turtle bycatch in coastal net fisheries held in Honolulu, Hawaii in January 2009, Yamin Wang (College of Ocean, Shandong University at Weihai) explained:

> China's fisheries are important in the world, with about 577,035 engine-driven fishing vessels operating in 2007. Total marine fisheries catch is about 12,435,480 tons, with about 75% as fish catch. Some of China's fishing vessels use longline gear for shark and tuna fish catch in different parts of the world. All of these fisheries have encountered sea turtle bycatch problems. Five species of sea turtles are found in China: the Loggerhead (*Caretta caretta*), Green (*Chelonia mydas*), Hawksbill (*Eretmochelys imbricata*), Olive or Pacific Ridley (*Lepidochelys olivacea*), and the Leatherback (*Dermochelys coriacea*). Most are documented in the South China Sea, with the greatest abundance reported from the Xisha (Paracel), Nansha, and Hainan islands.
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> An estimated 14,000 to 40,000 sea turtles annually migrate to the Xisha Islands (a group of low coral islands and reefs in the South China Sea, approximately 280 km southeast of Hainan Island) and to the Nansha Islands. About 2,300 to 5,000 migrate to Hainan Island (including Guangdong Province). These migrations involve mixed species groups, estimated at 87% Green, 10% Hawksbill, and 3% other species (Wang, 1993).

(Dep't State July 6, 2013); *Certifications Pursuant to Section 609 of Public Law 101-162*, 79 Fed. Reg. 36,572 (Dep't State June 27, 2014); *Certifications Pursuant to Section 609 of Public Law 101-162*, 80 Fed. Reg. 30,318 (Dep't State May 27, 2015); *Annual Certification of Shrimp-Harvesting Nations*, 81 Fed. Reg. 33,575 (Dep't State May 26, 2016); *Annual Certification of Shrimp-Harvesting Nations*, 82 Fed. Reg. 21,295, 21,296 (Dep't State May 5, 2017); *Annual Certification of Shrimp-Harvesting Nations*, 83 Fed. Reg. 22,739 (Dep't State May 16, 2018); and *Notice of Annual Certification of Shrimp-Harvesting Nations*, 84 Fed. Reg. 39,047 (Dep't State Aug. 8, 2019)

[28] *See* https://www.seaturtles911.org/about/mission.htm.

[29] U.S. Department of State, Fact Sheet: *U.S. China EcoPartnerships Program* (June 23, 2015) available at: https://2009-2017.state.gov/r/pa/prs/ps/2015/06/244111.htm, attached as **Appendix B**.

> Sea turtle populations have been sharply reduced in China over the past 50 years. Half a century ago, there were several identifiable sea turtle nesting sites at Hainan Island (Qionghai, Wanning, Ya, Dongfang) and in Guangdong Province (Nana, Hulai, Haifeng, Huidong, Wanshan, Taishan, Yangjiang, Dianbai). Today, only Huidong is known to have sea turtle nesting in China. Currently, the only hope for additional populations would be the discovery of nesting sites on some far and desolate island.
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> The major factors threatening China's sea turtle populations are fisheries bycatch; the killing of nesting females, the collection of eggs for sale and consumption; and a general lack of public awareness of the declining trends in sea turtle populations nationwide. A major challenge is the difficulties on estimating sea turtle bycatch by China fishing vessels.
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> In China, the management authority for sea turtles is the Bureau of Fisheries (BOF) within the Ministry of Agriculture (MOA). To protect sea turtles, China promulgated the "Law of Wildlife Protection, China [1989]," the "Ordinance of Aquatic Wildlife Protection, China," and the "Ordinance of Nature Reserve, China [1993]." In 1988, China also declared the sea turtle a protected species (Grade II under the Law of Wildlife Protection) and Guangdong Province promulgated the "Rule of Guangdong Sea Turtle Resources Protection [1988]."
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> To secure the future of sea turtles in China, the following measures are recommended: surveys to identify the critical habitat and better document population trends; the development of a National Action Plan to guide conservation and management efforts; enhanced international, regional and national co-operation; improved public awareness and participation; stronger measures to protect habitat; a science-based plan to restore populations to effectively mitigate major threats; and the reduction, in particular, of fisheries bycatch.[30]

A much more recent article in *China Daily* discussed the dire circumstances of sea turtle populations in Chinese waters and summarized conservation efforts in the country:

> Of the seven species of sea turtles, five are found in Chinese waters. The primary active nesting sites in China are now in the remote Paracel Islands in the South China Sea. The Huidong Sea Turtle Nature Reserve in Guangdong had around 500 nesting turtles 70 years ago but by 2012 only counted 2 nesting turtles.
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> Meanwhile, illegal products made from sea turtle shells are easily found for sale throughout Asia. In the last five years, Chinese authorities have intercepted 38

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[30] Gilman, Eric (editor), *Proceedings of the Technical Workshop on Mitigating Sea Turtle Bycatch in Coastal Net Fisheries*, Honolulu, Hawaii, U.S.A., 20-22 January 2009, International Union for Conservation of Nature and Western Pacific Regional Fishery Management Council, at 14, available at: https://portals.iucn.org/library/sites/library/files/documents/2009-024.pdf

> smuggling cases involving sea turtle products. Most commonly seen items are made from hawksbill turtles, with only an estimated 23,000 remaining globally.
>
> In 2018, China issued a sea turtle conservation action plan to help restore the country's dwindling sea turtle population. Along with restoring habitat and combating illegal trade, a key feature of this plan is to build public awareness and initiative to protect sea turtles.[31]

There is also clearly a large Chinese shrimp beam trawl commercial fishery operating in the northern South China Sea. One 2014 academic journal article explained:

> Shrimp populations in the northern South China Sea are currently exploited using a variety of fishing gear, including trawl, gillnet, and stow nets (Liu and Zhong, 1986), the shrimp beam trawl being preferable because it has the highest catch rates for shrimp. One shrimp beam trawler can carry several nets, and the largest boats (>300kW) can carry up to 20 nets (Yang, 2002). It has been estimated that there were 600 shrimp beam trawlers (125 092.1 kW) operating in the coastal waters of Guangdong in 2013. Shrimp beam trawlers also operate in Guangxi and Hainan provinces. The number of shrimp beam trawlers operating in the northern South China Sea is thus very high. Such an intensive fishery can have a significant effect on the sustainable development of fisheries in the northern South China Sea. For example, shrimp beam trawlers often operation in inshore waters (10~20 m depth), an area that often overlaps with the nursery grounds for fish juveniles and other organisms. Additionally, the codend mesh sizes are very small (18.5~25 mm stretched) and thus target a wide range of size classes.[32]

The study conducted by these researchers reviewed the fishing seasons of the shrimp beam trawl fleet in the northern South China Sea in 2005-2006 and 2012-2013, covering the operations of four vessels trawling in multiple areas.[33] The by-catch ratios reported by the researchers were substantial, including a 13.90 ratio of by-catch to shrimp for six trawls off the Dongping coast in March 2013.[34] The researchers noted that "[w]e documented a high level of by-catch in the shrimp beam trawl fisheries in the northern South China Sea. The poor selectivity of shrimp beam trawls, caused by the small codend mesh size, and the overlap of the fishery with multiple mostly juvenile marine species in the inshore fishing grounds likely exacerbate the by-catch

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[31] *Eddie Peng Journeys to Save Sea Turtles in New Documentary*, China Daily (Oct. 29, 2019) available at: https://global.chinadaily.com.cn/a/201910/29/WS5db79fa0a310cf3e3557425d.html, attached as **Appendix C**.

[32] B.-Z. Yang, L. Yang, P. Zhang, Y.-G. Tan, L. Yan, and S. Chen, *Fish By-Catch in Shrimp Beam Trawls in the Northern South China Sea*, Journal of Applied Ichthyology 31 (2015) 714-717, attached as **Appendix D**.

[33] *See id.* at 715.

[34] *See id.* at 715 (Table 2).

problem."[35] The researchers concluded that "[a]lthough there may be some variability in the ratio of by-catch to shrimp between regions and seasons, the survey data suggest that the problem of by-catch in shrimp beam trawl fisheries is substantial and not to be ignored."[36]

Consistent with this study, the Sustainable Fisheries Partnership (SFP) released a report in August 2015 regarding bycatch in the wild shrimp sector worldwide.[37] Citing its own 2013 analysis of the Chinese shrimp beam trawling industry as well as two other published studies,[38] SFP reported massive volumes of unregulated bycatch from the industry.[39]

Shortly after the issuance of the SFP's report, a short paper was issued as part of the proceedings of the Twenty-fifth (2015) International Ocean and Polar Engineering Conference regarding the impact of trawling on subsea pipeline in the China Sea.[40] This paper explained that a survey of fishing activities in the China Sea determined that four fishing methods are mainly

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[35] *Id.* at 717.

[36] *Id.* In addition, there is a substantial shrimp beam trawl industry operating in the East China Sea. *See* Congda Yu, Zhihai Chen, Lianyuan Chen, and Pingguo He, *The Rise and Fall of Electrical Beam Trawling for Shrimp in the East China Sea: Technology, Fishery, and Conservation Implications*, ICES Journal for Marine Science, 64: 1592 – 1597 (2007) ("By 2000, an estimated 10,000 shrimp beam trawlers were operating in the [East China Sea].").

[37] *See* Sustainable Fisheries Partnership (SFP), *SFP Report on Bycatch Released* (Aug. 26, 2015), available at: https://www.sustainablefish.org/News/SFP-Report-on-Bycatch-Released.

[38] The SFP's three citations are as follows: (1) Sustainable Fisheries Partnership (SFP). 2013. Pre-FIP Assessment Report on East Guangdong-Taiwan Bank Shrimp Fishery. http://fisheryimprovementprojects.org/wp-content/uploads/EGTB-shrimp-pre-assessment.pdf (link doesn't work); (2) Yang, L., Zhang X. and Zhang, P. 2005. Composition of by-catch of shrimping beam trawl in the Pearl River Estuary, China. South China Fisheries Science, 1(1): 27-34; and (3) Zhou Y and Yimin Y (1996) Estimation of discards and bycatch in Chinese fisheries - In Report on the Technical Consultation on Reduction of Wastage in Fisheries. (Clucas I J and D James - Eds.) Tokyo, Japan, 28 October - 1 November 1996. FAO Fisheries Report. No 547 supplement. Rome, FAO, 1996.

