White paper on potential ecosystem component species for the Dolphin Wahoo Fishery Management Plan

South Atlantic Fishery Management Council
Dolphin Wahoo Committee
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Jekyll Island, GA

Background

In March 2018, the Mid-Atlantic Fishery Management Council (MAFMC) requested that the South Atlantic Fishery Management Council (SAFMC) consider managing frigate mackerel (*Auxis thazard*) and bullet mackerel (*Auxis rochet*) as ecosystem component (EC) species in the Dolphin Wahoo Fishery Management Plan (FMP). The National Marine Fisheries Service (NMFS) disapproved inclusion of the two species in the MAFMC's Unmanaged Forage Omnibus Amendment, citing concerns over inconsistency with National Standard 2 and an insufficient connection to that Council's FMPs.

At the December 2018 meeting, the Dolphin Wahoo Committee of the SAFMC received a presentation on the presence of the two mackerel species in the diets of dolphin and wahoo and discussed the request from the MAFMC to manage bullet and frigate mackerel as EC species in the Dolphin Wahoo FMP. The Committee decided to further investigate the topic and have a more in-depth discussion on the potential for adding bullet mackerel, frigate mackerel, and possibly other prey species as ecosystem components at the March 2019 meeting. The Committee expressed particular interest in:

- Background information on fisheries for bullet and frigate mackerel.
- Identifying other major prey species for dolphin and wahoo, potentially focusing on flying fish and squid.
- The concept of adding unmanaged prey species to a FMP as an ecosystem component as well as regulatory permeameters and mechanisms for doing so.
- How other Councils have addressed unmanaged prey species through designating them as ecosystem components in FMPs and potential management options.

Fisheries for bullet and frigate mackerel

According to data provided by a query of the landings database for the Atlantic Coast Cooperative Statistics Program (ACCSP), commercial landings of bullet and frigate mackerel over the past 20 years were only reported by dealers in the Mid-Atlantic and New England regions and were all reported as frigate mackerel. Bullet mackerel and frigate mackerel are similar in appearance and it is possible that some landings of bullet mackerel may have been misidentified as frigate mackerel. Additionally, federal observer data has included records of small amounts of bullet mackerel caught in bottom trawl tows which resulted in landings of longfin squid, black sea bass, and summer flounder, indicating that the species are caught in some commercial fishing operations as bycatch (MAFMC 2017).

Commercial landings of frigate mackerel are provided in **Table 1**. Commercial landings of frigate mackerel have been variable but typically are relatively low, averaging 4,508 pounds (lbs) annually over the past twenty years of available data (1998 through 2017) and 1,677 lbs annually over the past ten years (2008 through 2017). Based on the relatively low annual landings in most years, it appears that frigate mackerel are typically caught incidentally to other species. The average ex-vessel price and value have been highly variable as well, with ex-vessel prices as low as $0.16/lb to upwards of $1.50/lb and annual ex-vessel values of less than $538 to upwards of $9,792 (2017 dollars). The species have largely been landed commercially using gill net, pound net, float trap, and otter trawl gears.

Table 1. Commercial landings, ex-vessel value, and ex-vessel price for frigate mackerel landed from the U.S. Atlantic Ocean, 1998-2017 (2017 dollars). * denotes confidential data.

Year	Landings (lbs)	Ex-Vessel Value	Average Ex-Vessel Price
1998	2,989	$664	$0.22
1999	36,472	$5,875	$0.16
2000	19,682	$9,792	$0.50
2001	6,343	$6,705	$1.06
2002	1,714	$1,763	$1.03
2003	4,013	$2,430	$0.61
2004	*	*	*
2005	*	*	*
2006	*	*	*
2007	*	*	*
2008	*	*	*
2009	*	*	*
2010	*	*	*
2011	3,467	$3,052	$0.88
2012	457	$538	$1.18
2013	*	*	*
2014	5,674	$6,215	$1.10
2015	*	*	*
2016	894	$1,342	$1.50
2017	*	*	*
20-year average	4,508	$2,391	$0.93
10-year average	1,677	$1,654	$1.14

Source: ACCSP Commercial Landings Query.

