National Marine Fisheries Service  
Endangered Species Act Section 7 Consultation

Biological Opinion

Agencies:  
Permits and Conservation Division of the Office of Protected Resources, National Marine Fisheries Service

Activities Considered:  
Permitting the Southeast Fisheries Science Center to increase the number of smalltooth sawfish captured under permit 13330 along the coast of Florida.

Consultation Conducted by:  
Endangered Species Act Interagency Cooperation Division of the Office of Protected Resources, National Marine Fisheries Service

Approved by:  
[Signature]

Date:  
SEP 4, 2012

Section 7(a)(2) of the Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.) requires that each Federal agency shall ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When the action of a Federal agency may affect a protected species, that agency is required to consult with either the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), depending upon the protected species that may be affected. For the actions described in this document, the action agency is NMFS’ Office of Protected Resources – Permits and Conservation Division (PR 1). The consulting agency is NMFS’ Office of Protected Resources - Endangered Species Act Interagency Cooperation Division (PR 5).

This document represents NMFS’ biological opinion (Opinion) based on our review of PR 1’s proposed changes to the previous permit, draft environmental assessment, the status review of the smalltooth sawfish (Pristis pectinata), the draft recovery plan for smalltooth sawfish, past and current research and population dynamics modeling efforts, and Opinions on similar research.

Consultation History

On January 28, 2008, PR 1 began pre-consultation with PR 5 concerning this project.

On March 31, 2008, PR 1 requested initiation of formal consultation with PR 5 and provided an initiation packet containing the draft permit to conduct research on the smalltooth sawfish and an Environmental Assessment. PR 5 initiated consultation on
On July 31, 2012, PR1 requested reinitiation of consultation to increase the number of smalltooth sawfish to be researched. PR5 initiated consultation at this time.

BIOLOGICAL OPINION

Description of the Proposed Action
The Southeast Fisheries Science Center proposes to increase the number of smalltooth sawfish being studied annually from 45 individuals to 90 captured using longline, rod and reel, set lines (drum lines), gill nets, and beach seines each year. All sawfish captured during field surveys will be handled, measured, tagged, sampled, and released alive. The proposed permit requests to conduct this research between August 1, 2012 and July 31, 2013 (the remainder of a five year permit).

Capture
This permit amendment will continue capturing smalltooth sawfish using the same sampling techniques currently being used under the existing permit. The permit amendment proposes to increase the capture of smalltooth sawfish from 15 individuals from each life stage by adding an additional 35 neonates, 5 sub-adults, and 5 adults. Therefore, for the final year of the permit, the researcher proposes to capture 50 neonates, 20 sub-adults, and 20 adults.

Handling
This proposed permit amendment will not alter the handling techniques currently being permitted for this research.

Tagging
This proposed permit amendment will continue to tag every fish captured. Tagging methods include rototags (fin tags), plastic headed dart tags, Passive Integrated Transponder (PIT) tags, acoustic tags (transmitters), Pop-Up Archival Transmitting (PAT) tags, and Smart Position Only Transmitting (SPOT) tags. The methodology for attaching these tags was discussed in the original permit Opinion. The proposed amendment will increase the number of smalltooth sawfish being tagged annually from 45 to 90, with an additional 35 neonates, 5 sub-adults, and 5 adults receiving tags.

Genetic sampling
The researchers would take a small tissue sample clipped with disinfected scissors from the dorsal fin for genetic analysis. The procedure is common and accepted practice in elasmobranch research.

Blood sampling
The researchers are proposing to continue drawing blood samples from all smalltooth sawfish captured. The methods proposed for this amendment will be identical to the methods described during the original application. As stated in the original Opinion, up
to 10% of circulating blood volume can be collected from an animal in a single sampling without significant disturbance to the individual's normal physiology (Diehl et al. 2001). Given this, the following conservative protocols would be used to collect blood from smalltooth sawfish collected during this study:

<table>
<thead>
<tr>
<th>Sawfish body weight</th>
<th>Amount of blood draw</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 kg</td>
<td>1 ml</td>
</tr>
<tr>
<td>1-2 kg</td>
<td>3 ml</td>
</tr>
<tr>
<td>&gt;2 kg</td>
<td>5 ml</td>
</tr>
</tbody>
</table>

Number and Age of Smalltooth Sawfish

Table 1 outlines the maximum number of listed species authorized to be directly taken annually until 2013 and the activities authorized to be performed on each animal. This will be the total number of takes available, including the previous amount authorized in the current permit. All procedures will remain the same, but the numbers of animals captured will increase by 35 neonates, 5 juveniles, and 5 adults. All of the mitigation measures identified in the current permit will remain in place.

<table>
<thead>
<tr>
<th>Animals</th>
<th>Life Stage</th>
<th>Species</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>Neonate</td>
<td>Smalltooth sawfish</td>
<td>Capture, weigh, measure, genetic sample, blood draw, rototag, dart tag, PIT tag, attach transmitter, release</td>
</tr>
<tr>
<td>20</td>
<td>Juvenile</td>
<td>Smalltooth sawfish</td>
<td>Capture, weigh, measure, genetic sample, blood draw, rototag, dart tag, PIT tag, attach transmitter, release</td>
</tr>
<tr>
<td>20</td>
<td>Adult</td>
<td>Smalltooth sawfish</td>
<td>Capture, weigh, measure, genetic sample, blood draw, rototag, dart tag, PIT tag, attach transmitter, release</td>
</tr>
</tbody>
</table>

Approach to the Assessment

NMFS approaches its section 7 analyses of research permits through a series of steps. The first step identifies those aspects of proposed actions that are likely to have direct and indirect physical, chemical, and biotic effects on listed species or on the physical, chemical, and biotic environment of an action area. As part of this step, we identify the spatial extent of these direct and indirect effects, including changes in that spatial extent over time. The results of this step define the action area for the consultation. The second step of our analyses identifies the listed resources that are likely to co-occur with these effects in space and time and the nature of that co-occurrence (these represent our
exposure analyses). In this step of our analyses, we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to an action’s effects and the populations or subpopulations those individuals represent. Once we identify which listed resources are likely to be exposed to an action’s effects and the nature of that exposure, we examine the scientific and commercial data available to determine whether and how those listed resources are likely to respond given their exposure (these represent our response analyses).