[39] The SFP's report, set out in an MS Excel worksheet format, is available at the following link: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=2ahUKEwjg8u-on6nnAhWqhHIEHWE6AVYQFjABegQIBBAB&url=https%3A%2F%2Fwww.sustainablefish.org%2FMedia%2FFiles%2FData-Annexes-for-Publications%2FShrimp-bycatch-data-annex-2015&usg=AOvVaw1BvNAnHFs0Yg3oxrh17GYJ.

[40] Xu Jia, Lusheng Jia, and Jun Huang, CNOOC Research Institute (Beijing, China), *Study of Trawling Effect on Subsea Pipeline in China Sea*, Proceedings of the Twenty-fifth (2015) International Ocean and Polar Engineering Conference, Kona, Big Island, Hawaii, USA June 21-26, 2015, pp. 399-404, attached as **Appendix E**.

used: (1) beam trawl gear; (2) twin trawling; (3) otter trawl gear; and (4) set-nets. Based on the authors' survey results, the study focused on the potential impact of otter trawl gear and beam trawl gear on subsea facilities. Describing the nature of these trawling activities in the China Sea, the study included the following table:

Table 1. Basic data for trawling activities in China Sea		
	Otter Trawling Gear	Beam Trawl Gear
Shape	Otter board	Beam
Dimension (L*h)	2.10 m * 1.40 m	40 m
Mass	170 kg (Max. 400 kg)	1905 kg
Trawl velocity	1.8 m/s	1.2 m/s
Working water depth	300 m	110 m
Typically, a hollow beam with length of 40 m and OD of 330 mm (ID 318 mm) is usually used in a beam trawl gear.		

Using these characteristics, the study's authors evaluated the potential impact of these fishing activities on subsea pipelines.

NOAA Fisheries reports that both bottom trawls[41] and midwater trawls (including beam trawls)[42] pose threats to sea turtles. NOAA Fisheries' regulations, at 19 C.F.R. § 223.206(d)(2)(ii)(B)(1), exempt certain beam trawls operating in the United States from the requirement to carry turtle excluder devices, but this exemption is expressly limited only to beam or roller trawls "if the frame is outfitted with rigid vertical bars, and if none of the spaces between the bars, or between the bars and the frame, exceeds 4 inches (10.2 cm)." At **Appendix F**, we are submitting photos of gear from roller trawl shrimp boats operating in the United States that meet these strict criteria and, as such, are exempted from turtle excluder device requirements. As can be seen from these photos, a series of vertical bars, with narrow spacing between the bars, sits on top of a cylindrical metal roller.

Nothing in the materials summarized above indicates that the Chinese shrimp beam trawling vessels operating in the China Sea employ rigid vertical bars narrowly spaced across the top of the beam. In fact, the scope and size of the operations described would make the use of such equipment impractical. Moreover, there is no exemption in U.S. law from the use of turtle excluder devices where otter trawls are employed.

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[41] *See* NOAA Fisheries, *Fishing Gear: Bottom Trawls* ("Many sea turtle species rest and forage on the bottom and are at risk of being captured in bottom trawls.") available at: https://www.fisheries.noaa.gov/national/bycatch/fishing-gear-bottom-trawls.

[42] *See* NOAA Fisheries, *Fishing Gear: Midwater Trawls* ("Sea turtles are at risk of being captured in midwater trawls as they transit from the bottom, where they rest and forage, to the surface, where they breathe.") available at: https://www.fisheries.noaa.gov/national/bycatch/fishing-gear-midwater-trawls.

These observations and characterizations appear to be inconsistent with the State Department's repeated Section 609(b)(2)(C) certifications for the Chinese shrimp fishing fleet since 2000. While there may be a basis for these certifications, this basis does not appear to have been previously articulated and it is unclear whether the State Department has accounted for the potential adverse impacts of the shrimp beam trawl and otter trawl fishery operating in the northern South China Sea in its evaluation of Chinese shrimp harvesting activities.

IV. CONCLUSION

Although China has been certified by the State Department pursuant to Section 609(b)(2)(C), there is substantial evidence that, first, the waters wherein shrimp are harvested in China are also inhabited by sea turtles and, second, that the primary means of harvesting wild shrimp in China is through a method (beam and otter trawl) that is likely to have adverse impacts on sea turtle populations. Accordingly, the Southern Shrimp Alliance requests that, based on this information, the State Department re-evaluate whether China qualifies for a certification pursuant to Section 609(b)(2)(C) of Public Law 101-162.

APPENDIX A

PUBLIC VERSION

U.S. Department of State

SHRIMP EXPORTER'S/IMPORTER'S DECLARATION

(See Instructions on Reverse)

OMB APPROVAL NO. 1405-0095
EXPIRATION DATE: 12/31/2019
ESTIMATED BURDEN: 10 minutes*

1. Harvesting Nation	2. Aquaculture Facility *(If applicable) (Name and Address)*
THE PEOPLE'S REPUBLIC OF CHINA	
3. Exporter *(Name, Address, and Telephone/Fax)*	4. U.S. Importer/Ultimate Consignee *(Name, Address, and Telephone/Fax)*
SHANTOU RED GARDEN FOOD PROCESSING CO., LTD. NO.51, TAISHAN NORTH ROAD, SHANTOU, GUANGDONG, CHINA	

5. Date of Export *(mm-dd-yyyy)* 08-18-2018

6. Description of Product

U.S. HTS Tariff Schedule Number	Number of Units	[illegible]

7. Exporter

I hereby declare that the shipment of shrimp accompanying this declaration *(Check One)*:

A. ☐ Harvested in a manner not harmful to sea turtles. Check the condition of harvest which applies:

1. ☐ Harvested by aquaculture.
2. ☐ Harvested using TEDs
3. ☐ Harvested using non-mechanical net retrieval or by special gear (*See the Instructions*).
4. ☐ Shrimp harvested in a manner or under circumstances determined by the Department of State not to pose a threat of the incidental taking of sea turtles.

B. ☒ Harvested in the waters of a nation currently certified pursuant to Section 609 of P.L. 101-162.

Exporter *(Name and Title)*	Signature	Date *(mm-dd-yyyy)*
SHANTOU RED GARDEN FOOD PROCESSINGCO., LTD.		08-18-2018

8. Government Certification *(Necessary only if box 7a above is checked; to be signed by a responsible Government official of the harvesting nation.)*

I hereby declare that the statements signed above by the exporter of this shipment of shrimp are true and accurate to the best of my knowledge.

Name/Agency/Title	Address/Telephone/Fax	Signature	Date *(mm-dd-yyyy)*

9. Import Information *(To be completed by U.S. importer or customs broker.)*

Date of Entry *(mm-dd-yyyy)*	Port of Entry	Entry Number	Signature

THIS FORM MUST ACCOMPANY ALL SHIPMENTS OF SHRIMP AND SHRIMP PRODUCTS INTO THE UNITED STATES

Public reporting burden for this collection of information is estimated to average 10 minutes per response, including time required for searching existing data sources, gathering the necessary documentation, providing the information and/or documents required, and reviewing the final collection. You do not have to supply this information unless this collection displays a currently valid OMB control number. If you have comments on the accuracy of this burden estimate and/or recommendations for reducing it, please send them to: Office of Marine Conservation, Attn: Section 609 Program Manager, U.S. Department of State, 2201 C Street, NW, Room 2758, Washington, DC 20520-7818.

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APPENDIX B

U.S. Department of State
Diplomacy in Action

U.S.-China EcoPartnerships Program

Fact Sheet
Office of the Spokesperson
Washington, DC
June 23, 2015

The United States and China announced six new EcoPartnerships today at the U.S.-China Strategic and Economic Dialogue in Washington, D.C. The State Department-sponsored EcoPartnerships program brings together experts and innovators from U.S. and Chinese cities, companies, universities, and NGOs to work together, exchange best practices, and find solutions to challenges related to environmental protection, clean energy, and climate change. Since its inception in 2008, the program has facilitated 30 partnerships that serve as models for the tangible results that can be achieved through sub-national cooperation.

The six new EcoPartnerships are:

Boeing and the Commercial Aircraft Corporation of China will work together to demonstrate how to fuel aircraft with waste oil and enhance operating practices to reduce greenhouse gas emissions.
Columbia University and Baotou Steel Group will capture iron and steel slag waste and recycle it for use in other industrial processes, preventing dangerous emissions.
The University of Kentucky and Jiangsu Wisdom Engineering and Technology Company will work to reduce air pollution and sequester CO2 through more cost-effective methods in energy intensive industries.
Ramboll Environ, IMACC and the Suzhou State Environmental Protection Hi-tech Industrial Park Development Company will continuously monitor air pollution near chemical industrial parks and publish the data to help protect vulnerable populations.
Sea Turtles 911 and Hainan Normal University will track sea turtle migration, help restore habitats, and foster community involvement in sea turtle protection.
Wilson Solarpower and the Shenzhen Enesoon Science & Technology Company will pilot an innovative solar thermal power collector to demonstrate performance and cost improvements over traditional technologies.
EcoPartnerships encourage environmental action at the sub-national level, mobilizing private sector investment and leveraging capital to pursue joint projects. The program relies on strong cooperation between a Secretariat of subject matter experts, offering technical support on behalf of the U.S. and Chinese governments, and the self-financed U.S. and Chinese EcoPartners. Each dollar of U.S. government investment is magnified through the efforts of the partners.

The value of the EcoPartnerships program is the peer-to-peer collaboration at the partner level between U.S. and Chinese entities. EcoPartners pilot their concepts within three years and share key findings with peers who can replicate and build upon their successes.