Recreational landings of bullet and frigate mackerel are provided in **Table 2**. Recreational landings have been variable and sporadic, averaging 1,159 lbs for bullet mackerel, 3,571 lbs for frigate mackerel, and 4,730 for both species combined annually over the past twenty years of available data (1998 through 2017). Recreational catches of bullet and frigate mackerel have largely occurred in the South Atlantic Region, with some limited catches reported from the Mid-Atlantic Region. Based on the relatively low annual landings, it appears that bullet and frigate mackerel are typically caught incidentally to other species. In most circumstances, the catch

estimates are accompanied by relatively high PSEs, which is likely reflective of relatively few intercepts.

Table 2. Recreational landings of bullet mackerel and frigate mackerel from the U.S. Atlantic Ocean, 1998-2017.

Year	Bullet Mackerel Landings (lbs)	Frigate Mackerel Landings (lbs)	Combined Landings (lbs)
1998	211	0	211
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0
2007	0	0	0
2008	0	0	0
2009	0	0	0
2010	0	322	322
2011	166	0	166
2012	296	51,856	52,152
2013	0	17,592	17,592
2014	786	0	786
2015	0	1,618	1,618
2016	11,467	0	11,467
2017	10,247	34	10,281
20-year average	1,159	3,571	4,730
10-year average	2,296	7,142	9,438

Source: ACCSP Recreational Landings Query.

Important prey species for dolphin and wahoo

Dolphin

Poland (2014) was used as a starting point to identify other potential prey species that the SAFMC may want to consider when discussing adding EC species to the Dolphin Wahoo FMP. When describing the findings of dolphin diets in the South Atlantic, the paper finds that "*dolphinfish had very diverse diets and were mostly piscivorous in their prey selection which was dominated by Sargassum associated species and surface schooling prey…Dominant prey recovered from the diets of dolphinfish based on frequency of occurrence and mass included juvenile carangids* (i.e. pompanos, jacks, jack mackerels, runners, and scads)*, porcupine fish, filefish, pufferfish and sargassum swimming crabs, which have been found to show high fidelity for Sargassum spp. habitat…Other important prey species recovered that are not generally*

associated with Sargassum included flying fish, jacks, bullet tuna (Auxis spp.), paper nautiluses and shortfin squid (Illex illecebrosus), as well as cannibalized dolphinfish."

Wahoo

When describing the findings of wahoo diets in the South Atlantic, Poland finds that "*wahoo diets were dominated by surface and deep schooling prey which is consistent with other studies in the Atlantic that have observed large squid and scombids as the primary prey of wahoo…The most dominant prey by occurrence, mass and number in the diets of wahoo was bullet tuna…Other important fish prey included flying fish, large jacks, file fish and trigger fish, but these fish occurred with low frequency relative to scombids. Paper nautiluses, shortfin squid, longfin inshore squid and Atlantic bird squid were the most dominant squid and octopods found in wahoo diets and were more commonly eaten during the spring and summer*."

Out of the major forage species listed, dolphin, some jack and triggerfish species, as well as shortfin and longfin squid are currently under federal management through FMPs developed by NMFS and either the SAFMC or MAFMC. The habitat often associated with dolphin and some wahoo forage species, *Sargassum*, is managed by the SAFMC through an FMP as well. Out of the remaining species identified (excluding bullet and frigate mackerel), that leaves porcupine fish, filefish, pufferfish, sargassum swimming crabs, flying fish, paper nautiluses, and Atlantic bird squid (flying squid) as identified unmanaged dominant forage species for dolphin and wahoo. **Table 3** summarizes average annual commercial and recreational landings of these species from 1998 through 2017 based on available landings data from a query of the ACCSP dataset. With the exception of filefish and pufferfish, annual landings for the selected species was relatively low or was not captured in the queried landings datasets.

Table 3. Average annual commercial and recreational landings of porcupinefish, filefish, pufferfish, Sargassum swimming crab, flying fish, paper nautiluses, and Atlantic bird squid from the U.S. Atlantic Ocean, 1998-2017.