The final steps of our analyses – establishing the risks those responses pose to listed resources – are different for listed species and designated critical habitat (these represent our risk analyses). Our jeopardy determinations must be based on an action’s effects on the continued existence of threatened or endangered species as those “species” have been listed, which can include true biological species, subspecies, or distinct population segments of vertebrate species. Because the continued existence of species depends on the fate of the populations that comprise them, the continued existence of these “species” depends on the fate of the populations that comprise them. Similarly, the continued existence of populations are determined by the fate of the individuals that comprise them; populations grow or decline as the individuals that comprise the population live, die, grow, mature, migrate, and reproduce (or fail to do so).

Our risk analyses reflect these relationships between listed species, the populations that comprise that species, and the individuals that comprise those populations. Our risk analyses begin by identifying the probable risks actions pose to listed individuals that are likely to be exposed to an action’s effects. Our analyses then integrate those individual risks to identify consequences to the populations those individuals represent. Our analyses conclude by determining the consequences of those population level risks to the species those populations comprise.

We measure risks to listed individuals using the individuals’ “fitness,” or the individual’s growth, survival, annual reproductive success, and lifetime reproductive success. In particular, we examine the scientific and commercial data available to determine if an individual’s probable lethal, sub-lethal, or behavioral responses to an action’s effect on the environment (which we identify during our response analyses) are likely to have consequences for the individual’s fitness.

When individual, listed plants or animals are expected to experience reductions in fitness in response to an action, those fitness reductions are likely to reduce the abundance, reproduction, or growth rates (or increase the variance in these measures) of the populations those individuals represent (see Stearns 1992). Reductions in at least one of these variables (or one of the variables we derive from them) is a necessary condition for reductions in a population’s viability, which is itself a necessary condition for reductions in a species’ viability. As a result, when listed plants or animals exposed to an action’s effects are not expected to experience reductions in fitness, we would not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise (e.g., Brandon 1978, Mills and Beatty 1979, Stearns 1992, Anderson 2000). As a result, if we conclude that listed plants or
animals are not likely to experience reductions in their fitness, we would conclude our assessment.

Although reductions in fitness of individuals are a necessary condition for reductions in a population’s viability, reducing the fitness of individuals in a population is not always sufficient to reduce the viability of the population(s) those individuals represent. Therefore, if we conclude that listed plants or animals are likely to experience reductions in their fitness, we determine whether those fitness reductions are likely to reduce the viability of the populations the individuals represent (measured using changes in the populations’ abundance, reproduction, spatial structure and connectivity, growth rates, variance in these measures, or measures of extinction risk). In this step of our analyses, we use the population’s base condition (established in the Environmental Baseline and Status of the Species sections of this Opinion) as our point of reference. If we conclude that reductions in individual fitness are not likely to reduce the viability of the populations those individuals represent, we would conclude our assessment.

Reducing the viability of a population is not always sufficient to reduce the viability of the species those populations comprise. Therefore, in the final step of our analyses, we determine if reductions in a population’s viability are likely to reduce the viability of the species those populations comprise using changes in a species’ reproduction, numbers, distribution, estimates of extinction risk, or probability of being conserved. In this step of our analyses, we use the species’ status (established in the Status of the Species section of this Opinion) as our point of reference. Our final determinations are based on whether threatened or endangered species are likely to experience reductions in their viability and whether such reductions are likely to be appreciable.

To conduct these analyses, we rely on all of the evidence available to us. This evidence might consist of monitoring reports submitted by past and present permit holders; reports from NMFS Science Centers; reports prepared by natural resource agencies in States, and other countries; reports from foreign and domestic nongovernmental organizations involved in marine conservation issues; the information provided by PRI when it initiates formal consultation; information from commercial interests; and the general scientific literature.

During each consultation, we conduct electronic searches of the general scientific literature using SCOPUS, American Fisheries Society, Google Scholar, ScienceDirect, BioOne, Agricola, SiteSeer, Conference Papers Index, JSTOR, and Aquatic Sciences and Fisheries Abstracts search engines. We supplement these searches with electronic searches of doctoral dissertations and master’s theses. These searches specifically try to identify data or other information that supports a particular conclusion (for example, a study that suggests smalltooth sawfish will exhibit a particular response to dissolved oxygen concentrations) as well as data that does not support that conclusion. When data are equivocal, or in the face of substantial uncertainty, our decisions are designed to avoid the risks of incorrectly concluding that an action would not have an adverse effect on listed species when, in fact, such adverse effects are likely.
We rank the results of these searches based on the quality of their study design, sample sizes, level of scrutiny prior to and during publication, and study results. Carefully designed field experiments (for example, experiments that control potentially confounding variables) are rated higher than field experiments that are not designed to control those variables. Carefully designed field experiments are generally ranked higher than computer simulations. Studies that produce large sample sizes with small variances are generally ranked higher than studies with small sample sizes or large variances.

**Action Area**

Sampling would occur throughout the coastal waters of Florida. Research efforts are primarily focused in the region of the Florida coast from Naples to Key West, encompassing the Ten Thousand Islands and Everglades National Park. Sampling may occur in waters throughout Florida if reliable and sufficient reports of smalltooth sawfish encounters are received to warrant sampling in those areas.

**Status of the Species**

NMFS has determined that the proposed amended action being considered in this Opinion may affect the following species that are protected under the ESA:

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smalltooth sawfish</td>
<td><em>Pristis pectinata</em></td>
</tr>
</tbody>
</table>

The possible effects to loggerhead, green, leatherback, hawksbill, and Kemp’s ridley sea turtles was assessed at the time the permit was originally issued. The proposal to amend the number of smalltooth sawfish captured is not expected to result in any additional sea turtle captures. There will be no change in the amount of effort being put into capturing sub-adult and adult smalltooth sawfish, only their success rate has been higher than expected and based on the capture rate from the first seven months of the year, the researchers expect to capture 20 of each life stage instead of 15. Sampling for neonates is done by sight and would not affect sea turtles.