For more information, visit http://ecopartnerships.lbl.gov/ (http://ecopartnerships.lbl.gov/). For media inquiries, please contact Esther Bell: BellEF@state.gov (http://mailto:BellEF@state.gov).

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Commercial and Business Affairs Office (//2009-2017.state.gov/e/eb/cba/index.htm)
Key Officers of Foreign Service Posts (//2009-2017.state.gov/documents/organization/111812.pdf)

APPENDIX C

Eddie Peng journeys to save sea turtles in new documentary

chinadaily.com.cn | Updated: 2019-10-29 10:10

WildAid, Chinese streaming service Youku, and the China Sea Turtle Conservation Alliance announced a three-part documentary that calls for immediate action to save wild sea turtles from extinction in Shanghai on Monday.

In *Beyond the Sea and Shore*, actor and WildAid ambassador Eddie Peng embarks on an epic adventure to explore the many threats sea turtles face around the world. Along the way, he meets environmental warriors on the front lines of a battle to save sea turtles.

Around the world, sea turtles are revered for their beauty and celebrated as one of Earth's oldest creatures. But, as the documentary illustrates, it's this beauty as well as plastic pollution, bycatch and coastal development that threatens their very existence.

As a dedicated environmental advocate, Peng notes "This was my chance to learn about the complex issues sea turtles face and be a voice for these incredible animals. In making this film I met so many heroes working to save them. Their work is truly

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remarkable. I hope I can inspire the audience to take action, starting with simple things such as never buying sea turtle products, reducing our use of disposable plastics, and choosing certified sustainable sea food."

In the film, Peng visits a wildlife hospital in Ecuador's Machalilla National Park – a WildAid partner and the only facility of its kind. There, he sees the devastating effects of fishing gear and plastic and learns just how vulnerable sea turtles are as newborns.

As one of oldest species in the ocean, sea turtles are not only seeing huge declines in recent decades from habitat loss, bycatch, and pollution, but also from illegal trade in their eggs, meat, and shells. Parts of the shell and whole bodies of critically endangered hawksbill turtles are used as raw materials for crafts and souvenirs, such as combs, glasses frames and hand fans. Meat from green and leatherback turtles and eggs from loggerhead and olive ridley turtles are widely consumed as important sources of protein and nutrition by coastal fishing communities in Southeast Asia, South Asia, Africa, and the Caribbean.

Of the seven species of sea turtles, five are found in Chinese waters. The primary active nesting sites in China are now in the remote Paracel Islands in the South China Sea. The Huidong Sea Turtle Nature Reserve in Guangdong had around 500 nesting turtles 70 years ago but by 2012 only counted 2 nesting turtles.

Meanwhile, illegal products made from sea turtle shells are easily found for sale throughout Asia. In the last five years, Chinese authorities have intercepted 38 smuggling cases involving sea turtle products. Most commonly seen items are made from hawksbill turtles, with only an estimated 23,000 remaining globally.

In 2018, China issued a sea turtle conservation action plan to help restore the country's dwindling sea turtle population. Along with restoring habitat and combating illegal trade, a key feature of this plan is to build public awareness and initiative to protect sea turtles.

"Partnering with WildAid on this film shows the government's commitment to marine conservation, and we're honored to be partnering with them," said WildAid China Chief Representative Steve Blake. "But also key to the film reaching its objectives is the participation of Eddie Peng. He is a role model to his fans all over Asia and has long used his voice to raise awareness on environmental issues. We invited Eddie to help bring the plight of sea turtles and ocean health from the periphery to a front and center issue in the public discourse. This is what drives change, and this film has the star power, media support, and enticing story to make that happen. "

Between the Sea and Shore was produced and directed by Andrew Wegst. It is a coproduction of WildAid, Youku and the China Sea Turtle Conservation Alliance, and will be released on first week of December 2019.

Photo

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APPENDIX D

Fish by-catch in shrimp beam trawls in the northern South China Sea

Article *in* Journal of Applied Ichthyology · April 2015

DOI: 10.1111/jai.12777

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South China Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences

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Fish by-catch in shrimp beam trawls in the northern South China Sea

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Summary

The by-catch of shrimp beam trawl fisheries in the northern South China Sea were estimated during the 2005–2006 and 2012–2013 fishing seasons. A total of 98 hauls from three important shrimp fishing grounds were used in the analyses. A total of 119 by-catch species were captured, compared with only 15 target species. The ratio of by-catch to shrimp ranged from 1.01 to 13.90. The dominant standard length (SL) range of fish by-catch was 51–100 mm. The percentage of juveniles in the total catch of some fish species was high (e.g. 100% for *A. aneus*).

Introduction

By-catch and discards have a significant effect on ecosystem biodiversity and abundance (Hall et al., 2000; Kelleher, 2005). Estimates by the FAO (UN Food and Agriculture Organization) suggest that up to 7.3 million tonnes (t) of fish are discarded annually in marine fisheries throughout the world (Kelleher, 2005). Shrimp trawl fisheries are notorious for having a high proportion of by-catch and discards, particularly tropical shrimp fisheries for which the ratio of by-catch to shrimp can be as high as 20 : 1 or greater (Eayrs, 2007). Based on a FAO estimate, shrimp beam trawl fisheries account for 27.3% of the 7.3 million t of by-catch discarded annually around the world, with a weight discard rate of 62.3% to the total catch of shrimp beam trawl (Kelleher, 2005).

Shrimp populations in the northern South China Sea are currently exploited using a variety of fishing gear, including trawl, gillnet, and stow nets (Liu and Zhong, 1986), the shrimp beam trawl being preferable because it has the highest catch rates for shrimp. One shrimp beam trawler can carry several nets, and the largest boats (>300 kW) can carry up to 20 nets (Yang, 2002). It has been estimated that there were 600 shrimp beam trawlers (125 092.1 kW) operating in the coastal waters of Guangdong in 2013. Shrimp beam trawlers also operate in Guangxi and Hainan provinces. The number of shrimp beam trawlers operating in the northern South China Sea is thus very high. Such an intensive fishery can have a significant effect on the sustainable development of fisheries in the northern South China Sea. For example, shrimp beam trawlers often operate in inshore waters (10~20 m depth), an area that often overlaps with the nursery grounds for fish juveniles and other organisms. Additionally, the codend mesh sizes are very small (18.5~25 mm stretched) and thus target a wide range of size classes.

For the development of regulations to manage the shrimp fishery, there is first a need to document by-catch composition and discards (Ye et al., 2000). Information describing the catch and by-catch species composition of shrimp beam trawls in northern South China Sea is limited (Yang et al., 2005, 2008; Zhang et al., 2009). Unfortunately, there is also little information describing the fish by-catch species composition, the proportion of juvenile fish in the by-catch, and the discard rate for fish. The by-catch of shrimp beam trawls has been reported in many parts of the world and is typically substantial. We used survey data to describe the composition of fish by-catch, and determine the proportion of juvenile fish in the total by-catch of the shrimp beam trawl fishery in the northern South China Sea.

Materials and methods

Field sampling

The study was carried out during fishing seasons of the shrimp beam trawl fleet in 2005–2006 and 2012–2013 in the northern South China Sea. Three important fishing grounds were selected (Table 1) and a total of 98 hauls from four commercial boats were analysed. Sampling details are listed in Table 2.

Fishing gear

The shrimp beam trawl designs used in this study were nearly identical. However, there were slight differences in the total net lengths (5.0–6.8 m) and beam lengths (1.7–2.4 m). The cod-end was made of polyamide (PA) material. The structure of the cod-end was nearly the same in all trawls used on the survey boats of this study. However, it is important to note that there were two kinds of cod-ends: one with a 10 mm mesh size, and the other with a 25 mm mesh size. A chafer was usually attached to the cod-end. The number of trawl nets carried out by fishing boats varied according to the engine power. The smallest boat carried three trawl nets and operated in the Pearl River Estuary. The largest boats carried as much as 20 trawl nets and usually operated in Zhanjiang. Towing speed varied from 2.4 to 3.6 knots, and hauling time was between 0.5 and 2.0 h.

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Table 1
Summary of sampling times, fishing grounds, fishing boat, and number of hauls

Sampling time	Location	Depth (m)	Boat length	Engine power (kW)	Number of hauls
September and October 2005	Zhanjiang (lat. 21°03′ N–21°11′N; long. 110°40′ E–110°45′ E)	10–15	18.7	206	35
September and October 2005	Dongping (lat. 21°33′N–21°40′N; long. 112°03′E–112°10′E)	11–18	14	79	16
October and November 2006	Pearl River Estuary (lat. 22 °32′N–22 °35′N; long. 113°44′ E–113°48′ E)	6–8	18	88	25
August 2012	Zhanjiang (lat. 21°08′ N–21°13′N; long. 110°40′ E–110°45′ E)	10–15	21	317	12
March and September 2013	Dongping (lat. 21°42′N–21°44′N; long. 112°07′E–112°11′E)	8–15	14	79	10
				Total	98

Table 2
Total weight, CPUE (catch per unit effort) of shrimp and by-catch caught by shrimp beam trawls from three fishing areas, northern South China Sea, during two beam trawl surveys (2005–2006; 2011–2012)

Sampled time	Fishing area	Number of hauls	Shrimp (kg)	CPUE of shrimp ± SD (kg h^{-1})	By-catch (kg)	CPUE of by-catch ± SD (kg h^{-1})	Ratio of by-catch to shrimp
September–October, 2005	Zhanjiang coast	35	53.49	0.92 ± 0.52	172.14	2.99 ± 1.23	3.22
September–October, 2005	Dongping coast	16	40.60	1.46 ± 0.53	108.99	4.37 ± 2.33	2.68
October–November, 2006	The Pearl River Estuary	25	9.29	0.37 ± 0.30	27.16	1.09 ± 0.44	2.92
August, 2012	Zhanjiang coast	12	11.34	0.95 ± 0.42	61.70	3.11 ± 1.14	5.44
March, 2013	Dongping coast	6	1.40	0.67 ± 0.23	19.45	9.60 ± 1.60	13.90
September, 2013	Dongping coast	4	9.83	2.46 ± 0.58	9.94	1.34 ± 0.55	1.01
	Total	98	125.95		399.38		

Data collection and analysis

During fishing each boat recorded the fishing time, location (latitude and longitude), and depth of the fishing grounds. After each tow, one trawl from the shrimp boat was randomly chosen, and its catch sorted into two groups, shrimp and by-catch. The ratio of shrimp to by-catch (by biomass) was estimated by weighing both total shrimp and total by-catch. The catch was then sorted to the species level and biological characteristics were measured (body weight, standard length, or carapace length). Weight was determined to the nearest g and length to nearest mm. When a large amount of by-catch or shrimp species was caught, sub-samples of about 30 individuals were randomly chosen to measure their biological characteristics.