Species	Average Commercial Landings (lbs)	Average Recreational Landings (lbs)
Porcupine fish[1]	527	1,470
Filefish	2,260	50,304
Pufferfish[2]	10,767	53,359
Sargassum swimming crab	-	-
Flying fish	2,260	2
Paper nautiluses	-	-
Atlantic bird squid	-	-

Source: ACCSP Commercial and Recreational Landings Query
[1]Only inclusive of landings from 2009-2017
[2]Excludes northern pufferfish
"-" indicates that no landings were found.

Regulatory parameters for adding ecosystem component species to an FMP

There is no mention of "ecosystem component" in the Magnuson-Stevens Fishery Conservation and Management Act (MSA) itself, so the legal basis for the concept in the Act

presumably is derived from multiple references to "ecosystem" and MSA Section 303(b)(12) authority for Councils "to conserve target and non-target species and habitats" through FMPs. The guidance from the MSA is somewhat limited as to the proper scope of any resulting regulatory measures from listing EC species, making it important for Councils to add EC species to an FMP in a logical and consistent manner, particularly if there are associated potentially restrictive regulations. Per the National Standard Guidelines (50 C.F.R §600 Subpart-D), Councils do have the option to establish EC species within an FMP if they determine that the species do not require conservation and management, but should be listed in an FMP in order to achieve ecosystem management objectives. In such a case, the National Standard Guidelines provide some guidance on factors that a Council should consider when determining whether species need conservation and management as well as whether species can be considered as ecosystem components. The following descriptions provide information on the definition of EC species and how EC species may be considered for addition to a FMP.

What are ecosystem component species?

EC species are defined as "*stocks that a Council or the Secretary has determined do not require conservation and management, but desire to list in an FMP in order to achieve ecosystem management objectives*" (50 C.F.R §600.305(d)(13)). While the Dolphin Wahoo FMP has been involved in an ecosystem based amendment before through the SAFMC's Comprehensive Ecosystem-Based Amendment 1 (CE-BA 1), specific "ecosystem management objectives" have not been fully developed in the FMP. If the SAFMC decides to pursue the addition of EC species that are unmanaged prey of dolphin and wahoo, it may be helpful to specify ecosystem management objectives that these species may address.

NMFS has encouraged ecosystem-based fishery management where applicable and has offered guidance through an Ecosystem Based Fishery Management Policy that lists the following six guiding principles[1]:

1. Implement ecosystem-level planning
2. Advance understanding of ecosystem processes
3. Prioritize vulnerabilities and risks to ecosystems and their components
4. Explore and address trade-offs within an ecosystem
5. Incorporate ecosystem considerations into management advice
6. Maintain resilient ecosystems

The SAFMC may choose to rely on some of these guiding principles when developing ecosystem management objectives. Since the prey element of the EC species is presumably the focus of adding bullet mackerel, frigate mackerel, and potentially other species, it appears that the SAFMC could focus on Principles 3, 5, and 6. Addressing unmanaged prey species as ecosystem components may reduce ecosystem risks, incorporate ecosystem consideration into management, and maintain a resilient ecosystem for dolphin and wahoo.

[1] NMFS Ecosystem-Based Fisheries Management Policy can be accessed at: https://www.fisheries.noaa.gov/resource/document/ecosystem-based-fisheries-management-policy

What should be considered when determining if a species or stock requires "conservation and management"?

According to National Standards General guidelines as found in 50 C.F.R §600.305(c)(1) *"…a Council should consider the following non-exhaustive list of factors when deciding whether additional stocks require conservation and management:*

(i) The stock is an important component of the marine environment.

(ii) The stock is caught by the fishery.

(iii) Whether an FMP can improve or maintain the condition of the stock.

(iv) The stock is a target of a fishery.

(v) The stock is important to commercial, recreational, or subsistence users.

(vi) The fishery is important to the Nation or to the regional economy.

(vii) The need to resolve competing interests and conflicts among user groups and whether an FMP can further that resolution.

(viii) The economic condition of a fishery and whether an FMP can produce more efficient utilization.

(ix) The needs of a developing fishery, and whether an FMP can foster orderly growth.

(x) The extent to which the fishery is already adequately managed by states, by state/Federal programs, or by Federal regulations pursuant to other FMPs or international commissions, or by industry self-regulation, consistent with the requirements of the Magnuson-Stevens Act and other applicable law."