Elkhorn and staghorn coral and Johnson’s sea grass can be found off the coast of Florida, but they will not be affected by this action because the researchers have identified where these species live and have agreed to not sample in those locations.

Shortnose sturgeon historically occupied the Saint Johns and Saint Mary’s river in Florida, but Kahnle *et al.* (1998) and Rogers and Weber (1994) determined that shortnose sturgeon had been extirpated from those systems. Current research has been proposed to search for shortnose sturgeon in those rivers but the best available science suggests that they have been extirpated. Transient fish may enter Florida’s waters, but due to the sampling protocols for this project and because only one shortnose sturgeon has been captured in the state during the previous 10 years, NMFS believes this project is not likely to adversely affect shortnose sturgeon.

Gulf sturgeon currently inhabit the west coast of Florida. While there is a good chance
that gulf sturgeon will be in the same vicinity as the research being conducted, the only sampling gear that would impact them would be gillnets. The gillnets proposed for use in this project are to be used in water less than 40 inches deep after visually identifying and targeting a smalltooth sawfish. If a gulf sturgeon or another listed animal is seen in the vicinity, gill nets will not be deployed and therefore the chances of bycatch are negligible. The three to four inch mesh size used when targeting sawfish is significantly smaller than what would be used to capture gulf sturgeon (6 to 12 inch mesh). For these reasons, NMFS believes this project is not likely to adversely affect gulf sturgeon.

Critical habitat has been designated for gulf sturgeon, green sea turtles, hawksbill sea turtles, and leatherback sea turtles. The critical habitat for hawksbill and leatherback sea turtles is outside of the action area and will therefore not be affected. Critical habitat for gulf sturgeon does occur within the action area of this project. That critical habitat occurs in Pensacola Bay, Santa Rosa Sound, Florida nearshore Gulf of Mexico, Choctawhatchee Bay, Apalachicola Bay, and Suwannee Sound (units 9 to 14). This project will not have any lasting effects to gulf sturgeon critical habitat because it will not affect any of their primary constituent elements. There will be no effect to their riverine habitat, their food sources, sediment or water quality, or their migratory pathways. Because the researchers will be targeting smalltooth sawfish and will be able to see and avoid gulf sturgeon during gillnet sets and will bait longlines with food not consumed by gulf sturgeon, gulf sturgeon will not be present or affected by the temporary activities in their critical habitat. NMFS therefore concludes that gulf sturgeon critical habitat will not be affected by this project.

**Smalltooth Sawfish**

**Description of the Species**

The smalltooth sawfish is a tropical marine and estuarine elasmobranch fish (sharks and rays) that has been reported to have a circumtropical distribution. All extant sawfish belong to the Suborder Pristoidea, Family Pristidae, and Genus Pristis. Although they are rays, sawfish physically more resemble sharks, with only the trunk and especially the head ventrally flattened. Smalltooth sawfish are characterized by their “saw,” a long, narrow, flattened rostral blade with a series of transverse teeth along either edge.

In the western Atlantic, the smalltooth sawfish has been reported from Brazil through the Caribbean and Central America, the Gulf of Mexico, and the Atlantic coast of the United States. The smalltooth sawfish has also been recorded from Bermuda (Bigelow and Schroeder 1953). Forms of smalltooth sawfish have been reported from the eastern Atlantic in Europe and West Africa; the Mediterranean; South Africa; and the Indo-West Pacific, including the Red Sea, India, Burma, and the Philippines (Bigelow and Schroeder 1953, Van der Elst 1981, Compagno and Cook 1995). Whether populations outside of the Atlantic are truly smalltooth sawfish or closely related species is unknown (Adams and Wilson 1995). Pacific coast records of smalltooth sawfish off Central America need confirmation (Bigelow and Schroeder 1953, Compagno and Cook 1995).

The range of the smalltooth sawfish in the Atlantic has contracted markedly over the past
century. The northwestern terminus of their Atlantic range is located in the waters of the eastern United States. Historic capture records within the U.S. range from Texas to New York. Water temperatures no lower than 16° to 18°C and the availability of appropriate coastal habitat serve as the major environmental constraints limiting the northern movements of smalltooth sawfish in the western North Atlantic. As a result, most records of this species from areas north of Florida occur during spring and summer periods (May to August) when inshore waters reach appropriately high temperatures. Most specimens captured along the Atlantic coast north of Florida have also been large (over nine feet) adults and likely represent seasonal migrants, wanderers, or colonizers from a core population(s) to the south rather than being members of a continuous, even-density population (Bigelow and Schroeder 1953). It is likely that these individuals migrated southward toward Florida as water temperatures declined in the fall, as there is only one winter record from the Atlantic coast north of Florida. The Status Review Team (NMFS 2000) collected and compiled literature accounts, museum collection specimens, and other records of the species to document the changes in distribution and abundance. At about the same time, two groups of researchers began collecting reports of sawfish encounters and captures in Florida to assess the current distribution of this species. Based on smalltooth sawfish encounter data, the current core range for the smalltooth sawfish is from the Caloosahatchee River, Florida, to Florida Bay (Seitz and Poulakis 2002, Poulakis and Seitz 2004, Simpfendorfer and Wiley 2004, NMFS 2006).

Life history information on smalltooth sawfish is limited. Small amounts of data exist in old taxonomic works and occurrence notes (e.g., Breder 1952, Bigelow and Schroeder 1953, Thorson et al. 1966, Wallace 1967). However, as Simpfendorfer and Wiley (2004) note, these relate primarily to occurrence and size. Recent research and sawfish public encounter information is now providing new data and hypotheses about smalltooth sawfish life history (e.g., Simpfendorfer 2001, Seitz and Poulakis 2002, Simpfendorfer 2003, Poulakis and Seitz 2004, Simpfendorfer and Wiley 2004), but more data are needed to confirm many of these new hypotheses.