Results

During two survey periods, a total of 98 hauls were conducted. During the first survey (2005–2006), 76 hauls were collected from three fishing areas. In the second survey, trawlers from the Pearl River Estuary were not included. The CPUE of shrimp varied from 0.37 ± 0.30 kg h^{-1} (N = 25) to 2.46 ± 0.58 kg h^{-1} (N = 4). CPUE for the by-catch also varied among areas and seasons and was highest [9.60 ± 1.60 kg h^{-1} (N = 6)] in the Dongping coastal area in March 2013. The ratio of by-catch to shrimp in the first survey was between 2.68 and 3.22. In contrast, the ratio changed dramatically during the second survey period, ranging from 1.01 to 13.90.

A total of 134 species were caught. Fifteen species of shrimp were captured, of which five species dominated, accounting for 90.43% of the total shrimp weight. The five dominant shrimp species were *Metapenaeus joyneri*, *M. ensis*, *M. affinis*, *Exopalamon carincauda*, and *Marsupenaeus japonicus*. By comparison, there were 119 by-catch species. Among these, the majority were fish species (91 species), accounting for 46.14% of the total by-catch weight. Many of these were commercially important species as well as 12 crab species captured in the shrimp beam trawls. An additional 15 by-catch species could not be classified into a group, as they included cephalopoda, mollusca, and other species.

The standard length (SL) distribution of 10 commercially important fish is shown in Fig. 1. For most of the dominant species, SL was in the range of 51–200 mm. The dominant SL range was 51–100 mm, except for *Harpodon nehereus*, *Trypauchen vagina*, and *Odontamblyopus rubicundus*, where the standard dominant length range was 101–150 mm. Only a very small proportion of fish were larger than 250 mm. The proportion of juveniles where the standard length was less than the minimal landing size (MLS) among the

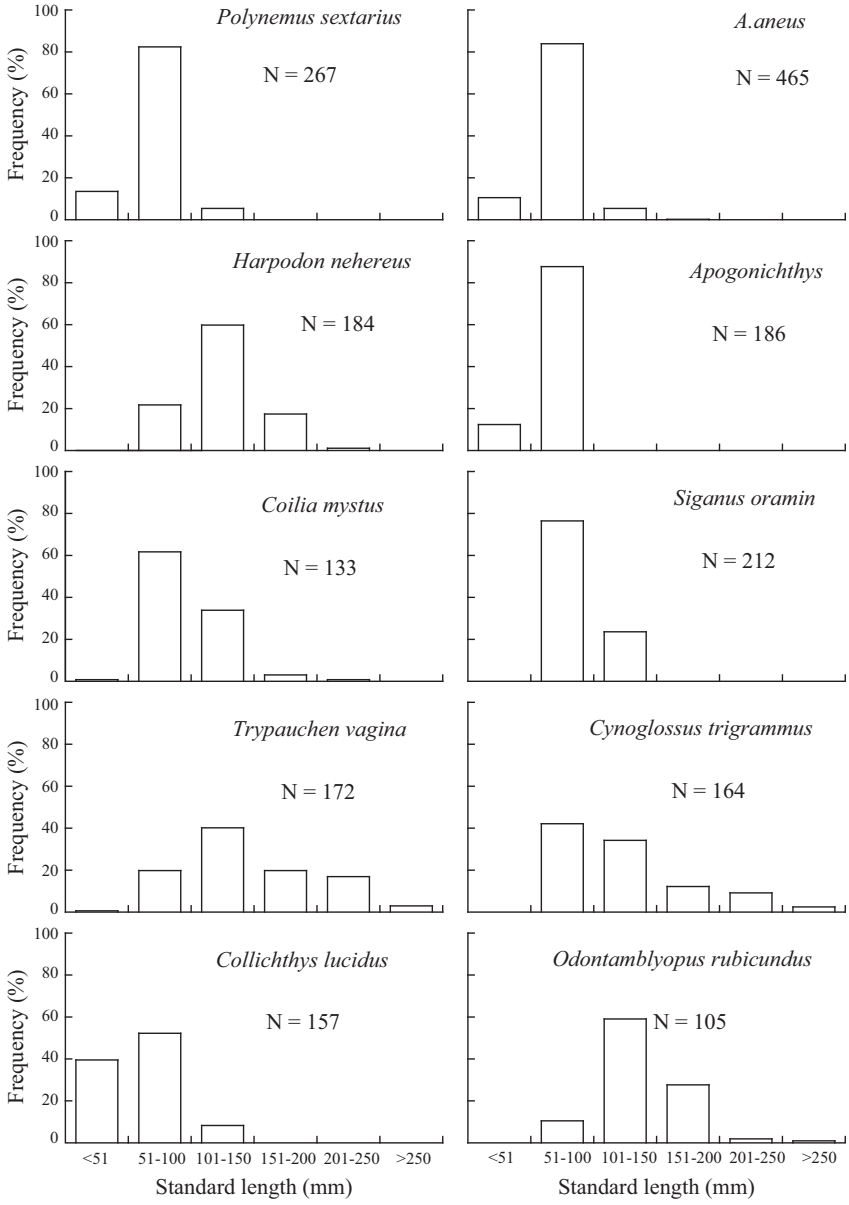

Fig. 1. Standard length distribution of 10 commercially important fish species collected during the 2005–2006 and 2012–2013 surveys

Table 3
Percent juveniles in total species catch of 10 commercially important fish species (all data pooled from beam trawl surveys 2005–2006 and 2011–2012) (MLS: minimal landing size)

Species	MLS (mm)	Number of juveniles (<MLS)	Total number	Ratio of juveniles (%)
A. aneus	160	465	465	100.00
Collichthys lucidus	110	150	157	95.54
Harpodon nehereus	160	157	184	85.33
Coilia mystus	120	112	133	84.21
Cynoglossus trigrammus	130	113	164	68.90
Odontamblyopus rubicundus	110	21	105	20.00
Trypauchen vagina	80	8	172	4.65
Polynemus sextarius	–	–	267	–
Apogonichthys	–	–	186	–
Siganus oramin	–	–	212	–

MLS, minimal landing size; –, no MLS recorded, and the percent of juveniles could not be calculated.

dominant species varied according to species. All *A. aneus* caught by shrimp beam trawl were juveniles. Conversely, the proportion of *Trypauchen vagina* juveniles was only 4.65% (Table 3).

Discussion

We documented a high level of by-catch in the shrimp beam trawl fisheries in the northern South China Sea. The poor selectivity of shrimp beam trawls, caused by the small codend mesh size, and the overlap of the fishery with multiple mostly juvenile marine species in the inshore fishing grounds likely exacerbate the by-catch problem. The ratio of by-catch to shrimp ranged from 1.01 : 1 to 13.90 : 1 (pooled ratio: 3.17 : 1), which is consistent with other surveys in the northern South China Sea. During 1980~1981, the ratio of by-catch to shrimp was 2.1 : 1 in the Beibu Gulf, northern South China Sea (Yang, 2002). According to Zhang et al. (2009), the ratio of by-catch to shrimp was 5.4 : 1 off Naozhou Island in Guangdong Province in 2008. In contrast, Yang et al. (2005) reported that the ratio of by-catch to shrimp was much higher (19 : 1) in the Pearl River Estuary. Although there may be some variability in the ratio of by-catch to shrimp between regions and seasons, the survey data suggest that the problem of by-catch in shrimp beam trawl fisheries is substantial and not to be ignored.

Worldwide studies of by-catch from shrimp trawl have shown that by-catch can have a negative impact on other fisheries. Based on the SL distribution of 10 commercially important by-catch fish species, the majority of these fish are juveniles. Thus, the shrimp beam trawl will negatively affect the harvest of other fishers who target these fish using gillnet, trap, and stow net fleets. As in other developing countries, the discard rate of the shrimp beam trawl is very low in the northern South China Sea (Ambrose et al., 2005; Nguyen and Larsen, 2013). The majority of the catch is landed, with only a small proportion of no commercial value or is damaged being discarded. The landed by-catch is either used for human consumption or sold to fishmeal factories.

The Chinese government (the Ministry of Agriculture) has developed management strategies for the shrimp beam trawl, including the minimal mesh size (25 mm). These restrictions have been promulgated recently, and practiced formally since 1 June 2014. Although these restrictions will hopefully reduce the by-catch, they may have unintended consequences, including an increase in the discard rate. In developed countries, such as the US and Portugal, efforts to avoid breaking regulations have led to an increase in the discard rate. Thus, the new restrictions alone may be insufficient to maintain the sustainable development of the shrimp beam trawl fishery in the northern South China Sea. Additional measures, such as modification of shrimp trawl fishing gear, may well be necessary. For example, the use of grids in the net has been shown to be effective at reducing by-catch. In the US, grids are mandatory for shrimp fisheries in the Gulf of Maine. The Nordmøre, which was first developed in northern Norway, is one of the most successful devices for addressing fish by-catch problems and not only reduces fish by-catch but also maintains shrimp catch (Isaksen et al., 1992; Broadhurst, 2000). After an almost-overnight success in the 1992 fishing season, use of the Nordmøre became mandatory in the Gulf of Maine shrimp fishery (He and Balzano, 2011). Given this, the selectivity of the BRD (By-catch reduction device) should be tested in the northern South China Sea.