If it is determined that a stock requires conservation and management then "*such stocks must have ACLs, other reference points, and accountability measures. Other stocks that are identified in an FMP (i.e., EC species or stocks that the fishery interacts with but are managed primarily under another FMP)…do not require ACLs, other reference points, or accountability measures*" (50 C.F.R §600.310(d)(1)).

How can a Council designate species as ecosystem components?

Under National Standards General guidelines, "*Councils may choose to identify stocks within their FMPs as ecosystem component (EC) species…if a Council determines that the stocks do not require conservation and management based on the considerations and factors in paragraph (c)(1) of this section. EC species may be identified at the species or stock level, and may be grouped into complexes. Consistent with National Standard 9*[2]*, MSA section 303(b)(12)*[3]*, and other applicable MSA sections, management measures can be adopted in order to, for example, collect data on the EC species, minimize bycatch or bycatch mortality of EC species, protect the associated role of EC species in the ecosystem, and/or to address other ecosystem issues*" (50 C.F.R §600.305(c)(5)). In the case of frigate and bullet mackerel, it appears that the species may have the potential to be listed as EC species if the Council and the Secretary of Commerce agree that the species do not fit the requirements for implementing conservation and

[2] National Standard 9 covers bycatch.

[3] From MSA 303(b)(12) when discussing discretionary provisions of an FMP: "include management measures in the plan to conserve target and non-target species and habitats, considering the variety of ecological factors affecting fishery populations."

management measures but are important in relation to ecosystem management of dolphin or wahoo stocks in the U.S. Atlantic Exclusive Economic Zone.

Mechanisms for adding prey species as ecosystem components

To add an EC species to a FMP, an amendment must take place. Some Councils, such as the Pacific and Mid-Atlantic, have designate EC species through a comprehensive amendment that added EC species to multiple FMPs at once. This is not required and a Council can add EC species to a single FMP.

How other Councils have designated unmanaged prey species as ecosystem components

Mid-Atlantic Fishery Management Council

The MAFMC developed an Unmanaged Forage Omnibus Amendment intended "*to prohibit the development of new and expansion of existing directed commercial fisheries on unmanaged forage species in mid-Atlantic federal waters until the Council* (MAFMC) *has had an adequate opportunity to assess the scientific information relating to any new or expanded directed fisheries and consider potential impacts to existing fisheries, fishing communities, and the marine ecosystem*" (MAFMC 2017). This amendment comprehensively implemented management measures for 17 species and groups of species, with 16 of the species or species groups being designated as ecosystem components in all of the MAFMC's FMPs. The amendment established a possession limit for all EC species combined, along with permit, transit, and reporting provisions and became effect September 27, 2017. The following specific measures were implemented[4]:

- Possession limit: A 1,700 pound possession limit for all EC species combined.
- Permit: Requirement that all commercial vessels and operators that catch and/or possess EC species be issued a commercial vessel and operator permit from NMFS.
- Transit provisions: Allows commercial vessels to transit the Mid-Atlantic Forage Species Management Unit, which covers an area from approximately Hatteras, North Carolina through Connecticut, with an amount of EC species onboard that exceeds the possession limit to land in a port outside of the management unit provided that the fish were harvested outside of the management unit and that all gear is stowed and not available for immediate use while transiting.
- Record keeping and reporting: Requires vessel operators and seafood dealers to report the catch and sale of EC species on existing vessel trip reports and dealer reports.

EC species included in the amendment were anchovies, argentines/smelt herring, greeneyes, halfbeaks, lanternfish, round herring, scaled sardine, Atlantic thread herring, Spanish sardine, pearlsides/deepsea hatchetfish, sand lances, silversides, cusk-eels, Atlantic saury, unmanaged pelagic mollusks except sharptail softfin squid, and species under 1 inch as adults (Copepods, krill, and amphipods). While initially proposed for inclusion in this amendment, frigate mackerel (*Auxis thazard*) and bullet mackerel (*Auxis rochet*) were excluded before the

[4] As outlined on the MAFMC's website at: http://www.mafmc.org/actions/unmanaged-forage

amendment's implementation, with NMFS citing concerns over inconsistency with National Standard 2[5] and an insufficient connection to the MAFMC's managed species. At least part of the concern over National Standard 2 appears to be based on the two mackerel species falling outside of the guidelines for defining forage species that were developed by the MAFMC's Scientific and Statistical Committee (SSC).