As in all elasmobranchs, fertilization is internal. Bigelow and Schroeder report the litter size as 15 to 20. Simpfendorfer and Wiley (2004), however, caution this may be an overestimate, with recent anecdotal information suggesting smaller litter sizes (~10). Smalltooth sawfish mating and pupping seasons, gestation, and reproductive periodicity are all unknown. Gestation and reproductive periodicity, however, may be inferred based on that of the largemouth sawfish, sharing the same genus and having similarities in size and habitat. Thorson (1976) reported the gestation period for largemouth sawfish was approximately five months and concluded that females probably produce litters every second year.

Bigelow and Schroeder (1953) describe smalltooth sawfish as generally about two feet long (61 cm) at birth and growing to a length of 18 feet (549 cm) or greater. Recent data from smalltooth sawfish caught off Florida, however, demonstrate young are born at 75-85 cm (Simpfendorfer and Wiley 2004), with males reaching maturity at approximately 270 cm and females at approximately 360 cm. The maximum reported size of a smalltooth sawfish is 760 cm (Last and Stevens 1994), but the maximum size normally
observed is 600 cm (Adams and Wilson 1995). No formal studies on the age and growth of the smalltooth sawfish have been conducted to date, but growth studies of largetooth sawfish suggest slow growth, late maturity (10 years) and long lifespan (25-30 years) (Thorson 1982, Simpfendorfer 2000). These characteristics suggest a very low intrinsic rate of increase (Simpfendorfer 2000).

Smalltooth sawfish feed primarily on fish, with mullet, jacks, and ladyfish believed to be their primary food resources (Simpfendorfer 2001). By moving its saw rapidly from side to side through the water, the relatively slow-moving sawfish is able to strike at individual fish (Breder 1952). The teeth on the saw stun, impale, injure, or kill the fish. Smalltooth sawfish then rub their saw against bottom substrate to remove the fish, which are then eaten. In addition to fish, smalltooth sawfish also prey on crustaceans (mostly shrimp and crabs), which are located by disturbing bottom sediment with their saw (Norman and Fraser 1937, Bigelow and Schroeder 1953).

Smalltooth sawfish are euryhaline, occurring in waters with a broad range of salinities from freshwater to full seawater (Simpfendorfer 2001). Their occurrence in freshwater is suspected to be only in estuarine areas temporarily freshwater from receiving high levels of freshwater input. Many encounters are reported at the mouths of rivers or other sources of freshwater inflows, suggesting estuarine areas may be an important factor in the species distribution (Simpfendorfer and Wiley 2004).

The literature indicates that smalltooth sawfish are most common in shallow coastal waters less than 82 feet (Bigelow and Schroeder 1953, Adams and Wilson 1995). Indeed, the distribution of the smallest size classes of smalltooth sawfish indicate that nursery areas occur throughout Florida in areas of shallow water, close to shore and typically associated with mangroves (Simpfendorfer and Wiley 2004). However, encounter data indicate there is a tendency for smalltooth sawfish to move offshore and into deeper water as they grow. An examination of the relationship between the depth at which sawfish occur and their estimated size indicates that larger animals are more likely to be found in deeper waters. Since large animals are also observed in very shallow waters, it is believed that smaller (younger) animals are restricted to shallow waters, while large animals roam over a much larger depth range (Simpfendorfer 2001). Recent data from sawfish encounter reports and from satellite tagging indicate mature animals occur regularly in waters in excess of 164 feet (Poulakis and Seitz 2004, Simpfendorfer and Wiley 2004).

Mote Marine Laboratory data indicate smalltooth sawfish occur over a range of temperatures but appear to prefer water temperatures greater than 64.4°F (18°C) (Simpfendorfer 2001). The data also suggest that smalltooth sawfish may utilize warmwater outflows of power stations as thermal refuges during colder months to enhance their survival or become trapped by surrounding cold water from which they would normally migrate. Almost all occurrences of smalltooth sawfish in warm-water outflows were during the coldest part of the year, when water temperatures in these outfalls are typically well above ambient temperatures. Further study of the importance of thermal refuges to smalltooth sawfish is needed. Significant use of these areas by
sawfish may disrupt their normal migratory patterns (Simpfendorfer and Wiley 2004).

Historic records of smalltooth sawfish indicate that some large mature individuals migrated north along the U.S. Atlantic coast as temperatures warmed in the summer and then south as temperatures cooled (Bigelow and Schroeder 1953). Recent Florida encounter data, however, do not suggest such migration. Only two smalltooth sawfish have been recorded north of Florida since 1963 (the first was captured off of North Carolina in 1999 (Schwartz 2003) and the other off Georgia 2002 [Burgess unpublished data]) but it is unknown whether these individuals resided in Georgia and North Carolina waters annually or if they had migrated north from Florida. Given the very limited number of encounter reports from the east coast of Florida, Simpfendorfer and Wiley (2004) hypothesize the population previously undertaking the summer migration has declined to a point where the migration is undetectable or does not occur. Further research focusing on states north of Florida or using satellite telemetry is needed to test this hypothesis.

**Status and Trends**

The U.S. smalltooth sawfish distinct population segment was listed as endangered under the ESA on April 1, 2003 (68 FR 15674). The smalltooth sawfish is the first marine fish to be listed in the United States. Despite being widely recognized as common throughout their historic range up until the middle of the 20th century, the smalltooth sawfish population declined dramatically during the middle and later parts of the century. The decline in the population of smalltooth sawfish is attributed to fishing (both commercial and recreational), habitat modification, and sawfish life history. Large numbers of smalltooth sawfish were caught as bycatch in the early part of this century. Smalltooth sawfish were historically caught as bycatch in various fishing gears throughout their historic range, including gillnet, otter trawl, trammel net, seine, and to a lesser degree, handline. Frequent accounts in earlier literature document smalltooth sawfish being entangled in fishing nets from areas where smalltooth sawfish were once common but are now rare or extirpated (Everman and Bean 1898). Loss and/or degradation of habitat contributed to the decline of many marine species and continue to impact the distribution and abundance of smalltooth sawfish.

Estimates of the magnitude of the decline in the smalltooth sawfish are difficult to make. Because of the species’ limited importance in commercial and recreational fisheries and its large size and toothed rostrum, making it difficult to handle, it was not well studied before incidental bycatch severely reduced its numbers. However, based on the contraction of the species’ range, and other anecdotal data, Simpfendorfer (2001) estimated that the U.S. population size is currently less than five percent of its size at the time of European settlement.