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APPENDIX E

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Study of Trawling Effect on Subsea Pipeline in China Sea

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ABSTRACT

There are busy trawling activities in China Sea. Recently more and more subsea pipelines are laid in this offshore area and most of them are not buried. Trawling activities are high risk for subsea structures especially for unburied subsea pipelines and pipeline damage events exist in this area. It is important to study the trawling effect on subsea pipelines to ensure the safety of them. There are mainly two types of trawling gear in China Sea, otter trawl gear and beam trawl gear. Numerically analysis and model experiments are carried out to study trawling effect on subsea pipelines. The study focuses on impact and pull-over forces of trawl gear onto the subsea pipeline. Impact and pull-over forces induced by otter trawl gear and beam trawl gear are calculated theoretically according to DNV-RP-F111. Meanwhile, model experiments are carried out both in air and underwater to measure the forces. Influences of trawling velocity, fishing equipment type, pipeline span height on impact and pull-over force are studied in model experiment and the results were also compared with the numerical results as verification. Results show that DNV results are generally higher than experimental results. For impact and pull-over force of otter trawl board and beam trawl, there is no significant difference between in air and underwater experiment cases. For all the cases, impact and pull-over forces increase with the increase of trawling velocity. The impact and pull-over forces of otter trawl board increase with the increase of pipeline span height obviously. However, span height doesn't show significant influence on beam trawl impact forces and pull-over forces. Compared with experimental results, DNV-RP-F111 overestimates the force, which is conservative for engineering design, and it will cost more money on the engineering facilities. So it is suggested to consider the DNV rules and the experimental results comprehensively in engineering design.

KEY WORDS: Trawling in China Sea; subsea pipeline; impact experiment; pull-over experiment.

INTRODUCTION

Subsea pipelines play an important role in transporting offshore oil and natural gas. Due to scouring of current and wave, free spans can occur even for a trenched pipeline, with different span height and span length in different projects. Should there be fishing activities, the naked or spanned pipeline will be subject to impact and pull-over, which will causes a hazard for both fishermen and the integrity of the pipeline, see Fig.1. In view of fishing activities in China Sea, this paper studies the loads the bottom trawl applies to the pipeline through numerically analysis and model experiments. Impact and pull-over forces of otter trawl gear and beam trawl gear are calculated theoretically according to DNV-RP-F111.Meanwhile, model experiments are conducted both in air and underwater to measure the forces. In this paper, sensitivity parameters, such as trawling velocity, fishing equipment type, different span heights, were studied to learn their influence on pipelines. Model experiment results were also compared with the numerical results as verification.

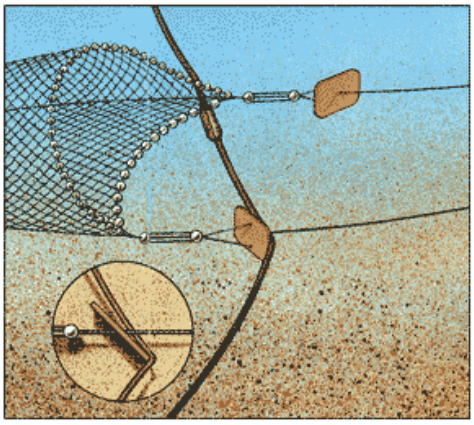
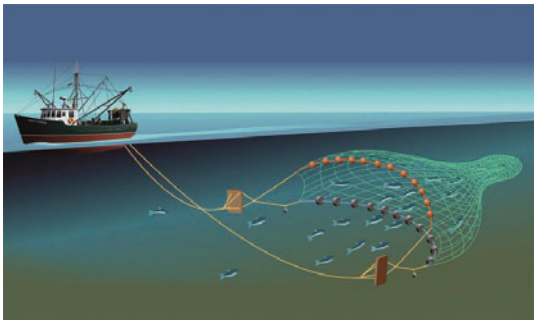


Fig.1 Trawling Effect on Subsea Pipeline

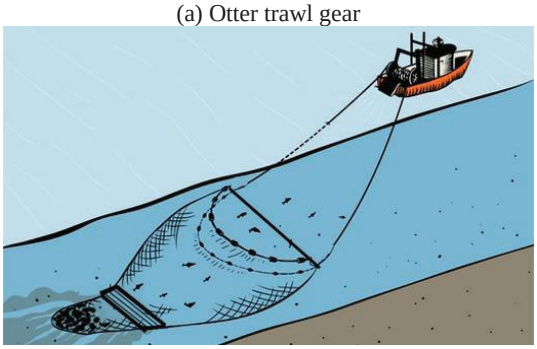
SURVEY OF FISHING ACTIVITIES IN CHINA SEA

According to survey data of fishing activities in China Sea, four fishing methods are mainly used: beam trawl gear, twin trawling, otter trawl gear and set-nets, among which the set-nets are fixed operation form and have no significant effect on submarine facilities. Twin trawling and otter trawl gear are of similar form, while the former is currently not used for industrial trawling and is hence only relevant in consumption trawl areas.

Therefore, in this paper, the experimental study focuses mainly on the effect of otter trawl gear and beam trawl gear (See Fig.2) on subsea facilities.



(a) Otter trawl gear



(b) Beam trawl gear

Fig.2 Typical trawling equipment in China Sea

Basic data about trawling activity include mainly: trawling gear type (otter trawl gear or beam trawl gear), size, mass and trawling velocities of trawling equipment, as listed in Table 1.

Table 1. Basic data for trawling activities in China Sea

	Otter Trawling Gear	Beam Trawl Gear
Shape	Otter board	Beam
Dimension (L×h)	2.10 m×1.40 m	40 m
Mass	170 kg (Max.400 kg)	1905 kg
Trawl velocity	1.8 m/s	1.2 m/s
Working water depth	300 m	110 m

Typically, a hollow beam with length of 40 m and OD of 330 mm (ID 318 mm) is usually used in a beam trawl gear.

NUMERICAL ANALYSIS OF INTERFERENCE BETWEEN TRAWLING ACTIVITIES AND SUBSEA PIPELINES

According to the survey data of fishing activities in China Sea, otter trawl gear and beam trawl gear are chosen as the main objects of this study.

In DNV-RP-F111, the interaction is divided mainly into two stages, that is, impact and pull-over, when bottom trawl gear is towed across a pipeline. The impact force and pull-over force is firstly calculated based on the recommended method in DNV rules.

Impact force of trawl board to the pipeline

The impact force of trawl board to the pipeline is calculated using the following expression:

$$F_{sh} = \left(\frac{75}{2} E_{loc} \cdot f_y^2 \cdot t^3 \right)^{1/3} \tag{1}$$

The permanent indentation of the pipe shell caused by the impact can be estimated as:

$$H_{p,c} = \left(\frac{F_{sh}}{5 f_y t^{3/2}} \right)^2 - \frac{F_{sh}\sqrt{0.005 \cdot OD}}{5 f_y t^{3/2}} \tag{2}$$

In above expressions, E_{loc} is the maximum of the impact energy associated with the steel mass and the impact energy from added mass of trawl board, which can be calculated according to DNV rules; f_y is the yield strength to be used in design; OD is pipeline diameter and t is the wall thickness.

Pull-over force of trawl board to pipeline

The horizontal pull-over force is calculated using the following expression:

$$F_p = C_F \cdot V \cdot \sqrt{m_t \cdot k_w} \tag{3}$$

In the expression, V is the trawling velocity, m_t is the steel mass of board, C_F is the drag force coefficient and k_w is the warp stiffness.

The vertical pull-over force can be calculated as follows:

$$F_z = F_p \left(0.2 + 0.8 \cdot e^{-2.5\overline{H}} \right) \tag{4}$$

In above expression, $\overline{H}$ is the dimensionless height, which can be calculated according to DNV rules.

The impact force and pull-over force can be calculated according to above method.

EXPERIMENTAL STUDY OF TRAWLING EFFECT ON SUBSEA PIPELINES

Impact and pull-over model experiments are conducted to study the trawling effect on subsea pipelines, according to the survey data of fishing activities in Ease China Sea. The experiments include:

—Impact experiments of pipeline in air and water, in which the combination cases of different trawling equipment (otter trawl gear and beam trawl gear) and different pipeline span height (0.14D, 0.43D and 0.87D) is considered. Pipeline diameter D is taken as 3.45mm in the experiments.

—Pull-over experiments of pipeline in air and water, in which the otter trawl gear experiment takes the effect of different span heights into account. Besides, large diameter subsea pipeline experiments are conducted.

Experimental facilities

Water channel

Main parameters of water channel are listed as follows: Length-60m; Width-40m; Depth-2.5m; Working water depth-0.2m~2.0m.

Variable - frequency towing system

The system consists mainly of motor, frequency converter, slider, steel wire rope, pulleys, sideway, fixed setting, etc. The slider moves along the sideway horizontally through the drag force provided by the motor. The experimental setup is shown in Fig.3.

Fig.3 Experimental setup of variable-frequency towing system

Trawl gear model is connected to the other end of the slider by cable, and impacts or pulls over the pipeline model at different speeds. The slider-cable-trawl board (beam trawl) system can maintain a constant relative position in the moving process, thus ensure that it impacts the structure model at constant angle. The motor speed can be controlled by the frequency converter so as to control the towing speed.

Bidirectional force sensor

Bidirectional force sensor is connected to both ends of pipeline model to measure horizontal and vertical impact and pull-over forces. The main advantage is that it can measure the force directly, see Figs.4~5.

Fig.4 Bidirectional force sensor

Fig.5 Impact experiment underwater

Fiber Bragg grating sensor

In the experiment, Fiber Bragg grating sensor is packaged on the pipeline surface. When stain occurs due to force, grating width changes, thus lead to the change of wavelength of optical signal. Optical signal is transmitted to the demodulator by optical fiber.