Pacific Fishery Management Council

The Pacific Fishery Management Council (PFMC) developed a Comprehensive Ecosystem-Base Amendment 1 (CEBA 1), effective May 4, 2016, that "*prohibits the development of new directed fisheries on forage species that are not currently managed by the Council* (PFMC)*, or the States, until the Council* (PFMC) *has had an adequate opportunity to assess the science relating to any proposed fishery and any potential impacts to our existing fisheries and communities*." It is stated that the amendment "*is not a permanent moratorium on fishing for forage fish. Instead, the Council* (PFMC) *adopted COP (*Council Operating Procedure*) 24, which outlines a review process for any proposed fishery*" (PFMC 2016). COP 24 provides a standard process for the PFMC, advisory bodies, and the public to consider EFP proposals for EC species intended to develop scientific information that may lead to potential future directed fisheries for one or more of the EC species[6] (PFMC 2016).

CEBA 1 included round herring, thread herring, mesopelagic fishes of the families *Myctophidae, Bathylagidae, Paralepididae*, and *Gonostomatidoae*, pacific sand lance, pacific saury, silversides, smelts of the family *Osmeridae*, and pelagic squids. The stated rationale of the PFMC to identify these species and groups of species for inclusion as EC species was "*to address "other ecosystem issues," because these species are the broadly used prey of marine mammal, seabird, and fish species in the U.S. West Coast EEZ. Shared EC Species are among the known prey of FMU species of all four of the Council's FMPs; therefore, Shared EC Species support predator species' growth and development…*" (PFMC 2016). CEBA 1 amended four of the PFMC's finfish FMPs and according to the amendment document, no new directed fishing can begin for EC species without a Council-related process to develop an exempted fishing permit. EC species can continue to be taken incidentally and landed or discarded, unless regulated or restricted for other purposes, such as with bycatch minimization regulations. The prohibition on directed commercial fisheries for EC species the following specific measures[7]:

General measures:

- Retention limit: A prohibition on landing EC species without any other species onboard.
- Trip limit: A vessel trip limit of 10 metric tons combined weight of all EC species onboard.
- Annual limit: An annual vessel limit of 30 metric tons combined weight of all EC species in a calendar year.
- Processing limitation: A prohibition, with limited exceptions, of at-sea processing of EC species.

[5]National Standard 2 covers scientific information.
[6] The PFMC's COP 24 can be found at: http://www.pcouncil.org/wp-content/uploads/2015/12/cop24.pdf
[7] As outlined in Federal Register implementing CEBA 1: http://www.pcouncil.org/wp-content/uploads/2016/04/2016-07516.pdf

Trawl gear measures:

- Trip limit: A vessel trip limit of 1 metric ton combined weight of all EC species onboard, with the exception of EC squid species.
- Annual limit: An annual vessel limit of 40 metric tons combined weight of any EC squid species in a calendar year.

No long-term directed EEZ fisheries are possible for the listed EC species without a future FMP amendment to specify the targeted species as a fishery management unit (FMU) species and to meet Magnuson-Stevens Act requirements for FMU species, which include: developing harvest specifications, identifying essential fish habitat (EFH) for the species, and providing gear specifications for the fishery (PFMC 2016).

North Pacific Fishery Management Council

The North Pacific Fishery Management Council (NPFMC) recently classified squids as EC species through amendments to their Bering Sea Aleutian Islands (BSAI) Groundfish and Gulf of Alaska (GOA) Groundfish FMPs (NPFMC 2018a and 2018b). The NPFMC noted that "*squid are important prey species for marine mammals, fish, and other squid*" and "*although squid do not require conservation and management, it is still appropriate to take measures to minimize squid bycatch to the extent practicable. This is consistent with Nation Standard 9 and the Councils* (NPFMC) *long-standing practice of minimizing the bycatch of species such as forage fish and grenadiers that are important to the ecosystem but that do not require conservation and management"* (NMFS 2018).