Seitz and Poulakis (2002) and Poulakis and Seitz (2004) document recent (1990 to 2002) occurrences of sawfish along the southwest coast of Florida, and in Florida Bay and the Florida Keys, respectively. The information was collected by distributing posters displaying an image of a sawfish and requesting anyone with information on these fish since 1990 to contact the authors. In addition to circulating posters, information was
obtained by contacting other fishery biologists, fishing guides, guide associations, rod and gun clubs, recreational and commercial fishermen, scuba divers, mosquito control districts, and newspapers. The Poulakis and Seitz database includes a total of 2,969 smalltooth sawfish encounters.

MML also maintains a smalltooth sawfish public encounter database, established in 2000 to compile information on the distribution and abundance of sawfish. Encounter records are collected using some of the same outreach tactics as above. The data are validated using a variety of methods (photographs, video, directed questions). A total of 434 sawfish encounters have been validated since 1998, most from recreational fishers (Simpfendorfer and Wiley 2004).

The majority of smalltooth sawfish encounters today are from the southwest coast of Florida between the Caloosahatchee River and Florida Bay. Outside of this core area, the smalltooth sawfish appears more common on the west coast of Florida and in the Florida Keys than on the east coast, and occurrences decrease the greater the distance from the core area (Simpfendorfer and Wiley 2004). The capture of a smalltooth sawfish off Georgia in 2002 is the first record north of Florida since 1963. New reports during 2004 extend the current range of the species to Panama City, offshore Louisiana (south of Timbalier Island in 100 ft of water), southern Texas, and the northern coast of Cuba. The Texas sighting was not confirmed to be a smalltooth sawfish and may have been a largetooth sawfish.

There are no data available to estimate the present population size. Although smalltooth sawfish encounter databases may provide a useful future means of measuring changes in the population and its distribution over time, conclusions about the abundance of smalltooth sawfish now cannot be made because outreach efforts and observation efforts are not expanded evenly across each study period. Simpfendorfer reluctantly gives an estimate of 2,000 individuals based on his four years of field experience and data collected from the public, but cautions that actual numbers may be plus or minus at least 50 percent.

Recent encounters with neonates (young of the year), juveniles, and sexually mature sawfish indicate that the population is reproducing (Seitz and Poulakis 2002, Simpfendorfer 2003). The abundance of juveniles encountered, including very small individuals, suggests that the population remains reproductively active and viable (Simpfendorfer and Wiley 2004). Also, the declining numbers of individuals with increasing size is consistent with the historic size composition data (Simpfendorfer and Wiley 2004). This information and recent encounters in new areas beyond the core abundance area suggest that the population may be increasing. However, smalltooth sawfish encounters are still rare along much of their historical range and they are thought to be extirpated from areas of historical abundance such as the Indian River Lagoon and John’s Pass (Snelson and Williams, 1981, Simpfendorfer and Wiley 2004).

**Threats**
Natural Threats. The primary natural threat to smalltooth sawfish survival is the species low reproductive rate. In the face of reduced population sizes, this biological parameter means that recovery, at best, will be slow, and that catastrophic perturbations can have severe consequences to recovery.

Anthropogenic Threats. Smalltooth sawfish decline has been largely due to fisheries interaction (NMFS 2006). The distinctive “saw” can easily become entangled in a variety of commercial and recreational fishing gear, resulting in drowning or injury. Even when individuals that have been entangled are retrieved alive, individuals may be killed for curio collection of the saw, fear of injury from fishermen, or injured from the gear or handling during gear removal. However, additional anthropogenic impacts result from habitat loss. Destruction of mangrove habitat, dredging, trawling and filling, and loss of reef habitat have negative impacts on all life stages of smalltooth sawfish. Although a concern, pollution impacts on particularly reproductive biology are unknown. However, habitat degradation due to runoff containing pesticides, eutrophying agents, and other contaminants can also have a negative impact on smalltooth sawfish habitat.

Critical Habitat
Critical habitat has not been designated for smalltooth sawfish.

Environmental Baseline

By regulation, environmental baselines for Opinions include the past and present impacts of all state, Federal or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process (50 CFR ' 402.02). The environmental baseline for this Opinion includes the effects of several activities that affect the survival and recovery of the listed species at different locations in the action area.

The following information summarizes the primary human and natural phenomena along the entire coast of Florida, that are believed to affect the status and trend of endangered smalltooth sawfish as well as their probable responses to these phenomena.

Destruction of habitat

Agriculture. Agricultural activities convert wetlands and shed nutrient, pesticide, and sediment-laden runoff. These in turn lead to excessive eutrophication, hypoxia, increased sedimentation and turbidity, stimulation of hazardous algal blooms, and delivery of chemical pollutants (SAFMC 1998). Freshwater wetlands associated with southeastern rivers have been extensively converted to agriculture or degraded by flood control and diversion projects in support of agriculture. Likewise, coastal wetlands have been converted to agricultural fields and degraded by flow alterations linked to agriculture. Agriculture is the single largest contributor of nutrients in southeastern watersheds (SAFMC 1998). Animal wastes and fertilizers are the largest sources of non-point source nutrient loading (USGS 1997). Agricultural non-point discharges are responsible for the
introduction of a wide range of toxic chemicals into coastal waters around Florida (Scott 1997). Even areas not immediately adjacent to agricultural areas can be affected by these activities. For example, all of Florida Bay has undergone biological, chemical, and physical change due to large scale agricultural practices and hydrologic modifications in the Everglades (Fourqurean and Robblee 1999).

Introduction of point and non-point source pollution can have impacts to smalltooth sawfish as there is evidence from other elasmobranches that pollution disrupts endocrine systems and potentially leads to reproductive failure (Gelsleichter et al. 2006).