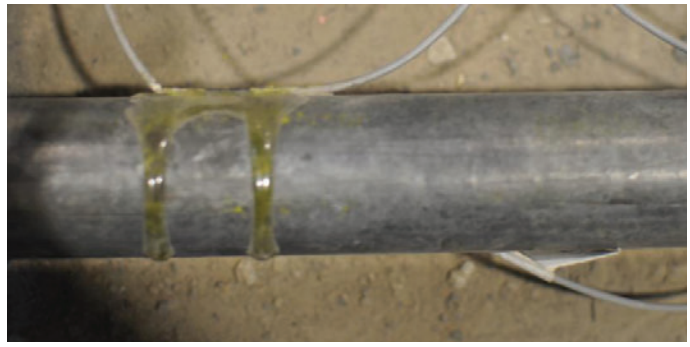


Fig.6 Fiber Bragg grating sensor

The strain can be calculated by analyzing the change of the wavelength, and then the force can be obtained according to the strain. For the reason that the output of Fiber Bragg grating sensor is optical signal, so there is no need for waterproof treatment. It can be used directly in the underwater experiments, meanwhile, it is not subject to external electromagnetic interference. Fig.6 shows the Fiber Bragg grating sensor system.

Similarity criterion and model scale

Similarity criterion

The experimental model is determined based on geometrical similarity and gravity forces similarity (Equality in Froude number in model and full scale).Geometric scale is taken as 1:10,so velocity scaling ratio is 1:3.16 and force scaling ratio is 1:1000.

Model material and dimension

According to the geometric scale and the survey data, model material and dimension is determined and listed in Table 2.

Table 2. Model material and dimension

Steel Pipeline	Small diameter: OD=3.45cm, WT=3mm, Length=0.9m; Large diameter: OD=7.20cm, WT=4mm, Length=0.9m; Yield strength: 235MPa
Warp	Glass fiber cord, OD=1.5mm
Trawl board	Steel, Length=20cm, Height=12cm, Thickness=2cm, Mass=396g;
Beam Trawl	Steel, Length=50cm, Mass=1900g;
Trawl velocity	0.3m/s ~ 1.0 m/s;
Trawl angle	14°.

Comparison validation of different force measuring methods

In order to verify the accuracy of the measuring equipment, the impact forces are measured using both the Bidirectional force sensor and Fiber Bragg grating sensor for a pipeline with span height 0.87D.

Figs.7~8 show the comparison results of different force measuring methods. Results show that the forces measured by Bidirectional force sensor and Fiber Bragg grating sensor agree well for both the trawl

board and the beam board experiments.

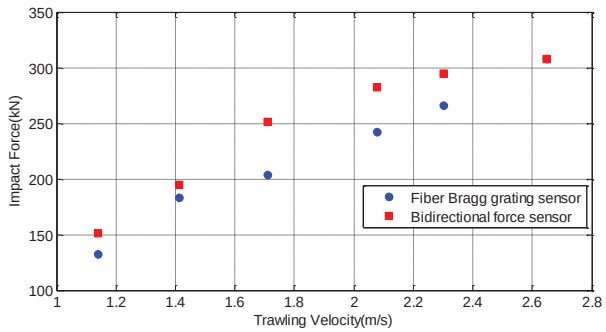


Fig.7 Experimental result of impact forces of trawl board to pipeline using different measuring methods

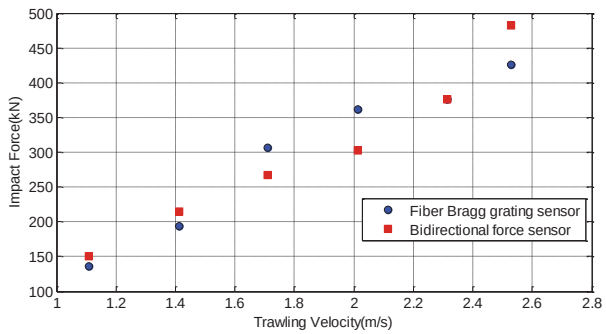


Fig.8 Experimental result of impact forces of beam board to pipeline using different measuring methods

Forces measured by Bidirectional force sensor will be used to make the following plots.

Impact experiments of pipeline model in air and underwater

Impact experiments were conducted both in air and under water for pipeline model (OD=3.45cm), and results are as follows.

Impact force of trawl board

As shown in Fig.9, when the span height equals 0.14D, the impact forces the trawl board applies to the pipeline show no significant difference for in air and underwater experiment cases. The impact force increases with the increase of trawling velocity. The analysis results calculated according to DNV rules are bigger, nearly two times of the experiment results.

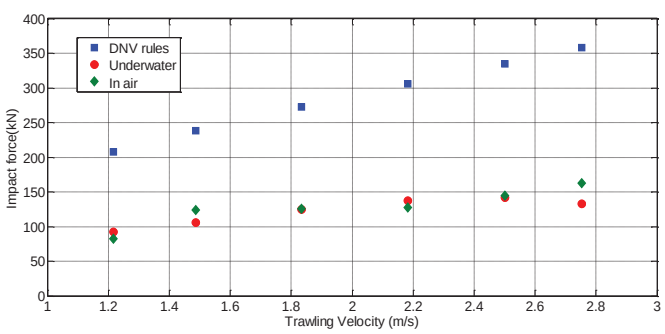


Fig.9 Experimental result of impact forces of trawl board to pipeline (span height =0.14D)

For span height 0.43D and 0.87D, as shown in Figs.10~11,experiment results show a similar trend as the case for span height 0.14D.

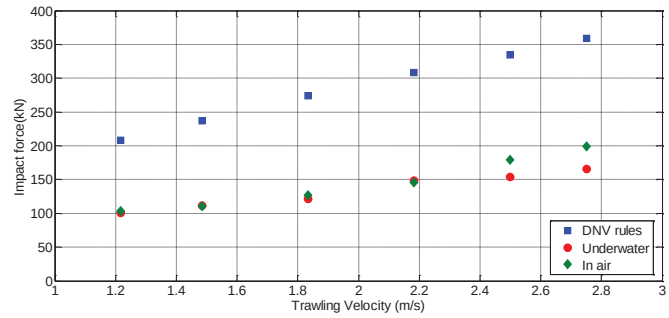


Fig.10 Experimental result of impact forces of trawl board to pipeline (span height =0.43D)

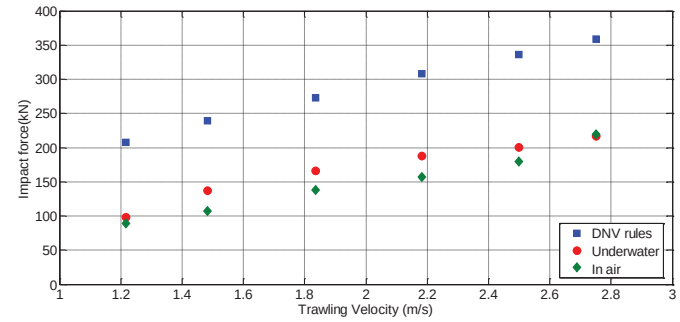


Fig.11 Experimental result of impact forces of trawl board to pipeline (span height =0.87D)

Impact force of beam trawl

When span height equals 0.14D, the impact forces the beam trawl applies to the pipeline show no significant difference for in air and underwater experiment cases. The impact forces increase with the increase of trawling velocity. The analysis results calculated according to DNV rules are nearly 150KN bigger than experiment results.

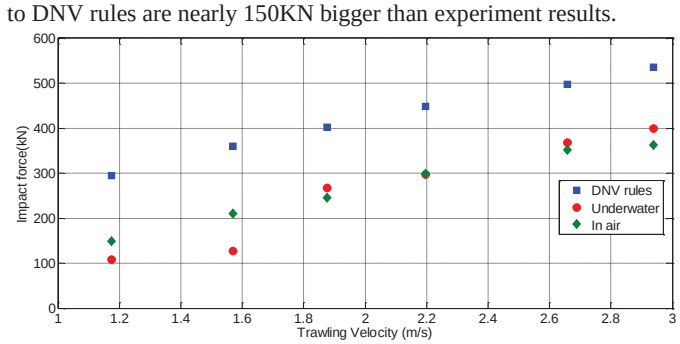


Fig.12 Experimental result of impact forces of beam trawl to pipeline (span height =0.14D)

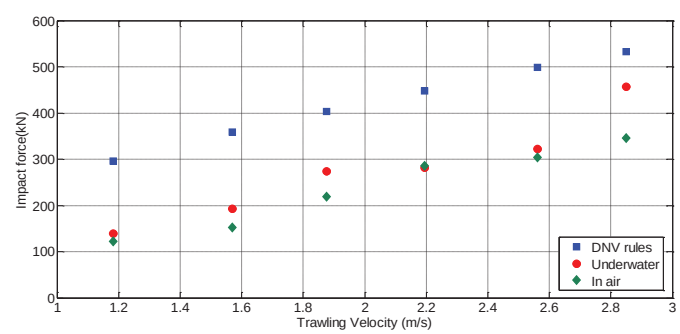


Fig.13 Experimental results of impact forces of beam trawl to pipeline (span height =0.43D)

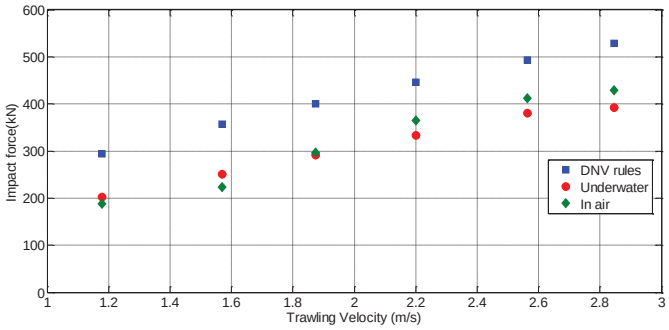


Fig.14 Experimental results of impact forces of beam trawl to pipeline (span height =0.87D)

For span height 0.43D and 0.87D, as shown in Figs.13~14,the experiment results show a similar trend as the case for span height 0.14D.