In addition to classifying squids as EC species, the two amendments prohibited directed fishing for squids in the BSAI or GOA groundfish fisheries, maintained record keeping and reporting requirements to record and report catches of squids, and specified retention limits for squids. These amendments became effective on August 6, 2018. Specific measures were as follows[8]:

- Record keeping and reporting: catch, discard, and production of squid must be recorded in logbooks or on catch or production reports.
- Retention limit: the maximum retainable amount of squid is not to exceed 20 percent of the total landings retained.

South Atlantic Fishery Management Council

While not directly implemented due to concerns over the protection of prey species, the SAFMC has listed several EC species in the Snapper Grouper FMP, including longspine porgy, cottonwick, ocean triggerfish, bank sea bass, and rock seabass. There are no regulations associated with the EC species listing, but the listing has prioritized the species for continued

[8] As outlined in Federal Register implementing BSAI Groundfish Amendment 117 and GOA Groundfish Amendment 106: https://www.federalregister.gov/documents/2018/07/06/2018-14457/fisheries-of-the-exclusive-economic-zone-off-alaska-reclassifying-squid-species-in-the-bsai-and-goa

data collection that may help with future ecosystem modeling and ecosystem-based fishery management efforts.

Implications of listing a prey species as an ecosystem component in an FMP

The implications of listing a prey species as an ecosystem component varies and is highly dependent on the management measures put in place around that species. In general, doing so recognizes the ecosystem role of the species as prey for species that a Council directly manages and can encourage resiliency of a specified Council-managed stock. Based on measures that other Councils have implemented, listing EC species can provide protection for the species from directed effort or an unexpected rapid ramp-up in landings while allowing for orderly growth in such fisheries if desired. If bycatch is a concern, then this can also be addressed when listing EC species. Listing a species as an ecosystem component may also prioritize it for research and monitoring. This may come as a potential cost to some fishery participants through a cap on potential revenue streams and to a Council and NMFS by dedicating resources to listing EC species in an FMP, implementing any resulting regulations, and providing monitoring.

Potential options for addressing EC species

As shown through past actions of the SAFMC and other Councils, there are several options that the SAFMC may have if designating prey species as ecosystem components. The seemingly flexible guidance that is provided in parts of the Nation Standard Guidelines appears to also encourage "out of the box" thinking on the part of Councils wishing to list EC species provided that ideas remain within the existing constraints. While not an exhaustive list, it appears that the SAFMC may have the following general options in **Table 4** when considering listing unmanaged prey species as ecosystem components in the Dolphin Wahoo FMP based on how other Councils have addressed adding EC species to FMPs within their jurisdiction.

Table 4. Potential options for listing unmanaged prey species as ecosystem components in the Dolphin Wahoo FMP.

Options	Description
Request guidance from the SSC	Request guidance from the SSC on identifying prey species to be listed as ecosystem components.
Designate EC species with no management related items	Designate EC species with no management related items such as trip or possession limits. This is similar to actions taken to list some snapper grouper species as EC species in the Snapper Grouper FMP and may elevate the importance of the species for research and monitoring purposes.
Prohibit or limit a directed fishery (trip limit)	Prohibit directed fisheries for designated EC species by establishing a trip limit which can be based on a total amount or a percent of total trip landings. This trip limit can apply across all gears or can focus on specific gears.
Prohibit or limit a directed fishery (annual vessel limit)	Prohibit directed fisheries for designated EC species by establishing an annual vessel limit.
Implement a reporting requirement	Establish or focus reporting requirements towards EC species such as through logbooks or dealer reports.
Implement a permit requirement	Establish permit requirements for EC species.

Implement a protocol for building directed fisheries for EC species	Establish a mechanism or protocol for allowing the development of a directed fishery for species listed as ecosystem components.
Other options???	Under National Standards General guidelines *"management measures can be adopted in order to…address other ecosystem issues."* Are there "other ecosystem issues" not listed that need to be addressed in the Dolphin Wahoo FMP and what management measures could be created to do so?

Sources

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