Coastal and urban development. The population in the Southeast increased at approximately 25.7% between 1980 and 1990, primarily along the coast (Chambers 1992, Cordell and Macie 2002). Threats from development include loss of wetlands, point and non-point sources of toxins, eutrophication, and hydrologic modification. Sawfish may also alter seasonal migration patterns in response to warm water discharges from power stations (Simpfendorfer and Wiley 2004). A major concern is the destruction of wetlands by filling for urban and suburban development (SAFMC 1998). In Florida, between 1943 and 1970, approximately 10,000 ha of this habitat were lost due to dredge fill and other activities related to accommodating the increasing human population. In addition, seawalls and canals for waterfront homes have replaced marsh and mangrove intertidal shorelines and shallow estuarine waters. Of particular concern are sawfish habitats in places such as the Indian River Lagoon (Gilmore 1995), where the species was once abundant, but now appear to have been extirpated (Snelson and Williams 1981). Many of the wetland habitats in the Indian River Lagoon were impounded for mosquito control (Brockmeyer et al. 1996) and the effects of these alterations on the smalltooth sawfish populations there are unknown.

Coastal development too close to the beach has directly consumed suitable nesting habitat or impeded sea turtle migration to suitable nesting habitat. This development has also influenced natural coastal processes such as erosion rates, resulting in accelerated erosion rates and interruption of natural shoreline migration. Where beachfront development occurs, the site is often fortified to protect the property from erosion. Beach armoring is a common type of construction that includes sea walls, rock revetments, riprap, sandbag installations, groins and jetties. Approximately 20% of Florida’s coast has been armored. Groins and jetties are designed to trap sand during longshore transport or to keep sand from flowing into shipping channels. These structures prevent sediment deposition and cause increased erosion on upcurrent and downcurrent beaches.

While loss of mangrove ecosystems throughout Florida is not overwhelming, losses at specific locations have been substantial (Odum et al. 1982, Veliela et al. 2001). Direct destruction of mangrove habitat is no longer allowed without a permit, but indirect damage to mangrove habitat from increased urbanization and the resulting overall habitat degradation still occurs. Given the documented losses that occurred during early developmental phases in Florida (1940 to 1970), it can only be assumed that, over the last 30 years, those losses have continued, and that the amount of available mangrove habitat is less than documented by these older studies. The smalltooth sawfish's decline may be
in part attributable to these habitat losses.

**Diversion of freshwater runoff.** Modifications of natural freshwater flows into estuarine and marine waters through construction of canals and other controlled devices have changed temperature, salinity, and nutrient regimes; reduced both wetlands and submerged aquatic vegetation; and degraded vast areas of coastal habitat (Gilmore 1995, Reddering 1988, Whitfield and Bruton 1989). Profound impacts to hydrological regimes have been produced in South Florida through the construction of a 1,400 mile network of canals, levees, locks, and other water control structures which modulate freshwater flow from Lake Okeechobee, the Everglades, and other coastal areas (Serayf et al. 1997). The Comprehensive Everglades Restoration Project is a major reconstruction project jointly led by the Army Corps of Engineers and the South Florida Water Management District, which has the potential to restore habitats and hydrological regimes in South Florida. Of particular concerns are Biscayne Bay (Serayf et al. 1997), Florida Bay, the Ten Thousand Islands (Fourqurean and Roblee 1999), and Charlotte. Three of these four areas support the last remaining populations of smalltooth sawfish in U.S. waters (Seitz and Poulakis 2002, Poulakis and Seitz 2004, Simpfendorfer and Wiley 2004).

**Boating activities.** Several environmental impacts have been associated with boating activities. These include pollutants associated with boat use and maintenance; pollutants carried by stormwater runoff from marinas; boating support facilities; and physical alteration and destruction of estuarine and marine habitats by boat propellers and dredging for navigation. Boat registrations have increased dramatically in Florida, and new boat designs allow ever faster boats to use ever shallower waters.

**Over utilization**

**Fisheries.** Large-scale directed fisheries for smalltooth sawfish have not existed. Historically, smalltooth sawfish were often bycatch in various fishing gears, including otter trawl, trammel net, seine, and, to a lesser degree, hand line. Reports of smalltooth sawfish becoming entangled in fishing nets are common in early literature from areas where smalltooth sawfish were once common, but are now rare, if not extirpated. Henshall (1895) noted that the smalltooth sawfish “does considerable damage to turtle nets and other set nets by becoming entangled in the meshes and is capable of inflicting severe wounds with its saw, if interfered with.” Evermann and Bean (1898) noted that smalltooth sawfish could be concentrated in areas such as the Indian River Lagoon, where on fisherman reported taking an estimated 300 smalltooth sawfish in just one netting season. Snelson and Williams (1981) attributed the loss of smalltooth sawfish in the Indian River Lagoon to heavy mortality associated with incidental captures by commercial fishermen. Baughman (1943) discussed documented and reported accounts of smalltooth sawfish being taken in shrimp trawls along the Texas coast.

The majority of the documented landings of smalltooth sawfish were from otter trawl fisheries. There were also landings from trammel nets, beach haul seines, pelagic longlines, cast nets, trap float lines, and hand lines. While there are no records of smalltooth sawfish captured in Louisiana waters since 1978, anecdotal information collected by NMFS port agents indicates that smalltooth sawfish are now taken very
rarely in the shrimp trawl fishery. Smalltooth sawfish are still occasionally documented in shrimp trawls in Florida, with four reports in the 1990s. Smalltooth sawfish are also occasionally captured in various Federal shark fisheries using drift gillnet and bottom longline. Based on mandatory observers placed on 2% of all shrimp trawls beginning in 2007 and 2008 for the Gulf of Mexico and South Atlantic, respectively, an increased number of smalltooth sawfish were reported, likely indicating that the previous observer coverage was missing a large number of interactions. In May of 2012, NMFS authorized 270 smalltooth sawfish to be captured by shrimp fishing boats over the next three years, with 90 mortalities approved during that time.