Pull-over experiments in air and underwater

Pull-over experiments were conducted both in air and under water for the pipeline model (OD=3.45cm). According to DNV rules, for different span heights, the trawl board drag force coefficients varied, while the beam trawl drag force coefficients remain the same, as listed in Table 3.

Table 3. Drag force coefficients for different span heights

	Span height =0.14*D*	Span height =0.43*D*	Span height =0.87*D*
trawl board drag force coefficients	2.96	3.48	4.20
beam trawl drag force coefficients	4.00	4.00	4.00

Pull-over force of trawl board

The horizontal pull-over forces calculated according to DNV rules range from 60kN and 180kN when trawling velocities are between 1m/s and 3m/s, with the vertical pull-over forces between 10kN and 30kN, when the span height is 0.14D.A trend that the force increases with the trawling velocity is shown.

As shown in Fig.15, the horizontal pull-over forces obtained from DNV results and model experiments are nearly the same when trawling velocities are low, while as the velocity increases, DNV results are a little bigger than experimental results. For vertical forces, DNV results are almost 2 times of experimental results. Overall, the forces in both directions increase with trawling velocities, and the horizontal forces are much bigger than vertical forces. The experimental results in air and underwater show no significant difference.

When span height is 0.43D, the horizontal pull-over forces range from 80kN and 200kN, with vertical forces 10kN and 30kN according to DNV rules. When span height is 0.87D, the horizontal pull-over forces range from 100kN and 220kN, with vertical forces 10kN and 30kN. Figs.16~17 give both the DNV results and the experimental results.

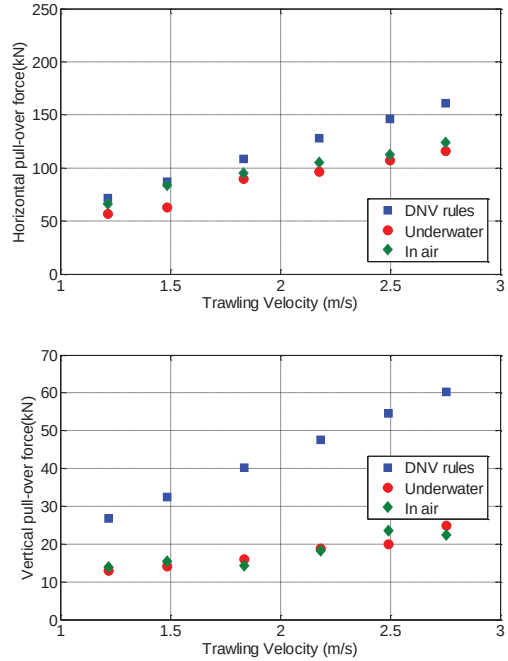


Fig.15 Experimental results of pull-over forces of trawl board to pipeline (span height =0.14D)

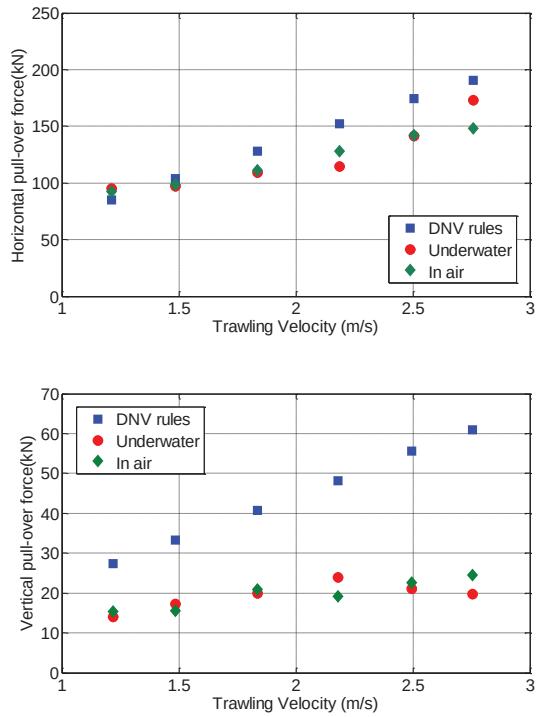


Fig.16 Experimental results of pull-over forces of trawl board to pipeline (span height =0.43D)

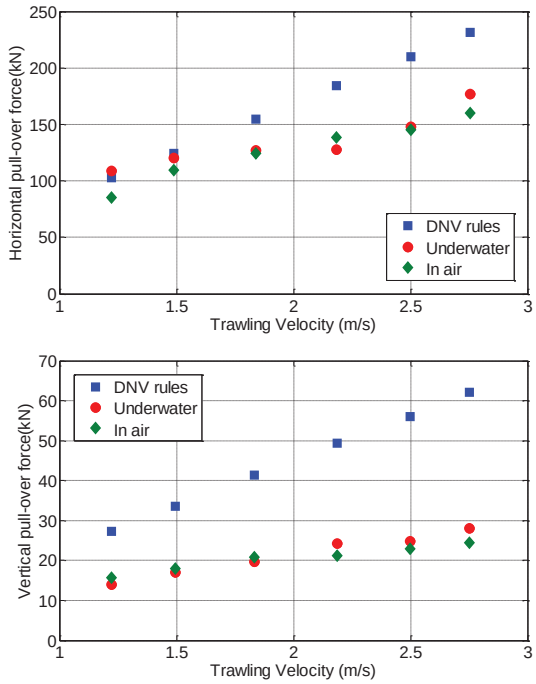


Fig.17 Experimental results of pull-over forces of trawl board to pipeline (span height =0.87D)

Pull-over force of beam trawl

The beam is put closely to the pipeline at the beginning of the experiment. When motor pulls the beam trawl over the pipeline, the force can be measured.

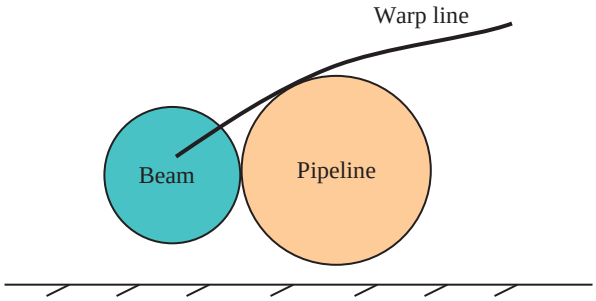


Fig.18 Sketch of relative position of beam model and pipeline model at the beginning of experiment

Pull-over forces are measured for different trawling velocities, as shown in Fig.19.

The pull-over forces the beam trawl applies to the pipeline show no significant difference for in air and underwater experiment cases, and increase with the increase of trawling velocity. The measured pull-over forces range from 60kN and 280kN when trawling velocities are between 1m/s and 3m/s. Limited by the experiment condition, the length of the beam is short and the tensional stiffness is big, thus the analysis results according to DNV rules are much bigger.

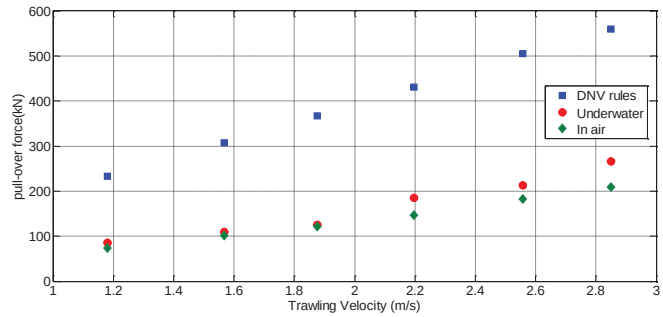


Fig.19 Beam trawl pull-over experiment results

CONCLUSION

Effects of fishing activities, especially otter trawl board and beam trawl, on subsea pipeline are studied numerically and experimentally based on survey data of China Sea. Typically, the mass of otter trawl board used in China Sea is 170kg, with the max. about 400kg.Trawling velocity is 1.8m/s and working water depth is 300m.For beam trawl gear, the mass is typically 1900kg,with a trawling speed of 1.1m/s and water depth of 100m.Survey data show that the fishing equipment size, mass and trawling velocity in China Sea are far less than that of North Sea, Norway.

Model experiments show that:

1) DNV results of impact and pull-over forces are generally higher than experimental results.

2) Impact and pull-over forces of trawl board and the impact forces of beam trawl show no significant difference for underwater and in air experiment cases, and all increase with increase of trawling velocities.

3) Impact and pull-over forces of trawl board increase with the increase of pipeline span heights. For span height 5cm, 15cm and 30cm, the impact force and pull-over force is 50kN~250kN and 60kN~200kN respectively when trawling velocity changes in the range of 1m/s~3m/s. However, span height doesn't show significant influence on beam trawl impact force and pull-over force, which is 100kN~450kN and 50kN~300kN respectively when trawling velocity changes in the range of 1m/s~3m/s.

Compared with the experimental results, DNV-RP-F111 overestimates the forces, which is conservative for engineering design. The reason is that the DNV code shall cover the uncertainties not covered by analysis. It is suggested to consider the DNV rules and the experimental results comprehensively in the engineering design.

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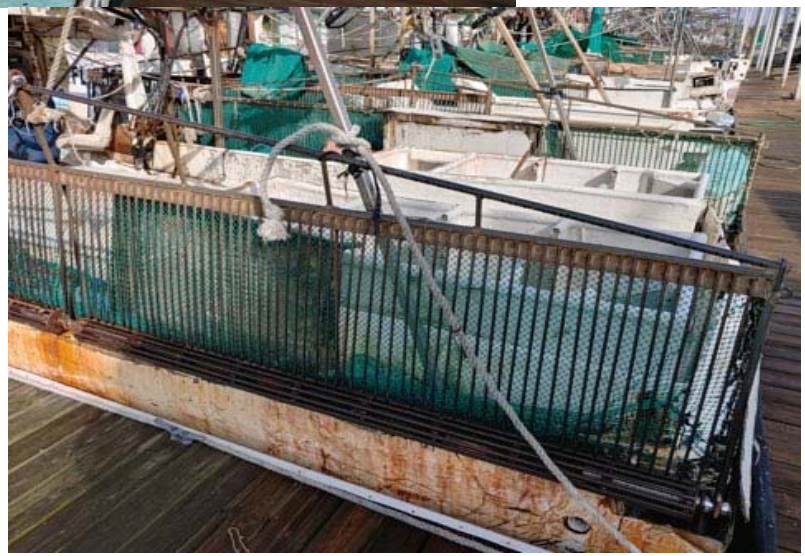
APPENDIX F



Oceana, *Investigating Chinese Trawlers in the South China Sea (Jan. 26, 2020)*

Investigating Chinese Trawlers in the South China Sea

January 26, 2020

Each year, the U.S. Department of State publishes a list of nations that are "certified" to import wild-caught shrimp to the U.S. This list encompasses countries that use manual, rather than mechanical, fishing gear to catch shrimp, and generally operate on an artisanal scale. This minimizes the potential for adverse impacts on sea turtles, and thus those countries are not subject to the same by-catch mitigation techniques that are employed in the U.S. shrimp fishery.

China has consistently been placed on this certification list even though there is published evidence that China's shrimp trawl fleet is quite robust. A 2015 academic paper by Yang et al.[1] states:

"*One shrimp beam trawler can carry several nets, and the largest boats (>300 kW) can carry up to 20 nets (Yang, 2002). It has been estimated that there were 600 shrimp beam trawlers (125 092.1 kW) operating in the coastal waters of Guangdong in 2013. Shrimp beam trawlers also operate in Guangxi and Hainan provinces. The number of shrimp beam trawlers operating in the northern South China Sea is thus very high*."

Oceana used Global Fishing Watch (GFW) to investigate apparent fishing[2] activity of Chinese flagged trawlers operating in the northern South China Sea (bounded from 105˚E to 118˚E and 17˚N to 27˚N). This was done by using Automated Identification System (AIS) signals, which are satellite-transmitted signals that relay information such as a vessel's speed, heading, and MMSI identification number. Depending on a vessel's speed, these may be sent out as frequently as every few seconds, or as infrequently as every few minutes. GFW incorporates AIS signals into machine learning algorithms to determine where fishing vessels are apparently fishing, as well as what type of gear they may be using based off vessel movement patterns.

In 2018, there were a total of **18,253,041 AIS signals** transmitted in the area of interest by Chinese trawlers. Of those signals, GFW lists **5,580 unique vessels** and **6,592 unique MMSI numbers**. The number of **apparent fishing hours** in that area by those Chinese trawlers was **2,844,676**.

In 2019, there were a total of **19,274,645 AIS signals** transmitted in the area of interest by Chinese trawlers. Of those signals, GFW lists **5,127 unique vessels** and **5,948 unique MMSI numbers**. The number of **apparent fishing hours** in that area by those Chinese trawlers was **2,698,480**.

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[1] Yang BZ, Yang L, Zhang P, Tan YG, Yan L, & Chen S. (2015). Fish by-catch in shrimp beam trawls in the northern South China Sea. *Applied Ichthyology*. 31, 714-717

[2] Any and all references to "fishing" should be understood in the context of Global Fishing Watch's fishing detection algorithm, which is a best effort to determine "apparent fishing effort" based on vessel speed and direction data from the Automatic Identification System (AIS) collected via satellites and terrestrial receivers. As AIS data varies in completeness, accuracy and quality, it is possible that some fishing effort is not identified and conversely, that some fishing effort identified is not fishing. For these reasons, Global Fishing Watch qualifies all designations of vessel fishing effort, including synonyms of the term "fishing effort," such as "fishing" or "fishing activity," as "apparent," rather than certain. Any/all Global Fishing Watch information about "apparent fishing effort" should be considered an estimate and must be relied upon solely at your own risk. Global Fishing Watch is taking steps to make sure fishing effort designations are as accurate as possible.

Figure 1: Apparent fishing hours by Chinese trawlers in the northern South China Sea in 2018. Data is displayed in 0.1˚ x 0.1˚ cells.

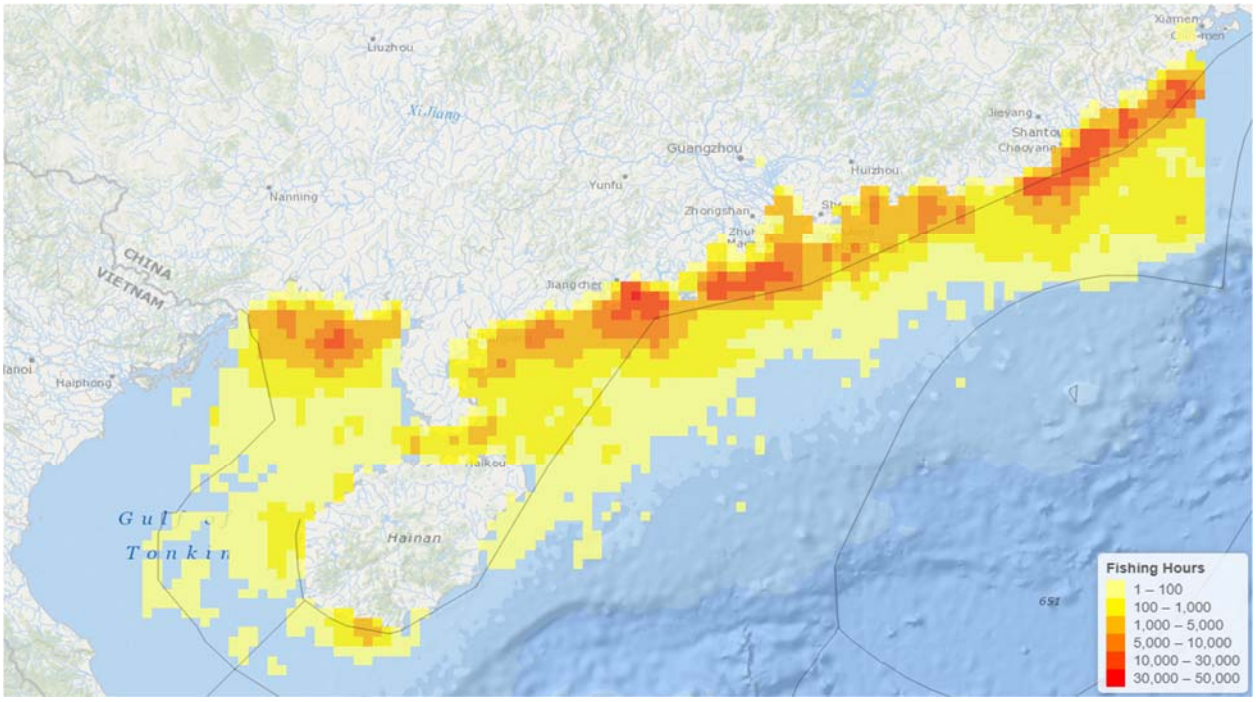

Figure 2: Apparent fishing hours by Chinese trawlers in the northern South China Sea in 2019. Data is displayed in 0.1˚ x 0.1˚ resolution.

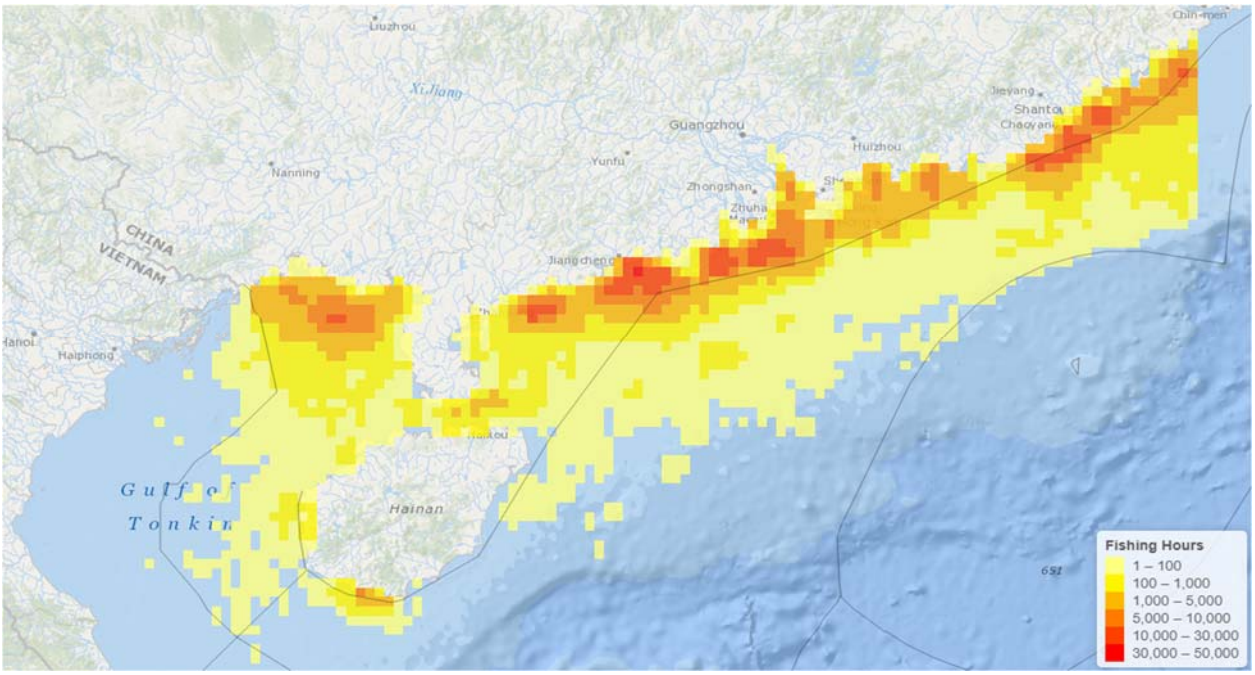

Figure 3: Vessel trackline of the Chinese trawler Gui Qin Yu 22888 in the northern South China Sea on the GFW public map. Pink dots along the three-month trackline represent apparent fishing events.