Smalltooth sawfish have historically occurred as occasional bycatch in the hook-and-line recreational fishery (Caldwell 1990). In Texas, Caldwell (1990) stated that sport fishermen in the bays and surf prior to the 1960’s took many sawfish incidentally but retained and displayed as trophy fish, but most were released. Caldwell noted that the saws of smalltooth sawfish were consistently removed prior to their live release and marks this as one of the reasons for their decline. Seitz and Poulakis (2002), Poulakis and Seitz (2004), and Simpfendorfer and Wiley (2004) indicate that smalltooth sawfish are still taken as bycatch, mostly by shark, red drum, snook, and tarpon fishers. Possession of smalltooth sawfish has been prohibited in Florida since April 1992. The records in the angler survey database indicate that only one sawfish was kept; this record was from 1990. There were 14 smalltooth sawfish recorded as kept in the guide survey database; one in 1991, one in 1992, and twelve in 1997.

**Research.** NMFS has authorized other research on smalltooth sawfish within the waters of the state of Florida. Much of this research already authorized will use the same methodology in the same locations as this permit. Besides the 45 captures authorized originally by this permit, Permit Number 15802 authorizes the capture and study of 125 neonates, 15 juvenile, and 65 adult smalltooth sawfish.

**Effects of the Proposed Action**

In this section of the Opinion, we assess the probable direct and indirect effects of authorizing the proposed procedures on smalltooth sawfish in the action area. We also summarize the results of studies that have examined the direct and indirect effects of each sampling procedure on these fish. We rely on these summaries of the literature to determine how individual smalltooth sawfish are likely to respond upon being exposed to a particular sampling procedure. Based on this body of information, we then assess the risks the activities contained in the proposed permit pose to the species as they are listed.

The specific stressors associated with the proposed permit are capture, handling and restraint during examinations, tagging, tissue sampling, and blood sampling. The following sections provide specific details of the stressors associated with each procedure and summarize the available data on the responses of individuals that have been exposed to the procedures.

**Capture**
The gillnets and longlines proposed for use in this research can result in mortality to
smalltooth sawfish (Musick et al. 2001, Simpfendorfer 2006) as seen through years of incidental captures in commercial fisheries. Much of the smalltooth sawfish mortality was due to the difficulty of removing smalltooth sawfish from fishing gear without damaging the gear. Most of the time, this meant lethal removal of the saw before returning the fish to the water to starve to death or killing the sawfish in the net and dropping the carcass overboard.

Research on smalltooth sawfish has been conducted under four permits for over 10 years. Table 4 shows the number of sawfish that have been captured, the number of sawfish that have been killed, and the number of listed sea turtle species that have been incidentally captured. To date, there have been no lethal takes of sawfish or sea turtles resulting from these research practices. Mitigation measures such as short sets and monitoring nets and longlines at all times while they are set reduce the chances of killing a listed species.

Table 4: number of sawfish and sea turtles captured, injured, or killed over the previous 10 years of permits.

<table>
<thead>
<tr>
<th>Permit Number</th>
<th>Sawfish captured</th>
<th>Sawfish injured or killed</th>
<th>Sea turtles captured (no recorded deaths)</th>
</tr>
</thead>
<tbody>
<tr>
<td>#13330 (2008-2012)</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>#1352 (2003-2008)</td>
<td>112</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>#1475 (2005-2008)</td>
<td>99</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>#1538 (2006-2008)</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

This project proposes to capture an additional 45 smalltooth sawfish each year until 2013. As demonstrated by commercial fisheries, there is a chance that smalltooth sawfish could die during capture, but mitigation measures included in the project have been proven to prevent mortality. Based on the results of fish captures in recent years, the previous research conducted by the applicant, and the thorough mitigation measures included with this project, NMFS does not expect any smalltooth sawfish mortalities.

**Handling**

Handling and restraining smalltooth sawfish may cause short term stress responses, but those responses are not likely to result in pathologies because of the short duration of the handling. The proposed methods of handling smalltooth sawfish are the same as have been carried out in previous permits and consistent with the handling of other elasmobranchs. Mitigation measures built into the handling protocols such as fish will not be held out of water for more than a minute without having sea water run over their gills, should negate the chance of mortality during handling and restraint. NMFS expects that individual sawfish would normally experience no more than short-term stresses as a result of these activities. No injury would be expected from these activities.

**Tagging**

Rototags, plastic headed dart tags, PIT tags, PAT tags, SPOT tags, and acoustic tags will be attached to smalltooth sawfish during the next five years. These tags have been used in this and previous smalltooth sawfish permits.
Rototags will be affixed to the smalltooth sawfish by punching holes in the dorsal fin using a leather punch. Manire and Gruber (1991) documented the effects of punching holes in the dorsal fins of elasmobranchs by taking 5mm hole punches from the fin of lemon shark. They found the holes were readily apparent for two to four weeks and became scars within a year of removing the punch from the dorsal fin. Heupel et al. (1998) monitored the effects of rototagging in carcharhinids. No infection was observed in tissues surrounding the wound. Disruption of the fin surface was observed due to abrasion by the tag, but did not appear to cause a severe tissue reaction. Even though the tags caused continued tissue disruption (until they fall off) no signs of infection were found in the tissue samples. They summarized that the use of rototags and Jumbo rototags appears to be an efficient way of marking elasmobranchs with minimal damage to the shark. They added that the mucous layer on the skin may be a primary response to injury that helps reduce ionic exchange and prevent infection of wounds. Therefore no swabbing of the area would be used to prevent any disruption to this natural mucous layer.

SPOT tags would be attached with nylon bolts through the dorsal fin so the effects would be very similar to that of rototags. Like rototags, the SPOT tags would work their way through the fin and leave no long-term damage. The use of satellite tracking tags is recommended for elasmobranchs over 150 cm (Simpfendorfer and Heupel 2004). However, to be conservative and ensure the tag to animal weight ratio is not exceeded SPOT tags would be used only on sawfish exceeding 200 cm in length.

Acoustic transmitters would be attached to sawfish via the rototag. To ensure the tag to animal weight ratio is not exceeded small transmitters (8mm) would be used on sawfish less than 200 cm. Sawfish over 200 cm would be fitted with 8mm or the larger 16 mm transmitters. The 16 mm transmitters have more battery power and can therefore be used for longer tracking. Since the transmitters are attached to the sawfish via a dorsal fin rototag, the transmitter/tag apparatus will eventually work its way through the fin and leave no long-term damage.

PIT tags have been used with a wide variety of animal species that include fish (Clugston 1996, Skalski et al. 1998, Dare 2003), amphibians (Thompson 2004), reptiles (Cheatwood et al. 2003, Germano and Williams 2005), birds (Boisvert and Sherry 2000, Green et al. 2004), and mammals (Wright et al. 1998). When PIT tags are inserted into animals that have large body sizes relative to the size of the tag, empirical studies have generally demonstrated that the tags have no adverse effect on the growth, survival, reproductive success, or behavior of individual animals (Brännäs et al. 1994, Elbin and Burger 1994, Keck 1994, Jemison et al. 1995, Clugston 1996, Skalski et al. 1998, Hockersmith et al. 2003). The smallest smalltooth sawfish researchers expect to capture is approximately 62 cm and therefore is well within the bounds of tag to animal weight ratio.

The effects of dart tags were analyzed by Heupel and Bennett (1997), who sampled the dermal and epidermal tissues of sharks and examined them histologically. Tissues from around tag sites were removed at time intervals ranging from 100 minutes to 284 days.
post-tagging. These samples showed acute and chronic responses to tagging. Acute responses consisted of localized tissue breakdown and hemorrhaging and occurred within the first few hours after tag insertion. At 10 hours post-tagging an intermediate response was apparent. This phase was characterized by further hemorrhaging and red and white blood cell movement into the wound area. The chronic response observed in the 10-284 day post-tagging samples was characterized by fibrous tissue formation to sequester the tag. This tissue presumably protects the adjacent musculature from further trauma produced by movement of the. Tissue repair appeared to progress consistently in all specimens and no secondary infections at the tag site were seen. Tagging produced only localized tissue disruption and did not appear to be detrimental to the long term health of individual sharks.

As a PAT tag would be attached using a nylon headed anchor the effects would be similar to those of the dart tags. When the PAT tag pops off the sawfish, the nylon headed anchor (and the monofilament) would remain implanted in the animal, resembling a streamer tag. The use of satellite tracking tags is recommended for elasmobranchs over 150 cm (Simpfendorfer and Heupel 2004). However, to be conservative and ensure the tag to animal weight ratio is not exceeded PAT tags would be used only on sawfish exceeding 200 cm in length.

In many cases, multiple tags will be applied to the same smalltooth sawfish. In all situations, the researchers have established length standards of the fish being tagged to ensure that the weight of the tags will not be detrimental to the fish being tagged.

**Tissue Sample**

The researchers would take a small tissue sample clipped with disinfected scissors from the dorsal fin for genetic analysis. The procedure is common and accepted practice in elasmobranch research. Research has shown that it does not impair the animal’s ability to swim and is not thought to have any long-term adverse impact. An extensive tagging program for small sharks has been underway at Mote Marine Laboratory since the early 1990s. Based on recapture data there has been no difference in recapture rate between clipped and unclipped blacktip sharks. This suggests that the survival of these animals is the same, and that fin clips do not have a significant long-term impact on the health of elasmobranchs. This method has been used on all sawfish captured under the previous activities of Permit No. 1352. No bleeding occurred upon taking the samples and the 23 recaptured animals showed no sign of infection at the site. NMFS would expect that the collection of a tissue sample would not cause any significant additional stress or discomfort to the animal beyond what was experienced during the other research activities.

**Blood Sample**

Caudal venipuncture has been performed by Mote Marine Laboratory Center for Shark Research staff on over 1,000 sharks, skates, and rays in a laboratory setting allowing for post-handling observation. No swabbing of the area prior to penetration will be used, as the effects of alcohol or betadine on the skin of sawfish is unknown. Dermatitis has been reported in some other elasmobranchs from the swabbing of the skin (Charles Manire,
Therefore, swabbing is not generally used unless the animal is going to be sampled numerous times and the effects of the agent applied to the skin can be observed in a controlled setting. No harmful side effects have been observed from the blood draws, and no known mortalities have resulted from the process. During a recent field collection of blood from over 50 bull sharks in the Caloosahatchee River all sharks were quickly sampled and successfully released. In order to ensure the samples are taken with minimal impact to the smalltooth sawfish, all staff listed on the permit to blood sample would be trained on blood draw procedures from experienced scientists and/or veterinarians, and practice on elasmobranchs held in captivity at their facility. Given the success of blood draws on many other elasmobranch species NMFS does not foresee any side effects from this process.

**Cumulative Effects**

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Coastal Florida has been heavily developed by private and state actions resulting in the loss of significant amounts of smalltooth sawfish habitat. More than 20 conservation, recreation, and civic organizations came together to write a “Blueprint for Economic and Environmental Leadership,” to address the state of Florida’s coastal environment. It appears more businesses and political leaders are recognizing the importance of a healthy environment to the economy of Florida. Despite the public awareness, NMFS is unaware of any actions being taken to reduce coastal development, repair or replace lost coastal habitat, or reduce pollution in the nearshore environment. NMFS is not aware of any future State, tribal, local, or private actions in the action area that have a bearing on the risk assessment contained in this Opinion.

**Conclusion**

After reviewing the current status of the smalltooth sawfish, the environmental baseline for the action area, the effects of the proposed additional research, and the cumulative effects, it is NMFS’s biological opinion that the issuance of this permit to the Southeast Fisheries Science Center is not likely to jeopardize the continued existence of the smalltooth sawfish.

Critical habitat has not been designated for smalltooth sawfish.

**INCIDENTAL TAKE STATEMENT**

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS
to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by USFWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Amount or Extent of Take

There will be no additional incidental take because the proposed action only requests an increase in the number of smalltooth sawfish captured and studied, but this should not result in an increase in the amount of effort being put forth.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

There are no additional conservation recommendations beyond the recommendations made in the original Opinion.

REINITIATION NOTICE

This concludes formal consultation on the proposed permit Southeast Fisheries Science Center [Permit Number 13330] pursuant to the provisions of section 10 of the Endangered Species Act. Reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of allowable take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.
LITERATURE CITED


Last, P.R. and J.D. Stevens.  1994.  Sharks and rays of Australia.  CSIRO Australia, East Melbourne, Australia.


Laboratory Technical Report 929.